THE MAINE GEOLOGIST

NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MAINE

June, 2001

Volume 27
Number 2

The President's Message:

It is quite strange for me to be sitting in my office at this time of year. Normally, as many of you know, we UMF-ers would be winging our way out west to the Colorado Plateau or the Pacific Northwest on our annual May term field trip. This year we decided to take a break, which thankfully gives me some time to tidy up after a busy semester, organize our summer field trip and of course write this message.

The spring meeting at USM was a great success with an abundance of high quality student oral and poster presentations. Even in my short time back here in Maine I have noticed a distinct elevation in the quality of the science and the presentations at our spring meeting. Our two prizewinners - Krista Anderson (best oral) and Ewan Wolff (best poster) were superb examples of just that! Lisa Churchill-Dickson's excellent presentation in the evening session on "Maine's fossil record" was an eye-opener to many, especially those of us who are concerned with the hotter, more fluid parts of the rock cycle! Again my thanks to Erwin Nowak and his colleagues at USM and to Dan Belknap for their hard work in organizing a very successful meeting. We have persuaded (coerced!) the folks at Colby to host next year's spring meeting (2002) but we are entertaining ideas for the fall 2001 meeting.

At our business meeting we discussed the possibility of the Society getting involved with a "Geology of Maine" text. This met with overall enthusiastic support and Lisa, Bob Marvinney and myself will be discussing this further. I am sure we will be calling on many of you for assistance, not just with writing but also in the review process. The consensus is I believe that this would be a very welcome addition to all who teach and practice geology in the state and also important to the general-interest audience. Another point discussed at our business meeting was to invite our various student university clubs and societies to submit news items or advertise their events in the Newsletter. The committee thought this a good way to encourage more student participation in the society.

Finally, the summer field trip: This year we will be heading way downeast, in fact so far downeast we will be in Canada! Our trip will be to Grand Manan Island where Dr. Les Fyffe will be showing us the superb geology of the island ranging from Mesozoic lavas and intrusives to meta-sedimentary rocks more akin to coastal Maine. If you want to take a look at the island check out this web site: http://www.grandmanannb.com/.
More information about the field trip is in this Newsletter and also on the GSM web page. Hope to see many of you on the field trip, but if not have a great summer.

Dave W. Gibson, President
<dgibson@maine.edu>

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Geological Society of Maine Summer Field Trip

Dates:
Friday 3rd August – Sunday 5th August 2001

Location:
Grand Manan Island, New Brunswick

Our summer field trip this year will be to Grand Manan Island, New Brunswick. We will depart early on Friday 3rd August from two starting points (Augusta and Orono) and travel in 15 seater vans (supplied by the University of Maine at Farmington and Presque Isle) to Blacks Harbor, NB, where we will catch the ferry to Grand Manan. We will be camping at the Hole-in-the-Wall campground on the Friday and Saturday nights though there are other accommodations available for those who wish.

Dr. Les Fyffe (Dept. of Natural Resources and Energy, NB) will lead the field trip on Saturday August 4th and we will be looking at the spectacular outcrops of Mesozoic lavas and meta-sedimentary rocks around the island. We will have our traditional supper that evening, probably outdoors.

Costs will be kept to a minimum. It is hoped that the travel (including ferry) costs will be covered by the Society. There will be a small charge for Saturday's supper.

Full details and schedule will be posted on the web page (www.gsmmaine.org/) very soon (look for it after May 30th) and you can also find out more details on the Grand Manan web site (www.grandmanannb.com).

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The Editor's Message:

All Geology clubs and related student organizations are encouraged to submit news and information for publication in the Newsletter.

We have decided not to accept paid advertisements, but are happy to pass on information concerning business or professional development opportunities that may be of interest to our readers, as space permits.

Dan Belknap, Newsletter Editor
<belknap@maine.edu>

GSM Web Site

www.gsmmaine.org

Our web master is Seth Barden at USM. Please send any information or questions to:

seth.barden@maine.edu

The State Geologist's Message:

Water, Water Everywhere…..

In Maine where we are blessed annually with about 45 inches of precipitation it is somewhat difficult to imagine that we face water supply issues. Yet over the past several years the State has faced several issues illustrating that even here we can have conflict. The most pressing issue has to do with water resources in eastern Maine. There the need for water to support irrigation of blueberry barrens is in direct conflict with habitat needs for Atlantic salmon, recently listed as an endangered species by the U.S. Fish and Wildlife Service. Conflict arises during dry summers (most recently 1999, but perhaps 2001?) when growers need water to irrigate during June and July. Rivers and streams approach base flows during this time and water withdrawals for irrigation on small tributaries can affect critical habitat. Over the past year and a half, my office has been engaged with other state and federal agencies, irrigators, wildlife managers, and other interested parties to develop solutions to this problem. The group is looking at ways to implement water storage so that some of the needs of irrigators can be handled by storing spring runoff. We are also looking to develop better information on base flows. Early in the process, we recognized that the State has very little information on low-flow conditions in rivers and streams other than general values that probably are not applicable everywhere. Together with funding from other state agencies, we are engaged with the USGS in a low-flow study of eastern Maine rivers that will establish base flow conditions that are protective of habitat in many of the small tributaries where water withdrawals occur.

Another water supply issue relates to lake level management. Consider the conditions of this past winter wherein water content in the snow pack was increasing in March rather than decreasing. This caused a great deal of concern among the members of the River Flow Advisory Commission about spring flooding. With typical April rainfall the State would nearly certainly have faced significant flooding and actions were taken to reduce this risk. Then it didn't rain. As a consequence, many dammed lakes will not reach full pond this year. At Sebago Lake, the water level on May 1 is usually at or near the spillway but was more than 2 feet below this year. Low water on the lake is actually beneficial for the beaches that have seen several damaging high-water storms in the last few years. Low water will allow waves to reactivate sand from deeper water and move it toward the beaches. It is a challenge to strike the appropriate balance here since many property and boat owners are not happy when they do not have access to their docks.

…. And not a Drop to Drink

In the past year there has been much media attention on the issue of arsenic in groundwater, brought on partly the Clinton Administration's proposal to lower the maximum contaminant level (MCL) for public water supplies from 50 ppb to 10 ppb, and the Bush Administration's reconsideration of this change. Arsenic hot spots in Maine such as Standish and Northport have also received much media attention. In 1994 our office was involved in an arsenic investigation in the southern Maine towns of Buxton and Hollis. As part of that effort we used the Department of Human Service's (DHS) water analysis database to assess arsenic levels on a statewide basis. We found that more than 13% of the tested private wells statewide were above the 50 ppb MCL. More recent studies of wells in New Hampshire and neighboring New Brunswick show only 2-3% of the wells in those areas above the MCL. So why is Maine so high? Part of the problem is that the DHS database is populated with volunteered well information. Property owners may have suspected a problem with arsenic (perhaps their neighbor's well had elevated levels) and had their water tested. This has skewed the database toward higher values. Both the New Hampshire and New Brunswick studies use randomly selected wells. To correct this problem, we are working with DHS on a study of arsenic levels in randomly selected wells. This project will be complete in early summer when we will better understand the statewide incidence of arsenic in groundwater. It is likely, however, that

there are regional clusters of higher arsenic values. Using the NH rate of 3% above the MCL, only 120 of the approximately 4000 wells in the Buxton-Hollis area should have been above 50 ppb. In our sample of 1100 wells, we found 150 above 50 ppb. We will have an update on the random-well study at the end of the summer. In the meantime, have your water tested!

Robert G. Marvinney, State Geologist
Maine Geological Survey
<Robert.G.Marvinney@state.me.us>

NEIGC – 2001 New Brunswick

The New England Intercollegiate Geological Conference will be held in New Brunswick, Canada, September 21-23, 2001. It is the 100th anniversary of the first NEIGC, held in 1901 when William Morris Davis led a field trip to terraces of the Westfield River in south-central Massachusetts. This year the meeting will be based in Fredericton, and sponsored by the Department of Geology, University of New Brunswick and the New Brunswick Department of Natural Resources and Energy. NEIGC 2001 will offer a wide variety of field trips in the New Brunswick-Maine area. Please visit the NEIGC website for more details on the meeting (http://neigc.org/NEIGC/2001/)

GSM Member News

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Glenn Prescott - Mrs. Betty Hamilton-Prescott informed us of the death of Glenn Prescott, Jr. She enclosed a donation of $50 to the education fund with the letter. Glenn passed away on January 29, 2001. He had worked at the Kansas Geological Survey in 1947-1948 and joined the USGS in 1948, retiring in 1983. Glenn prepared some of the first aquifer maps of the State of Maine, and current maps cite him as a source. Many of his maps are still in active use.

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Spike Berry (Maine Geological Survey) and his wife Joan are the proud parents of a son, Nathaniel Newhall Berry, born Friday, April 13th.

Lois Ongley taught Physical Geology in Saudi Arabia during the month of February.

Ray Kaczorowski has been named manager of mineral resources for IP Mineral Resources in Houston, Texas.

Charles Hebson joined the Maine Department of Transportation's Environmental Office in February as the Department's Chief Hydologist. He plans to update the Department's design methodologies and has begun rewriting the hydrology portion of the Design Guide. He will also provide technical guidance and training for design staff and will be instrumental in developing Department drainage policies.

Florence Grosvenor retired from the Maine Department of Environmental Protection in April. She is looking forward to camping, antiqueing, and whipping the garden into shape.

Steve Pinette has joined S.W. Cole as a Senior Geologist, and will be working out of the company's Augusta office.

Todd Coffin (Jacques Whitford) is starting off the running year well. He won the Boys and Girls Club Patriot's Day 5-Miler and the April Amble 4-Miler.

Please send member news to:
Carolyn Lepage at <clepagegeo@aol.com> or PO Box 1195, Auburn, ME 04211-1195 or by fax to 207-777-1370 or just call 207-777-1049

SECRETARY'S REPORT

GEOLOGICAL SOCIETY OF MAINE
Spring Meeting, April 6, 2001

Call to Order: The business meeting was called to order by President Dave Gibson.

Minutes: The minutes from the fall meeting should reflect an email Pat Seaward received from Andy Tolman regarding the misstatement that the licensing board had raised the annual geologist certification fees to $140. Let it be noted that the Legislature removed the Board's authority to set fees, giving that authority to the Bureau of Financial and Professional Regulation (BFPR).

Old business: Speaking of certification, Bob Marvinney reported that the process has not been completed. There was a legislative committee hearing to move the certification board to the Maine Geological Survey (MGS) where it once had been. The BFPR opposed the bill because they feel that the costs are not unreasonable. The committee seems willing to move the program to MGS, but has a problem with how the fees are set. There is a work session scheduled for April 12th for committee debate. This will not constitute a public hearing unless the legislature asks specific questions. Bob noted that a fair number of co-sponsors let the committee know the severity of the problem.

Walter Anderson added that he had heard from Dorothy Richter that New Hampshire has passed a certification bill. The process for certification will begin sometime in mid-summer.

Liz Champeon gave another friendly reminder about member's delinquent in paying their dues. Dan mentioned that he had extra newsletters with membership information if the students present are interested.

Pat Seaward made a plea regarding aboveground storage tanks. The Maine Department of Environmental Protection (MDEP) Response Services in Augusta has been called out to more than 50 failures associated with outside home heating oil tanks this spring. The culprit was that the amount of snow we had this winter served to fatigue the filters on AST's, and then ice and snow falling off the roof severed the line the rest of the way. The frustration is that these incidents are entirely preventable with a simple manufactured or homemade filter protector.

New Business: Dan Belknap has been approached regarding advertising in the Newsletter. The request was for a paid ad by a legitimate business. Dan didn't want to set any precedents without discussing with the membership. Archie Berry had told Dan that paid advertising would cause no problems with respect to tax status. Question arose as to how to charge (fee per inch?), and how to limit advertising for control purposes. It was suggested that it would be better not to accept any paid advertising. Dan noted that advertising should be offered free to members' business as informational only. No vote taken.

Student awards for best undergraduate poster and oral presentation:

POSTER: Ewan Wolff, Department of Geology, Bates College. "Paleoecology and Litho-facies Evolution of the Earnley Sand Formation and Marsh Farm Formation, Isle of Wight, England."

ORAL PRESENTATION: Krista Anderson, Department of Geology, Bates College. "Electron Microporobe Age Dating of Monazite from the Acadian Orogeny, Northern Presidential Range, New Hampshire."

Congratulations to you both!

A conversation on how to proceed with a "Geology of Maine Project" in the form of a textbook with the details to be worked out. Would it be a joint venture between GSM and the Maine Geological Survey (MGS)? Dan Belknap, speaking for Joe Kelley, supports the idea of such a venture. Questions arose as to what level, i.e., who would be the target audience; and should it be a sole author, or editor with chapter format? It was suggested that contributions by subject be compiled, edited, and published by MGS. Bob Marvinney will discuss with MGS staff to determine how this project could be scheduled.

Dave Gibson noted that there is space in the newsletter for news from the various geology clubs at Maine's colleges. Professors, please pass the word to your students.

A suggestion for the summer field trip to Grand Manan Island is under serious consideration.

The fall meeting is, again, proposed for Poland Spring; with Colby College hosting the 2002 student presentations.

The meeting was adjourned at 4:55.

My thanks to Lisa Churchill-Dickson for providing the abstract of her evening talk (see last page of this Newsletter).

Respectfully submitted,
Pat Seaward, Secretary
<Patricia.o.seaward@state.me.us>

GSM TREASURER'S REPORT

As of 05/24/01:

The Society currently has 370 members: They are distributed as follows:

Associates:	35
Institutions:	12
Regular:	279
Students:	44

Unfortunately it is easy to let your dues lapse. The dues date is shown on your mailing label.

Balance on Hand 01/27/01	**$ 12,289.44**
Anderson Fund (Total)	$ 4983.66
Education Fund (Total)	$ 792.70
Checking Account (other)	$ 6622.31
Receipts	
Dues	$ 416.00
Anderson fund (interest)	$ 113.02
Anderson fund (contributions)	$ 16.00
Education fund *	$ 57.00
Publications	$ 10.00
Subtotal	$ 612.02
Expenses	
Printing, mailing, stamps	$ 228.79
Anderson Awards (Plaques etc.)	$ 214.00
Conference/Meeting Expenses	$ 60.55
Website	$ 70.00
Tax Filing Fee	$ 20.00
Subtotal	$ 532.79
Balance on Hand 05/24/01	**$ 12,368.67**

* ($50.00 fom Betty Hamilton-Prescott in memorial for Glenn Prescott)

Respectfully submitted,
Elizabeth A. Champeon, Treasurer
< Lchampeon@aol.com>

GSM STUDENT ABSTRACTS

Spring Meeting, April 6, 2001

University of Southern Maine, Gorham, ME

ABSTRACTS

ELECTRON MICROPROBE AGE DATING OF MONAZITE FROM THE ACADIAN OROGENY, NORTHERN PRESIDENTIAL RANGE, NEW HAMPSHIRE *[ORAL]*

ANDERSON, Krista, Department of Geology, Bates College, Lewiston, ME. <kanderso@bates.edu>

This study used a unique new method of monazite age dating to constrain the timing of metamorphic and igneous activity in the Presidential Range during the Acadian orogeny. Monazite, (Ce, La, Nd, Th)PO_4, is a metamorphic mineral that forms at or above staurolite grade conditions of 525°C and 3.1 kbar (Smith and Barreiro 1990). The U-Th-Pb system in monazite provides a useful measure of timing for geological events by recording the ages of prograde metamorphism and igneous crystallization as a unique isotopic signature. Until recently, previous geochronology studies have assumed that metamorphic conditions above a certain grade would reset this isotopic signature and thus eliminate any prior ages recorded by a monazite grain. Yet numerous new studies have found that monazite can in fact record the ages of multiple events as distinct age domains in individual crystals through temperatures as high as 725°C (Copeland et al. 1988; Parrish 1990; Kingsbury et al. 1993; Suzuki et al. 1994; Teufel and Heinrich 1997; Cocherie et al. 1998; Williams et al. 1999). While conventional mass spectrometry ages would average these domains into a single intermediate age, microprobe analysis can differentiate between younger metamorphic or magmatic ages and any older ages inherited from previous events. Although the uncertainty of electron microprobe monazite ages is 10-20 m.y., the advantages of the technique can outweigh this higher uncertainty and establish monazite as an ideal geochronometer.

In situ electron microprobe analysis was conducted at the University of Massachusetts, Amherst to obtain quantitative compositional information for multiple age domains within compositionally zoned crystals of monazite. Three thin sections containing monazite were dated in this study—a two-mica granite from the Bickford pluton (sample RE-02), and a staurolite schist (sample O-09) and migmatitic gneiss (sample TLB-08) from the Devonian Littleton Formation. Analyses of two grains from the staurolite schist showed an inherited Silurian core domain (419.8 Ma) surrounded by Eifelian monazite growth (390.3 Ma). The Eifelian domain is interpreted to represent the peak phase of metamorphism in the region. This monazite growth is approximately 13 m.y. younger than previous estimates for the peak phase (Robinson 1997; Eusden et al. 2000), suggesting that prior mass spectrometry studies in the Central Maine Terrane may have incorporated older inherited domains along with the peak metamorphic growth.

Analyses of three grains from the Bickford two-mica granite produced a late Devonian/early Carboniferous age (363.5 Ma) as well as an older component (402.7 Ma) interpreted as a relict grain of the Littleton Formation partially preserved through the crustal melting episode that formed the pluton. Lastly, analysis of the sillimanite grade gneiss revealed Devonian ages related to the peak metamorphism (395.5 Ma) and the migmatization (369.5 Ma) associated with intrusion of the Bickford granite. Silurian and Ordovician ages from the core domains from grains of this gneiss are interpreted as a relict detrital component preserved through multiple phases of Devonian and Carboniferous thermal activity and possibly derived from the source for the sediments of the Littleton Formation.

Results of this thesis 1) confirm that monazite systematics can indeed preserve evidence of complex growth histories even through high-grade metamorphic and thermal events, 2) indicate that the Bickford granite intruded post-tectonically, 3) support Welling's (2001) interpretation of the migmatitic gneiss near the Bickford granite as the Littleton Formation, and 4) suggest that peak metamorphic ages determined by previous geochronology studies may represent the average of the metamorphic ages and relict core ages.

CORRELATION OF THERMAL INFRARED MULTISPECTRAL SCANNER (TIMS) AND FTIR DATA *[POSTER]*

FUENTE, David E., Geology Department, Colby College, Waterville, ME. <defuente@colby.edu>

False color produced from Thermal Infrared Multispectral Scanner (TIMS) data allow for the identification of gross lithologic differences between rock types. Although past studies support the usefulness of TIMS data for this purpose, little work has been done to investigate TIMS ability to decipher small-scale lithologic differences. This study, done in the Horse Hills Mining District of the Eastern Mojave Desert, California, examines the correlation of laboratory generated FTIR and remotely sensed TIMS data as a means of more accurately predicting lithologies from TIMS images. Thus, in order to better understand how the object domain (a 9m by 9m ground surface area) is represented in the display domain (a single pixel of a TIMS image) emissivity value estimates were made for pixels containing "unknown" rock types via reference to similar rock types contained within pixels of known emissivity values. Predicted emissivity values for pixels containing the samples used do not coincide with the actual emissivity values for the respective pixels. This indicates that material other than dominant lithology (i.e., vegetative cover, weathering products, soil, accessory lithologies, etc.) influence TIMS data.

The apparent inadequacies of relying solely on dominant lithology in the correlation of FTIR and TIMS data suggest that including appropriate percentages of material such as soil and secondary lithologies in prepared FTIR samples will result in more accurate modeling of the ground surface and thus improve our ability to correlate FTIR and TIMS data. An initial investigation into the usefulness this type of ground simulation (spectral mixing) indicates that it may prove to be an effective tool in the correlation of TIMS and FTIR data.

SEAFLOOR IMAGES FROM THE BLACK LEDGES POCKMARK FIELDS, PENOBSCOT BAY, MAINE *[POSTER]*

GONTZ, Allen M., Department of Geological Sciences, University of Maine, Orono, ME <allen.gontz@umit.maine.edu>

Pockmarks are seafloor depressions created by the escape of fluids under pressure through the surficial sediments. The source fluid can be either water or gaseous hydrocarbons. In the case of Penobscot Bay, direct sampling has revealed methane gas to be the fluid. Pockmarks are recognized with geophysical techniques in nearly every muddy embayment along the coast of Maine, and tend to occur in discrete fields bounded by changes in sediment texture, such as from gravels and till to muddy and silty

sediments. Pockmarks only occur in muddy and silty sediments. The area south of the Black Ledges in Penobscot Bay, Maine was recently mapped with high-resolution digital sidescan sonar and seismic reflection profiling. Mapping revealed at least six discrete pockmarks fields, with pockmarks in greater density than previously observed in Penobscot Bay. Sidescan sonar shows areas of gravelly, rocky seafloor abruptly adjacent to silty, muddy seafloor with pockmarks as well as drag marks from fishing, lobster traps, and sediments plumes, indicating possible methane release.

The mechanisms that generate shallow-water pockmarks are poorly understood. Detailed mapping of an area of pockmark occurrence is the first step in examining the field for activity levels, mechanisms of formation, fluid transport pathways, origins of the fluids, and life cycles of individual pockmarks and pockmark fields. It is crucial to understand the quantities of methane that pockmarks release into the marine system and are transferred to the atmosphere. Methane is a potent greenhouse gas, having several times the effect of carbon dioxide. To this date, the contribution of marine methane to the global carbon cycle is poorly understood, as is its role in global climate change. Detailed studies of features such as pockmarks are needed to understand the past and predict the future of climate changes.

HOW SAND BEACHES IN SOUTHERN MAINE ARE RESPONDING TO ANTHROPOGENIC INFLUENCES AND METEOROLOGICAL EFFECTS *[POSTER]*

HEINZE, H., <Heather.Heinze@umit.maine.edu>, KELLEY, J.T., <jtkelley@maine.edu>, BELKNAP, D.F., <belknap@maine.edu> Department of Geological Sciences, University of Maine, Orono, ME and DICKSON, S.M., Maine Geological Survey, Augusta, ME <Stephen.M.Dickson@state.me.us>

As a result of a growing population and an increase in development along the coast in the past several decades, it is necessary to study and comprehend the changes that are occurring in coastal beach systems. Although sand beaches in southern Maine comprise only a small segment of the coastline, they are economically important to the state. Since September 1999, volunteers have made monthly topographic profiles along ten beaches in southern Maine to monitor topographic changes. The volunteers used the Emery Method of beach profiling to take simultaneous measurements at spring low tide. In addition, moored buoys offshore collected wave/current data during the 2000 and 2001 winter months. The beaches are significantly different with respect to physiography, incident wave energy and direction, available sediment supply, tendency to erode or accrete, and extent of development. Coupling offshore meteorological data with profile data makes it possible to determine the response of the beaches to changing oceanographic conditions.

On the developed beaches, the profile results show the classic response of seasonal berm erosion/accretion, but no such patterns exist for the undeveloped beaches. The high sand volumes in the summer and low volumes in the winter that were expected were generally not observed along any of the barriers, indicating that sand was not lost, but rather moved within the system. Over a one-year time interval, eight of the beaches showed an actual net gain in the volume of active sand. Many of the beaches did experience berm erosion, corresponding to winter storms. However, several storm events were favorable for restoring sand to the beach, which may be sufficient to compensate for the storms that result in a net loss of sand.

Results from the past year and a half suggest that profiling efforts need to continue into the future to minimize the effects of seasonal and other short-term changes and to determine whether the beaches are in a stable state. It is probable that the barriers are currently in equilibrium with human-induced alterations and a significant storm event is necessary to cause extreme erosion and movement of the shoreline.

TESTING OF TIMS IMAGE LIMITATIONS CONCERNING WEATHERING AND ALTERATION PRODUCTS OF ROCK TYPES. *[POSTER]*

HOULAHAN, Matt, Geology Department, Colby College, Waterville, ME. <mmhoulah@colby.edu>

NASA's thermal infrared multi-spectral scanner is a remote sensing tool providing 6 channel capabilities based on mid-infrared radiance, termed emissivity, of various rock types. Through the isolation of these channels, single emissivity values can be produced to represent the relative amount of radiance within a 9m by 9m pixel. Using this technique, the limitations of the TIMS image was tested in terms of representation of weathered products and alterations. Analysis was performed on two rock types, a diorite, and a rock of felsic composition. First, spectra were obtained using a Fourier transform infrared spectrometer to verify under which of the six bands these alteration and weathering products could be accounted for. Next, percent differences of integration values of each of the bands were calculated for each weathered rock comparing it to the non-weathered rock. These trends in percent differences were then correlated to the percent differences of the emissivity values obtained by the TIMS image of each pixel representing the corresponding hand sample. Results show a great lack of correlation between the spectra and the emissivity values. It was concluded that the 9m by 9m area of ground representing the pixel contained far too many variables, minimizing the effects of weathering and alteration products. In addition, it was also concluded that integration, as a mathematical means for comparison, was not a very accurate method for comparison of spectra.

DEPENDENCE OF THE FELLFIELD ALPINE VEGETATION COMMUNITY ON THE LITTLETON FORMATION IN THE ALPINE ZONE OF THE PRESIDENTIAL RANGE, N.H. *[ORAL]*

LEVIN, David E., Environmental Studies, Bates College, Lewiston, ME. <dlevin@bates.edu>

Factors that influence the distribution of alpine vegetation communities are well-documented throughout the world. However, few studies have been conducted in the alpine habitats of the east coast of the United States. In the east, the majority of the 34 km^2 of this harsh type of ecosystem is found in the Presidential Range, New Hampshire, and in the Katahdin Range, Maine. The Presidential Range is composed of eleven peaks near the eastern border of New Hampshire and is located at the convergence of three different air masses. This convergence zone causes some of the worst weather on the east coast to occur regularly over the Presidentials.

Bedrock mapping in the Presidential Range has been an ongoing project over the past decade while detailed alpine vegetation community mapping was recently completed. One of the mapped communities, fellfield, is composed of three lichen species that grow on broken bedrock blocks. The study of lichens is a relatively new field and relatively little is known about the significance and distribution patterns of these communities. This particular community has been shown to be poorly correlated with topographical features that typically explain the distribution of alpine vegetation communities. This study was

undertaken to examine the possibility of a relationship between the fellfield community and the bedrock substrate using Geographical Information Systems.

The fellfield community, although studied little, is an important consideration for alpine area management. Management strategies are often based on protecting the obvious fragile, herbaceous plant communities that grow in the harsh conditions above tree-line. Therefore, trails and other use areas are often routed around those communities, through bedrock areas without obvious herbaceous vegetation. However, these areas are the durable substrate on which the fellfield community grows. Unfortunately, little consideration has been given to this community due to a lack of knowledge. Analyses over the entire alpine zone show that fellfield growth is dependant on the dominant bedrock type of the alpine zone, the Littleton Formation. However, this pattern is not consistently substantiated when various subsections of the alpine zone are examined. Physical properties of the bedrock substrates, perhaps such as the size of the bedrock blocks, may provide insight into these patterns. These results not only indicate a need for further research but also may have significant implications for future alpine areas management strategies.

GEOMORPHIC MAPPING AND ANALYSIS OF THE EASTERN MEDUSAE FOSSAE REGION OF MARS *[POSTER]*

MARI Takagi, Department of Natural Sciences, University of Maine at Farmington <maritakagi@hotmail.com>

Introduction

The enigmatic Medusae Fossae Formation (MFF) deposits cover almost one-quarter of the equatorial portion of Mars in the Amazonis Planitia region(18N to 12S latitude, 125 to 220W longitude). These unusual materials have generated many hypotheses of MFF origin including ignimbrite, massive accumulations of indurated aeolian sediments, polar layered materials, exhumed chemically altered ancient materials, eroded carbonate platform materials, and rafted pumice accumulations. Detailed geologic mapping and Mars Global Surveyor data are being used to investigate the complexities of MFF in an attempt to constrain likely hypotheses of origin. I will report on results obtained from new geological mapping of a portion of the eastern component of MFF.

Observations and Discussions

Here I summarize some of the most important observations derived from the mapping effort, and their potential implications.

Characteristics of MFF: All exposures of MFF appear to be severely eroded, often displaying extensive yardang fields and irregular topography. Some fresh craters do not have visible ejecta, suggesting burial by the MFF materials, and some craters have been exhumed from beneath an MFF covering.

Implications : Considering the ubiquitous characteristics of obvious friability and widespread development of yardangs on MFF, these materials must be very fine-grained. The specific origin of these mysterious materials still cannot be established with certainty. Since MFF is mostly found in specific regions, such as Elysium and Amazonis, the deposition and modification of MFF materials might be strongly influenced by orbital effects such as variations in obliquity, eccentricity, and inclination. Perhaps the discontinuous nature of the remnant magnetic field presently observed on Mars may also contribute to the MFF origin. Therefore, a more favorable hypothesis may include not only the present morphology of the deposition, but also the recent global environmental history.

Regional Setting for MFF: From both Viking and MOC images, lava flows and lava margins were found_not only near large volcanoes like Olympus and Arsia Montes, but also in areas relatively far removed from obvious volcanic constructs. Emplacement of lava in these remote areas suggests that much of the lava does not come from a visible volcanic construct. This observation probably indicates the existence of fractures or fissures as local volcanic sources, now likely buried beneath the current surface materials. Moreover, some small remnants of MFF materials are found near some of these isolated lava flows. Such flows may have been in contact with near-surface ice and/or water, which could have contributed to the catastrophic release of floods that eroded and abraded the MFF materials, so that not all MFF modification is the result of aeolian processes. Fluvial erosion also may not have always been catastrophic in nature: possible peperite lava flows, occur both sides of a recently identified channel exhumed from beneath the MFF materials.

DOING WHAT GEOLOGISTS DO: ENGAGING HIGH SCHOOL STUDENTS IN ORIGINAL FIELD RESEARCH *[POSTER]*

MILLETTE, Patricia M., Mt Blue High School, Farmington, Maine 04938. <patti.millette@maine.edu>

Since 1995 freshman earth science students at Mt Blue High School in Farmington, Maine have been analyzing local outcrops in the Farmington/Wilton area. In addition to learning various standard field and lab techniques, they have been acquiring new insights into the scientific method. By engaging in long-term research with no preconceived answers, they are learning to do what scientists do.

In the summer of 2000, a group of 18 high school students left the local area to pursue an additional summer research project. The purpose of this project was to attempt to discover the origin of morphological salt marsh features known as salt pannes. After forming possible hypotheses about the origins of salt pannes, the students and their mentor devised and executed a plan to compare physical features of creeks and pannes. To complete this plan, they retrieved a series of sediment cores from two coastal salt marshes in southern and central Maine, performed a standard grain size analysis on samples from selected cores, and performed rising-head slug tests on selected bore holes. Currently in the final stages of completing their analysis, they are preparing to present their findings to local groups and complete a technical report communicating these findings. With their experiences designing a research plan, executing field and lab work, and communicating their findings to others, the students receive an accurate representation of the real-world work of professional geologists.

A PETROGRAPHIC STUDY OF THE CASCO BAY AMPHIBOLITES, CASCO BAY, MAINE *[POSTER]*

MEYER, Edward, (Advisior: Rachel BEANE), Geology Department, Bowdoin College, Brunswick ME, 04011. <emeyer@bowdoin.edu>

A systematic petrographic study of the Spring Point formation, an Ordovician metavolcanic mapped from South Portland to Orr's Island Maine, shows a progression from greenschist to amphibolite facies metamorphism. Greenschist facies Spring Point rocks, from the South Portland area, show mineral assemblages of Chl + Qtz + Ms ± Plag ± Gt ± Epd. The Spring Point reaches amphibolite facies 50km to the east, with an assemblage of Hbl + Qtz + Gt ± Ms + Plag ± Bt ± Ilm ± Calc ± Zr. Greenschist rocks show mantling of plagioclase around hornblende, while the amphibolites have porphyroblasts of

garnet with inclusions of plagioclase and hornblende. Based on the minerals present, a potential reaction for the transition from greenschist to amphibolite facies is the dehydration reaction of chlorite + epidote = Al-amphibole.

The Spring Point is included in the Casco Bay Group, which is composed of pelitic, calcareous, sandstone, and volcanic protoliths. Regional metamorphism, folding, intrusion and faulting events are see throughout the Casco Bay Group, and are interpreted to be a consequence of the Acadian orogenic event (Hussey 1989). Previous mapping (Hussey 1987) of pelitic Casco Bay Group units shows a regional Buchan progression from South Portland to Harpswell.

The Spring Point formation provides the opportunity to apply the metamorphic facies concept to the Casco Bay Group, to better constrain metamorphic temperature and pressure conditions. Based on SEM/EDS chemistry and Fe-Mg exchange equilibria, the Spring Point amphibolite from the Cribstone Bridge, shows metamorphic temperatures of 550-590°C. Sillimanite presence in nearby pelitic rocks constrains pressure to 4 kbar. This corresponds with the predicted pressure of 0 – 7 Kbar and temperatures of 400°C – 700°C for a sillimanite constraint on the amphibolite facies metamorphic zone (see Spear 1993). This low to intermediate pressure and temperature metamorphic series most likely represents the effect of heating from plutonism in the Coastal Maine Magmatic Province.

GIS RECONSTRUCTION OF DEGLACIAL SHORELINES IN SOUTHERN MAINE FROM NEW GPR DATA *[POSTER]*

NELSON, John B., Department of Geological Sciences, University of Maine, Orono, ME <jnelson1@maine.rr.com> and BELKNAP, Daniel F., Department of Geological Sciences, University of Maine, Orono, ME. <belknap@maine.edu>

Long axes of streamlined hills in southern Maine parallel striations from late Wisconsinan glaciation flowing SE. Hills may be composed of bedrock (large roches moutonées), of bedrock plus till (crag and tail), or predominately of till (drumlins). Ground-penetrating radar (GPR) was used to evaluate the hypothesis that certain streamlined hills in the vicinity of Eliot, Maine are composed entirely of till, and are therefore classic drumlins indicative of zonal dynamics within the ice sheet. Common Mid-Point (CMP) studies using GPR demonstrate that the till near the surface of these hills has a wave propagation velocity of 0.13 meters per nanosecond (0.13m/Ns), which is identical to that of granite, and is commensurate with the observation in outcrop that these sediments have been over-ridden, and reconsolidated at some time in their history. Below 10 m the density of this till causes complete attenuation of the 100 MHz radar signal. While this dense material frustrates GPR examination, its enhanced resistance to casual erosion preserves clear subsurface evidence of the deglacial wave-cut terraces recognized in surficial sediments. At Marsh Hill, a distinct notch at 24 m elevation is overlain by gently inclined parallel strata, interpreted as a marine terrace. The local relative sea-level curve places this event during deglacial fall of sea-level due to rapid isostatic rebound, roughly 11,000 BP. A GIS map reconstructing the landscape surrounding Marsh Hill at the time of this 24 m sea-level clearly identifies the local hills as isolated islands open to wave attack, with longer fetch from the SW, and shows that a particular isolated narrow-mouthed inlet on the Mt. Agamenticus uplands was in fact a fjard, open to the sea during one of the relative pauses of deglacial sea-level retreat. This fjard may contain preserved marine sediments, the dating of which may more closely fix the deglacial chronology of southernmost Maine.

SEISMIC AND SEDIMENTOLOGICAL CHARACTERISTICS OF THE NEW MEADOWS RIVER *[POSTER]*

OAKLEY, Adrienne J. <aoakley@bowdoin.edu> and LAINE, Edward P., Geology Department, Bowdoin College, Brunswick, ME. <edlaine@bowdoin.edu>

For the last 14 thousand years, the “rock-bound” coast of Maine has been shaped by the interaction between glacial processes and fluctuating sea levels. Between 13.8 and 13.2 thousand years before present, the Laurentide Ice Sheet, which had covered coastal Maine, retreated leaving the sea in its wake. The Maine coast had been isostatically depressed by the ice allowing for a rapid marine transgression. At its highest, sea level in mid-coast Maine rose to approximately 70 meters above the modern level. As the ice retreated and the water rose, the Presumpscot Formation, comprised of glacial-marine mud, was deposited as a drape over the bedrock previously sculpted by glacial activity. As sea level dropped to –60 meters in response to isostatic rebound, the surface of the Presumpscot was eroded. Evidence for sea level change is contained in the sedimentary record of Maine estuaries.

My work this summer focused on the New Meadows River, an elongate, rock-bound estuary in mid-coast Maine. The seismic and sedimentological characteristics of this river were investigated using high-resolution seismic profiles and coring. The purpose of this study was to determine what role sea level fluctuation played in shaping these characteristics. The seismic records from the New Meadows River taken in the summer of 1999 using Datasonics CHIRP sonar equipment shows an unconformity between the erosion surface of the glacial-marine mud of the Presumpscot Formation and a flat lying unit of Holocene mud. This unconformity is seen clearly in three cores taken from tidal flats on the river. Further work will be done to correlate the sedimentological units observed in the sediment cores to the seismic-stratigraphic units in the seismic records.

ANALYSIS OF THE OPPENHEIMER PYROCLASTIC DEPOSITS USING CLEMENTINE UVVIS DATA *[ORAL]*

PETRO, Noah, Department of Geology, Bates College, Lewiston, ME, 04240 <npetro@bates.edu>

Clementine Ultraviolet-Visible (UVVIS) data are used in order to examine the compositions of small pyroclastic deposits in the Nectarian-aged lunar farside crater Oppenheimer. The compositions of these deposits are compared to other pyroclastic deposits located within the South Pole-Aitken (SPA) basin as well as in the nearside Alphonsus and J. Herschel craters. Compositional variations are observed amongst some of the seven deposits located within Oppenheimer. Overprinting of ejected highland material from the Copernican-aged farside crater Jackson causes these variations. The nearside crater Alphonsus is similar in morphology to Oppenheimer and that it also contains small pyroclastic deposits, however the compositions of these deposits differ. The Oppenheimer deposits are also compositionally distinct when compared to other pyroclastic deposits found within the SPA (Von Karman M and Leeuwenhoek). However, the compositions of the deposits in both Oppenheimer and Alphonsus craters and in the SPA deposits resemble that of low-Ti mature maria. The similarity to the other SPA pyrcoclastics and to the SPA low Ti mare presents the possibility that the SPA cryptomare are linked compositionally to the pyroclastics. The lack of variation within the

Oppenheimer deposits indicates that they originate from a common source region and represent a single eruptive event.

KEEPING K-12 GEOSCIENCE CURRICULUM ON THE CUTTING EDGE OF RESEARCH: THE GRANITE QUESTION *[POSTER]*

RANDALL, Anna L., Geology Department, Colby College, Waterville ME and DEIKE, Ruth, The Rock Detective, Dresden Mills ME <alrandal@colby.edu>

Grade school children are introduced to the simple origin of granites as melted continental crust early in their education, but during the past decade our understanding of granite genesis has dramatically changed due to advances in petrographic and field-related studies. The emerging paradigm of granite genesis calls upon a liquid interaction between felsic and mafic magmas, creating a variety of textures and altering magmatic properties. To incorporate these new and exciting concepts into K-12 geoscience education, it is necessary to simplify the material without altering its basic principles. The introduction of these concepts must be simple enough for both students and their teachers (many of whom have little or no geoscience background) to grasp. A geoscience education project has been developed using the commercially available Rock Detective that addresses this need.

The Rock Detective is a hands-on, inquiry-based program designed to supplement traditional teaching tools in the classroom. Through this program, we provide a mechanism for introducing the new granite paradigm and other fundamental geoscience concepts to middle schoolers. In order to simplify these complex concepts, we employ a variety of techniques that include: (1) Using observable hand specimen characteristics as a segue into these fundamental concepts, (2) Leading students through simple measurements to understand basic properties of matter and the Earth, (3) Using concrete, hands-on activities allowing students to discover the properties or concepts themselves, and (4) Relating geoscience knowledge to the student's own experiences. The use of such methodologies has allowed us to maintain the original factual information and intent while creating a foundation on which continuing knowledge can be built.

USING TRANSIENT ELECTROMAGNETIC SOUNDINGS TO MAP THE THICKNESS OF THE GRAY DELTA, MAINE, AND CORRECTION OF DATA USING COIL CALIBRATION TO IMPROVE RESOLUTION *[POSTER]*

ROBINSON, Michael A., SANDBERG, Stewart K., and KIRKPATRICK, Melissa D., Dept. Geosciences, Univ. of Southern Maine, 37 College Avenue, Gorham, ME 04038, <trob20@hotmail.com>

Transient electromagnetic (TEM) soundings have long been used to map depth to bedrock, and stratigraphic layering (corresponding to hydrogeologic units) in the subsurface. We investigated the use of TEM to map the thickness of the Gray Delta in an abandoned sand pit in Gray, Maine. The site was chosen because sufficient drilling and geophysical information was available to provide a check on the resolution of our method. Our study entailed analyzing the resolution improvement in calibrating the TEM receiver coils and incorporating these results in a numerical model of the thicknesses and resistivities of the geoelectric section. TEM data calibration is deemed necessary due to the finite bandwidth of both the receiver and receiver coils. Interpretation involves correlating these derived geoelectrical layers with geologic/hydrogeologic units.

A known uniform magnetic field can be created in the center of a solenoid. We constructed a solenoid three meters long, with a radius of 0.65 m, which was big enough for the TEM field coils to fit inside. Data procedures were tested in a miniature version in which scale-model coils, used for physical scale modeling in the University of Southern Maine geophysical laboratory, were calibrated in a small solenoid. An HP35665 Dynamic Signal Analyzer was used to transmit a sweep of frequencies from 10 Hz to 51.4 kHz through the windings of the solenoid. This instrument then collected voltages across a known resistor, providing the transmitted current, and voltages from the TEM receiver coil inside the solenoid, yielding the coil's response. Corrections were then made numerically to field TEM data collected in Gray.

The Gray delta is a glaciofluvial outwash delta, comprised of fine- to medium-grained unconsolidated sands. Bedrock beneath the delta is a granite of the Sebago Lake pluton. TEM results showed that the delta has a resistivity of about 400 ohm-m and is approximately 30 m thick correlating well with seismic refraction data and information from nearby wells.

LOCAL ENVIRONMENTAL PERTURBATIONS AS EVIDENCED BY FACIES RELATIONSHIPS: SPITTAL POND, BERMUDA *[ORAL]*

TACKABERRY, Will, Geology Department, Colby College, Waterville, ME. <wjtackab@colby.edu>

Spittal Pond is located on the South Shore of Bermuda in Smith's Parish. The eight-acre pond is believed to have formed in an inter-dune lowland as three independent basins, which have since joined to form the present feature. The proximity of the pond to the Atlantic Ocean adds to the unique environmental character of the site.

Fieldwork conducted in June 2000 yielded eight vibracores ranging from one to five meters in length, limited by lithified Pleistocene eolianites at their bases. The cores revealed three distinct sediment types: a hemic (fibrous) peat, a sapric (desiccated) peat, and a gastropod and ostracod "sand" composed primarily of whole shell material. The peats appear to form in couplets with a transitional zone between the hemic and sapric layers. The sapric peat also is characterized by interbedded ostracod and gastropod "sands."

The fact that the pond consists of three independent basins has resulted in three independent sedimentological sequences. The southwestern basin is best characterized by hemic and sapric peat couplets with a basal ^{14}C date of 4320 ± 40 years. The central basin contains not only the peats and "sands" but also includes 100 cm of basal clay that does not appear elsewhere in the record. The first peat in the central basin has a ^{14}C age of 3760 ± 40 years. Interbedded layers of sapric peat and the ostracod/gastropod "sands" dominate the northwestern basin that has a basal ^{14}C date of 3640 ± 40 years.

Over it's 5000-year history, Spittal Pond can be characterized as operating within two distinct depositional regimes. One supported the accumulation of thick deposits of a hemic peat while the other favored development of sapric peat. The presence of gastropod/ostracod "sands" within the sapric peat layers is thought to be related to environmental perturbations within the pond that exceed the tolerance of these invertebrate comminutes.

THE STRATIGRAPHY AND STRUCTURAL GEOLOGY OF THE NORTHEAST FLANK OF THE PRESIDENTIAL RANGE, NEW HAMPSHIRE *[POSTER]*

WELLING, Douglas, Department of Geology, Bates College, Lewiston, ME. <dwelling@bates.edu>

Bedrock geologic mapping was performed in the northeastern flank of the Presidential Range in New Hampshire with funding provided by the U.S. Geological Survey EDMAP 2000 program. A bedrock geologic map was created in an ongoing process of mapping the complex structural geology of the Presidential Range. The goal of this study was to create a more comprehensive understanding of the Devonian Acadian Orogeny and to correlate the stratigraphy and structure in this region to previously mapped areas. The field work was performed throughout the months of July and August, 2000. All measurements and observations were recorded for individual outcrop stations and samples were gathered for subsequent analysis. Thin sections were constructed from select samples for petrographic study of mineralogy and microstructures. The four different formations of metasedimentary rocks that were mapped in this region are as follows from youngest to oldest; the Devonian Littleton Formation, the Silurian Madrid Formation, the Smalls Falls Formation, and the Silurian Rangeley Formation. The Devonian Littleton Formation was subdivided into seven different members and two submembers based upon variations in lithology and ratios of schist to quartzite. A rare migmatic member of the Littleton Formation characterized the northern region of the field area. In addition, pegmatites, dikes, and two large igneous bodies were mapped, the Peabody River Stock Granite and the Bickford Granite. Evidence for a phase of premetamorphic faulting in this portion of the Presidential Range is absent. Three phases of ductile folding were identified in this study region. Evidence of D_1 deformation is most extensive throughout the study area. Regions, in which bedding (S_0) and foliation (S_1) were not parallel was common and aided in defining two macroscopic, easterly facing F_1 folds, the Pine Link Nappe and the Culhane Brook Syncline. D_2 deformation, defined as thrust faulting, and D_3 ductile folding were not observed in the area. D_4 was observed as outcrop scale and microscale crenulations and was the least pervasive phase of folding. D_5 crenulations were abundant in the southeastern portion of the field area and appear to be related to the boundary between umigmatized and migmatized Silurian Rangeley Formation.

DEVELOPMENT OF A FLOW MODEL FOR AN ELECTRO OSMOSIS REMEDIATION TEST SITE *[ORAL after 3:30 PM]*

WILCOX, Laura J., Geology Dept., Colby College, 5800 Mayflower Hill, Waterville, ME 04901. <ljwilcox@colby.edu>

Lawrence Livermore National Laboratory (LLNL) is located near the southeast end of the Livermore Valley. The LLNL site is underlain by the Livermore Fm. comprising an upper and lower member. The upper member is characterized by gravel, sand, silt, and clay, and is host to the underlying contaminant plumes. In 1982, volatile organic compounds (VOCs) were discovered in the ground water and a thorough investigation began of the subsurface hydrology, geology, and chemistry. In 1987, LLNL was placed on the Superfund National Priority List.

The East Traffic Circle Area is of interest because it was an unpaved parking apron between the runways of the Naval Air Station prior to 1951. These aprons were used to clean and repair airplanes. In 1984, the same area revealed landfill debris containing materials such as metal shavings, capacitors (containing PCBs), broken bottles, drums (containing chemical wastes), plating tank contents, and sandblasting sand.

Pump-and-treat remedial procedures have been implemented to remove contamination from the coarse subsurface sediments, but the problem of recalcitrant contaminants remains to be solved for the less permeable zones. Soon an experimental method of contaminant removal, Electro Osmosis (EO), will begin in the finer grained sediments. To evaluate the performance of this innovative remedial procedure, a model was constructed to help understand the hydraulic communication that occurs between wells in the test site under pumping conditions.

This talk describes the hydraulic test information, which was key to the development of a conceptual model of the site. A simple flow and transport model was created using this data to establish baseline remedial predictions under pump and treat conditions. These estimations were then compared to EO predictive analyses and used to evaluate future EO remediation design and operation.

PALEOECOLOGY AND LITHOFACIES EVOLUTION OF THE EARNLEY SAND FORMATION AND MARSH FARM FORMATION, ISLE OF WIGHT, ENGLAND *[POSTER]*

WOLFF, Ewan, Department of Geology, Bates College, Lewiston, ME. <ewolff@bates.edu>

The Earnley Sand and Marsh Farm Formations are mid-Lutetian age units in the Bracklesham Group, Hampshire Basin, of southern England. Paleoecological study of 25 meters of the Earnley Sand and Marsh Farm Formations permits evaluation of the turritelline distribution for existence of a link (Allmon 1988, 1995) to coastal upwelling of the type described by Mann and Lazier (1991). Analysis of the Earnley Sand and Marsh Farm Formation for environmental indicators, such as foraminifera, sea urchin spines, fish scales, corals, mineralogical and sedimentological evidence reveals a continuously changing environment. The interpreted depositional environments indicate a regressional prograding sequence (e.g. Davis 1985) of offshore shelf, barrier island/shingle, lagoon, sub/intertidal flat, prodelta, intertidal flat, and marsh. Within this sequence of prograding, upwelling might have occurred at the end of the Earnley Sand Formation, and to a limited extent elsewhere as vertical mixing related to storms and tidal currents. Geochemical evaluation of this site would be very useful for future studies.

Summary of GSM keynote address given at Spring Meeting, April 6, 2001

An Introduction to Maine's Fossil Record

Lisa Churchill-Dickson

There is a rich diversity of life preserved in Maine's rocks and sediments. Although most people are aware of the fossiliferous Pleistocene deposits, the bedrock record has curiously received much less attention. In fact, most (scholars, students and the public alike) believe that Maine has very little to offer with respect to pre-glacial paleontology. It gives me great pleasure to say that this is simply not true. In fact, the situation is quite the opposite.

Maine has a significant Paleozoic fossil record that dates from the Cambrian through the Devonian. A rather extensive review of the literature has revealed at least 150 fossiliferous deposits (most named formations, some unnamed units) from which well over 5000 specimens have been recorded. Several of these specimens represent species only known from Maine, others are quite rare, and the majority of them are more closely related to biota from Europe than they are to North America. Unfortunately, this information is so buried within obscure and seemingly unrelated literature that the unfortunate myth of scanty bedrock paleontology has become a sort of urban legend, even among professionals.

Contrary to popular belief, Maine's Paleozoic paleontology is really very important. It preserves a fauna and flora that were living along a tectonically active margin and subject to extreme and frequent ecological perturbations. This setting contrasts markedly with contemporaneous, inland areas such as New York and Cincinnati. Likewise, we would expect such a change to be reflected not only in the taxonomic composition of the different biotas, but also in their community structures and perhaps evolutionary trends.

Maine itself has been "on the move" for some time now, rotating from a position of nearly 30 degrees south of the equator during the Ordovician to its present position at nearly 45 degrees north of the equator. During that same time, Maine has undergone a significant increase in its geographic extent, due largely to tectonic accretion along its margin. It is this dynamic set of circumstances that has given the state such a diverse and compressed view of time and environments from the early Paleozoic. Today, one can encounter Ordovician, high latitude, cold water faunas from oceanic islands, equatorial, coral reef environments from the Silurian and a diverse, early land plant assemblage from the Devonian, all within a fifty mile radius of one another.

In the past, most studies involving Maine's paleontology have focused largely on the stratigraphic usefulness of the fossils, rather than what they can tell us about life during the Paleozoic. The time has come to switch the focus of Maine paleontology from an age-dating tool to one that truly utilizes the data to its fullest. We need to invoke a paleobiological approach and look at the evolutionary and ecological trends in the fossil record and the organisms that produced them. We need to ask what types of organisms inhabited "Maine"? Where did they live? How did their composition and distribution change through time? Were these trends produced in response to changes in the biotic and/or abiotic environment(s)? What does Maine's fossil record reveal about large-scale paleontological and geological phenomena? We need to animate the still-lifes, add color to the picture and paint an accurate and meaningful portrait of life in Maine during the Paleozoic. We have ignored the elephant in the room long enough. Let the Paleo Revival begin! *(flourish of trumpets)*

2 cm

Silurian graptolites, Aroostook Co., ME
D.F. Belknap collection

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The GEOLOGICAL SOCIETY OF MAINE, INC. is a non-profit 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 dialog among geologists working in Maine; and to further public awareness and understanding of the geology of the State of Maine; and of the modem geological processes which affect the Maine landscape and the human environment.

The Society holds three meetings each year, in the late fall (Annual Meeting), early spring, and mid-summer (usually field trips). A newsletter, ***The Maine Geologist***, is published for all members three times a year. The Society year runs from August 1 to July 31. Annual dues and gift or fund contributions to the Society are tax deductible. There are three classes of memberships:

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