



THE GREEN MOUNTAIN GEOLOGIST

NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

Summer 2002

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VERMONT GEOLOGICAL SOCIETY SUMMER FIELD TRIP

Mt. Independence State Historic Site
Orwell, Vermont
July 20, 10 AM

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THE GREEN MOUNTAIN GEOLOGIST
VERMONT GEOLOGICAL SOCIETY
DEPARTMENT OF GEOLOGY
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ADDRESS CHANGE?

Please send it to the Treasurer at the above address.

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PRESIDENT'S LETTER

June 24, 2002

Dear Members:

I hope you are all having a productive and relaxing summer. This is a short note to accompany our short summer GMG.

I want to thank all the presenters and their advisors for such interesting and professionally-presented papers at our spring student meeting on April 20. All participants deserve to be congratulated for their excellent contributions to geology in Vermont and elsewhere – Maine, Utah, Oregon, New Zealand, Honduras and Antarctica. And also thanks to the geology gods for scheduling the Ausable Forks earthquake that morning!

I also want to encourage members to participate in our two planned field trips: the first in July and the second in September. Details are included in this edition of the GMG.

Finally, I invite nominations to fill three executive committee positions in the society. Helen Mango, our current VP, will move into the president's slot next year. Thus, we need a person to be VP next year with the understanding that in the following year, they will become president. Also, after years of exceptional service, Treasurer Kristen Underwood and Secretary Jeff Hoffer have decided to step down next year. So, please send me names of people who might be interested in filling the VP, Treasurer, and Secretary positions next year.

Sincerely,
Ray Coish
coish@middlebury.edu

VGS SUMMER FIELD TRIP

Mount Independence, Orwell, VT led by Dr. Helen Mango,
Castleton State College

July 20 at 10 am - 1 pm

Directions to Mount Independence. Make your way to Rt. 22A in western Vermont. Rt. 22A runs from Fair Haven to Vergennes. Take Rt. 22A to the intersection with Rt. 73 in Orwell. Go west on Rt. 73 (towards Lake Champlain). In 0.3 miles, Rt. 73 bends right and the road to Mount Independence goes straight (there's a sign). Continue 5 miles to the end of the road. (Just after the road turns to dirt, there's a fork, and Mount Independence is up the left route, around a small hairpin turn.) Park in the parking lot on the left, across from the museum (which looks like a boat).

Alternately, one could take Rt. 100 to the intersection with Rt. 73, then follow Rt. 73 west through Brandon, Sudbury and Orwell, and then follow the directions above to get to Mount Independence.

We will also have a brief business meeting and Earth Science Week planning discussion following the hike. Bring your own lunch and snacks.

ADVANCEMENT OF SCIENCE COMMITTEE

The Committee is pleased to announce the launch of the Vermont Geological Society's website at:

<http://www.uvm.org/vtgeologicalsociety>

The site presently includes the Society's Constitution and Bylaws, a calendar of events, a list of contacts for the Executive Committee and the Chairs of the Special Committees, a list of VGS publications, instructions for submitting a VGS Research Grant proposal, and several interesting geological links. Coming soon will be a downloadable annual dues form. The Committee will be adding content to the website continually, and is especially interested in

digital photos or scannable print photos of interesting geological sites in Vermont. Please send any photos, and any other information pertinent to Vermont geology and the Society, to me at showe@csc.albany.edu for inclusion in the website.

No applications to the Research Grant Program were received by the April 1st deadline. The Committee is considering adding a second round of reviews with an October 1st deadline. This will be discussed further at the next Executive Committee meeting following the Mt. Independence field trip.

The Committee intends to begin soliciting field trip manuscripts for a new issue of Vermont Geology. It hopes to include descriptions and road logs from several past and upcoming VGS field trips, and possibly from a field trip being offered during the Vermont National Education Association Meeting in October.

Respectfully submitted,

Stephen S. Howe
Chair, Advancement of Science Committee

VGS CALENDAR 2002

- July 20: VGS Summer Field Trip, Mt Independence State Historic Site, Trip Leader- Helen Mango
- July 27-28: 23rd Annual Champlain Valley Gem, Mineral and Fossil Show, Tuttle Middle School, Dorset St., South Burlington, VT
- August 17: Champlain Thrust Canoe Trip, Green Mtn Club, 802-860- 0724, Trip Leader- Jon Kim
- Sept. 14: VGS Fall Field Trip, details TBA
- Sept. 27-29: New England Intercollegiate Geologic Conference, Lake George, New York
- October 12: OMYA, Inc. Quarry Open House for Earth Science Week 2002
- October 13-19: Earth Science Week 2002
- October 24: Vermont NEA Convention Field Trip, Trip Leaders- Christine Massey and Shelley Snyder

EXECUTIVE COMMITTEE MEETING MINUTES

Middlebury College, Middlebury, VT

April 20, 2002

3:00 pm - Meeting called to order by Ray Coish
Present: Ray Coish, Helen Mango, Steve Howe, Tim Grover, Christine Massey, Kristen Underwood

Student Paper Awards presented earlier today:

Charles G. Doll Award (\$100): Christopher Kautz
2nd Place Award (\$75): Parham Gardner
3rd Place Award (\$50): Anna Cotton

Stephen Howe announced the release of a new webpage for the Vermont Geological Society. The site presently includes the organization's By Laws and a schedule of upcoming events. There was discussion of placing a general invitation to new members including an announcement of annual dues and address of the VGS treasurer as a downloadable pdf file on the web site. Stephen will do this. All who have VT geology pictures, articles, papers and /or information to share are invited to submit them to Stephen for the Society to consider posting on the website.

Reports from Officers: President Ray Coish, reported that a letter of support for the Vermont Geological Survey, drafted by Jeff Hoffer and Ray, was forwarded from the Vermont Geological Society to State Senators and Representatives in March. VGS did not receive responses from the legislators.

Treasurer, Kristen Underwood, reported that the financial position of the Society remains strong. A slew of dues payments were received in the last week following the general notice sent via email and mail to those individuals whose membership had lapsed. Stephen and others raised the question of merging the duties of Treasurer and Membership Coordinator, for efficiency's sake.

Reports from Committees: Education - Christine Massey and Shelley Snyder are working together on a Field Trip entitled Geologic Sites in Northwestern Vermont to be offered in October, 2002, during the VT National Education Association Meeting for teachers, in Essex. This is a shorter version of their 1999 NEIGC trip. Earth Science Week preparations are slowly underway with Geologists in the Parks (Marjie

Gale) and the Poster Contest (Perkins Museum). OMYA may be planning another event as well. Larry Becker, State Geologist, is working to help create a Vermont State-Based Alliance to foster earth science education-stay tuned for further developments. The Perkins Geology Museum is moving forward in its project to digitize the collections of the Perkins Museum, including the Vermont State Collection. An on-line learning environment is in the development stages. Digital archive users will also be able to access the new database from new educational exhibits in the renovated Perkins Museum.

Advancement of Science - Steve Howe. Another issue of Vermont Geology is being considered. Possible inclusions are: a road log from Helen Mango's upcoming Summer VGS Field Trip (July 20), a writeup or road log from the upcoming Fall VGS Field Trip (Sept 14).

No applications for Student Research Grants were received by the April 1st deadline. There was discussion of adding a Fall deadline, which may be more suitable for the undergraduate students.

While past meetings recognized that publication of the Summer GMG could be optional, the group discussed that there appears to be enough material to warrant publication. Deadline for submissions for the Summer GMG is June 22. More information is pending regarding the issue of whether to change the name of the Society to "Geological Society of Vermont". This topic will be placed on the agenda for the Summer meeting.

3:40 pm - Meeting adjourned.

CALL FOR NOMINATIONS

VGS EXECUTIVE COMMITTEE

The election of the VGS Executive Committee officers for 2003 will take place at the VGS meeting following the Fall field trip. We need nominations for Vice-President, Secretary, and Treasurer. Please forward nominations to Jeff Hoffer, 167 Boynton Street, Barre, VT 05076 (geohoff@AOL.com) or to Ray Coish at coish@middlebury.edu

VGS TREASURER'S REPORT

The financial condition of the Society remains strong. The checking account balance is \$3,889.24 as of June 24, 2002. All bills received by me have been paid and are reflected in the above balance. The Society appreciates the response from Members as we went through a process to update lapsed memberships this Spring. It is evident that geologists across Vermont and New England value the Society and its ongoing sponsorship of educational outings, professional meetings, and student research. Thank you for your renewed support. Finally, I would like to notify the Society that I will leave my position of Treasurer effective this Fall at the Society's Annual Meeting. It has been a pleasure to serve the Society over the past 3 years. Any member who wishes to serve as Treasurer beginning in October 2002, please feel free to notify myself or Ray Coish.

Sincerely,
Kristen L. Underwood

Income and Expenses - 1/1/02 through 6/24/02

INCOME

Total Dues		\$1,453.00
Dues-Family	\$100.00	
Dues-Institution	\$70.00	
Dues-Member	\$1,275.00	
Dues-Student	\$8.00	
Interest Through January		\$0.57
Publications (UVM Geology)		\$30.00
Credit for Lost Student Check		\$30.00
Dues Overpayment		\$10.00
Student Research Grant Contributions		\$270.00
TOTAL INCOME		\$1,793.57

EXPENSES

US Post Office (stamps, GMG Distribution)	\$8.50
GMG Publishing	\$229.57
Earth Science Week Poster Awards	\$30.00
Expense Reimbursement (UVM Geology)	\$30.00
Student Awards (VGS Spring Mtg)	\$225.00
TOTAL EXPENSES	\$523.07

TOTAL INCOME - EXPENSES

\$1,270.50

GEOLOGY OF THE MOUNT INDEPENDENCE STATE HISTORIC SITE, ORWELL, VERMONT

Helen N. Mango, Department of Natural Sciences, Castleton State College, Castleton, VT 05735

Geologic Setting

The rock formations found at Mount Independence are typical of Cambrian and Ordovician sedimentary deposition on the passive margin that developed on the east coast of ancient North America (Laurentia). Beginning in the Late Proterozoic, rifting of a supercontinent began, leading to the formation of the Iapetus Ocean (forerunner of the present-day Atlantic Ocean) with Laurentia as the landmass to the west. Approximately 600 m.y. ago, sediment, at first of continental origin, began to accumulate on the eastern margin of Laurentia. As rifting continued, sedimentation on the developing passive margin became of shoreline and shallow marine affinity. The earliest of these sedimentary units occurring in western Vermont (Dalton, Cheshire, Dunham, Monkton, and Winooski Formations) are not found at Mount Independence; here, the oldest unit is the medial Late Cambrian Potsdam Formation, a quartz sandstone which unconformably overlies the Proterozoic metamorphic rocks of the Adirondack massif just to the west. Overlying the Potsdam Formation is the Late Cambrian Ticonderoga Formation, a sandy dolomite which marks the transition from a shoreline to more of a shallow marine environment. Overlying the Ticonderoga Formation is the Late Cambrian/Early Ordovician Whitehall Formation, which is mostly a massive dolomite, and then the cross-bedded sandstone at the base of the Early Ordovician Great Meadows Formation. The Whitehall and Great Meadows Formations belong to the Beekmantown Group. All formations dip gently to the north, at angles of between 4 and 10°, averaging 6 or 7°. The formation names used are from the New York stratigraphy because of lithologic similarities and geographic proximity; the equivalent "Vermont" stratigraphic names are given below:

New York – Champlain Valley	Vermont – Middlebury Synclinorium
Great Meadows	Cutting
Whitehall	Shelburne
Ticonderoga	Clarendon Springs
Potsdam	Danby

Road Log

Mount Independence is located in Orwell, Vermont, five miles west of the intersection of Vermont Routes 22A and 73. From that intersection, go west on Rt. 73 (toward Lake Champlain and away from the village of Orwell). In about 0.3 miles, Rt. 73 curves to the right (north); bear left on the road to Mount Independence (there's a sign). Continue to the end of this road. Just after the road turns to dirt, there is a fork in the road. Bear left, up a steep little hairpin turn. The parking lot for the Mount Independence State Historic Site is on the south side of the road (on your left) and the museum is on the north side (it's the building that looks like a boat). Park in the parking lot.

Note: 1.8 miles after the intersection of Rts. 22A and 73, as you head toward Mount Independence, you will go down a short, fairly steep descent. This marks the Champlain Thrust, one of the largest structural features of western Vermont.

Note: Bring a lunch and something to drink. There is nowhere to purchase supplies closer than the village of Orwell, which is six miles away.

This tour is done entirely on foot, and follows the colored and numbered trails of the State Historic Site (make sure you get a trail guide brochure). Therefore, instead of mileage notations, trail numbers and stop location descriptions will be given in this guide. Approximate compass directions will be given for orientation purposes. The trip will take three or four hours, and includes a fairly leisurely 3.5 mile walk and a little scrambling up talus slopes and through the trees.

Warning: Mount Independence is well endowed with poison ivy! Be vigilant!

Warning: Mount Independence is a State Historic Site. To the untrained eye, many of the historically important buildings remain bear a striking resemblance to scattered outcrops. Please make sure you know what rocks you're looking at before you start examining them too closely!

On the southern side of the parking lot is a signpost. From there, follow the Southern Defense Trail to the east (left), down the stairs, then along the path and downhill to first a set of three steps, then a set of six steps.

STOP 1. POTSDAM FORMATION. This "stop" begins here and continues down to the water. Typical upper Potsdam sandstone is displayed in the numerous outcrops along this trail. It is in general a pinkish, tan, and gray quartz-cemented quartz sandstone. As the trail descends to the Carillon dock at the water's edge, various features of the Potsdam Formation are visible both in outcrop and in the steps, including grain size differences, shaly layers, worm burrows and cross-bedding.

After completing Stop 1, return to the trip starting point, walk down to the road, and then follow the road to the east (in the direction of Orwell) to the hairpin curve. The outcrop in the inside of the curve is the next stop.

STOP 2. TICONDEROGA FORMATION. The outcrop displays most of the main features of this formation. It is a light- to medium-gray siliceous dolostone, weathering various shades of gray. It contains rounded quartz grains and scattered knots of white calcite and quartz. Some terminated quartz crystals are also present. Cross-bedding is also found elsewhere in the Ticonderoga Formation.

Cross road to north and go into the woods at the end of the split rail fence. Be careful of old strands of rusty wire. Go straight uphill and slightly left (west). The outcrop here is of Potsdam Formation with some excellent cross-bedding, structurally higher than the outcrop of Ticonderoga Formation just seen at Stop 2. Therefore, there is a fault between the two outcrops. This fault continues to the west, just south of the road leading to the marina.

Walk back up the road to the entrance to the State Historic Site. Go left (west) of the museum and walk up the gravel path, past a low exposure of Potsdam Formation (on strike with what we just saw in the woods). Continue up the grassy slope, following the sign to "Trails." The outcrop to the left (west) is also Potsdam Formation. After about 100 m, the trail flattens out briefly. To the right is a small marshy area containing an outcrop.

STOP 3. TICONDEROGA FORMATION. Somewhere in the last 50 m or so just traversed is the contact between the Potsdam and Ticonderoga Formations. This outcrop is therefore near the bottom of the Ticonderoga Formation. The flat surface of the outcrop is approximately equal to bedding, and contains a raised ridge of quartz sandstone. This is likely a clastic dike.

Continue up the path toward the Trail Information Outpost. Approximately halfway between Stop 3 and the Information Outpost, a mown trail heads around a boulder on the right (east) and goes in a southerly direction, at a 30° angle to the trail you just walked up. This is the White Trail, but because we are walking it backwards, the trail markers are only visible if you turn around and look back.

Follow the path downhill through the woods, looking back every now and again to see the White Trail markers. The trail goes around a large curve, heading east, and large slabs of rock lie next to and across the trail. About 5 m into this rocky section, a grassy glade is visible downhill and ahead, containing White Trail Stop 3 (Southern Battery). A large, squarish slab of Potsdam formation is on the upslope side of the Trail, and contains some good cross-bedding. Straight ahead along the contour is an outcrop.

STOP 4. POTSDAM/TICONDEROGA CONTACT. This outcrop contains the contact between the Potsdam and Ticonderoga Formations. The contact is taken to be the undulating surface where gray quartz-cemented quartz sandstone (containing truncated cross-bedding) is overlain by pinkish-tan coarse-grained sandy dolostone.

Continue along the White Trail, past White Trail Stop 2 (Foundation) and uphill over ledges of Ticonderoga Formation. Follow the White Trail to the Information Outpost, and continue west along the Red and Blue Trails. Where these trails diverge, follow the Red Trail (left) all the way to the end (Red Trail Stop 3). The outcrop just below the overlook is of dolostone containing chert, sandy layers/lenses and laminations. This outcrop is considered to be Whitehall Formation on the basis of the laminations and slightly fetid odor on a freshly broken surface, although the many similarities with the Ticonderoga Formation (dolomitic matrix, sand layers, chert) illustrate the difficulty in placing the contact between the two formations, especially in relatively flat areas where outcrop is discontinuous.

Take the Red Trail back to the junction with the Blue Trail. Go left (north) on the Blue Trail to the first outcrop on the left (west) side in the woods.

STOP 5. WHITEHALL FORMATION – WARNER HILL LIMESTONE MEMBER. This rock is a thick-bedded, light- to medium-gray limestone or calcic dolostone containing large, rounded, frosted quartz sand grains and having an almost conglomeratic appearance. Weathered surfaces are almost white, and contain wavy raised lines that resemble the stromatolites seen in the Warner Hill Limestone Member of the Whitehall Formation in Whitehall, New York. There are patches and pebbles of dark blue/gray chert, and occurrences of coarse calcite crystals stained yellow-orange by iron oxide.

Continue north and downhill along the Blue Trail. Where the trail gets closest to the water (Catfish Bay), there is a Blue Trail marker on the left (west) side of the trail. (This is about 40 m south of Blue Trail Stop 7.) Walk directly east through the trees along a vague trail that climbs up the talus slope to the base of a steep cliff.

STOP 6. WHITEHALL FORMATION – SKENE DOLOSTONE MEMBER. The outcrop is of massive dolostone with layers of chert containing nodules of dolostone, iron oxide staining on groundwater seeps, and a dark shaly layer. The dolostone is mostly medium- to dark-gray and finely crystalline, with a slightly fetid odor on a freshly broken surface. The massive bedding is characteristic of this part of the Whitehall Formation.

Continue north along the Blue Trail to its end, at a junction with the Orange Trail. Go left on the Orange Trail, toward the northernmost point of Mount Independence.

STOP 7. LUNCH. The "beach" here is a large outcrop of the fairly featureless, massive gray dolostone that typifies a large part of the Whitehall Formation. Coarse calcite is visible in some cracks.

Continue along the Orange Trail (east and south) to Orange Trail Stop 4 (Horseshoe Battery).

STOP 8. GREAT MEADOWS FORMATION – WINCHELL CREEK MEMBER. The basal unit of the Great Meadows Formation, the Winchell Creek Member, occurs all around the Horseshoe Battery in scattered outcrops on the slopes. To the north, along a now-abandoned section of the Orange Trail, are a few small outcrops of the distinct cross-bedding that exemplifies this unit. Other outcrops contain a sedimentary breccia that is also characteristic of the lowermost Great Meadows Formation. The fragments in the breccia are laminated and cross-laminated.

Continue south along the Orange Trail to where it bends to the east (an unused portion of the trail continues straight). Scattered about the trail are numerous moss-covered boulders and discontinuous outcrops of Winchell Creek breccia.

The Orange Trail continues all the way back to the Trail Information Outpost (about 15 minutes). Continue walking south to get back to the museum and parking lot.