



# THE MAINE GEOLOGIST

THE NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MAINE

SEPTEMBER

1985

VOL.12 NO.1

## Society News:



### President's Message -

As I assume the responsibilities as President of GSM, I would like to extend my personal thanks and gratitude for the fine job that Andy Tolman has done in this position over the last two years. Many thanks to the other past officers. Andy has pointed out at the last two meetings that membership in the Society is on the decline. Attendance at meetings appears to be holding steady. We can usually count on the core of "regulars", plus those drawn through interest of meeting topics and geographic closeness to the meeting site. I would hope that we would all work together and encourage our colleagues and students who have not joined to attend meetings and join our Society.

Fall Field Trip Time!! NEIGC is being held in New Haven, CT Oct. 4, 5 and 6. If you need a ride give a call, I'll see what I can do to arrange one. NEIGC 1986 is being organized by Don Newburg at Bates College. Anyone having some "hot stuff" within the greater Lewiston Area and desirous of leading a trip should contact Don.

Future Meetings and Conferences!! National GSA in Orlando, Florida, Oct. 28-31. Hope to see some of you there. Northeast GSA 1986 at Kiamesha Lake, New York in March '86. Abstract Deadline is Oct. 15.

Peter Garrett, Senior Geologist at DEP in Augusta writes that he, Andy Tolman, John Williams and others are interested in a conference on ground water management and policy. Peter envisions this as a non-technical conference for policy makers and resource managers. USM will be acting as host institution. The dates are two days (as yet to be announced) during the week of March 28, 1986. Peter's list of topics indicates a lot of us without technical expertise in this area may benefit from this conference as well. Details will be forthcoming. Northeast GSA 1988 in Portland?? Could be. Marc Loiselle, Irwin Novak and myself have been talking with GSA secretaries. An August 21 letter from Ken Weaver indicates a possible invitation for formal presentation of plans for 1988 at the NEGSA Management Board Meeting in Kiamesha Lake.

Stephen Pollock

1985 Annual Meeting

The 1985 Annual Meeting was held at Gould Academy in Bethel on July 27, 1985. The first order of business was to send Woody Thompson out to find a second slide projector. Andy Tolman then appointed the author of these minutes as acting Secretary, as Carol White was vacationing at a hazardous waste site in Michigan.

While we waited for the slide projector Bill Holland gave the Treasurer's report. 1984-1985 was a good year financially; the Society showed a profit of \$689.70, as

opposed to a loss of \$656.58 in 83-84. This is somewhat deceiving, however, as we paid \$2144.89 for a Bulletin Printing in 83-84, and \$0 in 84-85. We had a net loss of six members over the year, and now have 242. Total Society Assets are \$1632.05.

Since the slide projector had still not arrived, we next voted on the slate of Officers for next year. The following slate passed unanimously:

President	Stephen Pollock
Vice President	Carol White
Treasurer	Robert Gerber
Secretary	John Williams
Newsletter Editor	Chris Olson
Postal Chairman	Arthur Hussey
Director 1988	Fred Beck

Don Newberg announced that NEIGC will be held October 4-6, 1985 at Yale. The NEIGC is tentatively slated for October 17-19 at Bates. Don is looking for field trip leaders. Get in touch with him if you are interested.

Andy passed out a Landslide Survey form, and we all exchanged geologic wisdom while we waited for the second slide projector. Bill Holland collected dues from those in arrears, and since he had no change several members have now paid through the end of the decade. Although I'm sure it had no connection to due collections, Bill was also seen buying the first few rounds at the local watering hole after the meeting.

Just as Andy was about to resort to entertaining us with a few jokes, Woody Thompson arrived, armed with a slide projector. Woody would not confirm a report that he gave away his Visa card and re-mortgaged his house to obtain the needed audio-visual equipment.

Andy then gave the floor to Nicholas Eyles from the University of Toronto. Nick gave an excellent presentation on subglacial and superglacial sedimentation, with an emphasis on the difference between till and diamict. While Nick gave numerous examples detailing the difference between the two, it seems obvious to me that diamict is a more mysterious and difficult word to understand, and should therefore be used whenever possible.

The meeting was adjourned at 10:30 pm.

Submitted by John Williams

Field Trips 1985

The western Maine mountains are a little clearer now that they have been explained and demonstrated by our fearless field trip leaders, Woody Thompson and Bob Moench. Further, the mechanics of glacial deposition and when a till is really a diamicton are much clearer, thanks to Nick and Carolyn Eyles' discussions both on the surficial trip and at the annual meeting.



Woody began the festivities in downtown Lynchville. I'm not sure what the local populace thought of having 30+ geologists (in what seemed like 40+ vehicles) congregate at their street corner, but we all survived and launched on time. The trip included "multiple" tills, stratified sand/gravel/diamict sections (Bryant Hill is worth a visit if you missed it), deltas, meltwater channels, a bit of mineralized bedrock in Evans Notch, and the Androscoggin Moraine.

The Moraine resulted from a valley controlled(?) glacier or glaciers, and exhibits lots of good relief and a nice sharp crest. Rock types in the Moraine's north and south wings reflect variations in the north and south valley walls.

The annual meeting, for which we are grateful to Al Barth and Gould Academy, as well as the Eyles, was excellent. It is covered elsewhere in this newsletter.

Sunday's trip, for many of us, began with a mad dash from Bethel to Phillips, which was farther than it had looked on the map! Bob took our tardiness in stride and proceeded to modify his trip accordingly. The 30+ on Sunday had about a 60% overlap with Saturday. We started with a tour of Small's Falls rest area, a very nice exposure with good falls and potholes, as well as the Smalls Falls Formation. We then worked our way around Rangeley Lake looking at the Quimby, Greenvale Cove, and Rangeley Formation. After checking out the section, and the view from a beautiful lunch stop, we climbed hill 2808.

This hill is an experience: trail-less with budworm blowdowns and rather steep. The outcrop at the top showed a nice, clear contact between the upper Rangeley and Greenvale Cove, missing a big chunk of section. Bob interprets this as the result of major sliding in the sedimentary basin.

We then bypassed the Blueberry Mountain Slide and trekked back to North Newry in search of the Plumbago Mountain Slide. Here, thanks to DOT road improvement, we saw a sequence of north-facing Rangeley, a pegmatite and south-facing Madrid and Carrabasset(?). The fault surface has been digested by the pegmatite, but, we are told, can be seen at "elevation 2280" on Plumbago Mountain. Given the lateness of the hour, we declined to climb another height and adjourned with much thanks to Bob. Although his slides do look much like unconformities in outcrop, they do explain the stratigraphic sequence quite well.

Those of you who missed these trips missed beautiful scenery, healthful exercise, good companionship, and well-led trips to interesting outcrops. Next summer, take the weekend and come with us.

Andy Tolman



#### YEAR-END TREASURER'S REPORT

Membership	1984/85
Regular Members	180
Student Members	30
Associates	<u>32</u>
Total Members	242

#### 1984-85 INCOME STATEMENT

##### INCOME:

Program for Income	33.00	
Dues & Appl. Fees	1096.00	
Bulletin Sales	235.85	
NOW Acct. Interest	66.16	
less Cash Refunds		<u>10.85</u>
Total Income	1420.16	

##### EXPENSES

Postage Fees	12.08
Newsletter Printing	529.58
Meeting Expenses	33.00
Reimb. Members Out-of-pocket exp.	<u>155.80</u>
Total Expenses	730.46

##### NET PROFIT

\$689.70

#### 26 JULY 1985 BALANCE SHEET

##### ASSETS:

Cash in Bank	<u>1632.05</u>
TOTAL ASSETS*	<u>\$1632.05</u>

##### LIABILITIES:

Sales Tax Payable	.50
Prepaid Bulletin Sales	<u>7.00</u>
Total Liabilities	7.50

##### CAPITAL:

Retained Earnings	1624.55
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##### TOTAL LIABILITIES AND CAPITAL

\$1632.05

\*Does not include our inventory of bulletins, which is probably worth several thousand dollars.



## Maine Survey Notes:

This summer was a very busy one at the Maine Geological Survey.

Gary Boone mapped pre-Silurian rocks in portions of the Harrington Lake, Ragged Lake, Jo-Mary Mountain, and First Roach Pond quadrangles. Dick Gilman mapped in the Newfield quad and Lindley Hanson mapped in the Norcross and Jo-Mary Mountain quads. Mapping in the Calais area was conducted by Al Ludman and Malcolm Hill. John Hogan mapped the Blue Hill and Wallamatogus plutons in Hancock County. Art Hussey continued his mapping in southern coastal Maine, concentrating on the Westport and Bristol quadrangles. Beth Lincoln focused on stratigraphic and structural problems in the Boyd Lake, Schoodic, Passadumkeag, and Lincoln quads. Steve Pollock mapped in the Stockholm, Square Lake, Frenchville, and Grand Isle quadrangles, with an emphasis on the sedimentology, composition, and structural relations of the Siluro-Devonian units in the area.

Surficial geologic mapping was carried out by Dee Caldwell in the Katahdin and Harrington Lake quadrangles; Steve Kite and Tom Lowell in the Houlton-Mars Hill region; Jeff Smith in the Kennebunk quad; Woody Thompson in the Fryeburg area; and Tom Weddle in the Norridgewock quad. Hal Borns investigated some extensive gravel deposits that are overlain by glacial till in Aroostook County, and both Hal and Tom Lowell are finishing a report on the surficial geology of Acadia National Park. This report will be combined with Dick Gilman's bedrock write-up to form an MGS bulletin on the geology of Acadia (which will also contain a new bedrock/surficial map of the park).

Don Joyner, a resident of Lewiston, is collaborating with Woody Thompson and Ray Woodman to produce an MGS guidebook to approximately 50 of the more productive mineral collecting localities in Maine. There has been a strong demand from the public for this kind of publication. It will include maps and directions to some of the sulfide mines and other types of mineral deposits, as well as the ever-popular pegmatite localities such as Newry and Mount Mica.

The Marine Geology Division of the MGS had a lengthy and productive field season this year. Beginning in mid-May, Joe Kelley, working on a Sea Grant project with Dan Belknap and UMO graduate students, began to measure bluff erosion rates and mudflat accumulation rates in Casco, Damariscotta, and Machias Bays. In mid-June, Joe made several submersible dives aboard the research vessel Johnson Sea Link in Casco and Saco Bays. Much of July was spent collecting Side Scan Sonar black and white acoustic images of the sea floor from Wells to Damariscotta. These were then used to collect bottom samples for heavy mineral studies under a contract with the Department of Interior's Minerals Management Service.

The MGS-USGS-DEP cooperative Significant Aquifers project has been collecting information in Washington and eastern Hancock Counties this summer. The project has collected 6 weeks of 12-channel seismic, 10 weeks of single-channel seismic, and is in the midst of 6 weeks of drilling. In addition, Sarah Miller has been mapping aquifer boundaries and we have collected an extensive well inventory. The Washington and Hancock Regional Planning Commissions have also been involved in the project and their local liaison has been most helpful.

On another front, Dave Marchant and Steve Pollack have been mapping in northern/central Aroostook County on behalf of the pilot Bedrock Aquifers project. A group of Bill Forbes' students have amassed a large amount of well data for the project.

The MGS will be receiving funding from the USGS to conduct a study of landslides in Maine. Carolyn Lepage, Irwin Novak, and Jeannine Amos will be conducting geologic and engineering studies as well as compiling information on historic landslides.

#### MAINE GEOLOGICAL SURVEY CORE STORAGE FACILITY

For the past couple of summers, the Maine Geological Survey (MGS) has been cleaning and repairing a nearby 1820's-vintage gunpowder storehouse to use as a core storage facility. Renovations have included replacing rotten timbers and reshingling the roof. The major repairs are expected to be completed by the end

of September 1985.

In the meantime, the MGS has taken delivery of most of the core drilled in northern Maine by Humble Refining Company and Texaco in the late 1960's and early 1970's. Great Northern Paper Company, on whose land the drilling took place, gave the core and logs to the MGS. The MGS has also received a donation of logs, location maps, and other data from drilling in the Union area by Knox Mining Company on land now owned by Combustion Engineering, Inc. (the core will not be delivered until some later date). All of these data will be available for inspection at the MGS core storage facility in Augusta beginning Monday, September 23, 1985. Please contact Carolyn Lepage at 207-289-2801 for additional information or to schedule an appointment for inspecting the material.

#### PRELIMINARY RESULTS OF AN EPIDEMIOLOGICAL STUDY OF RADON IN THE DOMESTIC ENVIRONMENT AND ITS RELATIONSHIP TO CANCER

For four years the Maine Geological Survey has been involved in a study to determine if the radon levels found in homes in Maine are associated with the incidence of cancer, especially cancer of the lung. A preliminary analysis of the data indicates a strong association between high radon levels in water and the metamorphic grade of the bedrock. Mean radon values triple from low-grade to highly altered rock, and double from high-grade metamorphic rock to granite. However, waterborne radon from private drilled wells was found to account for only 16% of the variance in radon in air, which suggests that both the ventilation rate in the home and the amount of radon that originates in the overburden adjacent to the home, significantly influence the amount of airborne radon in the home. Average air radon levels were highest in homes built on sand and gravel, lower over till, and lowest over clays. This further supports the idea that the overburden is a significant source of airborne radon, and that radon levels increase with soil permeability (75% of radon comes from the first 3 feet of overburden).

Further analysis suggests that men under the age of 65 who have been exposed to 3 or more picocuries per liter of radon in the air have a significantly increased risk of lung cancer. No significant increase in the risk of forms of cancer other than lung cancer was indicated for persons exposed to high levels of radon in either air or water.

#### STATE GEOLOGIST HITS THE ROAD AGAIN

State Geologist Walter Anderson travelled around Ireland for three weeks this summer. In addition to participating in several field trips, he met with Professors Ben Kennedy (formerly of University of Newfoundland) and Ted Kelvin of the University of Ireland at Dublin and the University of Cork respectively. Topics of discussion included a National Science Foundation proposal for a cooperative international study of Northern Appalachian Caledonide settings, and the occurrence and significance of cotichules (quartzites rich in spessartine garnet) and their bearing on economic deposits.



**TWO LUSTS IN THE NEWS**  
 (LUSTS = Leaking Underground Storage Tank Spills)  
 by Peter Garrett

The discovery, investigation and remediation of spills from leaking underground petroleum storage tanks continues. The Department of Environmental Protection has investigated over 250 so far, a small number when one considers that there may be as many as 23,000 tanks in service in the State. In addition, there are an unknown number of abandoned tanks (i.e. out of service for more than 12 months). According to one industry analyst (Warren Rogers Associates), a quarter of all these tanks may be leakers.

The bad news is that a few of these leakers have contaminated over 100 household wells statewide. But the more or less good news is that since the adoption of the new underground tank rules in the last legislative session, the Bureau of Oil and Hazardous Materials Control has learned of the proper abandonment of about 125 tanks, and the supposedly proper installation of about 200 more (installation is neither inspected by DEP, nor are the installers registered, but the industry is becoming aware of their liabilities).

Two cases of leakers, in Friendship and North Berwick, have managed to grab the headlines for weeks, not because they are so very different from other cases, but because they came with and abetted a new public awareness of the public nuisance of leaking tanks. But each case has noteworthy twists to tell.

In Friendship, the first tank to be removed was leaking gasoline. But later two other leakers were removed, and both of those were leaking kerosene. Yet, either because of the difficulty of distinguishing the two blends by gas chromatography after each had been modified by passage through soils, or because the gasoline leak was so much bigger, the contaminant in all eleven bad wells has been identified as gasoline. No kerosene has been found.

The gas tank was removed by breaking open the tarmac paving which covered it, and when the job was done, the hole was backfilled but not resealed. So rainwater infiltrated through the site of the original source, and may have been the cause of a marked spread of the contamination to more houses down the street.

The bedrock is shallow in Friendship, and has a trough aligned along Town Road. This trough, the generally coarse soils which fill it, and the location of an abandoned water line with its gravel fill are probably responsible for the spread of the contamination. Almost all the wells are drilled, and it is in these that the contamination is found. In the well closest to the leaking tank, up to 5 feet of gasoline has been found floating on the water table. Only 15 feet away from this well, a recovery well was drilled in an attempt to draw the plume away from the household well. Though this well yielded over 10 gpm, it was unsuccessful: it got no gas. In the end, the recovery pumps were relocated in the household well, and water piped from the new well to the house!

Remediation costs may well be billed to the newly separated Ground Water Protection Fund, because the owner

of the tank has filed for bankruptcy.

In North Berwick, the spill came from a tank located atop a hill. In classic textbook style, the contamination found its way down both sides of the hill, and spread to wells off the major course of the plume by migration along fractures (in this case apparently parallel to foliation).

The nature of the contamination was misidentified at first by a private lab, which labelled all the gas chromatograph peaks of gasoline as separate priority pollutants.

Latterly, a mass spectrometer identified one particular peak as methyl t-butyl ether (MTBE), an additive which is more than 20 times as soluble in water as most of the common components of gasoline. Thus it always shows up as a major contaminant in local groundwater, may increase the solubility of gasoline in water, and in half the cases has been the only contaminant present above detection limit. In addition it gives the water a peculiar odor, more reminiscent of solvents than of gasoline. MTBE is, according to oil industry sources, added to all grades of gasoline, but is used most commonly in unleaded gas in proportions up to 6%. But the actual proportion in any batch of gasoline coming from the refinery will vary depending on the quality of the incoming crude, the grade of gasoline to be produced, the season of the year, and doubtless the whim of the refiner. But it is not a universal additive: samples of all grades at the local Exxon station in Augusta were recently found to contain no MTBE at all.

The removal of the guilty tank was considerably delayed by a false indication of innocence given by soil gas monitoring (soil sniffing). Small holes were augured in the soil at the site, and "sniffed" with both an organic vapor analyser and a portable gas chromatograph. Both surveys agreed on two fundamentals, that the 'hot spot' of contamination lay on the other side of the road in a hollow about 100 feet from the tank, and that the tank had no contaminated soil around it. The former point was proved nicely when several inches of product were discovered in a monitoring well at the hot spot. But the tank, though it lay directly on bedrock which sloped off towards the hot spot, did have a few inches of saturated soil beneath it.

The tank was only 12 years old according to its owner. It was buried in good fill well above seasonal high water. The owner said he "could have bet money on it being good". He did -- in lawyers fees delaying its removal.

Remediation, which may involve the extension of the town water line, will probably be paid for by the tank owner's business insurance.

Here's some news of water treatment to close with. MTBE isn't absorbed too effectively on activated carbon, and is the most difficult contaminant to remove by aeration. But Jerry Lowry's household water aeration systems, which fit in almost any cellar in about a 20 square foot space, have proven their capabilities in both of these cases. They were installed in the homes with the highest levels of contamination in both Friendship and North Berwick (several hundred parts per million gasoline and MTBE), and have shown that they are able to remove the contaminants to below detection limit (10 parts per billion) consistently.

# Open File Reports

(available from MGS)

Fresh-Water Wetlands Maps of Maine, by Michael K. Mullen and Andrews L. Tolman. (reports and maps - scale 1:50,000) Open-File Nos. 85-1 to 85-70. Index to wetlands maps coverage free upon request.

Price per map: \$2.00 plus 10 cents sales tax.

Earthquakes in Maine, October 1975 - December 1984, compiled by Carolyn A. Lepage and Robert A. Johnston. (map - scale 1:500,000) Open-File No. 85-71.

Price: \$1.25 plus 7 cents sales tax.

Faulting in the Grand Falls Area, Kellyland 15-minute Quadrangle, Eastern Maine, by Allan Ludman. (14 p. report) Open-File No. 85-72.

Price: \$1.50 plus 8 cents sales tax.

Sea-Level Rise in Passamaquoddy Bay: Archaeology and Sediment Cores, by David Sanger. (11 p. report) Open-File No. 85-73.

Price: \$1.50 plus 8 cents sales tax.

Sea-Level Rise and Archaeology in the Damariscotta River, by David Sanger. (13 p. report) Open-File No. 85-74.

Price: \$1.50 plus 8 cents sales tax.

Historical Dating of Salt Marsh Dikes in Coastal Maine/Historically Recorded Earthquakes in Central Maine, by David C. Smith and Beatrice Craig. (16 p. report) Open-File No. 85-75.

Price: \$1.50 plus 8 cents sales tax.

Pre-Silurian Rocks of Eastern and Southeastern Maine, by Allan Ludman. (29 p. report and 2 maps - scale 1:62,500) Open-File No. 85-78.  
Price: \$4.50 plus 23 cents sales tax.

Bedrock Geology of the Big Lake 15' Quadrangle, Maine, by Allan Ludman. (43 p. report and map - scale 1:62,500) Open-File No. 85-79.

Price: \$3.40 plus 17 cents sales tax.

Bedrock Geology of Acadia National Park and Environs, by Richard A. Gilman. (map - scale 1:50,000) Open-File No. 85-80.

Price: \$1.25 plus 7 cents sales tax.

Surficial Geology of Acadia National Park and Environs, by Thomas V. Lowell and Harold W. Borns, Jr. (map - scale 1:50,000) Open-File No. 85-81.

Price: \$1.25 plus 7 cents sales tax.

Surficial Geology of the Fish River Lake Quadrangle, Maine, by Eric F. Halter. (6 p. report) Open-File No. 85-83.

Price: \$1.00 plus 5 cents sales tax.

Bedrock Geology of the Palermo 7.5' Quadrangle, Maine, by Donald W. Newberg. (14 p. report and map - scale 1:24,000) Open-File No. 85-84.

Price: \$2.75 plus 14 cents sales tax.

St. Croix Region Crustal Strain Study, by David Tyler and Alfred Leick. (22 p. report) Open-File No. 85-76.

Price: \$2.00 plus 10 cents sales tax.

Water Quality in Sand and Gravel Aquifers in York County, Maine, by John S. Williams, Andrews L. Tolman, and Cheryl Woodard Fontaine. (90 p. report and map - scale 1:125,000) Open-File No. 85-77.

Price: \$5.75 plus 29 cents sales tax.

## MEMBERSHIP DUES STATEMENT

THE GEOLOGICAL SOCIETY OF MAINE, INC. is a non-profit Maine 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 dialogue 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, early spring and (with the Annual Meeting and sometimes field trips) in mid-summer. A newsletter, **THE MAINE GEOLOGIST**, is published for all members four times a year (more or less), approximately on a quarterly basis starting in September. The Society year runs from August 1st to July 31st. Annual dues and gift contributions to the Society are tax deductible. There are three classes of annual memberships:

- \$7 REGULAR MEMBER - Graduate geologists, or equivalent, with 1 year of practice in geology, or with an advanced academic degree in geology
- \$6 ASSOCIATE MEMBER - Any person or organization desirous of association with the Society
- \$4 STUDENT MEMBER - Persons currently enrolled as students in college who are interested in geology
- \$2 APPLICATION FEE - A one-time fee to all new members, payable when applying for membership

### ANNUAL RENEWAL or APPLICATION FOR MEMBERSHIP - THE GEOLOGICAL SOCIETY OF MAINE

NAME _____ (Please print or type)	Regular Member \$7 per year \$ _____
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THE GEOLOGICAL SOCIETY OF MAINE, INC.

MAIL TO: ROBERT G. GERBER, TREASURER  
P. O. Box 270  
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85-86 SOCIETY YEAR STARTED - AUGUST 1st - PLEASE SEND IN YOUR DUES

THE GEOLOGICAL SOCIETY OF MAINE

§ Arthur M. Hussey, Dept. of Geology,  
Bowdoin College, Brunswick, Maine 04011

THE MAINE GEOLOGIST is published four times a year, more-or-less, in early Fall, late Fall, late Winter, and maybe June or July, for members of the Geological Society of Maine, a non-profit educational Maine corporation interested in all aspects of the geology of the State of Maine.

Correspondence about membership in the Society should be mailed to Robert G. Gerber, P. O. Box 270, South Freeport, 04078. Items for inclusion in the newsletter may be directed to Chris Olson, RFD 3, Box 3070, Winthrop 04364.

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