



# THE MAINE GEOLOGIST

THE NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MAINE

SEPTEMBER

1976

VOL.3 NO. 1

## ANNUAL MEETING CONVENED

The Annual Meeting of the Geological Society of Maine gathered on a grassy knoll at the Darling Center of the University of Maine at Walpole on Friday, August 6th, with about 30 members, guests and one pet crow named Alfie in attendance. The day was nice, at around 710 (220C), and somewhat overcast. Toward the end of the day a very occasional raindrop kept things from lagging during the business part of the meeting.

1. The following Officers and Councilor were nominated from the floor and duly elected:

President	W. W. Rideout - Gardiner
Vice President	W. A. Anderson - Wayne
Secretary	A. W. Berry, Jr. - Farmington
Treasurer	J. R. Rand - Cundy's Harbor
Councilor to 1979	R. R. Holmes - Union

2. J. R. Rand read a summary of the Treasurer's Report for 1975-76, a detailed copy of same to be found elsewhere in this Newsletter.

3. J. R. Rand was also re-appointed Editor of the Newsletter. He thereupon made a loud request for news items, abstracts, drawings and any other technical material that might inspire the Newsletter to be something more than just a roughly periodic call for payment of dues.

## SPEAKING OF DUES...

The Society has adopted an August 1 to July 31 membership year, and dues for the 1976-77 year are now due. Annual dues are \$5 for Regular Members; \$4 for Associate Members; and \$2 for Student Members. There is also a one-time \$2 Application Fee for new members.

As a gentle reminder to old members, we have cleverly color-coded the address labels on this Newsletter to designate your membership standing. If your address label is unsullied white, you are recorded as paid up for 1976-77. If your label is coded yellow, you are paid up for 1975-76, but you still owe dues for 1976-77. If your label shows glowing PINK, you owe dues for BOTH 1975-76 and 1976-77, and it will be only fair to remove your name from the mailing list if you don't respond fairly shortly.

PLEASE MAKE DUES CHECKS PAYABLE TO THE GEOLOGICAL

SOCIETY OF MAINE, and send to J. R. Rand, Treasurer, Cundy's Harbor, RD-2, Box 210A, Brunswick, Maine 04011.

## THE DARLING CENTER

Located on 130 beautiful acres adjacent to the Damariscotta River in Walpole, the Ira C. Darling Center is the base station for marine science programs of the University of Maine, and is the home of the University's Department of Oceanography. Although the emphasis at present is in teaching biological sciences, Ken Fink and Detmar Schnitker have a small group of students working on geological theses. In addition to the academic curricula, there is a large group of professionals at the Center working on special contract programs, marine engineering, environmental monitoring and aquaculture. Total personnel includes about 70 people, with an annual funding of about \$1,000,000, mostly from grants.

Shore-based facilities are quite cramped, with all space (houses, barns, sheds, mobile-home labs) fully occupied. The only new capital construction at the Center has gone into one new classroom and to the aquaculture facilities at the river-front. The University now, however, is looking toward becoming more involved in marine research than in the past, and is attempting to bring all marine sciences studies throughout the University system together in a fully-coordinated enterprise.

The only apparent problem at the Center derives from geography, which creates a relative isolation of the faculty and students from close intellectual association with colleagues and peers residing at the main academic campuses, and requires all hands to develop a self-sufficiency not needed elsewhere in the system. To counter the academic isolation, the Center presents a series of seminars during the regular semester, bringing in speakers from "outside" to discuss current developments and thinking in scientific subjects. These seminars are held every 14 days, generally on Wednesday evenings and Friday afternoons. If you should wish to be on the list to receive notices of the seminar schedule, please contact Dr. L. Kenneth Fink, Jr., Ira C. Darling Center-UMO, Walpole, Maine 04573.

The Society wishes also to express its appreciation to Detmar Schnitker, Ken Fink and the University for providing a space for this year's GSM Annual Meeting, and for giving us a look at their fine and worthwhile marine research facility

## MID-SUMMER CONFERENCE

The major part of the Society's Annual Meeting consists of technical presentations by various geologists, to summarize their plans, work or findings with respect to bedrock, surficial, hydrogeologic, marine, geophysical and oceanographic matters. Because they are fielding the largest program of investigation in the State, the members of the Maine Survey always have plenty to offer a meeting, and they didn't let us down any at this year's conference.

### Maine Survey's 5-Year Plan

Bob Doyle, stating that the need for sound geological contributions to public planning and decision-making bodies has become critical in Maine, described his proposed 5-year plan for the Maine Survey. The plan visualizes establishing a permanent technical staff to run a Survey composed of four basic Divisions: Administration and Cartography; Physical Geology; Hydrogeology; and Marine Geology. The plan proposes an average annual budget of about \$384,000 for the period, with an annual average of \$198,000 to come from General Fund appropriations to support the basic technical staff, and with \$186,000 to come from outside grants to cover operating costs of specific pre-designated projects. The plan also calls for public release of maps and reports on each designated project at specific times during the 5-year period.

Bob noted that the Survey may seem to be shooting for the impossible in asking for markedly expanded appropriations at a time when State agencies are generally being pruned back. He emphasized, however, that the rapid development of recreational, commercial and industrial facilities in the State is creating immediate environmental problems for local and State managers; basic technical data must be collected, analyzed and distributed quickly to permit effective development planning, action or controls.

Waste disposal facilities should not be placed to jeopardize productive groundwater aquifers, but where are the aquifers? People shouldn't tamper with the natural sedimentation balance of coastal beaches, but what constitutes "tampering"? Government and industry must not be permitted to place hazardous facilities on unstable bedrock or surficial terrane, but what geologic features are unstable for what industries in what localities? Major commercial structures should not be built or maintained without having proper seismic design characteristics, but what are the earthquake potentials around the State?

At the present rate of funding of the Maine Survey, basic technical data might become available in a decade or two to deal with these questions. Bob's 5-year plan envisages the Survey's immediate obligation and responsibility to the people of Maine to provide fundamental geologic information for intelligent planning

and decision making before, rather than after, critical land-management and environmental decisions must be made.

### Maine Seismic Network

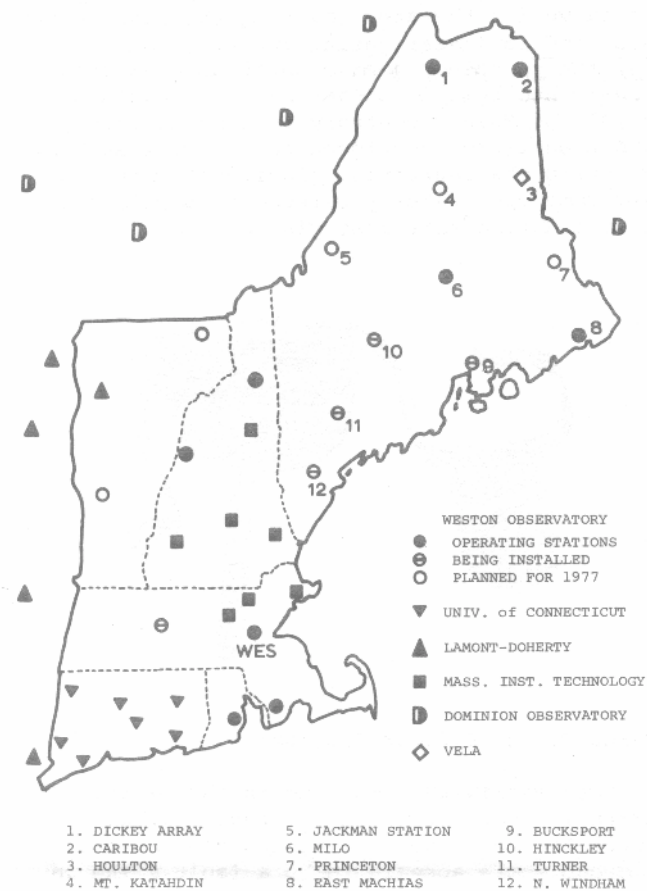
As head of the Maine Survey's Physical Geology Division, Walter Anderson is working with Weston Observatory, Weston, Massachusetts, to assist in siting a number of new permanent seismometer stations around the State, as part of an expanded New England seismic network. The network feeds raw data via phone lines to Weston Observatory. Presently operating stations in Maine are located at Dickey, Caribou, Milo and East Machias. New stations to be sited this year in Maine will be at Turner, North Windham, Hinckley and Bucksport. Stations are planned for Jackman Station, Mt. Katahdin and Topsfield (or Princeton) in 1977. A unit of some type may also be placed in the State House at Augusta. In addition to helping to site seismometers, Walter will be handling state-wide surveys to collect Modified Mercalli Intensity data immediately following future earthquakes in the region.

In connection with seismic matters, Jeff Johnson, seismologist at Weston Observatory, described the over-all Northeastern U. S. Seismic Network, made up of stations operated by Weston, University of Connecticut, M.I.T. and Lamont-Doherty Geological Observatory. Weston Observatory is currently expanding its network, largely in Maine, with funds provided by the Nuclear Regulatory Commission. The net issues a quarterly bulletin, itemizing earthquakes and quarry blasts occurring during the period. The map on the facing page shows locations for the various stations of the region operated by the several designated agencies, including locations of the new stations proposed for the area.

Jeff defined the criteria for locating new stations as that spacing of stations which will permit detection of a 2.3 Magnitude earthquake by at least two stations, to enable defining epicentral locations within 2 to 3 kilometers. Bedrock emplacement of new seismometers is not a critical requirement. The design of the instruments is such that the preference, apparently, is to bury them about 10' above bedrock in a quiet neighborhood serviced by power and phone lines. Upon the occurrence of a suitably strong earthquake, portable seismometers will be immediately deployed to the epicentral area to record aftershocks, to try to get data with which the focal mechanism (fault plane solution) may be calculated.

The recent results of network detection in Maine show a general scattering of small events, with an apparently anomalous concentration in the Lewiston area. Since the instruments have not been calibrated, no Magnitude estimates or fault plane solutions have been possible to calculate. A new analysis of the multiple event of July 1, 1967 near Augusta suggests that the trend of the many aftershocks during that day coincided spatially with a northwest line between Augusta and Readfield.

## NORTHEAST SEISMIC NETS



An interesting comment concerning Maine's seismicity was reported by Bob Doyle. It seems that because old, generally discredited seismicity diagrams for the country show parts of New England to be in the same seismic risk category as some active portions of California, the State of Maine is encountering some problems in insuring State buildings. It would seem that a relatively little funding in earthquake research might lead to a substantial savings in the high-risk premiums currently asked by insurers who believe the old diagrams.

### Hydrogeologic Studies

Brad Caswell has developed a great deal of useful hydrogeologic information over the past several years, working at the Maine Survey with grant moneys from other governmental agencies. His work to date has dealt largely with bedrock aquifers in the broad region between Penobscot Bay and southwestern Maine. His contouring of the bedrock surface in this area shows a good spacial relationship between many linear bedrock depressions and mapped regional fault or fold structures.

High-yield bedrock wells also appear in many cases to be associated with these bedrock troughs, leading to the thought that anomalous fracturing in fault zones not only has led to

differentially rapid erosion, but also has created important bedrock aquifers in these zones of fracture permeability. Brad noted that it may be possible to predict and to discover new high-yield bedrock aquifers by looking along the strike of regional bedrock structures between high-yield areas established by earlier drilling results.

An unexplained zone of high-yield bedrock wells (+200 gpm) has been defined for about 30 miles along a N42W trend between Windham and Bridgton, Cumberland County. Much of the zone lies within the terrane of the Sebago granite pluton, which has not been mapped in any detail, and the fundamental bedrock structure which may be controlling the concentrations of bedrock groundwater here is not known. Since many high-yield bedrock wells appear to be associated with regional zones of anomalous bedrock fracturing, it becomes critical to avoid placing waste disposal or other potentially polluting facilities at sites along the bedrock structure where the aquifer or its on-strike projection may become contaminated.

Brad also discussed his continuing work (with Jim Richard) on observation wells at High Head, a narrow coastal peninsula in Harpswell. Through a gift from the U. S. Geological Survey, certain of these wells have been instrumented, with widely varying results. Some well levels rise and fall in direct response to rainfall or lack of it. Some show a broad seasonal pattern of level changes, low in the summer and high in the winter and spring. One well shows no gross level variation throughout the year. Detailed mapping of bedrock joints along the shoreline of the peninsula has shown a good spacial correlation of closely-jointed zones with bedrock wells experiencing salt water intrusion. Sites on the coast characterized by close bedrock jointing should be avoided in searching for household water supplies.

Some wholly unexplained hydrogeologic phenomena have been turned up by Brad's work this year, fair game for your own reflective interpretations on a rainy Sunday afternoon. First, he's come up with a number of inland wells carrying anomalous salt contents (up to 5000 ppm NaCl). These are not located where road salt could have contaminated them. It is possible that a few, in the lower Penobscot River valley, may derive salt from evaporite beds which one might speculate to be associated with Late Paleozoic red beds of the area. But the others?? Brad also reported on a couple of wells drilled early this summer near Pemaquid Pond, Lincoln County, which, when blown out with high-pressure air, caused bubbles and then GEYSERS to erupt from the nearby pond. A report was also received that shortly subsequent to this heady excitement, at 5 PM on July 7th the earth in that area RUMBLED.

### Marine Geology

Barry Timson runs the Marine Geology Division of the Maine Survey with funds from outside grants. He has almost completed mapping of all coastal marine geologic environments, and soon

will sit down to write a text to accompany his maps. He also has a shoreline erosion survey under way, to define areas specifically subject to beach erosion, slope retreat or massive clay-slide erosion, and to estimate rates of shoreline retreat for these mobile areas. The need for this type of study is exemplified by the human problems caused by the rapid erosion and retreat of Popham Beach, Phippsburg, over the past two winters. Several summer cottages were lost to the sea early this year, and there are about a dozen more cottages in immediate jeopardy.

A controversy has developed at Popham as to whether sea walls built to protect individual cottages may not be doing more harm than good, by so altering the natural sedimentation scheme that beaches adjacent to the sea walls, including a State Park, may have become subject to increased erosion and possible destruction. In order effectively to understand how sedimentation and erosion work at Popham (and other beaches), detailed field work, meticulous data collection and rigorous historical analysis will be required. And this effort demands both time and money, neither of which seem to be fighting to present themselves for Barry's use.

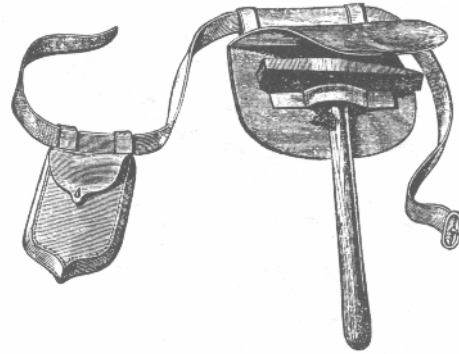
#### Darling Center Geologic Projects

Ken Fink described his projects along the coast, studying beach deposits and heavy metals concentrations in estuaries, funded by SeaGrant through the Universities of Maine and New Hampshire. The State of Maine has about 28 miles of good sandy beaches, of which about 8 miles are public. The beaches to the east of Penobscot Bay have large source materials in glacial outwash deposits which can readily replenish sands removed from the beaches by erosion. Unfortunately, beaches to the west of Penobscot Bay do not have these sources of replenishment, and must continually re-work their own materials to stay alive.

Ken's work on beaches involves looking at the entire coast, to collect basic information on natural conditions and land-use patterns for a basic data base. This base will ultimately support educational efforts before beach associations, planners and governmental decision makers, to show that Maine's beaches are truly a fundamental State resource and to show how best to protect them.

In his heavy metals studies, Ken is looking at metals, biota, suspended particulates and the water itself in compartments of the St. Croix, Narraguagus and Union River estuaries and at Cape Rosier, to trace the pathways of heavy metals introduced, respectively, by paper manufacturing, blueberry spraying, raw sewage disposal and zinc-copper mining operations. The most promising approach here seems to be to analyze the stratigraphic distribution of heavy metals in sediment cores collected down the axes of estuaries. Pollution due to human activities can be detected very well in sediment cores, and differentiated easily from natural background levels of metals in unpolluted sediments.

Detmar Schnitker is working with deep sea foraminifera in a couple of drill cores from the Gulf of Maine. He has developed a paleotemperature curve for the area covering the last 18,000 years, and is investigating the reaction of early man to paleoclimatic environmental changes. His paleontological studies have indicated that the Gulf of Maine, contrary to general theory, was not entirely overridden to George's Bank by ice during the Laurentide glacial advance. At least some open water persisted in portions of the Gulf during this last glacial event.



#### Maine Survey Bedrock Programs

Kost Pankiwskyj, working in the Liberty 15' quadrangle, noted that the contact in that area between the Vassalboro formation and the Casco Bay group rocks appears to be a fault. The fault is old, but Kost feels that it may have been subjected to rejuvenation. He will continue to trace the structure on strike to the northeast.

Gary Boone described his findings in the pre-Silurian rocks lying across Moosehead Lake and to the southwest. In the southwestern two-thirds of the 100-mile-long belt there are three distinctive formational units of an island arc sequence, comprised of submarine volcanics, complex metasilstone and a green phyllite. In the northeastern one-third of the belt, the volcanics thin and pinch out and a quartz wacke takes their place. Both the quartz wacke and the metasilstone in this area contain exotic slab inclusions, demonstrating a high degree of tectonic instability in the environment in which they were laid down. Along the Chase Stream break, Lower to Middle Ordovician fossiliferous rocks appear to lie with angular unconformity on the island arc sequence rocks, suggesting that these units may be of Cambrian or late Precambrian age. It appears that there may be as many as 4 different ages of volcanic rocks in this area, ranging from late Precambrian up to Lower Devonian (Kineo volcanics).

#### Maine Survey Surficial Projects

Working in Aroostook County, Nick Genes has identified a moraine which extends from Mars Hill westerly towards Van Buren and Stockholm. He correlates this feature with a moraine found in Grand Falls, New Brunswick. Nick also noted that in his work to date he has found no evidence in northern Maine of a postulated late-glacial body of open sea on the St. Lawrence River valley.

Pat Barosh is now starting a 5-year program for the NRC to try to develop an understanding of the relationship between near-surface geology and seismicity in the large region which extends from northern New Jersey and eastern New York through New England to the Canadian Maritimes. The program will involve fault mapping, geomorphic analyses, compilation of epicentral, magnetic, gravity, tectonic and brittle fracture maps for the region, plus some detailed geologic and geophysical investigations of locales characterized by anomalous seismicity or structural breaks. Art Hussey is working in this program in Maine, doing detailed stratigraphic and structural mapping in York County.

Pat also commented on a new USGS seismicity analysis for the country which has apparently reached open-file status. Noting that earthquake distribution in Maine tends to be fairly diffuse, he gave some comparative numbers to define our earthquake probability status according to the new USGS calculations, something like this: The probability is that ground motion from Maine earthquakes will not exceed 10% of the acceleration of gravity (0.1g) in the next 75 years. In New Hampshire, they will not exceed around 0.11g during the period; Massachusetts 0.09g to 0.1g. These seem to be pretty fair vibes when compared with California, for which the USGS estimates that earthquake ground motion as high as 0.7g to 0.8g may be experienced in the next 75 years.

It isn't an exact relationship, but if you were in (and made it through) a 0.8g earthquake, you would see well-designed frame structures thrown out of plumb, shifted off foundations, and some destroyed; great damage to substantial buildings, with partial collapse; the ground cracked conspicuously; underground pipes broken; sand boils, slumps and landslides; and of course, general fright. Here in Maine, about the most the long historical record shows for earthquakes are • few chimneys knocked over; some plaster cracked; • number of pendulum clocks stopped; occasional furniture moved around; shelf goods in grocery stores scattered to the floor; a few explosion-like noises and general rumbling sounds; and some fright. This is what 10% of gravity means to us.

SEARS ISLAND

Bob Gerber, geologist and environmental engineer for Central Maine Power Company presented a brief exposition of CMP's program last year to evaluate geologic features pertinent to siting a nuclear generating station on the southern part of Sears Island, Searsport. The site was first studied by seismic refraction and reflection, magnetometer surveys and core drilling investigations. Detailed physical explorations were then conducted by trenching to expose the bedrock surface in an area where geophysical data suggested anomalous bedrock conditions.

Two trenches exposed a condition at the bedrock surface where glacial tills were variously folded or displaced on a small scale, or were intruded locally by a few inches of extremely weath-

ered, plastic phyllite bedrock materials along a trend underlain by a weathered bedrock fault zone. The glacial stratigraphy downward in one trench included units interpreted to be Laurentide ablation till, submarine outwash, late-advance lodgment till, marine silt-sand, early-advance lodgment till and outwash sand, all overlying an iron-cemented "ferruginite", coarse outwash-till and basal lodgment till of possible pre-Wisconsin age.

Till deformation at the bedrock surface has been attributed either to loading by glacial ice during a final late Laurentide advance, with a lateral squeezing of the weathered bedrock which characterizes the deformed zones; or to a stress relief effect upon departure of the glacial ice, with the hard, unweathered bedrock relieving itself elastically and plastically into the soft, weathered rock of the bedrock fault zone.

**NEXT GSM MEETING**

The Fall Meeting of the Society is scheduled for Friday, December 3, 1976, at the Colby College Geology Department, Waterville. We'll convene at 3:00 PM for an afternoon technical session, go off someplace for supper, and then re-convene in the evening for an as yet undefined special presentation.

THE GEOLOGICAL SOCIETY OF MAINE  
TREASURER'S REPORT

For the Year ended July 31, 1976:

The paid-up Membership at July 31st included 74 members:

Regular	61
Associate	5
Student	8

(Two Regular Members still owe \$2 Application Fee)

YEAR-END BALANCE SHEET

RECEIPTS -	Balance from 1974-75	\$423.78
	Dues & Application Fees	389.00
		\$812.78
EXPENSES -	Printing	\$238.28
	Postage	61.10
	Addressing	13.29
	Check that Bounced	7.00
	overpayment Refund	2.00
		\$321.67
	BANK BALANCE, Canal Bank 4 July 31, 1976:	\$491.11

RECORD OF DISBURSEMENTS

08/09/75	Check #10	Brunswick Publ. Co., Printing	\$51.05
09/06/75	#11	J.R. Rand, Postage	15.00
09/12/75	#12	Color-Ad Inc., Photo Negs.	32.97
09/15/75	#13	J.H. French & Son, Printing	46.00
09/18/75		Check Returned, Insuf. Funds	7.00
11/12/75	#14	J.R. Rand, Postage	8.40
12/13/75	#15	Brunswick Publ. Co., Printing	15.38
12/17/75	#16	J.R. Rand, Postage	10.00
12/22/75	#17	J.H. French & Son, Printing	56.70
01/05/76	#18	Brunswick Publ. Co., Addressing	4.20
02/25/76	#19	Fo'c'stle Press, Address Labels	9.09
02/26/76	#20	J.R. Rand, Postage	10.80
03/06/76	#21	J.H. French & Son, Printing	12.87
05/01/76	#22	Carolyn K. Anderson, Refund	2.00
07/09/76	#23	J.R. Rand, Postage	16.90
07/12/76	#24	J.H. French & Son, Printing	23.31
		TOTAL DISBURSEMENTS:	\$321.67

There are no outstanding debts at July 31, 1976  
August 6, 1976 J. R. Rand, Treasurer

DON'T FORGET: 1976-77 DUES ARE NOW DUE AND PAYABLE

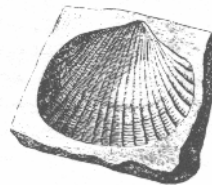
## Maine Survey Publications

In discussing general matters related to Maine Survey business, Walter Anderson noted that their Cartographic Division for the last 2 years has been just about totally devoted to constructing surficial geology maps. This work load has diminished to a degree, and time can now be scheduled for drafting bedrock maps. Ollie Gates' map of the Eastport area is at the printer and should be released (GM-Series) in a couple of months. An up-dated version of the 1:250,000 open-file lithologic map of the State, plus a new 1:250,000 open-file surficial geology map of the State will also be released this Fall.

## USGS Drilling Vessel

Bob Doyle announced that the USGS is now funded to drill some 1000-1200-meter core borings in the Gulf of Maine, and 3 holes are planned for this season in an area 40-60 miles (60-100 km) ESE of Isles of Shoals. The core from this drilling will be available for examination at Woods Hole this Fall. In 1977, the USGS is planning on drilling projects off Casco and Penobscot Bays, relatively near the coast, but beyond the influence of near-shore sedimentation. Bob advises that the USGS wishes your suggestions as to where to drill, and will, apparently, take on about any reasonable projects interested geologists may come up with. The rig's depth capacity is reported to

be 1800 meters, and it is also said that both Cenozoic sediments and pre-Cenozoic crystalline basement rocks can be handled. If you have some interest in looking at sediments or rocks off the coast, get in touch with Bob.



## On-Site Evaluations

A new procedure has been devised to qualify people to conduct on-site evaluations of soils for septic sewage disposal facilities. The Division of Health Engineering in the Department of Human Services (Health & welfare) now will qualify all evaluators by means of its own written and field tests, and will assign an official number to all who pass the tests. Whereas some evaluator-aspirants must also undergo some kind of formal course of study prior to taking the tests, Maine-certified geologists and soil scientists are automatically eligible to take the tests. Check with Bob Doyle at the Maine Survey or with the Health Engineering people if you want more information on this matter.

**The Geological Society of Maine  
c/o John R. Rand, Cundy's Harbor  
RD 2 -- 210A, Brunswick, Maine 04011**

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

Correspondence about this Newsletter, or about Membership in the Society may be addressed to John R. Rand, Cundy's Harbor, RD2-Box 210A, Brunswick, Maine 04011.

President	W. W. Rideout
Vice President	W. A. Anderson
Secretary	A. W. Berry, Jr.
Treasurer	J. R. Rand
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Councilor-1978	J. W. Skehan
Councilor-1979	R. R. Holmes