THE MAINE GEOLOGIST

THE NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MAINE

MAY 1986

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Society News:

PRESIDENT'S MESSAGE

A number of items that may be of interest to you are included in the various meetings of professional societies.

Summer Meeting GSM

TIME: Saturday, August 2 and 3, 1986
PLACE: Mount Desert Island
WHO: Dick Gilman, SUNY Fredonia
Hal Borns, UMO
Tom Lowell, University of Cincinnati

Tentative ASSEMBLY POINTS for the Saturday Bedrock Trip, Dic Gilman leading, and Sunday Surficial Trip, Hal Borns and Tom Lowell leading:

Seawall Campground
Tentative Assembly Time
9:00 A.M. (both days)

ACCOMMODATIONS

Two group campsites at the Seawall Campground. This is for the evenings of August 1 and 2. I plan on being at the campground to check in around 3:00 P.M. on Friday, August 1. If you desire to stay in a motel, you are responsible for your own reservations.

ANNUAL BUSINESS MEETING AND DINNER
6:30 P.M. (time approximate) Saturday, August 2
Seawall Dining Room and Motel
Seawall Road, Southwest Harbor

The assembly points and times are tentative . An announcement will be sent in early July, confirming the times and assembly points. The accommodations are firm. I have confirmation of the two group sites from the Park Service. The Seawall Dining Room can accommodate groups of our size. I have not negotiated a price for a lobster feed with the restaurant. They have indicated that everyone could order directly from the menu. Prices apparently start at $4.50. A full course lobster meal, exclusive of beverage, will be in the $12 to $15 range, depending on the price of shellfish. In order to help the restaurant plan for the evening, I would greatly appreciate a phone call or postcard from you if you plan to attend. This way we will have some idea of the approximate number to expect.

Northeast GSA will be in Portland in 1988! The Holiday Inn by the Bay and the Sonesta Hotel will be the two meeting facilities. The meeting is tentatively scheduled for Thursday, Friday and Saturday, March 9, 10, 11, 1988. There will be opportunities for many of you to contribute your energies and talents to make this a successful meeting.

I understand Jim Skehan is organizing support for National GSA Meeting in Boston in 1991.

Have you noticed the debate in various sportswriters' columns about the hunting season on antlerless deer? It seems, however, that they completely missed the recent open season on doe from January 16 through April 16 - and continuing.

Marc Loiselle has coauthored an article with T. Scambos and the late Dave Wones entitled: "The Center Pond Pluton - The Restite of the Story". Hmm. No gneissities in that title Marc.

Secretary's Report- Bates Meeting, March 28, 1986

by John Williams, with a lot of help from Pat Seaward

Student papers, presented elsewhere in this newsletter, opened the Spring meeting. Because the presentations ended early, a motion was introduced and passed to begin the business meeting one hour before it was scheduled. This prevented many of those who must work for a living from attending, including the secretary. Fortunately, Pat Seaward not only was in attendance, but took better notes than the secretary ever does.

Bob Gerber reported that the revival of our tax-exempt status is still pending, and that we paid $1.00 in taxes on our 1985 interest income. With luck, that won't result in a dues increase.

New business included a report by Steve Pollock on a change in the way the State regulates the licensing of professionals. Steve doesn't think that this will have a direct effect on geologists and soil scientists.

The summer field trip will be held in Acadia on August 2-3. Rick Gilman will lead the bedrock trip. After discussion and a vote, Hal Borns and Tom Lowell were elected to lead the surficial trip. It was noted that the Society should make reservations for group camping ASAP, and that vans should be made available for the trips to alleviate parking problems.

Most of the new business involved GSM bulletins, and how to make them more marketable. Two new ideas received considerable attention. A treatise on the history of geology in Maine was suggested by Steve Pollock. This history would be published in conjunction with the 150th anniversary of Jackson's work, would be distributed in bookstores, and would be available to the general public. The history would be written by several Society members, and would be 130-150 pages long. Woody Thompson noted that he and Carolyn Lepage are working with Rocks and Minerals to write an article for the sesquicentenial. Ollie Gates thought that the book would be of more interest to historians than geologists, and should therefore be written by a historian. Bob Gerber felt that the history would involve more work and

funds than we have available. A motion to proceed with the book was defeated, but a committee consisting of Woody Thompson, Steve Pollock and Irwin Novak was formed to pursue this matter further.

Arthur Hussey suggested that we produce a geologic road map with descriptions of specific localities on the other side. Bob raised the possibility of producing this map in conjunction with the DeLorme Publishing Company. A committee consisting of Art Hussey, Don Newberg, Ollie Gates, and Bob Johnston was appointed to further investigate this idea.

A motion for the society to take a stand on high level nuclear waste disposal was tabled until after dinner. The business meeting adjourned when it was scheduled to begin, at 4:30 pm.

After dinner Steve Pollock reported that the Northeast GSA will be held in Portland in 1988. The current slate of officers, with one exception, was then nominated to continue their work next year, pending a vote of confidence at the annual meeting. The one exception is Chris Olson, who convinced Bob Johnston that he wanted to be the next newsletter editor.

The tabled discussion of high level waste was re-opened. Tom Eastler made a motion to issue a statement suggesting that craton's are more stable than continental margins, and are thus better spots for nuclear waste repositories. Art Hussey questioned whether we could do this as a tax exempt agency. Bob Gerber said yes, if we stuck to geology and not personal opinions. Further discussion continued, both for and against Tom's motion- but Chris Olson started a movement for the "no" votes with an impassioned plea in defense of Wisconsin and Minnesota (is it fair to say that they are any more suitable for this dump than Maine or New Hampshire?). The motion was defeated 16 to 15.

The evening speaker, Dr. Froelich, followed this discussion. Dr. Froelich gave an excellent and very appropriate talk on detecting fractures in bedrock using geophysics. Dr. Froelich suggested that politics, not geology, is governing DOE's decision on radioactive waste disposal. This suggestion pleased the reporter who had been disguised as a Society member through the entire evening meeting. At the close of the meeting the cameras began to roll, and anyone who would stand still found him or herself interviewed on the nuclear waste issue. In what must be a first for a GSM meeting, the evening speaker and Andy Tolman ended up as the lead story on the Channel 13 news at 11 pm.

Letters to the Editor:

To The Editor:

The President's Message in the February newsletter (v.12, no. 2) made reference to the nuclear waste issue, currently very much in the news in Maine. President Pollock's personal opinions regarding the opportunities this issue may provide the Maine geological community notwithstanding, I agree with his view that geology is a responsible profession. However, his last question seems only to support the notion that scientists and engineers are not capable of dealing with sensitive social issues, and are only interested in the advance of technology regardless of public opinion. After lauding the media and the new-found public interest in geology, his condescending statement confuses me. Is he making fun of the people who lack a sophisticated understanding of geology, or is it an inside joke known only to certain geologists or students of geology?

At a time when the credibility of our profession is being tested, I find Mr. Pollock's remark unprofessional, patronizing of the general public, and one that should not be representative of the rest of us within the Society or the geological community in Maine.

Thomas K. Weddle
Senior Geologist
Maine Geological Survey

To The Editor:

Individuals far more qualified than I have concluded that deep burial in crystalline rocks is the answer to the problem of the long term storage of high level nuclear waste. This idea is shared by scientists in many countries of the world. I am, however, not convinced. I have not heard reasonable arguments why such waste cannot continue to be stored and monitored on site where it is generated. Particularly when nuclear power plants are decommisssioned it seems the plant site could be usefully used for long-term surface storage. Subsurface storage has always seemed to me a "let's sweep it under the rug" type of "solution".

But DOE has nominated two sites in Maine for consideration as high level waste repositories. The process of site selection seems to me to have been a reasonable one given the mandate of the Nuclear Waste Policy Act. I would criticize DOE for assessing population density in a misleading way by considering, as I understand it, only population statistics for incorporated towns. Also, its report does not reflect careful and perceptive understanding of the geological data base which exists for the Sebago area...(I am unfamiliar with the Bottle Lake site and cannot comment on it). The public hearings held to date should, in my judgment, have considered only comment bearing on criteria used in the nomination process. Instead there have been political, legal, and "emotional" arguments none of which, in my view, really aid in solving the problem of high level waste "disposal".

Relative to the nomination of the Sebago Lake site... my geological understanding, both of the thin and highly fractured nature of the Sebago Pluton, as well as of the numerous bedrock aquifers within it, lead me to suspect that site specific study by DOE will disqualify it. In any case there is only speculation and prediction at present. What are needed are data to inform these predictions. It is my opinion, then, that the next step in assessing the Sebago site should be taken unimpeded. It will most certainly lead to diqualification, but more importantly will greatly further geologic and hydrologic understanding of this important region.

Donald W. Newberg
Dept. of Geology
Bates College

To the Editor:

You have asked for opinions on the high level waste program and on the Department of Energy's selection of Maine as a candidate area. What follows are my personal opinions and do not reflect State or Maine Geological Survey policy.

The concept of "ultimate disposal" of hazardous wastes is not one that has served us well in the past. A number of such solutions have backfired because of inadequate siting, engineering, and operation of human intervention after closure (i.e. Love Canal). Further, we should always consider that a waste is a misplaced resource; it is not without value, in the long run.

Whether or not an unfractured mass of granite could be found in Maine or elsewhere, counting on hydrologic-geologic processes to contain radioactive waste for the 20,000+ years necessary to reduce its toxicity is unwise. Glaciation, seismic and tectonic activity, and

ground water all work against isolation; none of these can be assuredly negligible over the period in question.

Even though the nuclear power industry is not currently healthy, it is likely, over the next 1,000 years or so, that we will find a use for spent fuel. Burying a resource 3,000 feet down is not the best way to conserve it for future generations.

Based on this logic, I personally oppose mined repositories in crystalline rock and favor monitored retrievable storage on government property in an arid area. I do not believe, even under the current regulations, that a site in Maine would ultimately be found suitable, if only because of the difficulty of characterizing the fracture hydrology of such a site.

Sincerely,

Andy Tolman

From the Editor:

This is the last GSM Newsletter that I will be editing so I feel this is an appropriate time to make a few comments. First, I would like to thank everyone who contributed to the newsletter over the past two years. I'd especially like to thank Peter Garrett, Carolyn Lepage and Ellie Williams (my secretary) whose efforts were above and beyond the normal "call of duty". I'd also like to give special mention to Andy Tolman, not just for his prompt contributions, but for being a veritable fountain of information. Somehow he knows what every geologically inclined person in the state is up to!

I'd also like to take this opportunity to encourage all Society members to contribute to the newsletter. Not all contributions need be in the form of articles. Short notes, notices and letters to the editor are all welcome.

Now I'll stop bugging all of you and pass the job onto Bob Johnston, just as Roy Farnsworth happily passed the job onto me. GOOD LUCK, BOB!

Chris Olson

MGS Notes:

The Maine Geological Survey has gained three new faces, and lost one: Melanie Lanctot, after 15 years with MGS, has taken a position as Assistant Epidemiologist with the Department of Human Services. We all miss her, but the new folks are keeping us busy.

Tom Weddle and Pat Seaward have joined the Hydrogeology Division as Senior Geologist and Geology Technician, respectively. Pat is an ex-geophysical field assistant and teacher, and a University of Southern Maine graduate. Tom has been an MGS mapping contractor, consulting geologist, and a graduate student of Dee Caldwell's at Boston University. Both are commuting on weekends to see their families; we're working on getting them up towards our part of Maine. They'll be working primarily on aquifer mapping in Aroostook County.

Steve Dickson has joined Joe Kelley in the Marine Geology Division as a Senior Geologist. Steve comes to us from the University of Rhode Island where he was working on the deep sea bed. He'll be mapping the sandy south coast for us.

The Maine Geological Survey is now actively and totally immersed in a wide variety of geologic issues, which have brought Earth Science into public view. These issues, however, have placed an explosive and exponentially growing demand on the Survey for technical assistance and information by a wide variety of interests including State government, private sector, and citizens in general. This rapidly expanding need has resulted in an enlargement of our professional staff and has forced us to reorganize and harden the infrastructure of our organization.

We have placed several initiatives before the Governor and the legislature to alleviate this period of adjustment, which so far have been acknowledged and well recieved. In the interim, however, we must reallocate existing funds to see us through this period of growth and restructure. As a result we are reducing our field program this field season, with the exception of one or two people previously committed to federally funded projects.

Because of the well recognized importance of basic geologic mapping, we expect to be back on track as soon as our initiatives are in place. We will keep you posted. I emphasize, however, that we will maintain and increase our open-file and publications program and we will continue to provide maps and air photos for field investigators.

During this disruptive interim, we ask your indulgence while we bring ourselves back up to speed.

THE SAND DUNE MAPPING PROJECT: PROTECTING MAINE'S BEACHES

Steve Dickson, Maine Geological Survey

The Maine Geological Survey, in cooperation with the Department of Environmental Protection (DEP) and the State Planning Office, is mapping the beach and sand dune system of the southern Maine coast. The "Sand Dune Mapping Project" is being conducted by marine geologists, Joe Kelley and Steve Dickson of the Maine Geological Survey and is intended to clarify which coastal regions are affected by Maine's Sand Dune Law (M.R.S.A. Secs. 471-478).

The Sand Dune Law requires permits from the DEP for projects that alter coastal sand dunes and beaches. The Sand Dune Rules (Chapter 355) are the primary source of guidance in the permitting process. The Sand Dune Maps will provide environmental information to help property owners, town planners and the DEP make decisions that govern beach development affected by the Sand Dune Law.

The Sand Dune Maps will display site-specific geologic information for all of the major beaches on the Maine coast south of Portland. In addition, the mid-coast beaches, Popham and Reid State Park, will be similarly mapped. These maps will indicate geologic environments of the sand dune and beach systems, elevations of the 100-year flood and the Federal Emergency Management Agency's flood zones, and known rates of shoreline change. Thus, the maps will indicate portions of the sand dune system most vulnerable to damage by severe storms.

The primary source of geologic data will be from aerial photographs that will be taken this spring, and from field

mapping conducted this spring and summer. Boundaries of geologic regions and flood zones, as well as roads and structures in the sand dune system will be defined, digitized, and incorporated into a computerized data base this fall. Aerial photographs from previous years will provide additional data for evaluating shoreline change and help to indicate areas undergoing severe beach erosion and landward retreat of the sand dune system.

The computerized mapping system is advantageous to this project since data can be readily added in the future. Further changes in the sand dune system that occur through continued accretion or erosion, may be digitized in subsequent years. Similarly, rapid changes due to severe coastal storms or hurricanes can be assessed soon after the damage has occurred simply through the acquisition of post-storm aerial photographs. Consequently, new maps may be easily produced as additional information on the sand dune system is gathered.

The current Sand Dune Mapping Project is scheduled to complete the maps of the southern and mid-coast regions by the end of 1986. At that time, the DEP will hold workshops to increase awareness and use of the maps, as well as to receive comments that would help to revise or update site-specific details. As designed, the maps will provide information useful to the public and all levels of government in Maine that have an interest in protecting the precious few miles of sand beaches in Maine.

USGS Notes:

SACO RIVER VALLEY AQUIFER STUDY

Copies of the recently published report "Ground-Water Quality Data for the Saco River Valley Glacial Aquifer from Bartlett, New Hampshire to Fryeburg, Maine: July 1984 through November 1985" (USGS Open-File Report 86-129) are available for inspection at the USGS office in Augusta. All the field work has been completed and work is progressing on the next basic-data report and on the interpretive report. For further information, please contact Dorothy Tepper at USGS (622-8208).

HYDROGEOLOGY OF SIGNIFICANT SAND AND GRAVEL AQUIFERS IN MAINE

As recently announced in the MGS annual review, copies of the report for the 1982 study area (sand and gravel aquifer maps 10, 11, 16, 17 and 32) are now available from MGS. An index of these maps was provided in the last issue of the newsletter. The report for the 1983 study area (maps 12, 13, 14, and 15) is currently awaiting approval for publication from the Director's Office of USGS. The 1984 study area report(maps 18, 30, and 31) has been sent out for colleague review. The 1985 study area report (maps 24, 25, 26, 27, and 45) is under compilation. Preparations have started for the field season in the 1986 study area (maps 75, 76, 77, 78, 84, and 85). For further information, please contact Jim Adamik at USGS (622-8208), Andy Tolman at MGS (289-2801), or John Williams at DEP (289-3901).

Student Abstracts:

PROTOLITH DETERMINATION OF THE AMPHIBOLITE OF THE WHITE'S PASTURE AREA, AUBURN, MAINE

LAWLESS, Michael D., Department of Geology, Bates College, Lewiston, Maine 04240

The amphibolite of the White's Pasture area outcrops as either massive or thinly banded units. In thin section the two types appear identical. The dominant minerals are hornblende and plagioclase but biotite and chlorite are present in some samples as secondary minerals concentrated along fractures in the rock. Also found in the amphibolite are quartz, apatite, sericite, and opaque minerals.

Chemical analysis of the amphibolite shows three distinct units in the study area. The divisions between these units are best shown by TiO2, P2O5, Sr, Zr, Sc, La, and Sm.

The protolith of the amphibolites is determined to be igneous. This conclusion is based on comparison of the chemical analyses of the amphibolite with those of basaltic rocks from different tectonic environments. From this correlation it is determined that the protolith of unit I is an oceanic island basalt, the protolith of unit II is a transitional basalt, and the protolith of unit III is a mid-ocean ridge basalt.

A PETROLOGICAL STUDY OF THE QUARTZ SYENITE AND ASSOCIATED ROCKS, MORRISON HEIGHTS AREA, WAYNE, MAINE

MACIUIKA, Paul Anthony, Department of Geology, Bates College, Lewiston, Maine 04240

Quartz syenite occurs as a 4 by 9 km body in Wayne, Maine. The quartz content grades from 3% to 18% within the body. Primary minerals include perthite, alkali feldspar, plagioclase, and hastingsite. Augite, where present is rimmed by amphibole. A melanocratic quartz syenite occurs adjacent to the quartz syenite unit, separated by a thin septa of the Patch Mountain Member of the Sangerville Formation. This melanocratic rock contains up to 35% biotite, amphibole, clinopyroxene and opaque minerals. A biotite granite may be older than the quartz syenite. Quartz syenite shows decreasing Fe_2O_3 (7.21 -> 3.31%), MgO (0.41 -> 0.04%), and CaO (1.93 -> 1.38%) with increasing silica content (59.3 -> 68.9%). Trace elements and LREE are also depleted with decreasing silica content: Sc (12.0 -> 3.2 ppm), Sr (160 -> 130 ppm), La (384 -> 77 ppm) and Sm (39.6 -> 9.0 ppm). These data suggest fractionation of clinopyroxene, plagioclase, and allanite respectively. Biotite granite exhibits similar fractionation trends suggesting fractionation of amphibole and minor phases, such as zircon and sphene. Radiometric age of 305 m.y. for the quartz syenite seems to preclude a direct genetic link with the ALIC (280 m.y.), despite their close spatial associations. The syenite and granite units rim the outer margins of the ALIC. It is suggested that a mantle heat source generated partial melting of the lower crust to produce the quartz syenite magmas. Subsequently, basaltic magmas were emplaced as the ALIC.

THE PRESENT REGIMEN OF NORTH AMERICAN PACIFIC COAST RANGE GLACIERS, AND CLIMATIC IMPLICATIONS

PELTO, Mauri S., Department of Geology, University of Maine at Orono, Orono, Maine 04469

The Pacific Coast Range from Washington through southeast Alaska has experienced a significant climatic change in the past decade. the climatic variation has not been uniform throughout the region. A mass balance inventory was conducted on 100 glaciers to determine the pattern of climatic change and its effect on Pacific Coast Range glaciers.

In southeast Alaska and northwestern British Columbia a glacier's regimen is dictated by the percentage of the glacier's area above the equilibrium line and in the zone of maximum accumulation, and by the calving rate. The mass balance (1983 and 1984) and regimen (1976-1985) was determined for 60 northern Coast Range glaciers. The net balance was positive on 8, in equilibrium on 11 and negative on 41. The 1963-1975 period was one of slightly positive glacier balances, since 1975 the mean equilibrium line altitude has risen 100m and the maximum accumulation zone has risen 175m. The result has been slightly negative balances for the 1976-1985 period. The greater rise in maximum accumulation zone elevation indicates that the climatic change has occurred primarily during the winter. Equilibrium line patterns suggest that a southward shift of the Aleutian Low and westward shift of the Canadian Polar High have caused the increased winter temperatures.

The regimen (1975-1985) was determined on 40 North Cascade, Washington glaciers. Mass balance (1984 and 1985) was determined on 8 of those. The regimen has been positive on 4, in equilibrium on 5 and negative on 31. It is apparent that glaciers which are most susceptible to ablation (those with low winter balances) have large negative balances. In contrast glaciers with high winter balances are associated with only slightly negative balances. This reflects warmer summer conditions and relatively little change in winter conditions for the North Cascades.

Thus, in the southern part of the Coast Range the main climatic change has occurred during the summer, whereas north of Vancouver Island the change has been primarily a winter phenomena.

GRAVITY SURVEY OF THE WATERVILLE, MAINE 15' QUADRANGLE

Potts, Stephen S., Department of Geology, Colby College, Waterville, Maine 04901

Bouguer gravity anomaly maps of the Waterville, Maine 15' Quadrangle are marked by a steep gradient which trends northeasterly with the lowest Bouguer gravity anomalies in the northwest and the highest in the southeast section of the map. This gradient was crossed by a seismic reflection line of the Quebec-Western Maine Deep Crustal Studies Program conducted by the U.S.G.S. A detailed gravity survey was conducted by the U.S.G.S. along the reflection line and combined with older Defense Mapping Agency data to add constraints to structural models based on the seismic reflection data. My survey contains a greater number of stations than the sparse D.M.A. data, and a contour map was produced using data from this single survey. By concentrating a large number of measurements in the area of the gradient, we hoped to better define its structure.

The survey consisted of readings taken at 127 stations using a Worden gravity meter. The stations were located at spot elevations using elevation data printed on provisional 7.5' topographic maps within the Waterville Maine 15' quadrangle. Bouguer anomalies were calculated using a density of 2.67 gm/cc.

The resulting gravity contour map clearly shows the Central Maine Gravity Gradient as well as an elongate gravity high which is superimposed upon this trend near the eastern border. This differs from the U.S.G.S. map which indicates two peaks for this feature. Many single point anomalies are also eliminated on the new map. Three profiles perpendicular to the trend of the gradient have been created along which these anomalies can be modelled as two bodies with positive density contrasts. A deeper body can account for most of the gradient and a shallower body can account for the closed gravity high in the eastern part of the study area.

QUARTZ C-AXIS FABRIC AS A KINEMATIC INDICATOR IN SHEARED ROCKS: RYE FORMATION, GERRISH ISLAND, MAINE.

MOLINE, Gerilynn, R., Geoscience Department, University of Southern Maine, Gorham, Maine 04038

Determination of the sense of shear within ductile faults can be made by examination of microstructures in a properly oriented thin section (perpendicular to foliation and parallel to lineation). When quartz c-axis poles are plotted on an equal area stereonet they produce maxima patterns that are dependent upon the kinematics of flow and the slip systems involved. The pattern of these pole figures is directly related to shear zone geometry and tracks the finite strain ellipse through the deformation.

The study area includes a 300m oblique section of the southern mylonite zone on the southeastern coast of Gerrish Island. Here, exposures of the Precambrian Rye Formation have been poly-metamorphosed and multiply deformed by migmatization, mylonitization, and extensive brittle faulting. Seven thin sections were examined from sheared garnet-bearing micaceous pegmatites, garnet bearing mica schists (+/- sillimanite), and quartzo-feldspathic mylonites located within the ductile shear zone. The majority of quartz grains were located in ribbons (less than 1mm thickness) and varied in character from equi-dimensional polygons to imbricate elongate grains in an oblique shape fabric.

Kinematic indicators such as asymmetric augen, pressure shadows, S-C fabric, and mica fish indicate a clear sense of dextral shear. Quartz c-axis pole figures vary from broad crossed-girdle patterns to well-defined single girdles. The shear plane is defined by the major girdle which develops orthogonal to the shear plane. Girdle patterns are best developed where the quartz grains occur in the imbricate pattern and where the angle between the foliation and the shear direction is smallest. This would indicate a higher strain concentration within the quartz ribbons which have the oblique shape fabric. Three slip systems (basal, rhomb, and prismatic) are operable under varying temperature regimes and can be identified within the maxima patterns.

MYLONITE TEXTURES AND ASSOCIATED STRUCTURES IN THE LEWISTON AND WAYNE, 7.5' QUADRANGLES, MAINE

WILSON, Michael J., Department of Geology, Bates College, Lewiston, Maine 04240

Rocks in the Lewiston and Wayne 7.5' quadrangles exhibit mesoscopic and microscopic structures consistent with the development of mylonites. Mylonites are metamorphic rocks produced during ductile deformation. Deformed pegmatites in Lewiston and deformed rocks of the Androscoggin Lake Igneous Complex in the Wayne area reflect deformation by dominantly crystal-plastic processes.

The creation of a crenulation cleavage and the mylonite in the Lewiston area is indicative of a folding event, recognized as F3 by Watson (1986, pers. comm.). This folding is presumed to have been due to a tectonic readjustment after the emplacement of the Sebago batholith. Northeast plunging macro- and microstructures are consistent with layer parallel slip doming of the Lewiston synform. Kinematic indicators, including asymmetric augen structures and Type I S-C fabrics support this interpretation.

Syenite, present along the margins of the Androscoggin Lake Igneous Complex, contains shear zones trending N 30° E - N 40° E, consistent with the regional structural trend. Extensive dynamic recrystallization is indicative of ductile deformation. Kinematic indicators in a wide mylonite zone (>3m) on the lakeshore suggest a nearly vertical northwest side up fault.

Brittle fracturing, accompanied by emplacement of diabase dikes, was the last deformation event in the Lewiston quadrangle. This deformation is associated with Mesozoic rifting and the creation of the Atlantic Ocean.

THE CARRIER GRAVEL PIT IN SOUTH DURHAM, MAINE, AS AN EXAMPLE OF THE DEGLACIATION OF COASTAL MAINE

CHICK, Susan A., Department of Geology, Bates College, Lewiston, Maine 04240

The interpretation of glacially deposited sediments in the Carrier pit in South Durham correlates well with the studies of Kris Crossen, Geoffrey Smith, and Minze Stuiver and Harold Borns. Crossen's investigation of deltas and radiocarbon dates, Smith's mapping of glacial moraines and Stuiver and Born's radiocarbon dates and deglaciation chronology were utilized to describe the glacial environment during the deposition. The study postulates water dominated glacial front marine contact and depicts a sub-aqueous fan with the channel mouth located at the ice front. There is clear evidence of still water deposition, by the presence of dropstones in the Presumpscot Formation, and evidence of high intensity flow, indicated by the scoured channel, boulders and cobbles. Within the gravel pit are a thrust faults and a massive till-like deposit within the sands, indicating the proximity of the glacier's margin during deposition. A moraine parallel to a bedrock ridge to the northwest illustrates the influence of such a halt on glacial retreat. A similar but lesser bedrock ridge is exposed within the pit providing a rationalization for glacial halt in this area of study.

GEOLOGY OF THE BUCKFIELD 7 1/2' QUADRANGLE

MULRY, Christopher J., Department of Geology, University of Maine at Orono, Orono, ME 04469

Field mapping in the Buckfield 7 1/2' quadrangle, situated on the southeast limb of the Merrimack Synclinorium, has revealed a complex deformational and metamorphic history. Silurian age calcareous and pelitic metasediments of the Buckfield Group (Warner, 1967) display evidence for at least three distinct folding events. Metamorphic grade is uniformly within the sillimanite and K-spar range and local migmatization as well as pegmatite injection (lacking contact aureoles) is prevalent.

The youngest folds observed are tight, upright, asymmetrical, small scale crenulation folds with a consistent NW trend (F_3). These are preceeded by upright, NE trending, moderately open to tight folds of modest amplitude (F_2). An earlier generation (or generations) consists of upright, isoclinal folds with N-S (?) trending axial surfaces (F_1). Yet, the possibility that these folds (F_1) only appear upright due to later vertical deformation cannot be disregarded.

Evidence for stratigraphic tops suggests that the upright folds F_1 - F_3 face downward. Additionally, tenative correlation of the Buckfield and lower Bryant Pond Groups with the interpreted stratigraphy of the Waterville area allows for the postulation of a large scale, recumbent fold in the Buckfield quadrangle. As delineated by the regional map pattern, the axial trace of this recumbent fold extends from Skowhegan, SW to the Buckfield quadrangle where it is deflected WN and truncated by the Rumford allocthon. Thus, this structure is necessarily older than the Rumford allocthon and the regional upright folds which deform the thrust surface. In turn, the regional NE trending folds are cut by the Sebago batholith. Therefore, large scale recumbent folds in the Buckfield region (if present as postulated) are not related to the Sebago intrusion.

STRATIGRAPHY, METAMORPHISM, AND STRUCTURAL GEOLOGY OF THE WINTHROP AREA, MAINE

WILEY, Stewart A., Department of Geology, Bates College, Lewiston, Maine 04240

The bedrock in the Winthrop quadrangle consists primarily of a folded sequence of sillimanite-grade metamorphosed pelites, graywackes, and calcareous sediments. A stratigraphic sequence was developed based on a topping sense, which was determined from remnant bedding found in several outcrops. The once clay-rich tops of beds are now rich in aluminous minerals, such as staurolite and micas, while the bottom of the beds are rich in quartz. Five units were defined, and were then correlated to the Silurian stratigraphy already developed for the area.

Petrographic analysis provided evidence for several metamorphic events in the study area. The garnets in the samples formed early, as is indicated by quartz-filled fractures in the garnets, which parallel the schistosity in the matrix. Later metamorphic events are evidenced by a breakdown of staurolite crystals, and random-growing fibrolite, which cuts across undisturbed quartz boundaries. Metamorphic reactions are defined based on the textural evidence found in thin-section.

Early recumbent folding is believed responsible for the inversion of the stratigraphy in the area. The major structures which are currently found in the area are F-2 folds, which trend approximately 28 degrees and plunge gently to the northeast at about 7 degrees. Only a few minor folds were discovered in the area. They are right-handed "z" folds believed to be products of the earlier recumbent folding, which were later rotated by the upright F-2 folding.

GEOPHYSICAL STUDY OF THE WISCASSET AND GARDINER 15' QUADRANGLES

McMEEKIN, R. Lauren, Department of Geology, Bates College, Lewiston, Maine 04240.

A gravity study was conducted covering some 330 sq. miles in the Wiscasset and Gardiner 15' quadrangles in order to determine the subsurface geometry of the Blinn Hill and Jefferson plutons. Previous geophysical work in Maine has shown the correlation between the shape and depth of a pluton and the degree of metamorphic rocks in which it occurs.

The bodies in this study are both Devonian granites which outcrop in sillimanite grade rocks. The Blinn Hill pluton is cut by a splay of the Eastern River fault which trends NE in the same trend as the long axis of the body. The Jefferson pluton is located astride a pre-metamorphic thrust fault, which is the contact between the Cape Elizabeth and the Bucksport formations.

Gravity models for the Jefferson pluton show that the body is slightly thicker than would be expected. The models also show that it is highly likely the body was emplaced by exploiting the plane of the thrust fault, thus leaving a fair amount of the body offset to the west of the outcrop in the subsurface.

Gravity data for the Blinn Hill pluton show that it is unusually thin, having no gravity expression on the Bouguer Gravity map.

LITHOLOGICAL AND STRUCTURAL RELATIONSHIPS WITHIN THE EAST-CENTRAL PORTION OF THE POLAND 15' QUADRANGLE, MAINE

WATSON, Robert C., Department of Geology, Bates College, Lewiston, Maine 04240

Three distinctive lithologies of amphibolite, graphitic schist, and garnet gneiss are present in the east-central portion of the Poland 15' quadrangle, Maine. Due to their relative abundance within the area, the stratigraphic position of these lithologies within the stratigraphy of south-central Maine has been in question. A detailed stratigraphic column and geologic map of the field area has been correlated with the stratigraphy and structure of the region. The field area stratigraphy has been correlated with the lower unit of the Sangerville undivided and the Patch Mountain Member of the Sangerville Formation. Major structures in the area trend to the northeast, coinciding with structural trends of the region. However, due to the emplacement of the Sebago Pluton, some minor structures in the area trend to the northwest. Both major and minor structures indicate three separate folding events occurred in the field area. Inferred protoliths of the field area rocks are indicative of a continental slope depositional environment. The protoliths of amphibolite and garnet gneiss have been inferred as mafic volcanics and exhalite, respectively. These protoliths indicate a rifting or island arc system environment. A geologic history of the field area has been developed based on megascopic and mesoscopic structures seen in the field.

SURFICIAL DRAINAGE PATTERNS AND THEIR EFFECTS ON WATER QUALITY IN THE LAKE AUBURN WATERSHED, AUBURN, MAINE

KILEY, Mary C., Department of Geology, Bates College, Lewiston, Maine 04240.

Lake Auburn is the water supply for the cities of Auburn and Lewiston. While the major source of water is from springs and groundwater, the few surficial streams in the watershed can potentially contribute pollutants to the reservoir. During normal conditions, flow in ephemeral streams and intermittent streams is slight. During periods of heavy storms and spring runoff, these streams are flowing overbank. Because they are flowing through areas which may undergo changes in land use such as logging, expanded agriculture, and residential development, these streams have the potential to carry contaminants to the reservoir.

Notices:

78th ANNUAL MEETING OF NEW ENGLAND INTERCOLLEGIATE GEOLOGICAL CONFERENCE (NEIGC)

Hosted by: BATES COLLEGE

October 17, 18, 19, (Friday-Sunday)

Registration: $15.00, Guidebook: $10.00, Banquet:$9.95
Banquet is at 7:15 on Saturday; Melange(open bar social) is from 6:15 to 7:30 on Friday. Both at Chase Hall.

For further information contact:

Don Newberg, Dept. of Geology
Bates College
Lewiston, Maine 04240 / (213) 786-6155

Wright State University is preparing for its fourth cycle of INTERACTIVE REMOTE INSTRUCTIONAL SYSTEM (IRIS) in ground water hydrology beginning July 15, 1986. This comprehensive hydrogeology program was originally developed for the U.S. Agriculture, Soil Conservation Service to prepare their personnel for professional practice work.
For further information contact:
Coordinator, (IRIS Program)
Dept. of Geological Sciences
Wright State University
Dayton, Ohio 45435 / (513) 873-3455

VERMONT GEOLOGICAL SOCIETY

Summer Field Trip, July 12, 1986

"Beekmantown Stratigraphy in the Central Champlain Valley" Led by Paul Washington and Steven Chisick

7th Annual Champlain Valley Gem and Mineral Show

August 2 - 3, 1986, South Burlington High School and community library, Dorset Street north of Kennedy Drive (near Exit 13E of I-89)
Special Guest Speaker: Dr. Woodrow (Woody) Thompson, Maine Geological Survey

COMPUTER MODELING OF GROUND WATER FLOW AND TRANSPORT

October 27 - 31, 1986

Department of Civil and Mineral Engineering
University of Minnesota

A one week short course will be offered on the application of computer models to regional ground water flow and transport. The course is intended primarily to provide the participants with a working knowledge of powerful modeling techniques that are not as commonly used in the U.S. as the finite difference method: the analytic element method and the finite element method. However, the finite difference method will be covered as well. For information contact:
Mrs. Rita Mendenhall, Program Coordinator
Univ. of Minnesota, Dept. of Civil and Min. Engin.
500 Pillsbury Drive, S.E., Room 292
Minneapolis, Minnesota 55455/ (612) 376-7630

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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Associate Member $6 per year $_____

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MAIL TO: ROBERT G. GERBER, TREASURER
P. O. Box 270
South Freeport, Maine 04078

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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