



# THE MAINE GEOLOGIST

THE NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MAINE

DECEMBER  
1984

VOL. 11 NO. 2



## Society News:



### PRESIDENT'S MESSAGE

After a warm and hectic fall, winter is finally setting in: cooler, but still busy geologically. With so many geologic activities, we need to maintain the Society as a common forum where we can keep up-to-date on each other. In that regard, I was happy to have a great turnout (80+ afternoon, 50 for dinner and evening!) for the Fall Meeting at Colby.

We attracted a diverse group, including a fair number of chemists, to talk about ground-water sampling and analysis. Brad Caswell, Marcel Moreau, John Williams, Tom Potter and Gary Mabbot all gave excellent talks and a lively panel discussion followed. In this rapidly-changing area, we all can learn from each other.

After taking over Colby's watering hole and loft, we reconvened for more excellent presentations by Dan Lux, Fritz Hubacher, Ed Decker and Martin Hamborg. We covered a wide range from isotope dating to heat flow to computer mapping. Those who didn't make it missed a good one!

We will not be running a winter meeting this year, but the March 29 Bates Spring Meeting should be a good one if all the professors encourage their students to submit abstracts. Now is a good time to start working on them. It looks like we will have Dave Stewart, of USGS, giving us a report on the Deep Crustal Seismic Line.

I heard today from Bob Moench, USGS-Denver, that he will be able to lead a trip this summer on pre-metamorphic faulting in the Rangely-Phillips area. That coupled with Woody Thompson's Androscoggin Moraine trip make ample reason to mark out July 27-28 on your 1985 calendar. Do it NOW - no excuses.



### FALL MEETING

The Fall Meeting of the Geological Society of Maine was held at Colby College, Waterville, Maine on November 16, 1984. Approximately 60 people attended the afternoon session - "Ground Water Sampling and Analysis: A Geological and Chemical Synthesis".

President Andy Tolman of the Maine Geological Survey, opened the program with a brief presentation on ground water movement and instrumentation. The slides accompanying his presentation illustrated how complex flow systems can influence ground water movement and contaminant migration. A responsible evaluation of a ground water regime requires the synthesis of ground water flow information, the chemical and physical nature of the contaminant, if present, and variations in the subsurface. In addition, Andy emphasized that ground water samples represent a specific point in both time and space and programs must be carefully planned and implemented in order to obtain information that is truly representative of the aquifer being evaluated.

Brad Caswell, Consulting Hydrologist, followed with a presentation on fractured rock aquifers. As the result of his work over the years with bedrock aquifers Brad has identified several features characteristic of high yield fracture zones. They often, though not always, exhibit a surface expression or photolinear that can be identified on air photos. Fracture traces generally have definable geometries: a strike, dip and thickness. Transmissivity is greater along these fracture zones, though low yield wells may be associated with fracture zones. Brad illustrated the necessity for understanding bedrock aquifer properties and their hydrologic influence with examples of underground gasoline spills in Maine. In the investigation of an underground gasoline spill in Readfield it was clear that the dissolved component plume configuration was influenced by the fracture zone characteristics. Brad described a variety of techniques used to define fractured bedrock aquifer properties including well installation, pump tests, and geophysical methods.

Marcel Moreau of the Maine Department of Environmental Protection discussed the difficulties associated with evaluating immiscible fluids, particularly petroleum. Intuitive and even published impressions of petroleum - ground water mingling, namely the floating "pancake plume", are not supported in recent investigations funded by the Maine DEP. Investigations by hydrogeologists in Maine and other States have shown that gasoline contamination can be distributed both horizontally and vertically in an aquifer. In addition, the dissolved component of the plume is not constrained by significant density differences and can be a significant threat to ground water supplies. Marcel described the various tools used to evaluate underground petroleum spills including: drilling, sampling and analysis. He noted that a thorough consideration of these methods relative to the specific site conditions is necessary in order to optimize data collection and obtain quality results.

John Williams of the Maine DEP discussed various sampling techniques used to obtain ground water samples. The Sand and Gravel Aquifer Project has provided an opportunity to evaluate both the accuracy and efficiency of various techniques used

to sample ground water. The importance of proper well development was emphasized. John described a new technique employed in the sampling program that utilizes an air compressor to evacuate water and silt from a monitoring well.

The first chemist on the afternoon program was Tom Potter of the DEP lab in Augusta. Tom addressed some of the intricacies involved in analyzing organic contaminants. Analytical techniques vary in their degree of sophistication and interpretations must be sensitive to analytical limitations. Tom encouraged individuals, particularly non-chemists, to consider all possible sources of error and introduced variation in their interpretation of water sample results. He encouraged the professional community to familiarize themselves with all the steps involved in sample collection and analysis, and to evaluate analytical results with critical mind.

The final speaker of the program was Gary Mabbot from the Colby College Chemistry Dept. Gary's talk concerned analytical quality control or "are the numbers reliable?". He described the various statistical techniques that can be used to ensure accurate results. Standardization of laboratory techniques combined with replicate sampling and external checks care essential for adequate quality assurance.

The panel of speakers answered several questions from the audience before heading for the liquid refreshments.

A brief business meeting followed the afternoon program. Andy Tolman announced that the Spring Meeting would be held at Bates College on March. The afternoon session will consist of student presentations and the evening session will be an up-date on COCORP activities in Maine. Colleges in the State were urged to encourage their students to submit papers for this program. The Annual Meeting is scheduled for the weekend of July 27-28, 1895 at Gould Academy in Bethel. Excuses for inadequate notice will not be accepted !!!

Bob Gerber followed with the Treasurer's report. A large percentage of Bulletin 3 remain to be sold. Various suggestions were made including advertising in the AGU newsletter and submitting copies to Geotimes' list of books received. No formal action was taken. Bob also noted that the the printing cost for the last newsletter was perhaps more than the society could afford.

Don Newberg announced that the 1986 NEIGC would be held at Bates College in Lewiston. He would be interested in hearing from anyone interested in leading a field trip.

Walter Anderson, State Geologist, invited interested parties to donate rock core to the Survey's new core storage facility. Rock core must be properly identified and boxed to be acceptable for the facility. The fate of soil samples, rock chips and duplicate water samples will be considered by the Survey staff.

The evening program included presentations on advances in Appalachian Geology and a description of European mapping techniques. Dan Lux from the University of Maine at Orono described some of the equipment used Argon 40/39 dating. Fritz a graduate student at UMO presented some of his work dating rocks in the Smyrna Mills quad. Analysis of the data from the Hunt Ridge Pluton suggests that the pluton experienced rapid cooling approximately 400 myrs ago. Comparison of pre-plutonic deformation styles in the Smyrna Mills rocks with the Dorkendorf Group of sediments and volcanics indicate similar styles of deformation. Consequently, the date of 387 myrs currently

assigned to the Dorkendorf Group may be suspect.

Ed Decker, also of UMO, presented a rapid-fire slide show of Thermal Modeling and Heat Flow in the northern New England region. Thermal data suggests that the pluton thicknesses in Maine increase toward the coast. Thermal/age relationships also suggest repeated heating and cooling of the rocks in this region.

Martin Hamborg of the Norwegian Geological Survey described the various methods used to map and classify Quaternary deposits in Norway. Quaternary deposits in Norway are quite similar to Maine in both their distribution and geologic properties. Intensive field programs, a standardized classification and a digitized computer mapping system provide an efficient means of compiling and up-dating geological information. Sand and gravel resource maps include classification of deposits for engineering purposes, as well as offshore deposits. Martin described how computer generated color maps can be printed at requested scales with a variety of geologic information to the envious audience. Several examples of the maps were available to the audience for review.

The Fall Meeting of the Geological Society of Maine adjourned at approximately 10:00 p.m..



## Maine Survey Notes:

by W. B. Thompson

Several new publications by MGS staff and seasonal contractors have just been completed. Five bulletins, collectively titled "Peat Resources of Maine", are now available. They were authored by Cornelia Cameron (USGS), Michael Mullen, Carolyn Lepage, and Walter Anderson (MGS). The areas covered by the bulletins are as follows:

- Bulletin 28 - Aroostook County
  - Bulletin 29 - Penobscot County
  - Bulletin 30 - Piscataquis and Somerset Counties
  - Bulletin 31 - Southern and Western Maine
  - Bulletin 32 - Washington County
- (Each of these bulletins costs \$4.00)

For several years the MGS has been investigating earthquakes, faults, and Holocene crustal movements in Maine for a project funded by the U.S. Nuclear Regulatory Commission. This project has also involved scientists in a variety of disciplines from the Quaternary Studies Institute at the University of Maine at Orono, as well as the USGS and the University of Oslo in Norway. The results of the first 5 years of the Crustal Warping Study are summarized in an article by project investigators in the November issue of Geology magazine, published by the Geological Society of America. It has recently been learned that the MGS will receive funding to continue the study through at least 1985, and comprehensive results of the project will be published in a forthcoming MGS bulletin.

Another project is also close to completion. The Geological Society of America is about to publish Special Paper 197, entitled "Late Pleistocene History of Northeastern New England and Adjacent Quebec". This volume was edited by Harold Borns (UMO), Pierre LaSalle (Quebec Dept. of Energy and Resources), and Woodrow Thompson (MGS). It contains 13 articles on the Pleistocene stratigraphy, deglaciation, and human colonization of Maine, New Hampshire, and Quebec. Many of the articles deal with Maine, and were written by MGS contractors and staff of the Quaternary Studies Institute at UMO. The volume has evolved as a result of a symposium held at the 1981 Bangor GSA meeting, and publication is expected within a few weeks.



The Materials and Research Division within the bureau of Project Development of the Maine Department of Transportation, acting in a quasi-consulting capacity, is responsible for the acquisition and dissemination of geologic, geotechnical and hydrologic data relative to highway and bridge design and construction. Six certified geologists, a geology technician and five civil engineers with soils and geotechnical backgrounds form the nucleus of a staff of about sixty-five people who perform the various tasks necessary to supply the MDOT Design and Construction Divisions with pertinent surficial and subsurface information, and general materials test data.

Three regional geologists and the geology technician supervise field crews and washboring equipment statewide in soils borings, ledge soundings and bedrock coring on existing roadways and proposed new highway alignments, and for bridge pier and abutment sites. Lloyd Dickson, George Eaton, Al Eggleston and Becky Hewett also conduct field surveys of granular deposits to determine the types and suitability of aggregate sources for highway embankment and base course utilization, and for asphalt and concrete mixes. In addition, they do septic site evaluations to aid the Right of Way and Maintenance Divisions in appraisals of private and state-owned land parcels, and occasionally collaborate with the Legal Division and the Location and Survey Division on groundwater and surface water problems. The geologists compile field geologic and geotechnical information and laboratory test data into soils reports for each highway project. Information on existing surficial soils, subbase soils, subsurface ledge interfaces, bedrock types, roadside drainage, possible unique local circumstances and special considerations of all natural and/or man-made features that affect the final roadway or bridge configuration are discussed in detail. Recommendations may be included relative to underdrain locations, muck excavation, potential rock excavation problems and other salient data, in collaboration with the soils engineers, consistent with good design and construction criteria.

Charlie Norburg at our Bangor office is the materials geologist, coordinating granular deposit and sample data from the field with laboratory test results, and compiling and writing the final project reports on granular source quantity, quality and various aggregate specifications suitability. He maintains the voluminous M & R files on statewide granular deposits by updating, adding data and doing on-site investigation as necessary. In addition, he is responsible for checking and describing bedrock cores obtained at bridge sites by the washboring crews.

Two certified geologists with the classification of Soils Research Scientist are primarily involved with the remote sensing of aerial photographs and associated necessary ground truth acquisition in the development of preliminary project surficial soils maps for the geologists and soils engineer, and drainage reports for the Highway and Bridge Design Divisions. Wilbur Tidd at the Bangor office handles projects generally located in the northern and eastern sections of the state, and Ray Woodman at the Augusta office handles western and southern division projects. Both are also involved in the other described disciplines, often working with the field geologists.

By employing the standard disciplines of photo interpretation processes, engineering soils type boundaries are delineated for proposed highway relocations, new location corridors and bridge sites. The map units describe two basic till types, granular formations and deposits, marine and lacustrine deposits, areas of thin soil cover on bedrock, bedrock outcrops and swamp and peat deposits. Units may be tailored to site-specific conditions by appropriate modifying explanations to better identify

ground features relating to possible engineering problems. Specific points of interest may be field checked to verify or disprove delineations. The soils maps are used by the Soils Engineer at checkpoint meetings prior to the field work and by the geologists to indicate expected field conditions.

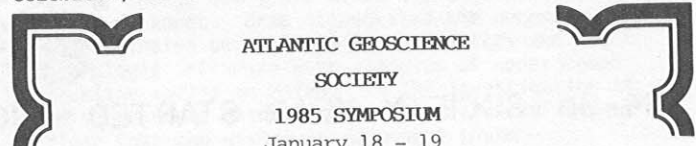
Drainage reports consist of hydrologic data for individual drainage structures on or associated with MDOT projects. Structures upon which data are compiled range between driveway culverts and major bridges to urban storm systems, where individual catch basin data are required. Ridge lines, or drainage divides, are delineated stereoscopically to define watersheds and their respective areas. Eleven watershed formulae parameters are determined utilizing airphotos. USGS quadrangle maps, ground truth and local municipal knowledge of underground systems. These raw data are used by the Design Division to compute the optimum size structure for each location.

There are two currently on-going remote sensing research projects for comparing the data acquisition potentials and capabilities of various scale-wave length combinations of air photos, for optimum delineation of very small watersheds.



## In Other News:

A meeting to review and present results of the Sherbrooke-Lewiston 1° X 2° Quadrangles CUSMAP (Conterminous United States Minerals Assessment Program) Program was held in Franconia, NH September 24 - 26. The meeting was jointly sponsored by the U. S., Maine, and Vermont Geological Surveys, and the Office of the New Hampshire State Geologist, and included a field trip September 26 led by Bob Moench on the metavolcanic stratigraphy and mineral potential of the Littleton - Moosilauke area, NH. Bob also led the Maine Mineral Resources annual field trip September 27 on the metavolcanic stratigraphy and resource potential from Colebrook, NH to Grafton Notch, ME.



**ATLANTIC GEOSCIENCE  
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For information contact:

Dr. N. A. Van Wagoner  
Department of Geology  
Acadia University  
Wolfville, Nova Scotia BOP 1X0

**JOINT ANNUAL MEETING**

Geological Association of Canada

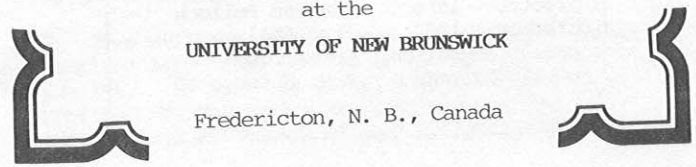
Mineralogical Association of Canada

15 - 17 May, 1985

at the

**UNIVERSITY OF NEW BRUNSWICK**

Fredericton, N. B., Canada



**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

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**84-85 SOCIETY YEAR STARTED - AUGUST 1st - PLEASE SEND IN YOUR DUES**

THE GEOLOGICAL SOCIETY OF MAINE

c/o 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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