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THE PRESIDENT'S MESSAGE

This year's successful spring meeting was hosted by the University of Maine, and we owe many thanks to Dan Belknap and Marty Yates for taking the organizational lead. Thanks also to Chris Gerbi for his very interesting talk on the connections between rheology and many geologic processes as represented in some beautiful outcrop shots from the Canadian shield. The oral and poster presentations by both undergraduate and graduate students were excellent in quality and wide-ranging in content. Carlos Castro from Bates College won the Walter Anderson poster award for "Paleostress analysis of Mesozoic fractures and basalt dikes in Tuckerman Ravine, New Hampshire." Caleb Boucher from the University of Maine earned the Walter Anderson award for his oral presentation, "Magma Mixing in Composite Dikes of Jetteau Point, Gouldsboro, ME." With more than a dozen recipients for each of the Walter Anderson awards, new awards plaques were engraved this year and will be sent to the winner's institutions this year.

Joe Kelley, from the University of Maine, has agreed to lead this year's summer field trip. We'll be visiting stops in the Cobscook and Lubec area on Saturday, and walking part of the Bold Coast Trail in the Cutler Coast Reserve on Sunday. The group will be camping at Cobscook Bay State Park and we'll have a cookout on Saturday night. Please see the field trip announcement for more details. This promises to be a fun trip with the chance to explore some new areas, hear more about an upcoming research project, and see some interesting coastal environments. This is also a practice run for the NEIGC field trip.

Two notable events are coming up early in the fall. The University of Maine will be hosting NEIGC this year on October 1-3. Please see their website (www.neigc.org) for additional details. The fall GSM meeting will be hosted by USM on October 15. Irwin Novak has invited Paul Marinos to be the evening keynote speaker. Dr. Marinos is a professor of Engineering Geology in the National Technical University of Athens, School of Civil Engineering, Geotechnical Department and is this year's Jahn's Distinguished Lecturer in Engineering Geology sponsored by AEG and GSA. We plan that the afternoon panel will focus on engineering geology – please contact me if you are interested in presenting. We will be updating the GSM website later this summer with additional information about the meeting, and hope that many will be able to attend.

I look forward to seeing many of you at Cobscook in August and hope you will bring some great weather for camping and walking! Please be in touch with me if you plan to join us.

Julia Daly, President (2008-2010)
dalyj@maine.edu

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Geological Society of Maine Summer Field Trip Fri-Sun August 6-8, 2010

Downeast: Lubec & Cutler

Camping at Cobscook Bay State Park Aug. 6 & 7; group cookout Saturday night

Joe Kelley will be leading this year's trip! On Saturday, we'll meet at Cobscook Narrows reversing falls for stops including visits to coastal bogs in transition, the spit and salt marsh in Lubec, and the type locality of the Quoddy Formation. Sunday, we plan to walk part of the Bold Coast trail in the Cutler Coast Reserve to spectacular views of the cliffs. The walk is a gentle mile to the coast from Rt. 191.

The group campsite at Cobscook State Park is reserved for us on Friday and Saturday nights. Group camping is in the day use area of the park, separate from the regular tent sites, and can only accommodate tents. We'll have a group cookout at the nearby picnic shelter on Saturday night.

Please RSVP to Julia Daly dalyj@maine.edu by July 31 with the following information:

_____ # people

_____ camping w/group Friday and Saturday nights

_____ camping w/group Saturday night only

_____ cookout on Saturday

People wishing to make their own reservations for staying individually in the park may do so, but please still RSVP to Julia if you plan to join us.

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THE EDITOR'S MESSAGE:

Please send items of interest for the News from the Campuses and Member News columns, or other things you'd like to share.

Please check the date on your address label – members more than two years in arrears will be dropped from the mailing list. Send dues to Rob Peale (see address on the last page).

Dan Belknap, Newsletter Editor (1998 – present) <belknap@maine.edu> (207) 581-2159, FAX: -2202

PLEASE CHECK THE DATE ON YOUR ADDRESS LABEL – THIS IS THE DATE TO WHICH YOUR DUES ARE PAID UP. MEMBERS MORE THAN TWO YEARS IN ARREARS WILL BE DROPPED FROM THE MAILING LIST.

GSM WEBSITE: www.gsmmaine.org

The GSM website has been changed to a new provider, which we expect will result in better service. The web address (above) is unchanged.

THE STATE GEOLOGIST'S MESSAGE

What the National Cooperative Geologic Mapping Program has done for Maine

The National Cooperative Geologic Mapping Program (NCGMP) was authorized by Congress in 1993 through legislation developed by the State Geologists through the Association of American State Geologists. Since then more than $88 million in federal funds has been matched by state funds to support geologic mapping in critical areas nationwide. Maine has received more than $1.2 million to date that has made possible the completion of more than 75 surficial and bedrock geologic maps in southern and central Maine.

The program is focused on important mapping and continuing productivity in state surveys. Each state is required to have a Geologic Mapping Advisory Committee to help identify important areas for mapping. Maine's Committee includes representatives from state agencies, federal agencies, academia, and the private sector – all users of geologic maps. Over the years, the Committee has helped focus the program on key areas – generally the more populated areas where mapping would contribute to the resolution of issues affecting our citizens. Many individuals have served on the Committee, and I thank them all for their service.

Each year, the Maine Geological Survey submits a proposal, based on the recommendations of the Committee, to the program administrators at the USGS. In this competitive program, a peer-review committee of State Geologists and USGS geologists carefully considers the merits and quality of each proposal. Having served on this panel on several occasions, I can attest to the rigor of this process. States are not guaranteed funds, but are awarded them based on the quality of the proposal, past performance, and quality of map products delivered annually. Maine has consistently earned among the highest scores, ensuring that we receive close to the funding we request.

The funds from the program have been critical to keeping MGS programs moving. The NCGMP requires a one-to-one match of state dollars, which for us has been the salaries of several state-funded geologists working on the program. The federal funds pay for field expenses and contract geologists; state funds for these expenses have been seriously eroded over the years of state budget cuts.

Some results from the program:

- MGS completed most of the detailed surficial mapping of southern Maine from York to Portland to Lewiston. The distribution of surficial units from these maps is fundamental to our subsequent efforts to construct maps identifying landslide risk in towns underlain with marine clay.
- The distribution of surficial units is also essential to identifying significant sand and gravel aquifers.
- Our bedrock mapping in the Augusta area is the underpinning for Columbia University's study of the relationship to bedrock of arsenic and other naturally occurring metals in groundwater.
- We have gained a far greater understanding of the geologic history of Maine's landscape.

I now am a member of the Federal Advisory Committee for the NCGMP that will help guide this important program through the next decade.

Robert G. Marvinney, Maine State Geologist:
Robert.G.Marvinney@maine.gov

GSM MEMBER NEWS

Lisa Dickson was promoted to Area Manager following the corporate merger of S E A Consultants, Inc. (Cambridge, MA) with Kleinfelder (San Diego, CA) in the fall of 2009. She has overseen the expansion and relocation of the Augusta, ME office to 151 Capitol Street in February 2010. The Augusta office specializes in bridge and highway design as well as numerous energy efficiency projects in New England that involve green markets and carbon reduction in institutional and governmental settings (http://www.kleinfelder.com/).

Alice Kelley is featured in the "Experts on Topic" section of the Summer 2010 issue of *UMaine Today*. In the wake of recent earthquakes in Haiti and Chile, the article focuses on her use of the on-campus seismometer, which is linked to the New England Seismic Network based at Boston College, as a teaching tool to help students learn about earthquake locations and the travel of seismic waves.

Please send member news to:
Carolyn Lepage, Member News Correspondent (1996-present) calepage@roadrunner.com or
PO Box 1195, Auburn, ME 04211-1195 or
Phone: (207)-777-1049

GSM ABSTRACTS

DETERMINING SEABED POCKMARK ACTIVITY WITH ^{210}PB DATING IN BELFAST BAY, ME

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Pockmarks are relatively newly discovered phenomena on the seabed found in muddy environments. King and McLean (1970) first noted these features on the Scotian Shelf. Pockmarks can be found on quiet, passive margins. Through numerous studies conducted around the world, these features are generally associated with the escape of fluid (i.e., gas, pore-fluids, and groundwater). Large volumes of sediment may be redistributed from the seabed but the exact mechanism is yet to be determined. It is important to understand pockmark formation given their potential hazard to seabed activity such as offshore infrastructure emplacement including oil rigs, LNG terminals, offshore wind turbines, utility cables and pipelines. If pipelines and/or cables reach a critical angle as an active pockmark evolves it will break. Methane release has been associated with pockmark formation and can play an important role in contributing to global warming. This study uses ^{210}Pb to analyze sediment accumulation or lack thereof in Belfast Bay, ME, one of North America's most studied giant pockmark fields. Use of ^{210}Pb as a radionuclide based dating tool has become an accepted method to help determine sediment accumulation rates. This study used this tool to test two separate hypotheses: Hypothesis 1: Pockmarks are actively venting fluid. Thus cores collected in the center of a pockmark will have a scattered signal. Hypothesis 2: Areas of the field without pockmarks are not actively venting fluids. Thus cores taken from the intra-pockmark field and outside the field should show a steady signal indicating steady sediment accumulation.

⇓ AWARD for best undergraduate oral presentation ⇓

MAGMA MIXING IN COMPOSITE DIKES OF JETTEAU POINT, GOULDSBORO, ME

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The mixing of felsic and mafic magmas is difficult because of their contrasting physical properties, such as density, temperature, and viscosity. Nevertheless, felsic and mafic magmas do mix in nature and the phenomenon is a major process in igneous petrology. Composite dikes can often serve as a window into magma-mixing processes. Jetteau Point, located in coastal Maine contains composite dikes composed of aphyric mafic margins grading to a felsic interior that intrude into the Gouldsboro granite. Previous work on dikes found in the Gouldsboro intrusive complex suggests a magma-mixing origin for the chemical variation seen throughout the entire complex. This study conducts a more rigorous investigation of the composite dikes seen in one part of the Gouldsboro intrusive complex to test the magma-mixing hypothesis. Petrographic evidence, including hornblende halos around quartz phenocrysts and sieve textures in plagioclase phenocrysts imply a mixing origin. Furthermore, well-constrained linear trends in geochemical data imply that the Gouldsboro granite is the source for the felsic interior and that magma mixing occurred between the felsic and mafic end members to produce the hybridized rocks seen in between. Mafic magma intruded into a partially crystallized felsic magma chamber (the Gouldsboro granite), causing the felsic magma to flow in the interior of the dike. Detailed examinations of the composite dikes at Jetteau Point support the magma-mixing hypothesis suggested by earlier work.

POCKMARKS: SELF-SCOURING MUD LANDFORMS?

BROTHERS, Laura L., KELLEY, Joseph T., BELKNAP, Daniel F., KOONS, Peter O., Dept. Earth Sciences, Univ. Maine, Orono, ME, and BARNHARDT, Walter A., U.S. Geological Survey, Woods Hole Sci. Ctr., Falmouth, MA 02543. Laura.Brothers@umit.maine.edu.

Pockmarks, or seafloor craters, occur worldwide in a variety of geologic settings and usually within cohesive fine-grained sediment. Pockmarks may appear in fields numbering thousands

in areas of petroleum production shelf basins, continental slopes and rises, deltas, fjords and previously glaciated estuaries. Associated with fluid escape, the mechanisms and timescale of pockmark formation are not well constrained and several hypothesis for their formation and maintenance have been proposed including seismic activity, cetacean feeding, and even meteorites. This study combines morphologic analysis and numerical modeling to assess the role of nearbed currents in pockmark evolution. In 2006, 2008 and 2009 the US Geological Survey Seafloor Mapping Group collected 35 km^2 of high-resolution swath bathymetry and Chirp sonar data in the Belfast Bay, Maine pockmark field. Bathymetry data were gridded at 2.5 and 5-m resolution and indicate that the field contains over 2,000 pockmarks representing over 15 million cubic meters of displaced sediment and pore fluid. Morphology varies throughout the field and indicates scour in certain locations. Though most pockmarks in the northern portion of the Bay are circular and concave, the largest pockmarks located at the center of the field have extensive flat bottoms. Back-scatter and seismic-profile data reveal that these pockmarks terminate in coarse grained sediments that characterize the Holocene/Pleistocene unconformity. Pockmarks in the southern portion of field, where the Bay transitions to a channel, are elongate and current-aligned. Recent work in the Oslofjord pockmark field observed upwelling currents within pockmarks and suggested the possibility of rotational flow. Our simulations of flow over a depression in both 2 and 3-dimensions corroborate these findings. Further, our simulations produce rotational flow within the depression whenever flow passes above the pockmark. In the simulations, zones of shearing occur at the depression's base and rim, suggesting that vortical flow may play a role in pockmark areal and vertical erosion, even in perfectly circular, concave pockmarks. From these findings we construct a novel working hypothesis that pockmarks result from initial seafloor perturbations that become modified and grow by vortical flow.

⇓ AWARD for best poster by an undergraduate ⇓

PALEOSTRESS ANALYSIS OF MESOZOIC FRACTURES AND BASALT DIKES IN TUCKERMAN RAVINE, NEW HAMPSHIRE

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The purpose of this research is to measure the fractured bedrock geometry of Tuckerman Ravine in the Presidential Range, New Hampshire, in an effort to determine the paleostress regimes in the Mesozoic during the continental rifting of the supercontinent Pangea. Strike and dip of fractures and associated basalt dikes of the region were measured and recorded spatially. Schematic maps and cross-sections of the fractures and basalts were made and later imported into ArcGIS. A rose plot map was also made that shows structural domains of discrete fracture patterns within the region. The main fracture trends of the region were determined using the Kamb contour method. The field data was then compared to a lineament analysis which was performed in ArcGIS on three separate datasets: 1) a black and white air photo; 2) hillshade maps derived from a 10m DEM with an illumination angle of 315 and 45; and 3) a high resolution Google Earth image. All three lineaments sets were merged and the duplicates removed. A domain overlap analysis was then made to identify discrete regions within the study area where lineaments and fracture domains have the same azimuth overlap to remove any final discrepancies. There are two dominant fracture trends striking 264.4°and 58.1° with two less dominant trends striking 2.3° and 153.2°. The dips for each fracture trend are 79.1 north, 84.1 southeast, 80.4 east, and 78.7 southwest, respectively. Two basalt dikes were mapped and one is parallel to the 60° fracture set (striking 61.6) while the other does not match any fracture set and strikes 110.0°. The dips for the dikes are 85.4 southeast for the 60 set and 85.4 southwest for the 110.0. A preliminary interpretation is that the three fracture sets yield three different stress fields oriented E-W (80 set), NW-SE (60 set) and N-S (180 set).

FRACTURE DISTRIBUTION AND CHARACTERIZATION IN BETASSO GULCH, COLORADO

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This study focused on several questions regarding the structural geology of Betasso Gulch, Colorado, where detailed geologic and fracture maps were made to analyze the brittle structural geology: 1) How does the newly mapped bedrock geology relate to previous studies? 2) Do the fractures have a relationship to the rock types? 3) What were the paleostresses that caused the fractures? and 4) How do these stresses and fracture formations relate to regional geologic history? Betasso Gulch is located in the Front Range of the Colorado Rocky Mountains, just west of Boulder. The bedrock found in the gulch is primarily comprised of the Boulder Creek Granodiorite but lenses of quartz monzonite, syenite and pegmatite dikes have also been identified. SEM/EDS analyses of rock samples allowed for characterization of the rock types found in the area. Four main fracture orientations were found in the gulch: 41°, 81°E; 252°, 74°N; 10°, 40°E and 336°, 67° E. No correlation was found between fracture sets and rock type. The fractures are interpreted to be two different sets of conjugate pairs that formed under tensile-compressive stress after the Laramide orogeny. The formation of the Front Range of Colorado began about 1.8 Ga with the Colorado orogeny laying the groundwork for deformation in the Laramide. Faults formed in the Proterozoic were later reactivated during the uplift of the Front Range in the Laramide orogeny. The Laramide orogeny (80-60 Ma) is thought to have contributed to the current fracture patterns seen in Betasso Gulch. After the Laramide, there was a period of regional extension that allowed for the reactivation of faults, thereby forming the north-northwest (10° and 336° sets) conjugate pair. Between 50 and 35 Ma erosion in the Front Range caused the un-roofing of the batholith that created the east-northeast (41° and 252° sets) conjugate pair.

MESOZOIC EXTENSION IN THE PRESIDENTIAL RANGE: HUNTINGTON RAVINE, NH

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Mesozoic extensional structures were examined in Huntington Ravine in the Presidential Range, New Hampshire to determine their relative ages, distribution, and paleostress fields. The bedrock geology of the ravine consists of schist and quartzite couplets of the Devonian Littleton Formation. The dominant joint sets in the ravine are not parallel to bedding or foliation planes and over 1,000 such fractures were measured and mapped. Four systematic fracture sets were identified and assigned relative ages based on field relations. The oldest fractures in the Ravine have a NE strike (~036, 74 SE) and are sub-parallel to the Pinnacle alkaline dolerite dike (~045, 58 SE). This joint set and the Pinnacle dike are likely coeval and are interpreted to be part of a regional NW-SE extension associated with the Late Triassic and Jurassic Eastern North American (ENA) igneous province, which formed during the rifting of the North American and African plates causing NE-SW extension in New England (Mchone & Butler, 1984). The next youngest fracture set in the ravine have a E-W strike (~284, 71 N), and are sub-parallel with the Upper Trail andesite dike (~270, 89.5 N) and Escape Hatch alkaline dolerite dike (~263, 59 N). Structures with similar E-W strikes are found throughout New England and Quebec as part of the Middle Cretaceous New England-Quebec (NEQ) province associated with regional N-S extension associated with north Atlantic rifting or passage of the North American plate over the Great Meteor hotspot (Faure et al. 2006). The third youngest fracture set is characterized by NW-SE striking joints (~162, 85 SW), which are found throughout the ravine. Correlations of these joints to others in the New England region are uncertain suggesting a localized event. The youngest fracture set is shallow dipping (~203, 17 NW) and are thought to have formed from glacial unloading.

INFLUENCES OF DISSOLVED ORGANIC CARBON AND IRON PHOTOCHEMISTRY ON PHOS-PHORUS CYCLING IN SURFACE WATERS: IMPLICATIONS OF PARTICLE-SIZE DISTRIBUTION

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Dissolved organic carbon (DOC) provides a carrier for the export of terrestrially derived iron (Fe) to surface waters. Particulate and colloidal Fe is important in surface water chemistry because it readily adsorbs dissolved phosphorus (P), a limiting nutrient to phytoplankton. The cycling of P is an essential component in controlling the trophic dynamics and overall water quality in freshwater environments. Surface waters exposed to UV radiation undergo photo-chemical reactions involving DOC-Fe complexes that, in turn, influence how trace metals and nutrients, including P, interact in first- and second-order streams. We conducted laboratory photochemical experiments to assess the influence of concentrations of DOC and Fe on P cycling, as well as quantifying the size distribution of aqueous Fe and P particles during irradiation. Batch solutions were irradiated and analyzed for DOC, total Fe and P, and organically bound Fe. Samples were also sequentially passed through 0.45 μm, 100,000 daltons (~30nm), and 5,000 daltons (~3 nm) filters to evaluate relationships between similarly sized Fe and P particulate, colloidal, and dissolved fractions. Results indicate a negative correlation between DOC concentration and the size distribution of particulate Fe and P. Furthermore, a positive correlation exists between the particulate or colloidal Fe and P size fractions during irradiation, suggesting that a specific Fe size fraction scavenges similar sized P from solution. This analysis supports the importance of the characterization of photosensitive complexes in understanding how UV radiation influences the cycling of limiting nutrients in fresh surface waters.

STABLE ISOTOPE ANALYSIS OF *FUNDULUS HETEROCLITUS* (MUMMICHOG) AND THE EFFECTIVENESS OF DITCH-PLUG RESTORATION AT THE SPRAGUE RIVER SALT MARSH, PHIPPSBURG, ME

JUDICE, Elyse V., JOHNSON, Beverly J., DOSTIE, Phil T., and LOCKE, William L., V, Geology Department, Bates College, Lewiston, ME. ejudice@bates.edu.

The Sprague River Salt Marsh is a back-barrier salt marsh adjacent to Seawall Beach in Phippburg, Maine. The Sprague River Salt Marsh has undergone significant modification by humans over the past 300 years with evidence of three different episodes of ditching documented. In an effort to restore sections of the marsh by creating pool habitats, the U.S. Wildlife and Fisheries Service plugged several of the ditches in the southern end of the marsh between 2002 and 2006. The purpose of this study is to evaluate the efficacy of the restoration method by comparing food web dynamics and water quality in pools recently created by ditch-plug restoration versus pools that have been on the marsh for a longer period of time. Stable carbon and nitrogen isotopes from muscle tissue from *Fundulus heteroclitus* (mummichog), particulate organic matter (POM), and surface sediment were examined in three pools to the east and four pools to the west of a large ditch-plug in the SE section of the marsh. The ditch-plug has severely restricted tidal exchange with the pools to the east of the plug. Water quality parameters, including pH and specific conductivity were also measured at these pools. Our results show that livers are consistently depleted in ^{13}C relative to muscle tissue, likely reflecting the presence of more lipids in liver relative to muscle. Additionally, *F. heteroclitus* tissues and POM from the eastern pools are significantly more depleted in ^{13}C than tissues from the western pools. Because *F. heteroclitus* in pools from Sprague Marsh relies primarily on aquatic vegetation as a food source, the spatial differences in $\delta^{13}C$ are likely due to differences in isotopic composition of the dominant aquatic vegetation at each site. We suspect that this varies with salinity and degree and duration of water saturation of the pools. Our results suggest that nutrient dynamics in pools behind at least one of the ditch-plugs at Sprague Marsh have been altered to a significant degree.

STABLE NITROGEN ISOTOPES OF *ZOSTERA MARINA* AS A PROXY FOR ANTHROPOGENIC NITROGEN ENRICHMENT IN CASCO BAY, MAINE

LOOPESKO, William V., JOHNSON, Beverly J., BOHLEN, Curtis C., DOAN, Mike, and DOSTIE, Philip, Dept. Geology, Bates College, Lewiston, ME. wloopesk@bates.edu.

Common Eelgrass, *Zostera marina*, is the most abundant and productive seagrass in near shore coastal environments of the Gulf of Maine. Nitrogen is the primary limiting nutrient in marine systems; thus, any increase in its concentrations can have a profound effect on marine environments and eelgrass beds in particular. Stable nitrogen isotope analyses of eelgrass and associated organic matter provide a method for tracking nutrient flow through estuaries. The purpose of this study is to determine the extent to which, if any, stable isotopes in eelgrass can be used as a proxy for anthropogenic nitrogen loading in Casco Bay, an estuary in the Gulf of Maine.

Samples of particulate organic matter (POM), sediment and eelgrass were collected from two different areas of Casco Bay in Fall, 2009, and subsequently analyzed for stable nitrogen and carbon isotopes at the Environmental Geochemistry Laboratory, Bates College. One site is located at Mackworth Island, near Portland, ME, at the mouth of the Presumpscot River, where eelgrass biomass is relatively low and anthropogenic loading of nitrogen is expected to be relatively high. The other site is Maquoit Bay, 25 miles north of Portland, where eelgrass biomass is high and anthropogenic loading of nitrogen is expected to be low. Surprisingly, the average total nitrogen concentrations were similar at both sites. The nitrogen isotopic composition of eelgrass at Mackworth was slightly enriched in ^{15}N relative to eelgrass at Maquoit, possibly indicating the presence of isotopically enriched anthropogenic nitrogen available for uptake at Mackworth. The isotopic offsets between the POM, eelgrass, and sediments were different at each site, indicating differences in the rates of nitrogen uptake in the water column and the eelgrass beds at both sites. The results of this study suggest that the stable isotope composition of eelgrass may be a sensitive indicator to the presence of anthropogenic nitrogen, as well as areas experiencing different rates of primary production.

EFFECTS OF SEASONAL ROAD SALT APPLICATION ON LILY POND, WHITE MOUNTAIN NATIONAL FOREST, NEW HAMPSHIRE

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Road salt application to roads in northern states, provinces, and mountainous areas is a common practice for deicing. Unfortunately melt season runoff from salt-laced snow banks impacts the adjacent aquatic environment by contaminating both ground water and surface water. This study investigates these effects by focusing on Lily Pond, a local pond in the White Mountain National Forest, New Hampshire. A major highway passes through the vast watershed on the southern side of Lily Pond providing an inevitable source of road salt into the ground and surface water entering the lake throughout the year. The purpose of this study is to examine and help explain the effects of the presence of a major roadway positioned within close proximity to an undisturbed freshwater system. This research will hopefully find a correlation or pattern between specific conductivity and various ion concentrations throughout the winter months. The ions in question are all prime components in the production of road salt, potassium (K^+), magnesium (Mg^{2+}), calcium (Ca^{2+}) and most importantly sodium (Na^+) and chlorine (Cl^-). Field monitoring will consist of water profiles, which include temperature, specific conductivity, dissolved oxygen and pH levels through the consistent utilization of a hydro-lab and conductivity logger throughout the year. Information about the ground water entering from the road will be obtained by monitoring wells dug between the road and the lake. Water and snow samples will be collected in various locations in and around Lily Pond throughout the winter months to be further analyzed in the Geochemistry laboratory at Bates College. Previous studies on high mountain lakes, including Lily Pond, have shown a direct correlation between the amount of snow run-off and higher conductivity measurements throughout the water column. This helps to support the various hypotheses of the effects of road salt on natural mountain lakes. Data taken from Lily Pond throughout the year will be used as a proxy to help show the effects of road salt application on local freshwater body systems.

MODERN SEDIMENTARY PROCESSES PROXIMAL TO A POLYTHERMAL TIDEWATER GLACIER COMPLEX, KRONEBREEN/KONGSVEGEN, KONGSFJORDEN, SVALBARD

POPPICK, Laura[1], RETELLE, Mike[1], POWELL, Ross D.[2], and BRIGHAM-GRETTE, Julie[3], [1]Bates College, Lewiston, ME, [2]Northern Illinois University, DeKalb, IL, [3]University of Massachusetts, Amherst, MA

A series of sediment gravity- and box-cores were collected in Kongsfjorden, Svalbard during the summer of 2009 as part of the Svalbard REU project, which aims to charac-terize the modern sedimentary environment proximal to the Kronebreen/Kongsvegen tidewater glacier margin. This study serves to generate baseline data for future assess-ment of the local polythermal glacial response to climate change, and to contribute to the framework by which proximal polythermal glacimarine environments are interpreted in the sediment record. Sedimentary facies identified within the cores, collected between 60 – 900m from the ice face and spanning the width of the ice margin, serve as proxies of modern meltwater and sediment depositional processes at the tidewater margin. Sedimentary facies are characterized, with increasing resolution, through x-radiograph, thin section, and grain size analyses and are considered in relation to local fjord floor morphology and sedimentation rates as measured from sediment traps.

Ubiquitous evidence of sediment reworking from gravity flows in all cores implies a predominance of underconsolidated mud along the slope of the submarine outwash fan and surrounding moraines. Correlative laminae units on the millimeter scale observed in two cores collected 400 and 600m from the ice-front suggest a >200m lateral extent of episodic sediment gravity flow events. Cyclically laminated fine sand/silt and clay couplets, interpreted to have settled from suspension, are also preserved at varying intervals through most cores. Additional analysis is required to identify the forcing mechanism responsible for the cyclicity of these deposits. Once identified, sedimentation rates can be estimated and compared across the ice-front.

BRECCIATION MECHANISMS AND SELF-SIMILARITY OF TRANSITIONAL ROCK FRAGMENTATION IN THE SHATTER ZONE, MOUNT DESERT ISLAND, MAINE

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The Shatter Zone is a 450 m to 1 km thick aureole of fragmented rock that defines the perimeter of the Cadillac Mountain Granite. Fragmentation was caused by a Late Devonian volcanic eruption correlated with the volcanic rocks of the nearby southern Cranberry Islands. The volcanic edifice has subsequently eroded away exposing breccias that formed at 2-5km depth. The dominant mechanism of brecciation was apparently explosive fragmentation during the volcanic eruption, with additional magma-filled fracture propagation along the outer edge of the breccia. The result is a succession of increasing rock fragmentation from the farthest point of the Shatter Zone to the Cadillac Mountain Granite interface. We hypothesize that this progressive fragmentation may correlate with the dissipation of kinetic energy from magmatic volatile volume expansion. In this model, the outer zone of brecciation may preserve a record of the earliest stages of brecciation experienced by the more fragmented rocks. Alternatively, the different stages of fragmentation may represent multiple volcanic events. Breccias formed by a common mechanism tend to display similar particle size distribution curves dependent on the tendency of a rock to fracture into self-similar fragment sizes. The slope of the curve is dependent on the power of the brecciation event. The particle size distribution record for the Shatter Zone is marred by thermal alteration of the smallest size fragments, specifically for breccias near the magma chamber interface. During the volcanic event and related brecciation, ca. 900°C magma was emplaced into the fractures. Viscosity needed to be low enough to allow filling of 1mm wide cracks 1km from the magma source. The magma chamber itself was hot relative to typical granitic magma, causing extensive contact metamorphism of the country rock. Thermal modeling is underway to provide constraints on the time required to form the metamorphic aureole and the degree of fragment melting.

MONITORING SEDIMENT TRANSPORT AND INLET MIGRATION AT THE SEAWALL BEACH COMPLEX: PHIPPSBURG, ME

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Monitoring seasonal and long-term changes of the undeveloped Seawall Beach complex in Phippsburg, Maine is crucial to understanding this dynamic barrier system as sea-level rise continues to affect local coastal environments. The goal of this study throughout the summer and fall of 2009 and winter of 2010 was to document current longshore transport patterns on the barrier beach and adjacent spits in this swash-aligned system. The spits accrete sediment over time due to westward and eastward longshore transport patterns stemming from the center of the system (Chandler 2009). Such transport is possible due to a central wave corridor (Cary 2005) which cannels the energy of refracted southeastern approaching waves. The evolution of the resulting northeastern and southwestern spits can in turn control the flow of two backbarrier inlets, the Sprague and Morse Rivers, which define the margins of Seawall Beach. At the Sprague River in the southwest, progradation of the spit has caused westward migration of the inlet and erosion of the pocket beach, Little Beach. Just south of the Sprague River inlet, Ice Box Beach accretes sediment throughout normally erosive winter months as it is well protected from approaching southern waves. Eventually the sediment from this beach is transported offshore and circulated into the barrier system. To the northeast, eastward migration of the Morse River has recently caused significant erosion to Popham Beach and destruction of the backbarrier maritime forest. Topographical profiles GPS tracking and weather data were used to record beach morphology during the study period. Historical photos, satellite imagery and previous studies were used to document and compare the long-term changes. Ongoing investigation of this transgressive system is necessary to predict the beach's adaptation to sea-level rise.

ARE MAINE'S SALT MARSHES DROWNING? SALT POOLS AS DYNAMIC DRIVERS OF SURFICIAL CHANGE FOR SIX MAINE SALT MARSHES

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Salt marshes are critical components of coastal systems and are vulnerable to rising sea level in response to climate change. Studies in the Gulf of Mexico and Mid-Atlantic regions indicate that one response to sea-level rise is an expansion of salt pools in interior marsh sections, leading to the rapid conversion of once-vegetated surfaces to open water over short time periods. These changes are a concern because they signify ongoing loss of ecosystem area and associated natural systems and resources. This may represent an irreversible ecological tipping point (or state change) within these environments. In Maine, previous work demonstrates that the dynamic exchange between pools and tidal creeks is one mechanism for substantial transformations of the marsh surface. This study examines surficial dynamics of six salt marshes distributed S-N along Maine's coast (Ogunquit, Wells, Brunswick, Gouldsboro, Addison, and Lubec), combining field surveys of pool ecophysical properties with geological coring and spatio-temporal analyses. Time-series of aerial photographs starting in the 1960s indicate that many pools alter their shape and size and that new pools form over decadal time periods. Dating sediments with ^{210}Pb and ^{137}Cs in high-marsh and re-vegetated pools indicate that pools can drain, rapidly fill in, and re-vegetate at 2-3 times the rate of the adjacent high-marsh surface. By this process, some north-temperate salt marshes may mitigate or circumvent potential drowning. Preliminary results of the ecophysical data (area, location, elevation, pool depth, and surrounding vegetation type) from 458 pools suggest that there are several distinct types and that pool type may relate to observed patterns of surficial change. Our results demonstrate that many pools are dynamic and that they are important drivers of surficial change as these marshes respond to sea-level rise.

GSM SECRETARY'S REPORT

Spring Meeting, March 26, 2010
University of Maine, Orono

The GSM Spring Meeting included a poster session and oral presentations by students, a business meeting, a social hour and a keynote speaker, Dr. Chris Gerbi, of the University of Maine. The meeting was hosted this year by the University of Maine, Orono, and was held in the Bryand Global Sciences Center, Department of Earth Sciences and Climate Change Institute.

Abstracts of student presentations are included in this newsletter. The award for an outstanding poster presentation went to Carlos Castro from Bates College for his presentation titled "Paleostress analysis of Mesozoic fractures and basalt dikes in Tuckerman Ravine, New Hampshire". The award for outstanding oral presentation went to Caleb Boucher from the University of Maine for his presentation titled "Magma Mixing in Composite Dikes of Jetteau Point, Gouldsboro, ME". Thanks to all of the presenters for updating us on the research that is going on at Maine schools.

The title of the keynote talk by Dr. Gerbi was "Rheology in the field - what, why, how". An abstract is included in this newsletter and his slides are available on the GSM website (http://www.gsmmaine.org/meetings-2/). Dr. Gerbi defined rheology as the study of material flow, or viscous deformation of rocks. The talk illustrated, with spectacular photography, the influence of some factors such as water content, mineralogy, and rock type on the deformation of rocks in his field areas. Dr. Gerbi gave a nod to last year's Spring Meeting keynote speaker (Bruce Reuger, "Influences on Benedict Arnold's March Through Maine to Quebec, 1775") by setting the historical context of his field areas in territories explored by Samuel De Champlain.

Business meeting:

An executive council meeting was held at 11 a.m. and was attended by Julia Daly, Tom Weddle, Dan Belknap, Rob Peale, Cliff Lippitt and Martha Mixon. A business meeting was held following the student presentations. The following items were discussed in the council meeting and in the business meeting:

Fall elections and leadership transition: A nominating committee was assembled to seek nominees for all offices for the fall elections. The committee consists of John Field, Martha Mixon, Julia Daly, Carol White, Joe Kelley and Walter Anderson. Some of the current office holders have indicated a willingness to continue in their current positions. Rob Peale would like to resign as Treasurer and Lois Ongley of Unity College has indicated an interest in serving as Treasurer and will be included on the slate for the fall elections. Please contact one of the committee members if you are interested in serving, or would like to nominate someone.

Board composition and bylaws: A review of the bylaws was undertaken. The bylaws call for two-year terms for President, VP, Secretary, and Treasurer but three-year terms for directors. We did not elect a director last fall. Currently, directors are:

Tom Weddle (2007-2010)
Cliff Lippitt (2008-2011)
Vacant (2009-2012)

We will elect two directors in the fall to correct the situation. Tom is interested in continuing as director for another term.

New website review: An announcement was made that the new website is online. The URL has not changed: <gsmmaine.org>. Comments are solicited from all members on ways to improve the site, events to be added to the calendar, and additional favorite photographs to add to the pool of photos that randomly display in the banner and random photo widget on the lower right. The site has been set up using WordPress blogging software, and updates can be made by GSM, without having to contact the website consultant. Send content to the Secretary at martha.mixon@gmail.com.

Fall meeting plans, impact on spring meeting schedule: The Department of Geosciences at USM will host the fall GSM meeting in 2010. The date will be October 15th. The keynote address will be by Dr. Paul Marinos, Professor of Engineering Geology in the National Technical University of Athens. Dr. Marinos is the 2010 Jahns Distinguished Lecturer, Association of Environmental & Engineering Geologsits and the Geological Society of America. USM was scheduled to host the spring meeting in 2011. The rotation of spring meetings among the campuses will be moved up, with Bates College

hosting in Spring 2011, to avoid USM hosting two meetings in a row (see end of Newsletter).

Summer Field Trip: The summer field trip was still in the planning stages at the time of the meeting.

NEIGC: GSM has pledged to support this fall's New England Intercollegiate Geological Conference (NEIGC) with a $500 contribution. The meeting and field trips are to be hosted by University of Maine, Orono this fall, October 1-3, 2010.

Biogeomon: GSM endorsed a meeting of international ecosystem scientists known as "Biogeomon". The University of Maine will host it in July 2012. The effort to organize the meeting is being led by Professors Ivan Fernandez and Steve Norton. See the Spring Meeting Notes posted April 3, 2010 on the GSM web site Home page for more information.

Submitted by Martha N. Mixon, Secretary.
martha.mixon@gmail.com

GSM TREASURER'S REPORT

The Society currently has 211 members, of which 79% are up to date with their dues. In keeping with policy, we will drop any members more than two years in arrears at the end of this calendar year. The present membership is distributed as follows:

Students:	18	Associates:	12
Regular:	174	Institutional:	7
TOTAL:	211	Total Paid Up:	166

Balance On Hand: January 31, 2010

Anderson Fund Savings	$ 4,184.92
Anderson Fund CD	$ 5,951.13
General Fund Money Market	$ 4,026.73
General Fund Savings	$ 526.16
General Fund CD	$ 5,698.90
General Fund Checking	$ 25.00
Total	$ 20,412.84

Income

Dues	$ 650.00
Interest	$ 53.18
Anderson Fund Donations	$ 0.00
Other Donations	$ 0.00
Publication Sales	$ 0.00
Checks never cashed	$ 0.00
Subtotal	$ 703.18

Expenses

Newsletters	$ 0.00
Honoraria	$ 0.00
Anderson Awards	$ 200.00
Other Awards	$ 0.00
Meeting Expenses	$ 301.35
Donations	$ 800.00
Postage	$ 0.00
Web Site	$ 332.70
Refunds	$ 0.00
Miscellaneous	$ 0.00
Subtotal	$ 1,634.05

Balance On Hand April 30, 2010
(note that this line in the previous Newsletter should have read January 31, 2010 – Editor's error)

Anderson Fund Savings	$ 4,406.16
Anderson Fund CD	$ 5,970.61
General Fund Money Market	$ 2,856.51
General Fund Savings	$ 502.77
General Fund CD	$ 5,720.92
General Fund Checking	$ 25.00
Total	$ 19,481.97
Net gain [or loss]	[$ 930.87]

Respectfully submitted,
Rob N. Peale, Treasurer (2004 -present)
<Rob.N.Peale@maine.gov>

For those who like to plan ahead, the Spring Meetings Schedule is projected as follows:

[Univ. Southern Maine, Gorham, special, invited national speaker	Fall 2010]
Bates College, Lewiston,	2011
Univ. Maine, Presque Isle	2012
Univ. Maine, Farmington	2013
Bowdoin College, Brunswick	2014
Colby College, Waterville	2015

Please see the Secretary's Report, June 2005 for the establishment of this rotation.

GSM 25 years ago – quoting Andy Tolman
(Vol. 12, No. 1 – September, 1985)

"Fearless field trip leaders Woody Thompson and Bob Moench… Woody began the festivities in downtown Lynchville. I'm not sure what the local populace thought of having 30+ geologists (in what seemed like 40+ vehicles) congregate on their street corner, but we all survived and launched on time… Those of you who missed these trips missed beautiful scenery, healthful exercise, good companionship, and well-led trips to interesting outcrops. Next summer, take the weekend and come with us."

MEMBERSHIP DUES STATEMENT

The GEOLOGICAL SOCIETY OF MAINE, INC. (often referred to as **GSM**) 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:

FEE SCHEDULE AS OF February, 2008

$20.00	REGULAR MEMBER	Graduate geologists, or equivalent, with one year of practice in geology, or with an advanced degree.
$20.00	INSTITUTIONAL MEMBER	Libraries, societies, agencies, businesses with interests in or practicing geology and related disciplines.
$10.00	ASSOCIATE MEMBER	Any person or organization desirous of association with the Society.
$ 5.00	STUDENT MEMBER	Persons currently enrolled as college or university students.

THE GEOLOGICAL SOCIETY OF MAINE ANNUAL RENEWAL / APPLICATION FOR MEMBERSHIP

Regular Member	$20.00	$__________	Name ____________________________________
Institutional Members	$20.00	$__________	
Associate Member	$10.00	$__________	Address ____________________________________
Student Member	$ 5.00	$__________	
Contributions to GSM		$__________	____________________________________
(please write gift or fund on check)			
TOTAL ENCLOSED		$__________	____________________________________

Make checks payable to:
Geological Society of Maine
Rob Peale, Treasurer
Maine Dept. Enviromental Protection,
State House Station 17
Augusta, ME 04333-0017

Email Address ____________________________________

(GSM funds include the Walter Anderson Fund___, and discretionary gifts as noted by contributor)

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2009/2010 SOCIETY YEAR BEGAN AUGUST 1 - PLEASE SEND DUES TO TREASURER.
The DATE on your mailing address refers to PAID UP DUES DATE

THE GEOLOGICAL SOCIETY OF MAINE
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THE MAINE GEOLOGIST is the Newsletter of the Geological Society of Maine, published three times a year, in mid-winter, summer, and early fall, for members and associates.

Correspondence about **membership** in the Society, **publications** and **dues** should be mailed to:
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Items for inclusion in the **Newsletter** may be directed to:
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