

June, 2000

Volume 26
Number 2

The President's Message

We are almost half way into the year 2000 and a year and a half into my term of office, and it does seem that time passes at the speed of light! Thanks to the creativity of our membership, this year has already produced several successful events: (1) a joint meeting with the Society of Civil Engineers; (2) a magnificent spring meeting at Bowdoin College where a variety of excellent and very professional student papers were given (one from Vermont!), followed by an important and timely presentation by Al Ludman on his geologic work in Washington County; and (3) also at Bowdoin the quintessential Kibbe Northern Appalachian Symposium and roast in honor of our friend and colleague Arthur M. Hussey II on his retirement (?).

Arrangements are now in progress for the GSM summer field meeting to be led by Bob Marvinney and Tom Weddle and headquartered at the Bigelow Lodge on beautiful Flagstaff Lake (see following pages). Some hearty souls may wish to challenge Bigelow Mt. before or after meeting! Plans are now underway for a field trip for a teachers workshop during Earth Science week and we seek a host for our fall meeting - any volunteers for this great honor?

In the 1999 July issue of the newsletter (vol. 25, No.2) I cynically submitted a list of references to "science" often preceded by meaningless adjectives (good, pure, voodoo, junk, etc.) and definitions. It seems that we can definitely add "ignored science" to the long list. As a private citizen and former member of the Maine Low-Level Radioactive Waste Authority I gave testimony prepared by Tom Eastler and myself to a legislative committee attempting to define a standard for low-level rad waste in millirems/yr for the decommissioning of Maine Yankee. While some law makers expressed appreciation for the testimony, there were those that were not interested and preferred the demagogary of the anti-nuke activists present. One legislator stated that this was political issue and not a science one! So much for "good science". I also challenged an editorial statement (PPH) that oil companies had polluted the groundwater on the Alaska north slope- in an area where there is no groundwater and the the ground is frozen solid to a depth of at least 1000 ft. Needless to say, I got no response. There is a new variation on "creation science" recently reported by AGI. It is called "Intelligent Design" (ID theory) and was

presented and promoted by supporters to Congress and staff on May 10th. It was described as "an attempt to debunk Darwinism evolutionary theory and expose the negative social impact of Darwin." This briefing took place as the Senate entered into its second week of debate on over-hauling federal K-12 education programs. I'm not sure that this bodes well for science, education or religion!

In response to this growing anti-intellectual atmosphere, it might be helpful for the science community in Maine to establish an entity which can be available to serious policy makers and upon request respond to science-related issues. I suggest a Maine Academy of Sciences might be helpful. I'm researching the federal and state "academy" models - stay tuned. I solicit your thoughts, opinions, suggestions. I'll reject all recommendations to REPENT!

Walt Anderson, President
<WAAGEO@aol.com

The Editor's Message:

WARNING ABOUT UNPAID DUES

On the outside of this newsletter you should find an address label with a date. That date is the last time we have a record of your paying dues. We have carried a large number of unpaid subscriptions for a number of years now. However, as decided at the fall meeting in 1999, the new policy will be to drop members who are more than three years in arrears. Therefore, if your label reads 1997, please pay up to date to remain in good standing. Anyone with dates older than 1997, this will be your last newsletter unless we hear from you immediately. *(Sorry about the blanks last time, the computer printout was incorrect and I didn't catch it until all the newsletters were mailed. And the dog ate my homework).*

Thanks for your cooperation.

Dan Belknap, Newsletter Editor
<belknap@maine.edu>

GSM Web Site

www.gsmmaine.org

Wayne A. Power, Webmaster, UMF
<wpower@maine.maine.edu>



Geological Society of Maine Summer Field Trip

When: Saturday, July 29 and Sunday, July 30. Friday night arrival is possible for those who wish to come early. Saturday departure is 9 AM.

Where: The Bigelow Lodge on beautiful Flagstaff Lake. The lodge has 11 bunk rooms which sleep 3-4 persons each, and 4 bathrooms. Rooms are available on a first-come, first-served basis. Camping is also available at the adjacent Round Barn campsite. The lodge and campsite are managed as part of the 35,000-acre Bigelow Preserve by the Maine Bureau of Parks and Lands.

Trip Leaders: Bob Marvinney and Tom Weddle

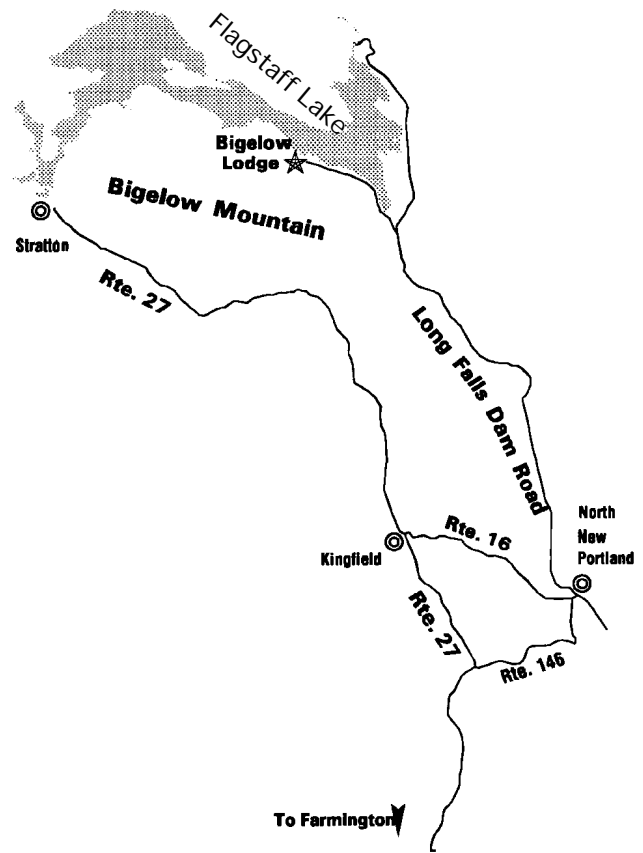
What we'll see: Our plan for Saturday is to tour roads to the east and north of Flagstaff Lake to look at relationships in the Flagstaff Lake igneous complex and pre-Silurian metamorphic rocks. We will also see several aspects of the glacial geology of the area at interspersed stops and discuss glacial Lake Bigelow. We plan a short walk along Long Falls, Dead River.

After clean-up Sunday morning, we will head south (and homeward) from the Bigelow Lodge to look at glacial deposits of the Lexington sand plain and elsewhere.

Meals: GSM will provide breakfast on Saturday and Sunday, plus dinner on Saturday for a modest cost, subsidized by the Society. Breakfast for Sat./Sun morning: eggs, bacon, pancakes, coffee, tea, juice, etc. Menu for the Saturday Night dinner at Bigelow will be: Bean Hole Beans with Ham, hot dogs, Macaroni & cheese, cold slaw, rolls, pickles. Apple Crisp for dessert. Lunches are on your own. There are no nearby restaurants or stores.

Alternative activities: great swimming in Flagstaff Lake, canoeing in your own boat, and the several mile hike to Avery Peak on Bigelow Mountain.

Directions: From Farmington, proceed north on Rte. 27 to Rte 146. Turn right on Rte. 146 and follow until it intersects Rte. 16. Turn right on Rte. 16, follow for about 0.2 miles to the intersection with Long Falls Dam Road, and turn left. This is in North New Portland near Morton's Country Store. Follow Long Falls Dam Road (paved) northward for 17.3 miles to the left-hand turn onto the dirt road to the Bigelow Preserve. Look for the small brown sign "Bigelow Preserve" near the large "Drown Your Campfire" sign at this intersection. Follow this road to the west for approximately 5 miles to the Bigelow Lodge on the right. Driving time from Farmington is about 1.5 hours.



DR. and MRS. FRANK KIBBE APPALACHIAN SYMPOSIUM IN HONOR OF ARTHUR M. HUSSEY II Saturday, April 8, 2000 Bowdoin College

Bowdoin College and benefactors Dr. and Mrs. Frank Kibbe sponsored a unique opportunity to hear the viewpoints and hypotheses of prominent scientists engaged in Appalachian geology from Newfoundland to the Carolinas. The symposium was in Honor of Arthur M. Hussey II for his long decades of service to Bowdoin College, the Brunswick area communities, the Maine Geological Survey, and Maine geology in general. Both Dr. and Mrs. Kibbe were able to attend, and a full house of geologists and others participated. After the formal presentations, Arthur was roasted and feted by colleagues, former and present students, and friends at a magnificent dinner at the Moulton Union. Presentations were by:

Philip H. Osberg, University of Maine at Orono:
Some Current Thoughts on Paleozoic Tectonics in the Northeastern Appalachians

J. Dykstra Eusden Jr., Bates College: Comparisons Between Ancient Acadian and Active New Zealand Tectonics

Hank Williams, Memorial University of Newfoundland : Tectonics of Atlantic Canada: The Accordion Effect

David B. Stewart, USGS: Problems in Appalachian Orogenesis that are Solvable and Timely: A Coastal Maine Perspective

Jim Hibbard, North Carolina State University: Tectonics of the Southern Appalachian Piedmont

A Word of Thanks and Appreciation.

I want to thank all the people who planned, organized, and attended the Appalachian Symposium and dinner that followed at which I was honored. For me it was not a surprise in the sense that I knew in advance about the get together. What was a surprise was all the people who attended or sent on letters, and the kind words they had to say. One of the nicest things about the symposium was the chance that it afforded for a lot of my colleagues over the years to get together and reminisce with each other about our endeavors toward understanding the geology of the Appalachians. I also appreciate the remembrances by my students from ages ago to the present. To be remembered as a mentor who started them on in their careers is something I most cherish. I am most grateful to the Kibbes who so graciously made it possible to put on the meeting and dinner. Again thank you all. Please keep in touch.

Art Hussey <a.hussey@polar.bowdoin.edu>
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State of Maine's Beaches Conference

On July 12, the University of Maine, Maine Geological Survey, Maine Coastal Program, and Maine Sea Grant Program will co-sponsor a "State-of-Maine's-Beaches" meeting at Thornton Academy in Saco. The event will include talks by professional geologists describing the origin, evolution and development status of the beach systems, a poster session by volunteer beach monitors, and a panel discussion on the management issues in Wells and Saco Bays. The meeting will be followed by a field trip to Ferry Beach State Park. Registration (and lunch) are free for the first 200 registrants. Register at: shina@maine.edu, or by phone to 207-581-1435.

Joe Kelley <jtkelley@maine.edu>
Dan Belknap <belknap@maine.edu>
Steve Dickson <stephen.m.dickson@state.me.us>

Solar System Model

The Northern Maine Museum of Science is well advanced in the construction of a 40 mile long solar system model, to be located on Route 1 between Presque Isle and Houlton, Maine.

This model is built at a scale of one mile equaling the distance from Sun to Earth (an astronomical unit), and will include three-dimensional roadside models of all planets and seven moons. Information on this developing project can be found at: www.umpi.maine.edu/info/nmms/solar/index.htm.

The page is being rapidly upgraded, and will soon include a map and additional photos showing the construction of Jupiter and Saturn. We also need donations to support the costs of the construction.

Kevin McCartney: Professor of Geology and Director, Northern Maine Museum of Science, University of Maine at Presque Isle

<mccartney@polaris.umpi.maine.edu>

GSM Member News

After a short stint as an independent consultant, **John Wathen** was selected as the Regional Director of the Maine Department of Environmental Protection's Portland office.

Andy Tolman (Department of Human Services) is once again riding in the Trek Across Maine, this time as a member of the "Bikers Against *E. coli*" team.

Governor King has appointed **Irwin Novak** (USM) to the Board of Certification for Geologists for a 5-year term, Irwin replaced **Art Hussey** (Bowdoin College) whose term expired in December 1999.

Nancy Beardsley was recently named the Director of the Maine Drinking Water Program at the Department of Human Services.

Todd Coffin (Jacques Whitford) and his wife Lorena had a second son, Max, last fall. Max is crawling now and Todd expects him to run his first marathon next spring.

Brad Caswell is retiring from Jacques Whitford to work part-time for a major Maine-based agricultural company and other clients while enjoying his farm in Vermont.

Please send member news to:

Carolyn Lepage
<clepagegeo@aol.com> or
PO Box 1195, Auburn, ME 04211-1195 or
by fax to 207-777-1370 or just call 207-777-1049

Report of the Spring Business Meeting

Friday, April 7, 2000 at Bowdoin College

Business Meeting called to order at 4:04 pm by President Walter Anderson

INTRODUCTION OF OFFICERS

Walter reminded the attendees that the Fall Meeting is the election of officers - "any volunteers"?

REPORTS

The minutes and the treasurer's reports were accepted as printed in the Newsletter.

OLD BUSINESS

The first joint meeting with ASCE was a big success. We anticipate future opportunities to share information and technology.

Bob Marvinney noted that MGS is working on the formatting for the Ollie Gates map of Vinalhaven for publication.

Bob Marvinney reiterated that the STATEMAP program has been reauthorized. Dyk Eusden, who has mapped extensively around Mt. Washington, encourages both graduate and undergraduate students to apply for mapping funding under the EDMAP program.

Walter asked the status of review of Doug Reusch's "Field Trip Guide to the Northern Appalachians - Quebec City to the Gulf of Maine". The review committee (Bob Marvinney, Spike Berry, and Art Hussey) has not completed said review. Walter is anxious to have the Guide published to celebrate GSM's Jubilee (25th) Year.

Bob Marvinney had no status report regarding the NH Council of Professional Geologists' certification. Walter noted that it passed in the NH House of Representatives, and awaits action by the NH Senate.

According to Dave Gibson, the GSM Website continues to evolve. Patti Millette added that there will soon be an educational component to the web page targeting grade K-12 teachers.

Bob Marvinney reminded us that the GSM Summer Field Trips will take place from Bigelow Lodge on Flagstaff Lake on the last weekend in July, 28th -30th. Because of the geography, both Saturday and Sunday trips will combine surficial and bedrock geology. Details will be posted on the web, as they become available.

Dan Belknap conceded that dues continue to be a problem. There are approximately 100 lapsed members who still receive the Newsletter; speaking of which, anyone is welcome to submit articles. Hint, hint.

NEW BUSINESS

Bob Marvinney reported that LD2558 passed in spite of Walter's and others' efforts in opposition. It is likely that the annual fees for Certified Geologists will increase. The cap has been raised to \$250, but a committee will decide on fees as part of the rulemaking process. Bob encourages input from Certified Geologists.

Earth Science Week 2000 activities are planned for the second week of October. The goal is to help the public understand more about earth science and geology, and the natural impact on society. Looking for volunteers for workshops and/or field trips. Bob recommends that all GSM members participate in some way, either at the local or state level. Patti Millette volunteered to assist Bob in organizing activities at the state level.

Marty Yates announced that the 2000 NEIGC will be at Orono during the October 6-7-8 weekend. Information is available at: www.neigc.org .

Kevin McCartney, UMPI has been authorized to teach introductory geology on ITV at 40 sites across Maine. Kevin is looking for hand specimens of rocks and minerals (see list below) to distribute to each site.

Walter is the new Chairman of NEGSA for 2000-01. The rest of the Management Board is: David C. Roy, Vice Chair; Kenneth N. Weaver, Sec.-Treas.; Robert D. Jacobi, Past Chair; George C. Stephens, Member-at-Large; and Jo Laird, Member-at-Large. New Web address for NEGSA is - www.geology.um.maine.edu.negsa - Web Master will be Marty Yates.

Walter encouraged everyone to attend the Appalachian Geology Symposium honoring Art Hussey, tomorrow (April 8th) here at Bowdoin.

Dan Belknap noted that the membership on NESEPM has dwindled to approximately 75. He questions what NESEPM could be doing better to boost membership; and noted that GSM is successful because we have "activities, enthusiasm, and leadership".

On that note, Walter expressed a desire for GSM to support students going to GSA/NEGSA. Al Ludman added that NEGSA has money available for graduate and undergraduate research. Check out the website above.

Walter accepted volunteers Dan Belknap, Dave Gibson, and Kevin McCartney to form a committee to examine GSM support for student travel/research to NEGSA/NEIGC.

LAST, BUT NOT LEAST...

Judges for the student presentations, Bob Marvinney, Steve Pollock, and Dave Stewart, awarded first place in the talks to:

Undergraduates: Katherine Heggeman, Bates College, oral presentation

Heather Adkins, Bates College, poster presentation
Graduate: Julia Daly, U. Maine, poster presentation

THANK YOU

The GSM appreciates the hospitality of Bowdoin College for hosting this spring meeting; specifically, the work of Rachel Beane, Ed Laine, Peter Lea, and Midge Walters.

The meeting adjourned at 4:45 for social hour, dinner, and evening speaker, Al Ludman, at 7:00 p.m.

Respectfully submitted,
Patricia O. Seaward, Secretary
<Patricia.O.Seaward@STATE.ME.US>

GSM Treasurer's Report

No update of Spring Report.

Elizabeth A. Champeon, Treasurer
<Lchampeon@aol.com>

Maine Water Conference: 2000 Review and 2001 Sneak Preview.

The Maine Water Conference was held at the Augusta Civic Center on April 13, 2000. A record-breaking 312 people attended the conference and 93% of the attendees rated the conference as good to excellent. This year we included a judged poster session for undergraduate and graduate students. Sarah Vidito, Ecology and Environmental Studies, University of Maine, was awarded First Place for her poster entitled 'The Relative Importance of Landscape Factors: Linkages Between Atmospheric Deposition and Stream Export in Contrasting Watersheds at Acadia National Park.' As in past years the meeting was divided into a morning plenary session and topical breakout sessions.

Plenary Session. Maine DEP Commissioner Martha Kirkpatrick presented a vision of how environmental legislation should evolve to a problem solving process instead of the traditional blunt-object approach. In general, it is very clear that we have made much progress in improving water quality in Maine, especially surface waters. This has been accomplished through a combination of forward-looking environmental legislation and the effort of many volunteers, lake associations, water utilities, and conservation groups.

Arsenic Session. The presence of arsenic in water was considered an isolated problem for many years. Increased testing of private wells has shown that arsenic is a problem statewide with excessive concentrations occurring in 2 to 3% of wells. The present maximum limit set by the EPA is 50 ppb and

this limit is probably going to be dropped to 5 ppb. Many more people will then find themselves with arsenic above safe limits for drinking. Where is the arsenic coming from? The jury is still out because only some studies find correlations with geology and arsenic compounds were widely used as pesticides for many years.

Eco-Friendly Development Session. Many people question whether water quality and development can coexist. There have been several recent development projects that used ecologically friendly technologies. These projects needed the cooperation of developers, regulators, contractors, and engineers to design and build projects that minimize the degradation of water quality. This may be the shape of things to come.

Citizen Monitoring Session. Keeping an eye on developments are the citizen monitors. In many regards unnoticed, the citizen monitors are doing the key legwork to make sure our water resources are kept in good shape. The longest running effort is the very successful Volunteer Lake Monitoring Program. Less well known are local watershed associations that have formed to help protect water quality.

Water Quality and Impacts on Wildlife Sessions. Water quality also has a tremendous impact on wildlife, especially creatures like fish, beavers, and birds. Pollutants that accumulate up the food chain still exist in the environment. Recent research has found that mercury can be deposited in watersheds from distant sources. This mercury can accumulate up the food chain and cause health problems for fish and fish eating birds. Lead shot and lead sinkers continue to cause excessive mortality in diving birds. In many regards, human actions such as agriculture, mining, and hydropower continue to have an adverse affect on water quality and associated wildlife.

MWC 2001. The 2001 Conference program is taking shape. Topics to be highlighted include: (1) Water Quality and Health, (2) Source Water Protection, (3) Water Contamination and Remediation, and (4) Atmospheric Deposition and Water Quality. The organizing committee is open to suggestions for focus topics. Volunteers to organize special sessions are welcome. A general call for titles will be issued in the fall.

Contact John Peckenham at the Water Research Institute at the University of Maine for more information about the Maine Water Conference (phone: 581-3254 or email: jpeck@maine.edu).

The University of Maine Water Research Institute, with support from the State Drinking Water Program, has revised the Safe Drinking Water

Digest. This digest is intended to help homeowners with installing a water supply well. This 8 page pamphlet provides general information about siting a well and selecting a drilling contractor, as well as information about water quality testing. Copies can be obtained from the Drinking Water Program (287-2070).

John M. Peckenham <JPECK@maine.edu>

GSM SPRING MEETING:

Walter Anderson Best Student Papers Awards of \$100 each to:

Undergraduates:

Katherine Heggeman, Bates College, talk

Heather Adkins, Bates College, poster

Graduate: Julia Daly, Univ. Maine, poster

ABSTRACTS OF STUDENT ORAL AND POSTER PRESENTATIONS

GEOARCHAEOLOGY OF MERRYMEETING BAY, COASTAL MAINE: CORRELATIONS BETWEEN HOLOCENE SEA-LEVEL RISE AND HUMAN OCCUPATION.

ADKINS, Heather E., Bates College, Lewiston, ME 04240

Merrymeeting Bay, located along the central coast of Maine, is an archaeologically rich area that exhibits a long continuity of human occupation. The purpose of this thesis is to correlate the paleogeographic evolution of the Bay and its archaeological record. Rising sea level throughout the Holocene impacted human settlement along the coast of Maine. Corresponding increases in tidal range affected the surficial environment, and led to changes in ecological productivity in estuarine resources. These changes required aboriginal peoples to adapt, and these adaptations are recorded within the archaeological record. Insights to the history of these adaptations can be gained in the comparison of the archaeological record to the paleoenvironment. This thesis hypothesizes that the prehistoric settlements located on Merrymeeting Bay correspond to knickpoint locations, commonly known as waterfalls, in the paleochannels of the Androscoggin and Muddy Rivers. These areas were crucial fisheries in both prehistoric and historic periods.

This thesis used remote sensing and vibracoring to reconstruct the paleogeography and sedimentary environment of Merrymeeting Bay. The geologic data allowed modeling of the geomorphology and geologic environments of the landscape at times of lower sea level. Archaeological reports permitted the correlation of this model to prehistoric settlement patterns within the Bay. The comparison of the two data sets shows settlement patterns with a strong focus on maritime subsistence. Early sites are located just above the head of tide, while later sites are located within the estuarine zone. Reconstruction of the tidal migration into the Bay revealed that sea level fluctuations correspond with changes in the archaeological record. These fluctuations do not appear to have motivated changes within the fishing strategies. Instead, they seem to have caused dispersal of cultural groups out of the area.

THE OXIDATIVE STATE OF INTERTIDAL MUD FLATS OF THE NEW MEADOWS RIVER

BISWAS, Abir, Geology Department, Bowdoin College, Brunswick, ME

The New Meadows River is an elongate rock-bound estuary that separates the towns of Brunswick and West Bath in mid-coast Maine. In recent years, shellfish harvesting from mudflats within this estuary has been restricted due to high levels of fecal bacteria. The study this summer has been a preliminary investigation into the health of this marine ecosystem through the examination of the oxidative state of the surficial sediments.

Measurements of the depth of the redox potential discontinuity (RPD) layer were collected at five intertidal coves. Five sampling locations were chosen within each cove, with three measurements taken at each location. At each site where the RPD was examined, a mud sample was also taken for analysis of organic carbon.

RPD depths on July 16-17, 1999 were primarily in the 10-17 mm range, with an average of 13.8 mm. During the second sampling on July 31, 1999, mean RPD depth had decreased significantly at 9 of 25 sample sites, with most values in the 8 to 15 mm range, and a mean RPD depth of 10.9 mm. The RPD values at two of the five coves decreased significantly. The organic carbon content of the surficial sediments decreased significantly at 2 of the 5 coves and 12 of the 22 sample sites overall (3 sites could not be sampled), during the sampling period.

Pearson and Rosenberg (1978)¹ consider a depth of 30 mm to be a baseline RPD depth for a healthy marine ecosystem. The lower values observed in this study suggest ecosystem stress, or may reflect different controls in this setting. A decrease in the depth of the RPD was expected over the course of the summer due to increased bacterial activity resulting from the rise in temperature, but not to the degree observed. These uncertainties indicate that long-term monitoring of this area is needed to understand the factors that control RPD variations and to ensure the continued health of this ecosystem.

¹Pearson and Rosenberg (1978) Oceanogr. Mar. Biol. Ann. Rev.

TRANSIENT TOPOGRAPHY OF POPHAM BEACH, PHIPPSBURG, MAINE

BLYTHE, Laura, and Eller, Michael, Dept. Geology, Colby College, Waterville, ME 04901

Weekly topographic surveys of Popham Beach, from Fort Popham to Hunnewell Point are being conducted at 210 m (700 ft.) intervals from January to May, 2000. Using a surveying transit, height and distance data are collected at significant topographic highs or lows at seven separate transects along this stretch of beach. Each transect is marked at the dune line with a permanent stake and is measured at a pre-determined compass direction normal to the waterline. Using these data, supplemented by statistical analysis of water-line sediment grainsize distributions, we hope to get a picture of sediment dynamics over time and/or in response to seasonal

changes. Factors affecting sediment transport include long-shore drift and river flow.

To the time of this writing (March 28) we have seen a gradual increase in the berm height of approximately 30-60 cm (1-2 ft) of transects 4 through 7. Transects 1 and 2, those closest to the fort, continue to decrease in length, indicating net erosion, while transects farther south are seeing an increase in length, indicating net accretion. Further analysis should help determine whether the accreting sand is in fact derived from upstream sources or those west of Hunnewell Point on Hunnewell Beach.

NEWFOUNDLAND SALT MARSHES AND LATE HOLOCENE SEA-LEVEL CHANGE

DALY, Julia F., KELLEY, Joseph T., and BELKNAP, Daniel F., Dept. Geol. Sci., Univ. Maine, Orono, ME 04469-5790, julia@iceage.umeq.s.maine.edu

Constraining the relative influence of glacioisostatic adjustment on late Holocene sea-level change can be addressed by comparing data from spatially distant locations. The coast of Newfoundland affords an excellent opportunity to constrain differential isostatic adjustment across a relatively small (~450 km x ~500 km) region. Determination of late Holocene sea-level change by analysis of salt-marsh stratigraphy at four locations around Newfoundland is the basis for defining trends in sea-level change around the island. At each marsh, samples were collected to determine modern foraminiferal assemblages at different elevations on the marsh surface. Cores were collected along transects to define general marsh stratigraphy, and to provide samples of basal peats. Modern foraminiferal assemblages will be compared to fossil assemblages in the basal peat to assign a paleoenvironment to the basal peat. This environmental description can be used to relate the basal sample to paleo-mean high water level. Examination of the general stratigraphy of each marsh indicates that sea-level rise is occurring at three locations (Port-au-Port Peninsula, Deadman's Bay, and the Avalon Peninsula), but that recent sea-level change at the fourth location (St. Paul's Inlet) may be more complex. St. Paul's Inlet lies between an area of falling sea level to the north and rising sea level to the south, but the transition between these two sea-level trends has not been well defined. The development of salt marsh at St. Paul's Inlet includes both regressive and transgressive features, and may reflect a recent transition from falling to rising sea level. If this hypothesis is correct, this record could constrain the timing and position of the transition between falling and rising sea level. The stratigraphies described for all locations vary significantly, indicating that there is a strong local control (e.g., local sediment flux, inlet dynamics, isostatic changes) on the development of salt-marshes along this coast.

INVESTIGATION OF A MAGNETIC ANOMALY AT CRESCENT BEACH STATE PARK, MAINE

GLASER, Danney R., Geosciences Dept., Univ. of Southern Maine, Gorham ME 04038, danneyglaser@hotmail.com, SANDBERG, Stewart K., ROBINSON, Tony, and FLEMMING, Erica E., Geosciences Dept., Univ. of Southern Maine, Gorham, ME 04038.

Mesozoic-age mafic dikes are common in southeast Maine, the vast majority of which are a meter or less in width, commonly with chilled margins. A linear-trending magnetic anomaly was discovered at the eastern end of Crescent Beach State Park in Cape Elizabeth, Maine. In order to determine if this magnetic anomaly was due to a subsurface mafic dike, a geophysical investigation was initiated.

The magnetic method was used to map the extent of the Crescent Beach magnetic anomaly. A GEM Systems, model GSM-19, magnetometer was used to map the Earth's total magnetic field intensity along survey lines oriented approximately north-south, perpendicular to the low tide mark on the beach. The station spacing used was one meter, and line lengths were generally 60-70 m. A regular grid was established at 4-meter line spacing. Differential GPS was used for positional control. Repeated local base station readings were used to monitor diurnal drift, and a linear drift correction was applied, along with leveling all lines to the same datum.

Magnetic data on the grid suggested a linear magnetic anomaly with varying intensity from 50-400 nT. The strike of the anomaly was traced to a resulting outcrop on the west-southwest end of the beach. A second geophysical grid was established at this location in order to correlate the magnetic results with the resulting linear features in the Scarborough Formation. The resulting data indicated one large-scale anomaly and some minor magnetic structure likely due to enhanced magnetite content in the metamorphosed bedding planes. Upon closer mineralogical identification the Scarborough Formation is known to have some amphibolite structures (Hussey) that may have previously been a basalt dike. This feature has retained its magnetic signature. Due to the age of the compressional shearing that formed the Scarborough Formation it is impossible for this feature to be a Mesozoic-age dike.

REMEDICATION OF ARSENIC CONTAMINATED WATER USING THE SORPTION CAPABILITIES OF THE SOYATAL FORMATION, ZIMAPAN, MEXICO

HEGEMAN, Katherine M., Dept. Geology, Bates College, Lewiston, ME.

Arsenic contaminated drinking water in the Zimapan Valley of Hidalgo, Mexico is a health concern. The Soyatal Formation, a Cretaceous shaly limestone has been shown to adsorb arsenic. The aqueous arsenic adsorbs to the kaolinite and illite present in the shale beds of the Soyatal Formation. Sorption isotherms quantifying arsenic sorption to the Soyatal Formation were measured experimentally using contaminated waters with varying arsenic concentrations and rock/water ratios. This shale has an adsorption capacity of about 180 milligrams of arsenic per kilogram of rock. Preliminary analysis indicates that 2 kilograms of crushed Soyatal is sufficient to decontaminate 180 liters of water with an initial arsenic concentration of 1 mg/L. With occasional stirring, each decontamination cycle can process 20 liters of water in 24 hours. This low-tech, low-cost remediation technique will make clean drinking water available to even the poorest residents of the Zimapan Valley.

PEBBLE AND COBBLE MORPHOLOGY ON A PORTION OF CRESCENT BEACH, CAPE ELIZABETH, MAINE

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Size and shape distribution of the backshore and foreshore was studied on the gravel beach at Crescent Beach State Park, Cape Elizabeth, Maine. Two hundred and thirty-nine pebbles and cobbles were collected at twelve sampling sites. Seven sites were located on the backshore and five located on the foreshore. The series of seven and five samples from the backshore and foreshore, respectively, were combined and treated as composite samples.

The mutually perpendicular axes (long, intermediate, short) of each particle were measured. Particle size, using the intermediate diameter, ranged from medium pebbles to small cobbles (-3 to -7 ϕ). The mean particle size for the backshore was -5.513 ϕ and the mean particle size for the foreshore was -5.168 ϕ .

Particle shapes were determined using the method of Krumbein and Sloss (1951). A particle was classified as either a blade, disk, rod or spheroid. On the backshore, blades comprised 31.94% of the sample, disks 34.03%, rods 20.83%, and spheroids 12.50% of the population. On the foreshore, blades comprised 13.54% of the sample, disks 35.42%, rods 18.75%, and spheroids 32.29%.

Previous studies have indicated that more disks and blades will be located on the backshore, over the berm crest and that more spheroids and rods will be found on the foreshore, in the tidal zone or the zone of swash and backwash. This study generally supports previous studies inasmuch as the majority of the particles from the backshore (65-97%) were disks and blades, while just over half (51.04%) of the particles sampled on the foreshore were spheroids or rods.

Gravel, beach, particle morphology, Maine

USER-INTERACTIVE GIS MODEL FOR CHANGING SEA LEVEL

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Sea level is currently changing, and it is, with global climate change, a significant public-policy issue. From a theoretical standpoint, revealing the past behavior of Maine's sea level (which has been as much as 60 meters lower in the remote past) contributes to studies of climate change, of the geology of Maine's coastal zone and its economic deposits of sand and gravel, and of the anthropology of indigenous peoples. Rising sea level, in a coastal state such as Maine, will reduce or redistribute significant human and natural resources, including shorefront property, recreational beaches, shallow-water seafood production area, ports and harbors, endangered species habitat, and arable land near the coast. How will planners, scientists and elected officials come to a personal understanding of the changes in store for our state? Geographic Information Systems (GIS) are one of the data-

and-display tools that are enabling this kind of visualization. We have created a Geographic Information System from a National Geophysical Data Center (NGDC) Digital Elevation Model (DEM) with a dynamic user interface that allows anyone to create a new coastline based on the user's choice of time future or time past. The model is linked to best data on sea level developed at the University of Maine and elsewhere. The input architecture allows varying estimates of the future rate of sea-level rise to be applied. The GIS behaves like a coastal time machine, covering present-day landforms with a rising sea, and uncovering submerged landforms with a falling sea.

FELSIC VOLCANIC AND VOLCANICLASTIC ROCKS OF VINALHAVEN ISLAND, MAINE

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The northwest part of Vinalhaven Island in Penobscot Bay, Maine, is underlain by a volcanic complex of probable Silurian age. In stratigraphic order the units, as defined by G.O. Smith (1907), are the Thorofare Andesite, the Vinalhaven Diabase (Klemetti and Wobus, 1999), and the Vinalhaven Rhyolite (VHR). Gates (in review) has proposed the name "Perry Creek Formation" for the bedded volcaniclastic deposits beneath the flow-banded rhyolites of the VHR. This report describes the Perry Creek lithologies in some detail and provides extensive new geochemical data for the VHR.

The Perry Creek Formation grades from basal layers of well-sorted maroon siltstones and sandstones (some containing the trace fossil *Chondrites*) into tuffs and breccias with fragments of mafic to intermediate volcanics. The upper layers are breccias dominated by pebble-sized clasts of flow-banded rhyolite. Most horizons are matrix supported (lahars?) and come contain low-angle cross beds. The base of the VHR as defined by Gates is a thick breccia layer with cobble- to boulder-sized fragments of flow-banded rhyolite. The remainder of the VHR contains a wide variety of extraordinarily well preserved volcanic textures and structures: air-fall tuffs (some with accretionary lapilli), welded tuffs, tuff breccias, and flows and autobreccias with well-defined flow banding (locally containing spherulites up to 15 cm in diameters). Some of the thickest flows could be remnants of exogenous domes. Geochemically, most of these rocks are true rhyolites, though early air-fall tuffs plot as rhyodacites, which are chemically similar to the Vinalhaven Granite in the southern half of the island. MORB-normalized spider diagrams for the rhyolites and granites show parallel patterns, and both units plot on the boundary between "within-plate" and "volcanic-arc" fields in tectonic discriminant diagrams (consistent with other volcano-plutonic assemblages of similar age to the northeast in coastal Maine).

A PRELIMINARY STUDY OF THE SEISMIC STRATIGRAPHY OF THE NEW MEADOWS RIVER

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Previous studies by Kelley and others of the stratigraphy underlying Maine estuaries have identified seismic stratig-

raphic units deposited in response to glacial history and sea-level change. Work done this summer focused on the New Meadows River, an elongate, rock-bound estuary in mid-coast Maine that is located farther inshore than any of the areas studied thus far. Images observed with Datasonics CHIRP sonar distinguished two basic seismic stratigraphic units. The lowermost unit observed is a thick sequence of fine-grained, glacial-marine sediments deposited primarily as a drape over bedrock. This unit, most probably an expression of the Presumpscot Formation, is seismically stratified with alternating light and dark reflectors, possibly indicating variations in texture. As sea level fell in response to isostatic processes the surface of these fine sediments was eroded, in some areas appearing as truncated reflectors in high-resolution seismic profiles. Overlying this erosion surface and lying unconformably on the "Presumpscot" is a unit of Holocene mud. This unit appears in the seismic image as flat-lying beds that lack internal reflectors. In patchy distribution are areas in which reflections are obscured or missing, perhaps indicating pockets of gas within the sediments.

ELECTRICAL-HYDRAULIC RELATIONSHIPS OBSERVED FOR UNCONSOLIDATED SAND/CLAY SEDIMENTS

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A model proposed by Börner et al. (1996) for the determination of saturated hydraulic conductivity from Spectral Induced Polarization (SIP) measurements was applied to laboratory data collected on various unconsolidated samples. Adjustment of the model parameters was required to fit hydraulic conductivity measurements obtained from flow tests. A single set of model parameters was not appropriate for hydraulic conductivity estimation across the range of unconsolidated sediments investigated. However, the model performed relatively well on individual subsets of unconsolidated sediments, suggesting that the SIP method could be used to obtain field 'order of magnitude' estimates of hydraulic conductivity, given correct selection of the parameters for the type of sediment investigated. Saturation effects were also investigated. The presence of a dominant low-frequency dispersion was observed to develop with drying of a glacial till.

PETROGRAPHIC AND SEM EXAMINATION OF LACUSTRINE STROMATOLITES OF THE UPPER CARBONIFEROUS (WESTPHALIAN D) MORIEN GROUP, SYDNEY COAL FIELDS, CAPE BRETON ISLAND, NOVA SCOTIA, CANADA

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Lacustrine stromatolites were collected from the ~30 cm thick algal limestone bed of the Morien Group (Westphalian

D) of the Sydney Coal Fields, Cape Breton Island, Nova Scotia, Canada. Compound stromatolites form domical masses ranging in size from ~3.0 to 30 cm in diameter and 1 to 10 cm in height. The stromatolites formed around basal oncoids and each stromatolite consists of multiple (2-15) linked to unlinked columns and domes. Columns and domes range in width from 5 to 40 mm and in height from 10 to 60 mm. Stromatolite macrostructures typically grade from domal at the base to columnar or pseudocolumnar towards the distal portions. Mesostructurally, all forms are composed of distinct couplets of light and dark laminae that range in size from ~0.25 to 1.5 mm. Laminae are smooth in the proximal portions of the stromatolite but tend to be wrinkled toward the distal portion. There is a high degree of inheritance and stacking is continuous between the laminae of each column. Distinct laminae are traceable between individual columns and domes. Petrographically, the carbonate stromatolites contain *Girvanella* that range in length from 0.5 to 2.0 mm. *Garwoodia* and clusters of cyanobacterial cocci (with individual cocci ~0.05 mm in diameter) are also present. Micritized spar-filled serpulids are found between the laminae and in the intercolumnar fill of the stromatolites. The diameter of the serpulids ranges from 0.425 to 0.5 mm. 3-D reconstruction, mesostructural examination, and quantitative stromatoliteology suggests that these stromatolites are not of the group *Gouldina* as previously classified. A comparison with other known lacustrine stromatolites in coal sequences suggests that stromatolites of the Morien Group bear some resemblance to the Permian stromatolites of the Untersee of Lake Constance, Germany.

GROUND-TRUTHING TIMS DATA

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The Thermal Infrared Multi-spectral Scanner (TIMS) is a six-channel aircraft-mounted spectrometer that measures mid-infrared spectral radiance between the wavelengths of 8 and 12 μm . Pixelated images based on TIMS data are useful in differentiating gross lithologies and identifying lithologic contacts in the Horse Hills/Hidden Hills districts of the Mojave Desert, San Bernardino County, California. TIMS Radiance values within pixels along lithologic contacts are a product of the radiance components of disparate lithologies coming together to create an intermediate spectrum. TIMS-based false-color RGB images facilitate photo-interpretation of regional lithologies by assigning radiance-derived red, green, and blue values to each ~9m by 9m pixel. RGB correlation between TIMS pixels may also be used to compare lithologies. While false-color RGB images are useful for photo-interpretive purposes, compositionally-indicative emissivity data are also derived from TIMS data by removing temperature dependence from TIMS Radiance values. Rocks from selected pixels of interest were collected and analyzed during January 2000. When TIMS Emissivity data are compared to laboratory-based Diffuse Reflectance Infra-red Fourier Transform Spectrometry (DRIFTS) data, both techniques produce similar spectra for the rocks analyzed.

Photo-interpretation of TIMS images and comparisons between TIMS Emissivity and FTIR Transmissivity support TIMS' applicability in demarcating lithologic contacts and remotely sensing the composition of inaccessible localities.

THE HURRICANE MOUNTAIN MELANGE AND FORMATION OF FAULT BOUNDED AUGENS ALONG COLD STREAM, MAINE

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Field and structural research in the Northern Appalachians focused on Penobscottian through Acadian deformation recorded in foliated pelites of the Hurricane Mountain Formation of west central Maine. The Hurricane Mountain Formation is a melange with a grey sulfidic slate to gneiss matrix. Boulders and clasts in the matrix have endogeneous and exogenous origins, ranging in size from microscopic to 1.5 km. The Hurricane Mountain Formation melange represents the accretionary zone between the Gander and Boundary Mountain Terranes. From early Cambrian to early Ordovician, this suture zone was part of a south dipping subduction zone/island arc system. The Hurricane Mountain Formation is stratigraphically bounded above by the Dead River Formation, a silvery green slate and phyllite, and overlies the Jim Pond Formation, a dark green to black meta-tuff and pillow basalt. Field research focused on a transect, through the Hurricane Mountain Formation, along Tomhegan and Cold Streams, in Johnson Mountain and Black Brook Pond Quadrangles, to determine the sequence of deformation. Northeastern foliation, within the matrix, along Tomhegan Stream, in the east, occurs within a grey slate with centimeter scale cubes of pyrite, grades into a well consolidated phyllite up Cold Stream. Kinematic indicators along Cold Stream record, within the matrix, clockwise rotation of meta-arenite augens, northeast foliation, boudinage of quartz veins, box folding, and three directions of crenulation cleavages (C1 north, C2 northeast, and C3 north-west). Foliation, in the Hurricane Mountain Formation, and stereonet analysis, of elongated cobbles, are similar to the indices of Boone's (1984) research along Indian Pond. Petrographic analysis of oriented samples taken along the transect, show plastic and brittle deformation are recorded along the cleavages in sinistral microfaults, mica fish, and folded quartz veins. These structural and petrographic data give us an understanding of the formation of the melange sequence and its relation to the units bounding the Hurricane Mountain Formation.

Bob Nelson (Colby College) would like to hear from anyone who comes across any Quaternary sections this summer with visible terrestrial organics (plant remains) of any kind - buried peats, organic sands or silts, etc. He can be reached by e-mail at renelson@colby.edu or by phone at 872-3247.

MEMBERSHIP DUES STATEMENT

The GEOLOGICAL SOCIETY OF MAINE, INC. is a non-profit corporation established as an educational Society to advance the professional improvement of its members; to inform its members and others of current and planned geological programs in Maine; to encourage continuing social contact and dialog among geologists working in Maine; and to further public awareness and understanding of the geology of the State of Maine; and of the modern geological processes which affect the Maine landscape and the human environment.

The Society holds three meetings each year, in the late fall (Annual Meeting), early spring, and mid-summer (usually field trips). A newsletter, *The Maine Geologist*, is published for all members three times a year. The Society year runs from August 1 to July 31. Annual dues and gift or fund contributions to the Society are tax deductible. There are three classes of memberships:

- \$7.00 REGULAR MEMBER Graduate geologists, or equivalent, with one year of practice in geology, or with an advanced degree.
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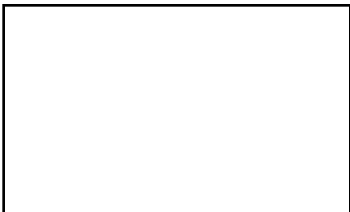
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1999/2000 SOCIETY YEAR BEGINS AUGUST 1 - PLEASE SEND DUES TO TREASURER

THE GEOLOGICAL SOCIETY OF MAINE
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