QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

VGS Website: http://www.uvm.org/vtgeologicalsociety/

SUMMER 2013	VOLUME 40	NUMBER 3

TABLE OF CONTENTS

"The Anticline" at the Watershed Center in Bristol

Massive Cheshire Quartzite near the top of Hogback Mountain in Bristol (above) and folds in the Forestdale Marble(below)

PRESIDENT'S LETTER

Field Work Update: After mapping the Bristol Quadrangle last field season, the Vermont Geological Survey will shift southward into the adjacent South Mountain Quadrangle. In both quadrangles, metamorphic rocks of the hanging wall of the Hinesburg Thrust are generally found east of Route 116 and sedimentary rocks of the footwall, with kilometer scale folds, to the west. The recent rains have greatly bolstered the mosquito population, which may temporarily exceed what I experienced 25 years ago in Texas and Louisiana, during a hitch in the oil industry.

Cool Geology: Over the past decade, the Vermont Geological Survey and partners from Middlebury College and the Vermont Agency of Agriculture have conducted reconnaissance age dating of groundwater in the Waits River Formation and in lithologies from the hanging wall and footwall of the Hinesburg Thrust. We obtained ages that ranged from 20-50 years using Chlorinated Fluorcarbon (CFC) and Helium techniques. These ages are considered modern.

A fabulous recently-published study on the age of "groundwater" from a deep gold mine in Timmins, Ontario revealed ages in excess of 1500 million years, using Xenon isotopic methods. This water presumably evolved in Neoproterozoic oceans and was trapped in the surrounding rocks as fluid inclusions or along fractures. See the links below:
http://www.npr.org/2013/05/16/183950854/water-trapped-for-1-5-billion-years-could-hold-ancient-life

http://www.nature.com/nature/journal/v497/n7449/full/nature12127.html

Spring meeting: On Saturday April 27, 2013 the Vermont Geological Society (VGS) and the Lake Champlain Research Consortium (LCRC) held a joint meeting in the Aiken Center at the University of Vermont to present student research. The VGS and LCRC each held coordinated symposiums in separate lecture halls that flanked a central atrium, where a continental breakfast buffet of pastries, juices, and coffee were served. Total attendance was ~80. All the feedback I received about the meeting was positive.

There were 13 talks in the VGS symposium and the following awards were presented:

- 1st Place Award and Doll Award ($100): Sarah Studwell, Undergraduate Student at Middlebury College

Talk Title Arsenic Concentration within Variably Metamorphosed Shales of the Taconic Sequence, Vermont and New York

- 2nd Place Award ($75): Juliet Ryan-Davis, Middlebury College

  Talk Title Origins of the Moretown Formation, Vermont: A Detrital Zircon Study"

- 3rd Place Award ($50): Daniel Hobbs, Middlebury College

  Talk Title Developing Geochronometers: Diffusion of Helium in Calcite, Aragonite, and Dolomite

Award winners: Daniel Hobbs- 3rd Place (2nd from left) and Sarah Studwell- 1st place (2nd from right. Judges: Shelley Snyder, Dave Westerman, and Les Kanat (left, center, and right, respectively.

Respectfully submitted,
Jon Kim, President

ADVANCEMENT OF SCIENCE COMMITTEE REPORT

Although I may be preaching to the choir, the student talks at the VGS Spring Meeting were ***absolutely superb***. I have mused year after year with VGS geologists from across the spectrum that these talks would hold their own any place in the country. In addition to the winning talks, you could hear about Lake Champlain hydrodynamics, arsenic and metamorphism, Montana mylonites, Egyptian tectonics, stratigraphy of a Nevada lake, ground penetrating radar at Mt. Philo State Park…….. If you have never attended one of these meetings, I strongly encourage you to make plans to do so. I learn so much every year.

By the way, some of the young geologists that presented at this meeting (Juliet Ryan-Davis and Eric Weber) were funded by the Vermont Geological Society Research Grant Program. Each year, this program competitively awards research grants to 3-4 students (maximum is $700

each). For some students, this is the only source of funding for their research. Contributions to support this research grant program can be sent to the Vermont Geological Society Treasurer.

Respectfully submitted,
Jon Kim, Chair

TREASURER'S REPORT

Due to the timing of this newsletter, the Treasurer sends greetings from Italy! Look for a complete report in the Fall GMG.

SUMMER FIELD TRIP OF THE VERMONT GEOLOGICAL SOCIETY

For the Vermont Geological Society summer field trip, Pat and Tom Manley of the Geology Dept. at Middlebury College have offered to run a cruise on Lake Champlain in their research vessel. The goals of the trip will be to demonstrate the use of their survey equipment and discuss their research. The vessel has a capacity of 10-15 visitors, so if more members than this sign up, more than one cruise will be run. The cruise will run a maximum of two hours and will leave from the docks on Thompson's Point in Charlotte on Saturday August 24, 2013. As of July 1, 2013, Jon Kim will be taking reservations by e-mail or phone (jon.kim@state.vt.us, 802/522-5401) for this field trip. Please make your reservation by July 31, 2013.

VERMONT STATE GEOLOGIST'S REPORT

Bedrock Map Display – UVM Perkins Museum and USGS Lobby, Reston, VA

The 2011 Bedrock Geologic Map display was installed in the Perkins Museum at the University of Vermont in May. The map was re-printed on solid panels and an interpretive panel was created by MajaDesigns with input from Char Mehrtens, Marjorie Gale and Laurence Becker. The display, funded by the Lintilhac Foundation, is permanently mounted to the granite floor as stand-up panels. Gabriela Mora-Klepeis coordinated the installation. The map offers new educational opportunities for museum visitors in terms of map uses and linking mineral specimens, fossils, and age dates to map locations and the geologic time scale in order to understand the geologic setting of the museum specimens. Other map displays are in process at Middlebury College, Johnson State College and the Fairbanks Museum plus the full map assembled north to south is now on display in the main lobby at USGS in Reston, VA.

Vermont State Bedrock Map Presentations

The New Hampshire Geological Survey Annual Geologic Mappers Workshop was held in Concord, NH on April 16. Rick Chormann, NH State Geologist, hosted the meeting for approximately 40 geologists/hydrogeologists from academia, state government and industry. The meeting provides a forum to share ideas among NH and adjoining New England states. Marjorie Gale represented the Vermont Geological Survey and presented a half-hour slide show about the 2011 Bedrock Geologic Map of Vermont and its applications to issues of water, energy, climate

Charlotte Mehrtens and UVM students unload the crated map panels for the Perkins Museum exhibit.

UVM's maintenance people came through on the installation!

and natural communities. Other talks ranged from new digital mapping technologies to basic surficial mapping.

The Institute for Lifelong Education at Dartmouth (ILEAD) offers up to 80 courses each year to its members. Marjorie Gale was invited to present a talk about the 2011 Bedrock Geologic Map of Vermont for a plate tectonics class taught by geophysicists Martin Smith and Randy Martin. The seminar with 25 students evolved from a 40 minute slide presentation to a livelier two hour hands on discussion covering the history of geology, making of the geologic map, basic fundamentals of geology and uses of geologic maps. Students were interested in obtaining more detailed, local maps from our web site and learning about their towns' geology.

Green Mountain National Forest

Scott Bailey, Research Geoecologist, US Forest Service, Northern Research Station is requesting coordination and cooperation with the VGS for an "Evaluation of Spatial Patterns in Soil Parent Material Chemistry and Calcium Mineralogy for the Green Mountain National Forest". Soil base saturation is a primary control on both terrestrial and aquatic species distribution and community composition, and influences forest health, productivity, and resilience. Understanding spatial patterns in calcium supply will aid the Forest in inventorying rare plant species and communities, in assessing the impacts and recovery from air pollution, and in evaluating potential impacts of harvesting and other land management activities on forest health and productivity. The VGS is finalizing a project Memorandum of Understanding with the U.S. Forest Service. UVM Rubenstein School is also a partner.

Geothermal Energy

The Vermont Geological Survey is funded through the US Department of Energy to contribute to the National Geothermal Data System (NGDS) which is a portal for access to state and federal geologic and geothermal data. The emphasis is on the search for deeper higher temperatures although much of the data collected and collated is also applicable to shallow resources.

Poster Presentation: For the ANR Earth Day Celebration on April 23, the Division prepared a poster session on Geothermal Energy. The VGS explained to visitors the workings of shallow (groundwater heat pump) and deeper technologies (studies to understand the potential for resources hot enough to generate electricity).

Rock Sample Collection Complete: The VGS finished collecting rock samples for thermal conductivity analysis. Rocks of lower thermal conductivity (resistance to the flow of heat) near the surface may act as insulation to trap heat and lead to more advantageous temperatures at

depths of up to 5 km. Plugs were cut from the Vermont samples and sent to Southern Methodist University to be analyzed for density, porosity, and thermal conductivity at slightly elevated pressures. In addition, since one source of heat is radioactive decay at depth, samples will be sent out for geochemical analyses. Data will be used to evaluate the potential for workable temperatures to support electricity production (>150^{o}C) in Vermont and will also contribute to our understanding of background geochemistry in the State.

Geophysical Logging of Bedrock Wells: During the last week of May, the Vermont Geological Survey (Jon Kim) and partner, Ed Romanowicz, from the Geology Department at SUNY Plattsburgh conducted geophysical logging on bedrock wells in the Town of Berlin. This logging measured temperature, conductivity, gamma (natural radioactivity), and borehole diameter for three deep (600') closely-spaced wells that were drilled as future public water supplies. Data will be contributed to the NGDS. The analysis of these well logs will yield detailed information on the hydrogeology of the Waits River Formation aquifer and will be shared with the Town of Berlin and their geological consultant.

Maps Delivered/Geology and Health

The Vermont Geological Survey and our Norwich University partner recently submitted bedrock and surficial geologic maps of the Bristol Quadrangle to the U.S. Geological Survey. These maps complete our obligations for the 2013 STATEMAP grant. During 2013 and 2014, we will work with the Town of Bristol to obtain accurate locations for private water wells and collate these locations with associated well data such as yield, depth to bedrock, and static water levels. In addition, with our Middlebury College Geology Dept. partner, we plan to test the groundwater from a selected group of wells for naturally-occurring contaminants such as Arsenic, Uranium, Gross Alpha, Manganese, Fluoride etc. The bedrock and surficial maps will be integrated with the groundwater quality and quantity data to analyze the groundwater resources in Bristol. Completion of this work will contribute to the Williston to Bristol "Geology and Health" corridor we have been working on since 2007.

Abigail Ruksznis

Congratulations to our most recent VGS temporary employee, Abigail Ruksznis, for her acceptance to graduate school at Stanford University in the fall. Abi worked two summers on mapping projects and assisted on the VGS geothermal project. Both Marjorie Gale and Jon Kim worked with Abi and her able UVM advisor Keith Klepeis. Abigail was the principal author for two Northeast Geological Society of America Abstracts: "Variation in Two Styles Of Acadian Thrust Faulting in the Pinnacle Formation, Richmond, VT" in 2013 and "Integration of Structural Analysis, EMI and GPR Surveys, and Hydrogeology in the Plainfield Quadrangle, Central Vermont" in 2012.

Respectfully submitted,
Laurence R. Becker, State Geologist

ANNOUNCEMENTS

Internship Work Group: While at NE GSA this spring, Helen Mango of Castleton State College and Marjorie Gale of the Vermont Geological Survey discussed the availability of paid and unpaid internships for undergraduate Geology and/or Environmental Science majors at Vermont colleges and universities. Although many students go on to graduate school, many others plan to enter the work force with a bachelor's degree and hope to remain in the northeast. Marjorie then presented the topic at the Spring VGS Board Meeting and a brainstorming session ensued. Initial discussions and investigations show internship programs are quite varied with varying degrees of success.

We intend to form a small work group to research existing internship programs/opportunities and to investigate roles the VGS membership and organization could pursue. We are particularly interested in participation from the business community and if you would like to be part of the work group, please contact Marjie at 802-522-5210 or e-mail Marjorie.gale@state.vt.us.

WHERE'S IT, WHAT'S IT?

Send me an e-mail (marjorie.gale@state.vt.us) with the Vermont town name and a brief description of what is in the picture. All correct entries will be entered in a drawing for a copy of the 2011 Bedrock Geologic Map of Vermont. Look for the answers in the GMG Fall Issue along with another puzzler. Feel free to contribute your own Vermont puzzlers too. (Photo: J.Kim)

Answer to Spring's Where's It, What's It?: *The Green Mountain Giant, Whitingham, VT as described in Hitchcock, E. et.al, 1861 (Photo: M. Gale)*

"But the most gigantic specimen with which we have met, lies on the naked ledges on a high hill on the farm of Jonathan Dix, in the west part of Whitingham. From this hill we look westerly into the valley of the Deerfield River, which must be over 500 feet deep, and from the character of the rock, corresponding to that of the Green Mountains (a highly micaceous gneiss), we feel sure that the bowlder was transported across this valley. Yet its length is 40 feet; its horizontal circumference is 125 feet; its average width 32 feet; its cubic contents 40,000 feet, and its weight 3400 tons. Think of the power requisite in the first place to tear off from the ledge such a gigantic mass, and then to lift it up and carry it across a deep mountain valley, and then to plant it near the highest part of a rocky ridge. It does not seem to have been much rounded, and cannot therefore have been subject to mere mechanical or aqueous attrition. Hence we suppose it to have been lifted up bodily and transported- not rolled – along with other fragments by a vis a tergo. The sketch below will give some idea of one of the sides of this bowlder. An end view is quite different. It is situated in the midst of a forest and a little southeast of and below the crest of the hill.

Until a larger bowlder shall be found, we propose for this one the name of Green Mountain Giant. It is the largest we have met with in New England, save one at Fall River – which is now destroyed for architectural purposes. The Giant should have a ladder attached to it, and the forest around it be cleared away, that persons of taste might be induced to visit it. Such objects are beginning to be incorporated into the world's literature, and we already have at least one volume entitled "The Bowlder," as well as Hugh Miller's Autobiography of a bowlder. Ere many years we predict that the Guide Books for summer tourists will describe the route to the Giant."

CALENDAR

August 24:	VGS Summer Field Trip on Lake Champlain
Sept. 9-12:	2013 Highway Geology Symposium, North Conway Grand Hotel, North Conway, NH: http://www.highwaygeologysymposium.org/default.asp
Sept. 23-24:	National Ground Water Association Conference on Groundwater in Fractured Rock and Sediment, Hilton Burlington, Burlington, VT

October 11-13: New England Intercollegiate Geologic Conference, Millinocket Lake, ME

October 27-30: Geological Society of America Annual Meeting, Denver, CO

Sept. 23-24: National Ground Water Association Conference on Groundwater in Fractured Rock and Sediment, Hilton Burlington, Burlington, VT

The **Vermont Geological Society** is a non-profit educational corporation.
The **Executive Committee** of the Society is comprised of the Officers, the Board of Directors, and the Chairs of the Permanent Committees.

Officers

President	Jon Kim	(802) 522-5401	jon.kim@state.vt.us
Vice President	Keith Klepeis	(802) 287-8387	keith.klepeis@uvm.edu
Secretary	Will Amidon	(802) 443-5988	wamidon@middlebury.edu
Treasurer	David Westerman	(802) 485-2337	westy@norwich.edu

Board of Directors

Les Kanat	(802) 635-1327	les.kanat@jsc.edu
George Springston	(802) 485-2734	gsprings@norwich.edu
Kristen Underwood	(802) 453-3076	southmountain@gmavt.net

Chairs of the Permanent Committees

Advancement of Science	Jon Kim	jon.kim@state.vt.us
Membership	David Westerman	westy@norwich.edu
Public Issues	Laurence Becker	laurence.becker@state.vt.us
Publishing	Marjorie Gale	marjorie.gale@state.vt.us

Vermont Geological Society
Norwich University, Dept. of Geology
158 Harmon Drive
Northfield, Vermont 05663

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