



# THE MAINE GEOLOGIST

THE NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MAINE

MARCH  
1988

VOL. 14 NO. 2

Geological Society of America  
Northeast Section



March 9-12



Welcome to Portland

Northeast GSA, Portland, Maine, March 10-12, 1988

The Northeastern Section of the Geological Society of America is holding its annual meeting in Portland, Maine. Papers will be presented on a wide variety of topics including stratigraphic and structural relations in Northern Appalachian geology; glaciomarine sedimentation; contaminant transport, and practical applications of Geographic Information Systems (GIS). Any questions you may have can be directed to the Maine Geological Survey or Chairman of the Local Committee: Steve Pollock, Dept. of Geosciences, USM-Gorham, Maine 04038; (207) 780-5350

The Geological Society of Maine is one of the many sponsors of the meeting. We plan to grab a corner of the MGS booth to display --and hopefully sell a few of our publications. We will also have our current listing of your dues status and mailing address at the meeting so you check it and make needed corrections.

## The Geological Society of Maine

The Geological Society of Maine is an association of geologists and others interested in furthering the public awareness and understanding of Maine geology; in developing and encouraging dialogue and social contact among geologists working in Maine; and informing members and the public of current and planned geologic programs in Maine. The Society was formally organized in 1974, and was incorporated as a non-profit Maine corporation in 1977. Membership has historically ranged from about 200 to 250 members, with about 70% Mainers and the rest from all over the U.S. and Canada.

The Society meets three or four times a year to hear technical presentations and news of current field programs, and to conduct its business, and also sponsors geologic field trips within Maine and special meetings on subjects of particular public interest. Field trip guidebooks are published for those events and programs are printed for special meetings. A newsletter, THE MAINE GEOLOGIST, is published quarterly, more or less, containing announcements, pertinent news items, and short technical articles on Maine geologic subjects.

## GENERAL MATTERS

### Fall Meeting

The Fall GSM meeting on Computer Applications in Geology was Carolyn LePage's brainstorm and we think it was a great success. We hope that you had an opportunity to see several of the different software applications and associated hardware. We would especially like to thank all the individuals who prepared presentations and lugged all their equipment to USM for the program.

The Fall Meeting of the Geological Society of Maine was held on Friday the 13th, November 1987 at the University of Southern Maine in Gorham. The topic of the Fall Meeting was **Computer Applications in Geology**. The afternoon meeting consisted a series of concurrent workshops, demonstrations and poster sessions covering a wide variety of software programs and graphic displays. We ran out of programs (65) so we figure that we had about that many people over the course of the afternoon.

Seeing that it was Friday the 13th we were a little jittery figuring that we were due for some sort of catastrophe - a power failure, a tidal wave or something. As it turned out one person was the recipient of all bad luck on that Friday. The story goes something like this: On his way down to the meeting, not far from L.L Bean, Detmar Schnitker's car broke down. He ended up at a gas station in Freeport trying to get it towed or fixed. Well GSM was in for a little GOOD LUCK because who should stop by for gas but geologist Ed Laine from Bowdoin College. Ed was able to give Detmar and his MAC a ride to Gorham and the show went on without a hitch.

A crew of about 35 stayed around for the evening program of food, drink and talk. The business meeting was about 30 seconds long and consisted of an introduction of the evening speaker John Rand, Consulting Geologist from Freeport, Maine. Jack's talk was titled **A Grab Gag of Baddies ....Only Mother Nature Can't Make Mistakes** was profusely illustrated with overhead slides of familiar maps and birds. Jack's presentation centered about the current practice of the Geologic Arts in Maine science. He cautioned that we must be aware of, and offer to the public, ONLY the geologic truth that balances on the scale with intellectual honesty.

Jack followed his sermon with a discussion of his experience with the fractures in the six miles of tunnels that go out under the Atlantic at infamous Seabrook. Here was a perfect example of how Mother Nature calls the shots. For those of you who missed it, a summary of Jack's thoughts appear elsewhere in this newsletter.

## MEMBERSHIP, DUES AND MAILING ADDRESS

We've had a few problems in the changing of the guard. The transfer of the treasurer's duties from Bob Gerber to Irwin Novak required setting up a new computer system for both the accounting and the mailing labels. This took a little more time

than we expected. We apologize for any inconvenience this may have caused the members of GSM, both old and new. We think we have it under control now BUT if you think you have a problem with either your dues status or your mailing address please contact our treasurer:

Irwin Novak  
Dept. of Geosciences  
University of Southern Maine  
Gorham, Maine 04038  
(207) 780-5350

**A reminder:** Please make sure that your mailing address is correct. Several people are still listed at former haunts and abodes. The post office will not forward your newsletter --and we have to PAY extra postage when it is returned to us.

The bulletin, MAINE GEOLOGY, was established by the Society in 1977 to make available worthy research relating to various aspects of the geology of Maine. To date we have published three bulletins:

Bulletin No. 1., edited by Arthur M. Hussey II & David S. Westerman, was published in 1979 and contains five papers on a variety of geologic topics. It is presently out of print. Copies are available for inspection at the Maine Geological Survey Library in Augusta, and at many of the Maine college and university libraries.

Bulletin No. 2, edited by Arthur M. Hussey II & David S. Westerman, was published in 1982, and contains six papers on Maine geology. Copies of Bulletin No. 2 are still available for purchase from the Society and copies will be on hand at GSA for purchase during the meeting.

Bulletin No. 3 was published in 1983 and consists of a collection of the twelve field trip guides from trips conducted from 1978 to 1983, as part of the GSM annual summer meeting. The trip guides include both surficial and bedrock programs, complete with maps and road logs. This is a popular publication, but there are still a few copies available for purchase. Again, copies may be obtained by mail from the the Society, or they may be purchased at the GSA meeting in March.

Inquiries concerning submission of papers for publication in future Bulletins are encouraged. Contributions will be reviewed by the editors and specialists in the topic of each. article. Contributions (or inquiries) should be sent to either editor:

Dr. Arthur M. Hussey II Department of Geology Bowdoin College Brunswick, Maine 04011	David S. Westerman Dept. of Geology Norwich University Northfield, Vermont 05663
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### Spring Meeting

The Spring Meeting of the Geological Society of Maine has been scheduled for Friday March 18th at Bates College in Lewiston. As in previous years the afternoon session will consist of presentations by students from Maine colleges and universities. Last year the student presentations were excellent, but attendance was a little slim. We encourage you to attend and show your support for the student program.

Geological Society of Maine  
Spring Meeting  
Bates College/Chase House  
March 18th

2-5 p.m. Student Presentations  
5-6 p.m. Business Meeting & Social Hour  
7 p.m. Evening Speaker - TBA

### THE GEOLOGICAL SOCIETY OF MAINE Annual Student Presentations Spring Meeting

Friday, March 18, 1988 2:00 P.M. Bates College

**TO: UPPER CLASS GEOLOGY AND EARTH SCIENCE MAJORS**  
Students in Maine colleges are invited to present papers on their geologic projects, generally following the style of the Geological Society of America technical sessions. The thought here is to provide students an opportunity to discuss their work before a group of "outside" geologists, to give them some experience in preparing a technical paper, in writing a concise and informative abstract, and in making an oral or poster presentation before a professional audience.

In connection with this program, you are invited to consider preparing a paper on such of your projects as may be far enough along to be shaped up for a formal presentation either orally or in a poster session. Presentations will be limited to 15 minute length with an additional 5 minutes for open discussion. A total of eight oral presentations will be allowed. Poster sessions will be held during the social hour. Limitations on number and information regarding available space will be determined on the basis of number of submissions.

An important part of the student presentations will be the preparation of abstracts for publication in THE MAINE GEOLOGIST in a subsequent issue of the newsletter. Depending on the size of type used by the author, the space will permit a 200 to 250 word abstract. Check your abstract carefully before submission.

**DEADLINE:** Submit an original and two copies (unfolded) of CAMERA READY ABSTRACT to:

Professor Roy L. Farnsworth  
Department of Geology  
Bates College  
Lewiston, Maine 04240

By: March 4, 1988

Note: If more information is needed call 207-786-6154 or write to the above address.



### UPCOMING EVENTS



#### MAINE GROUNDWATER ISSUES

A one-day technical seminar on groundwater will be held on March 15, 1988 in Augusta, Maine. Sponsored by the Maine Section ASCE, the program will cover such topics as hydrogeology, regulatory considerations, sources of groundwater contamination and treatment technologies for contaminated groundwater. A luncheon keynote address will be given on the legal aspects of groundwater. The individual topics and speakers were selected to reflect the general interests of engineers, geologists and soil scientists in the Maine professional and environmental consulting community.

For more information contact Charles R. Nickerson c/o Haley & Aldrich, Inc., P.O. Box 4076, Portland, Maine 04101 or telephone (207)772-7869.



"Bedrock Geology, till provenance, and geochemical prospecting" a lecture by Ralph Stea of the Nova Scotia Department of Mines and Energy. Thursday April 14th at Boardman Hall, University of Maine at Orono at 3 p.m. (Room 116).





The Maine Remote Sensing Interest Group will meet in Augusta in Mid-March. Please contact Steve Sader in the Forestry School at Orono for more information (581-2845).

The Bates College Geology Club will host a lecture by Dr. Julie Brigham-Grette of the University of Massachusetts on Friday, March 25 at 3 p.m. in the Carnegie Science Building. The topic of the talk will be **Beringia: A Marine and Terrestrial Crossroad for the Last Three Million Years.**

**1988 Annual Meeting and Field Trip** - Tentative plans are on for Allan Ludman to lead a bedrock geology trip in the Bottle Lake region of Maine on one of the days. Anyone wishing to lead or co-lead a surficial trip in east-central Maine should contact the editor. The weekend of August 6th is the proposed date of the field trip.

The New England Section of the National Association of Geology Teachers (NAGT/NE) annual meeting will be in Maine at the University of Southern Maine in April of 1989.

The flavor of the meeting will be environmental. If any of you have a suggestion for the program, or an offer to participate, please contact:

PAT SEAWARD  
MAINE GEOLOGICAL SURVEY  
STATE HOUSE STATION # 22  
AUGUSTA, ME 04333  
289-7173

### Maine Mineral Resources Association

The Maine Mineral Resources Association met on February 22 at the Pilots Grill in Bangor. Ed Sheffington opened the meeting with the treasurers report. MMRA is solvent. Fred Beck updated the members on the status of DEP's water quality regulations, an issue very important to the mining interests present. Theresa Secord was elected as the New President of MMRA. She will be replacing Hal Downey, who is moving to Arizona, following the spring meeting. Bill Drinkwater spoke briefly on a new gold panning club he is forming. Yearly membership will be twelve dollars. Membership entitles you to a club patch, gold pan, and a monthly newsletter and meeting. The date for the spring meeting was tentatively set for May 7th. There is a field trip planned Government Pit in North Conway for smokey quartz collecting followed by a visit to the cassiterite veins in Jackson, New Hampshire.

Following dinner Ed Decker from UMO spoke on the relationship between heat production in rocks and heat flow. He had many good examples from Colorado and Maine. Apparently plans for an ultra deep (15 km) drill hole have recently been scrapped by the government.

In general it was a very successful meeting. Membership and moral are high and a good time was had by all. Craig Neil, MGS

### Ground Water Classification

On May 23, 1986 the Groundwater Classification Subcommittee of the Ground Water Standing Committee recommended a pilot project that would evaluate the feasibility of using a three-level groundwater classification system based on groundwater vulnerability to surface and near-surface contaminants. On July 1, 1986 the Standing Committee authorized this project to be undertaken with the cooperation of the town of Lamoine, Maine. Specifically, data was compiled and generated in an attempt to map the groundwater

resources of Lamoine as highly, moderately, or least vulnerable.

On December 1, 1987 the results of this pilot project were presented to the Ground Water Standing Committee. Due to the limited variability of hydrologic conditions in Maine, the three-level designation was shown to be inappropriate. Furthermore, the adequacy of the State's hydrogeological data bases and the questionable success of adding to them with locally generated data creates uncertainty in accomplishing specific vulnerability delineations.

On December 22, 1987 the Ground Water Standing Committee discussed alternatives to the three-level vulnerability classification system. One option was a two-level vulnerability classification system (vulnerable and highly vulnerable) based on a few very simple parameters. A second option was to classify groundwater by use (current public water supply, potential public water supply, private water supply, non-drinking water supply, etc. in order of priority) or by availability (significant sand and gravel aquifers and high-yield bedrock fracture areas highest priority, everything else second priority). Another option was to not pre-classify at all. Instead, as part of a local growth management and comprehensive planning effort, communities would identify important current and future water supplies and take steps to protect them. Additionally, the resources would be provided (guidelines, technical assistance, etc.) to communities to enable them to conduct site specific evaluations of development proposals as they occur to determine their suitability in relation to the groundwater resource.

The Standing Committee directed the Groundwater Coordinator to determine the needs of this latter option and explore with the State Planning Office the possibility of including this program in state growth management efforts being undertaken in 1988. The Groundwater Coordinator will report to the Standing Committee at the earliest opportunity. Other classification system options will be evaluated in light of that report. The suitability of the current system as opposed to feasible options will be determined in 1988.

Paul Dutram, SPO

MAINE GEOLOGICAL SURVEY  
Department of Conservation  
State House Station 22  
Augusta, Maine 04333

The Maine Geological Survey wishes to announce the availability of two new publications. The Second Edition of the Ground Water Handbook for the State of Maine by W.B. Caswell is available from the Survey for \$5.00, plus 25¢ sales tax. Also available are reprints of the November/December 1987 issue of Rocks & Minerals magazine, featuring Maine minerals and mineral localities. Copies are available from the Survey for \$4.00, plus 20¢ sales tax. Make checks payable to the Treasurer, State of Maine.

The first of the new Maine Geological Survey surficial geology/surficial materials maps, with reports, are available. These maps, done in the USGS COGEMAP program, show detailed surficial information. The first five 7.5' quads completed are Dover East, Kittery, Portsmouth, York Harbor and York Beach, Contact the MGS for more information.



## 1988 Geologic/Hydrologic Legislation

The following is a listing of Legislative Documents (LD's) currently before the 113-th Maine Legislature, which would have an impact on the Maine Geological Survey and the rest of the geological community:

LD 2111 - Resolve, Regarding the Study of low-level Radioactive Waste in the Town of Greenbush

-This is for a study of the former University of Maine low-level radioactive waste disposal site in the Town of Greenbush.

LD 2122 - An Act to Appropriate Funds for Mapping of Sand & Gravel Aquifers

-This bill is a result of a study of pesticide regulation by the Joint Standing Committee on Agriculture.

LD 2156 - Governor's Budget - Appropriations

-This LD provides funds for the following:

- Completion of the Bottle Lake & Sebago Lake granite projects.
- Systematic mapping of Groundwater Resources of Sand & Gravel/Bedrock Aquifers.
- GIS-Geographic Information System Facility for Natural Resource Identification and Spatial Evaluation.
- River Flood Forecasting - provides funds for a river flood forecasting by the MGS and Energy Management Agency in cooperation with the National Weather Service. This also includes funds for a cartographer and hydrogeologist.

Mike Foley, MGS

### BASIC ASSUMPTIONS

J. R. Rand  
RR 1 - Box 403  
Freeport, Maine 04032

"Our society encourages the belief that there are quantifiable solutions to everything. We're particularly susceptible to pseudoscientific approaches, be they in corporate management or psychology or physical fitness. This eagerness for the easy answer helped produce Oct. 19, 1987.

The stock market crash showed what can happen when perfectly good academic theory is converted into a magic formula." (A. Sloan and R. Stern, FORBES, Vol. 141, No. 2, p. 55; Jan. 25, 1988)

Thus, Messrs. Sloan and Stern introduced their discussion in FORBES on how the Black-Scholes equation, devised 15-20 years ago specifically to value financial-market "options", was adapted, customized, fine-tuned and generally jiggered with to become the foundation for the house of cards known as Program Trading. Like a lot of things, the Black-Scholes equation was fine for its original, limited purpose. It was the magic-wand folks that blew the fuse, by ignoring its basic assumptions as to open and orderly markets, no problems in executing trades, and constant volatility of the stocks underlying the options.

Basic Assumptions. Now, we have a myriad of equations that attempt to describe the various aspects of the ground water domain. To work properly, these equations also have their own built-in basic assumptions. The historical emphasis in ground-water education, research and practice has been on the hydrology of unconsolidated sediments - the spawning ground for the equations in common usage. Given the equations and (hopefully) a few facts gathered in the field, some appropriate mathematical analyses may actually characterize a surficial aquifer in a reasonably useful way. And then be extended to define the

distribution and migration of contaminants that may be in or impinging upon the aquifer.

That's in sediments. Something to worry about here, though, is that so much of our present and future ground-water contamination in Maine either now does or eventually will impact aquifers in fractured crystalline bedrock. A whole new game, with one fundamental Basic Assumption: each bedrock aquifer is UNIQUE unto itself. A further worry is that hydrogeological practitioners who play with our crystalline bedrock - project planners, field people, analysts, modelers - may fail to appreciate that basic assumption.

You see people magic-wand airphotos to come up with a network of lines which they define as "fracture traces". And then they jump to rose diagrams which certify their airphoto apparitions as True Fractures. And then they leap from there (with or without field data) to formal characterization of the bedrock ground-water regime, by looking sometimes merely at their network in the context of local topography; sometimes by doing quite complex mathematical modeling. If subsequent pump-testing doesn't confirm the model, never mind: the model has a life of its own.

You see people do pump tests in bedrock aquifers and plot their observation-well drawdowns on distance-drawdown graphs. Then, faced with a shotgun pattern of points on the graph, undaunted they either eyeball or compute a "best fit" line through the crowd and use that slope to proclaim something called the "bulk transmissivity" of the bedrock aquifer. Maybe (and maybe not) the bulk transmissivity bears some real relationship to the aquifer's long-term yield as a water supply, but it is a meaningless - and dangerous - concept to use when dealing with contamination of bedrock aquifers.

You see people collect close-interval measurements at the start of a pumping test and fit these to mathematically derived "type" curves that tell them all they ever wanted to know about the well's bedrock aquifer. And you wonder if they're taking well-bore storage into consideration; or whether they know that their curve's basic assumption is an expression of some systematic fracture geometry which is anathema to Nature.

Remember: each aquifer in fractured crystalline bedrock is unique. Some may actually fit good old porous-media concepts, and be amenable to all sorts of classic analyses - maybe even to packer-testing for a guess at hydraulic conductivity. But these bedrock aquifers are rare and localized, and the only way you can be sure you have one is by doing pumping tests.

My modest experience with pumping tests in Maine bedrock aquifers, combined with somewhat more extensive practice in chasing fractures down from surface mapping to core-hole interpretation to the Real World underground in mines, tunnels and powerhouse caverns, is that fractures and water-courses in them tend to march to their own music. Maybe there's a wizard somewhere who, once you have mapped a fracture system in detail in three dimensions, can derive a mathematical expression for the geometry of your system. But even then, two problems would remain: first, not all of the fractures would carry water; and second, the model would apply solely and uniquely only to the block that was mapped.

A good example of the vagaries of aquifers in crystalline rocks is represented by the continuous bedrock exposure opened in the cooling-water tunnels at the Seabrook nuclear station in New Hampshire. Two 22-foot diameter tunnels, each about 3 miles long, were bored from the plant site out under the Atlantic ocean to points about 1 mile offshore. The tunnels were driven at an average depth of about 220' below sea level through a variety of rock types including the Newburyport quartz diorite, the Kittery and Eliot Formations, and numerous steeply-dipping mafic dikes.



Prior to construction, I mapped surface exposures and logged and interpreted some 9000' of NX bedrock cores, many of which had been drilled using orientation equipment which allowed strike-and-dip measurement of fractures, foliation and contacts. Geotechnical Engineers of Winchester, Massachusetts, performed countless packer tests in the exploratory borings. During excavation of the tunnels, Frank Bellini of Yankee Atomic, Tony Stewart of Morrison-Knudsen, and David Corkum, now of Stone & Webster, mapped bedrock geology and structure in the tunnels at a scale of 1" = 10', recording ground-water inflows in each 10' interval along the tunnels.

There's nothing like ground-truth to show a pre-construction expert that he's only mortal. GEI's estimate of total water inflow into the tunnels clocked in at about 5X higher than was actually experienced. And my estimates of the needs for artificial roof supports and pre-excavation grouting were commensurately off the mark - also on the happy side. In a couple of cases, for example, where cores at tunnel elevation came up either as soggy mush or so closely fractured as to suggest a straight pipe up to the ocean, the tunnel machines flew through like Air France headed for Paris. No problems.

Now, with close-order mapping of more than 2 1/4 million square feet of continuous bedrock exposed in two huge almost-horizontal borings lying a couple of hundred feet below the Ultimate recharge source, there's a little too much information to cover in any detail here. Some simple generalizations may be useful, however, to picture my views as to the quite non-uniform relationships amongst fractures and ground water.

1. Of about 73 non-welded faults (open cracks with or without gouge) that were mapped in the tunnels, northeasterly strikes predominate but dips show no preferred attitude. Dips range from 15° to 90° with an average of about 58° and median of 61°; 29% of the non-welded faults dip flatter than 45°. Non-welded faults occur throughout both tunnels, but tend to cluster in zones of closer spacing at intervals of a mile or more. There is only a poor association of closely-spaced non-welded faults with ground-water inflow into the tunnels.

2. There is a general spatial association of close joint spacing with broad bedrock valleys above the tunnels, and a general (if imperfect) association of wide joint spacing with bedrock highs above the tunnels. There is no consistent association of close joint spacing with zones of closely-spaced non-welded faults, and only a relatively poor association of close joint spacing with ground-water inflow.

3. The greatest ground-water inflows are associated with discrete, individual features: mafic dikes; single faults; and (imperfectly) with deep, narrow bedrock valleys. Not all of the mafic dikes are water-bearing, and water-bearing non-welded faults may deliver quite inconsistent inflow rates at different points along their strikes. One area of faulting in the intake tunnel, for example, that delivered a cumulative inflow of about 100 GPM through a 150' stretch of tunnel, leaked less than 10 GPM where it crossed the discharge tunnel, 90' away. Again, one deep, narrow bedrock valley beneath Hampton Harbor in which exploratory borings made me sound dire alarms as to the very poor rock quality and probable heavy water inflow, was passed under by both tunnels with hardly any splash: less than 5 GPM.

"Our society encourages the belief that there are quantifiable solutions to everything." As to hydrogeological inquiries in fractured crystalline bedrock, the worry here is lest the belief should itself become the basic assumption. As to

hydrogeologists, the hope here can only be that they try to be more perceptive than the stock brokers.



#### MAINE GROUNDWATER ISSUES

Program Schedule for Technical Seminar  
Maine Section American Society of Civil Engineers  
Augusta, Maine  
March 15, 1988

8:00 a.m.	Registration & Welcome
8:40	THE OCCURRENCE OF GROUNDWATER IN MAINE - John S. Williams, State Hydrogeologist, Maine Geological Survey
9:30	GROUNDWATER REGULATORY ISSUES - Dean C. Marriott, Esq., Commissioner, Maine Department of Environmental Protection
10:45	SOURCES OF GROUNDWATER CONTAMINATION John Sevee, Sevee & Maher
11:45	LUNCHEON SPEAKER: LEGAL ASPECTS OF GROUNDWATER - Daniel E. Boxer, Esq., Pierce, Atwood, Scribner, Allen, Smith & Lancaster
1:15 p.m.	CURRENT TREATMENT TECHNOLOGIES FOR SITE REMEDIATION - Donald E. Jones, Groundwater Technology, Inc.
2:10	REMEDICATION OF GASOLINE STATION LEAKAGE - Michael Penzo, Haley & Aldrich, Inc.
3:30	BIORECLEMATION - Louise B. Fournier, Ph.D., Groundwater Technology, Inc.
4:20	QUESTION AND ANSWER SESSION/PANEL DISCUSSION
5:00	Adjourn



PLEASE UPDATE YOUR MAILING ADDRESS

AND

PAY YOUR DUES



**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	\$ _____
	Associate Member	\$6 per year	\$ _____
ADDRESS _____ (permanent Mailing Address)	Student Member	\$4 per year	\$ _____
	Application Fee	\$2 One-time	\$ _____
	<u>TOTAL ENCLOSED :</u>		\$ _____
_____		Zip code	

Please make checks payable to:

THE GEOLOGICAL SOCIETY OF MAINE, INC.

**87/88 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 nonprofit 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 Arther M. Hussey, Dept. of Geology, Bowdoin College, Brunswick, ME 04011. Items for inclusion in the newsletter may be directed to Robert A. Johnston, Maine Geological Survey, Department of Conservation, Station #22, Augusta, ME 04333

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