The Maine Geologist

NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MAINE

June 2018 Volume 44 Number 2

PRESIDENT'S MESSAGE

We have earned an enjoyable Maine summer! This edition of The Maine Geologist is packed with reports of how busy we were this spring. The GSM Spring Meeting at Unity College was a wonderful success, with a full afternoon of student research presentations from eight schools across Maine. The abstracts are printed below for you to ponder at your leisure. I marvel at how the curiosity of students and their advisors leads them to investigate not only distant places, but also their own neighborhoods. We heard about geology from across four continents as well as from beneath the campus where we were gathered.

I especially want to mention Alex Bloomer as an example of how geoscience education is happening in new ways. Alex is a student at Bangor High School in the STEM Academy, a research-based learning experience. Alex was a top-five ranked student in Maine in the US chemistry Olympiad program, which brought him to the attention of Dr. Jim Killarney of Unity College, an environmental geochemist. When Dr. Killarney got together with Alex and his high school chemistry teacher to discuss potential research projects, Alex immediately expressed an interest in microplastics and took it from there. Microplastics in the environment is an emerging global issue that he approached by conducting a local study at the Bangor wastewater treatment plant on the Penobscot River. It was a nice study, and his poster presentation at the GSM Spring Meeting was impressive. Here is a project that a student did because he thought it was important. I am pleased that the GSM could offer him a place to talk about his work.

Education has been on Sarah Hall's mind, too. She has put out the call for us to come together to find ways we can share what we know as professionals with the broader community. Please think about how you might respond to her invitation in this Newsletter.

Also in the Newsletter, you will find an update on the Anderson Fund Committee, which is excited about increasing the capacity of GSM to fund new initiatives in geoscience education in Maine. That committee has been working hard and will continue to meet over the summer.

I am especially grateful for the work of the Executive Council, who I have called upon more than usual this spring. Sarah stepped up to run the Spring Meeting in my absence, which she did beautifully, Bruce has done a significant amount of financial research related to the dues issue and the Anderson Fund, and I have sent Amber scrambling after web site upgrade information. The entire council has worked together diligently and well to keep the society running smoothly. Keep in mind that several positions on the Council will come available in November, so if you think it might be your turn to serve (or if you want to nominate someone else), please let Sarah or me know.

Finally, comes the reward! The GSM Summer Field Trip is waiting for you. Chunzeng has arranged accommodations Thoreau would be proud of. Dark night skies. Loons and sunsets. Evening paddling. And some of the most interesting and new geological and archaeological mapping in Maine in decades. Space is limited, so register soon.

Henry Berry, GSM President
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THE EDITOR'S MESSAGE

The newsletter is distributed through email in pdf format. Anyone with special needs please contact the Editor. Please send items of interest and photographs of GSM activities to:

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GSM WEBSITE: www.gsmmaine.org
FACEBOOK: facebook.com/GSMMaine

2018 SUMMER FIELD TRIP: REGISTRATION AND FEES

July 27-29, 2018
North Maine Woods

The 2018 GSM Summer Trip is fast approaching! You must register for this field trip as space is limited. Registration costs **$10** and must be completed by **July 13**. The trip will leave from Ashland District School at **5:00 pm** on Friday, **July 27**. The field trip registration form is attached to this newsletter and available on the website, and will be distributed via email to members with current email addresses. Please see previous newsletters and read the form for additional logistical information, or contact Chunzeng Wang with questions. We hope to see you there!

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NEWS FROM THE STATE GEOLOGIST

Lidar, landslides, and hazard mitigation

Lidar (Light detection and ranging) technology is revolutionizing how we measure and image the landscape. Using high resolution lasers from aircraft, ground stations, drones, or other platforms, the technology produces a point cloud of billions of points from which very precise locational and elevation data can be extracted. Innovative applications of this technology to natural resource management are revolutionizing how we work. Geologists generally prefer the bare-earth datasets created through post-processing which strips away vegetative cover and manmade structures to reveal the intricacies of the natural landscape as no other technology can. Foresters often prefer to process the multiple returns from single locations from which forest metrics can be generated. The applications are endless.

Over the past several years, a consortium of state and federal agencies along with private sector interests have contributed to acquiring lidar coverage for the entire state, a goal which will be met in the next few years. Early coverage on the coast revealed systematic recessional moraines marching northward as glacial ice retreated, features that were impossible to see without this technology. An early application by MGS geologists of coastal lidar was the development of a storm surge inundation portal that graphically illustrates the impact of this hazard in coastal areas.

One of the more important applications and one to which we are now committing significant resources is landslide investigations. Even casual review of lidar data in areas of the state underlain with the Presumpscot Formation reveals dozens of previously unrecognized landslide features. Vegetative cover was too dense and the features too subtle for MGS geologists to recognize them in some areas during detailed surficial mapping.

Of course, the potential for landslides, predominantly in the Presumpscot, has long been recognized as a geologic hazard. Periodic catastrophic landslides remind us that this is an ongoing hazard: the 1868 Westbrook slide that dammed the Presumpscot River, flooding the mill;

the 1983 Gorham landslide that destroyed a home; the 1996 Rockland landslide that destroyed two homes and prompted significant remediation of unstable areas of Rockland Harbor.

The revelation of so many prehistoric landslide features in southern Maine led to this overarching question: Did many of these landslides occur immediately post-deglaciation when precipitation patterns were different and the landscape was largely unvegetated, or have they occurred sporadically over the last 10,000 years? If most were old, the hazard would be of lesser concern, but what if most were not old? To answer this question, we have been working with the Maine Emergency Management Agency (MEMA) over the past two years to investigate a subset of these landslides. Among MEMA's responsibilities is developing and updating the State's Hazard Mitigation Plan. With the Plan due to be updated in the next few years, we had the perfect opportunity to access Federal Emergency Management Agency funding to investigate these landslides. Through last fall and continuing this summer, Senior Geologist Lindsay Spigel has been mapping the details of several dozens of these landslides, sampling the subsurface materials primarily via hand auger. Carbon-14 dating of the organic material she retrieved is revealing an intriguing picture of episodic landslides. While several landslides occurred in the suspected timeframe around 10,000 years ago immediately following deglaciation, there is a large cluster of events in the 600-700-year timeframe. We'll probably never know what triggered these, but perhaps it was a significant rain event, a forest fire over a broad region, or an earthquake. From the standpoint of hazard mitigation, we can no longer dismiss these features as irrelevant to modern hazard. Over the course of this summer, Lindsay will be collecting additional datable materials to further refine our understanding of these significant landslide features.

Robert G. Marvinney, State Geologist
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VICE PRESIDENT'S MESSAGE

Geoscience education opportunities

The Executive Council is looking to ways to expand our geoscience education opportunities to the Maine community. At this stage we are looking to identify some of the main needs of educators as well as people to be involved with this initiative beginning in Fall 2018. Some initial ideas for how GSM may extend educational opportunities include: 1) facilitating the matching of "experts" (potentially graduate students or professional geoscientists) with K-12 educators for support, classroom visits, or participation in field trips, 2) providing continuing education options for educators through workshops or field trips, and 3) making Maine-centric curricular material available to educators through our website. If you are interested in participating in this initiative or providing feedback, please email Sarah Hall (shall@coa.edu).

Sarah Hall, GSM Vice President
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GSM FINANCES AND MEMBER DUES

The finances of the Geological Society of Maine are fairly straightforward in concept. It's a pay-as-you-go system. Members pay dues every year (well, more or less), which gives us enough money to pay for our society activities plus education grants through the Anderson Fund. Some years we have a surplus and some years we have a shortfall, partly because dues don't come in evenly, but mostly because field trip and meeting costs fluctuate from year to year as events move around the state hosted by different volunteer members and institutions. If you want more details, you can find the annual GSM Treasurer's reports in The Maine Geologist newsletter, archived on our website. Thanks to the GSM treasurers through the years who have tracked the checks, paid the bills, kept the books, and generously donated their valuable time in service to the society.

In recent years we have noticed more shortfalls than surpluses creeping into the bottom line. Early this year, the Executive Council took a comprehensive look at the issue from the standpoint of membership, income, and expenses for the past five years. Here are some of the figures we looked at.

Income and membership

Fiscal Year	No. of paid-up members	Dues received	Anderson Fund contributions	Total
2013-14	179	$4,475	$355	$4,830
2014-15	173	$3,385	$265	$3,650
2015-16	174	$3,495	$220	$3,715
2016-17	191	$3,995	$255	$4,250
2017-18*	188	$2,745	$685	$3,430

*through 5/1/2018

So the total number of dues-paying members has remained steady. The fluctuation in dues income is because people either get behind, catch up, or pay ahead. This may be a cash-flow management issue, but it is not a cause for concern in the long term. Our members remain active and engaged.

Expenses

This is where the change has occurred. The cost of our regular society activities has gone up since we last looked at the dues rate ten years ago. Our three main professional events are the spring and fall meetings and the summer field trip. In addition, we fulfill our educational mission through awards and grants from the Walter Anderson Geoscience Education Fund. The following table gives an overview of these annual expenses in recent years. The Executive Council discussed each of these items, looked at the details and established a reasonable "planning target" value for each item that will allow us to continue our current level of activity. Clearly, our current dues income falls short of this target.

Expense item	5-year low to high	Planning target
Spring meeting, various host schools	$0 to $1,008	$800
Summer field trip, various sites	$497 to $3,003	$1,000
Fall meeting, Augusta Civic Ctr	$1,003 to $1,513	$1,550
Misc. administrative expenses	$128 to $802	$700
Anderson Fund awards and grants	$500 to $1,500	$1,000
Total expenses	$3,198 to $6,574	$5,050

A Proposal

To be able to continue funding our society activities, the Executive Council is proposing to raise the dues for Regular Members to $30 per year, Associate Members to $15, and to leave Student dues at $5. The following table shows the effect this proposal would have on income, calculated using current membership numbers. Although "dues received" may not match exactly what is calculated, as recent history has shown, the Proposed rate should bring in enough income to meet our planning target for foreseeable expenses. This will allow us to continue to hold meetings without charging registration fees, to offer a modest subsidy for field trips to keep the cost affordable to members, and to pay our own way when invited to meet at host schools that don't have a budget they can draw from.

	Regular + Institutional	Associate	Student	Calculated Income
Number of current members	154 + 4	18	12	
Current rate	$20	$10	$5	$3,400
Proposed rate	$30	$15	$5	$5,070

Moving Forward

At the Spring Meeting, we announced that we were looking at the likelihood of a dues increase and got some general feedback from the membership. Now that we have a specific proposal, we would like to hear from you, not only about the proposed dues rate, but more generally about how we are managing the finances to provide activities and events that

benefit members. The Executive Council will meet again on July 27 to review feedback and make a final decision on the dues rate that will take effect for the coming year starting September 1. Feel free to contact me or any of the Executive Council members listed at the end of the Newsletter and on the GSM website.

Henry Berry, GSM President
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ANDERSON FUND COMMITTEE

Update

A group of 8 volunteers met as a task force on April 20 at Maine Environmental Labs in Yarmouth to review the status and future of the Anderson Fund. The lively discussion produced general consensus on several points, including the need for a dues increase to cover GSM society activities and maintain current Anderson Fund awards for the time being (see separate article in this Newsletter), an intention to promote and increase the Anderson Fund separately from member dues, an intention to seek contributions from the broader community beyond GSM members, and the possibility of establishing a substantial part of the fund as an endowment that would generate earnings to leverage contributions. In consideration of the outreach intention of the campaign, the group proposed renaming the fund The Walter Anderson Geoscience Education Fund, though we would continue to call it the Anderson Fund for short. Also, it was considered essential that we upgrade the GSM web site to be able to accept online donations from potential contributors.

On the basis of this preliminary meeting, a motion was approved by the GSM Executive Council on May 8 to appoint the Anderson Fund Committee for the purposes of seeking contributions to the Walter Anderson Geoscience Education Fund and of working toward establishing an endowment fund. The committee met on June 1 to begin the lengthy process of developing promotional materials, designing and organizing a fund-raising campaign, and setting up fiscal policies. The members of the Anderson Fund Committee include Walter himself, who continues to energize and inspire us, Carol White, Mike Deyling, Bruce Hunter, Cliff Lippitt, Henry Berry, Steve Kelley, and Steve Pinette. We are committed to this process because of its long-term goal of supporting geoscience education in Maine. The Anderson Fund has served Maine geology well over the past twenty years, and it can do even better.

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MEMBER NEWS

Get into the field with GEOetc

Field-based learning is just so important in Earth science. Seeing and understanding the relationships between rocks and working out geological timing and mechanisms by examining field evidence is what geoscience is all about. Seeing the scale of information – from the size of minerals in the rocks to how those rocks build massive landforms requires being in the field. And while many of us have had those wonderful, often life-changing, field experiences, many people who are linked to our profession (teachers, students, etc.) have not. And for others, they love to get back into the field with an experienced and enthusiastic guide to show them places that they have only dreamed about visiting.

With all those thoughts and ideas in mind, I started designing and leading trips for teachers and students back in the 1980s for organizations such as Geoscience Australia, the Geological Society of America, and, since 2015, GEOetc LLC based right here in Maine.

So why are teachers such a key group? There is no doubt that the group that influences students more in their career choices beyond their parents is their teachers. Yet the vast majority of teachers who teach any Earth science have had little or no formal training in the subject. Getting them into the field to show them the wonders and joy of geology is a

fundamental tool in getting them passionate for, and therefore advocates of, our science. GEOetc runs more than half of its trips just for teachers. In my experience, I have seen field trips change teachers lives. It makes them have an understanding for the planet that they have not even considered they could have. I have watched their faces as the geological 'penny has dropped' when they work out a geological problem in the field. I have seen their inner child burst with joy when they have seen lava flow or the glow of a lava pool. I have heard then talk years later of the amazing experience and how they use it in their classroom.

But not all GEOetc trips are for teachers. We also run trips every year that are for professional geoscientists, retirees, students, and geology enthusiasts, as I find that getting the additional perspective from experts and inquiring minds helps me to be a better leader. We visit Hawaii, Iceland, Italy, Australia, and more.

GEOetc trips are not just 'tours'. While we take in the amazing sights, we also try our hand at mapping, working on geological puzzles, and exploring how geology and society interact. We mix learning with fun – making these valuable trips for the mind and the body.

Our next open trip is to Hawaii in late December 2018 (December 30 – January 6). We will be examining the current eruption of Kilauea as well as visit all the other volcanoes on the Big Island. We will walk on green and black sand beaches, see the remains of recent fissure eruptions, walk on frozen lava lakes and through lava tubes, and so much more. The trip includes accommodation, breakfasts, some dinner, all ground transport, and park entries. You can find out more details here (https://geoetc.com/hawaiijan19/)

Our last trip was just in February this year. The photos in this article were all taken on that trip. Since then (literally as I write) a new vent has opened on Kilauea and so who knows what amazing new sites we will be able to visit in December.

I will keep leading field trips until my legs can't take it anymore. Why? Because I think I owe it to teachers and all the students they inspire to make a difference. I guess it is my passion – giving back the science that has given so much to me.

The glow of the summit lava pool at night on Kilauea.

Lava flows cut roads – here the group sits on a 1974 flow.

Exploring the amazing lava flows on Kilauea where they have flowed over the fault scarp to the coast.

Gary Lewis
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SECRETARY'S REPORT

Spring 2018 Business Meeting Minutes

Kevin Spigel, Professor of Geoscience, welcomed GSM to Unity College, and thanked the organizers and catering, facilities, and events crews for making the event possible. Erica Latty, Chief Academic Officer, welcomed GSM to Unity and provided an overview of Unity's focus and philosophy, including support for research and focus on solutions.

GSM Vice President Sarah Hall welcomed GSM members to the spring meeting, gave an overview of the afternoon's agenda, and opened the business meeting at 1:10 pm.

Announcements from GSM Committees and Task Forces

Communications Committee – Amber Whittaker (Chair) reported from the committee (Amber, Sarah Hall, and Marty Yates). The committee's ongoing work includes developing better ways to communicate with members. The primary focus will be on digital methods: the website and social media. Marty is GSM's webmaster, and content for the website can be sent directly to him. Amber is the newsletter editor.

Anderson Fund Task Force – Bruce Hunter provided an overview of the purpose and work of the Anderson Fund, to support research and study of Maine geology and/or by Maine geologists. At the Fall 2017 GSM meeting, volunteers were sought to look at ways to increase the Anderson Fund balance in order to be able to support grants and stipends out of the fund's interest. Bruce expressed a hope to get the fund principal to $100,000, to be able to provide $1,000 per year out of the interest. The task force will meet on Friday, April 20.

Nominating Committee – Sarah Hall reported out from the Nominating Committee, and noted that all officer's positions are up for election in the fall of 2018. Contact Henry Berry or Sarah Hall with interest.

2018 Summer Field Trip – Chunzeng Wang (UMPI) reported that the summer field trip will be in the northern woods. Much more information will be forthcoming on the website and in the June newsletter. Accommodations will be primarily camping, and there is limited lodge space. The trip will be held the last weekend in July 2018. Participants should plan to arrive on Friday afternoon. Field trip travel will be in 12-passenger vans. Direct any questions to Chunzeng.

Other Announcements

Friends of the Pleistocene – There will be a meeting on Mount Dessert Island, June 1-3, 2018. Space is limited by Acadia National Park restrictions. Additional information is available on the website.

The Maine Geological Survey has two internship openings. Information is available on the website and materials on the welcome table at today's meeting.

The Executive Council (EC) voted to grant $750 to the UMO geology Club to support their May 2018 field trip to Iceland. The club will report back to GSM about their trip at an upcoming meeting.

The Fall 2018 GSM meeting will be held on Friday, November 9, 2018 at the Augusta Civic Center.

State Geologist Bob Marvinney announced that the Northeast Section spring meeting of the Geological Society of America will be help in Portland in March 2019. Sessions will need to be pulled together soon, and Bob will contact GSM members for further information/planning.

T-shirts – Ordering information for regular GSM t-shirts will be made available on the website. There are plans for special field trip t-shirt, available to trip participants. More information will follow.

Membership dues

Current dues of $20 (Regular membership) dues include a $12 portion to support the work and expenses of GSM and an $8 portion to support the Anderson Fund. The EC has a plan for assessing dues, including a review of costs/needs. The EC plans to provide information and a proposal for dues adjustments in the June newsletter, with an opportunity for GSM members to provide feedback. The EC will meet in August to review GSM feedback and to implement changes to the current dues structure.

Kevin McCartney provided the suggestion that the student membership fee (currently $5 for one year) be doubled and the period of membership extended to two years. As a cost saving measure, the

student members could be dropped from the rolls after the two-year membership period. Dan Belknap noted that encouraging student membership is more important than the value of the $5 membership fee, and suggested keeping student fees low while raising professional, institutional, and associate member dues.

Sarah adjourned the business meeting at 1:28 pm.

Respectfully submitted,

Lisa Jacob, GSM Secretary
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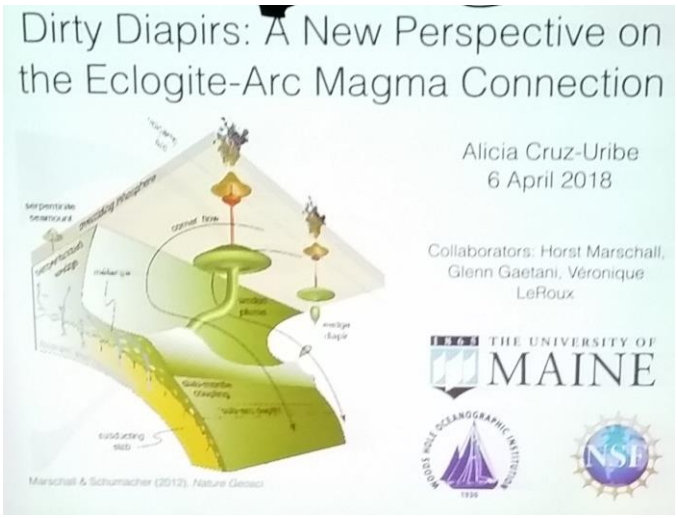
GSM SPRING MEETING
APRIL 6, 2018

Unity College, Unity, Maine

Keynote Speaker
Alicia (Cici) Cruz-Uribe,
University of Maine

DIRTY DIAPIRS: A NEW PERSPECTIVE ON THE ECLOGITE-ARC MAGMA CONNECTION

The trace element and isotopic compositions of arc lavas require three component mixing of altered oceanic crust (AOC), sediment melt, and depleted mantle in a variety of proportions in their source regions. Recently, models have been proposed in which intense mixing of subducted AOC and sediments with hydrated mantle-wedge material occurs along the slab-mantle interface to produce high-pressure mélanges. Exhumed high-pressure mélanges that occur globally bear witness to this process and provide opportunities to study the geochemistry and petrology of the products of the mixing process in the field. These models further suggest that these well-mixed materials are transported into the hot corner of the mantle wedge beneath arcs by low-density mantle-wedge plumes or diapirs, as has been predicted by numerical and analog models and geophysical observations. Melt is produced either in the low-density plumes from partial melting of mélange rocks due to heating and decompression, or in the overlying mantle-wedge peridotite due to the influx of hydrous fluids released from the dehydrating plume. In this experimental study I demonstrate that melts produced from rocks that dominate exhumed high-pressure mélange complexes under the pressure–temperature conditions prevailing in the mantle wedge produce characteristic magma compositions that are frequently observed in modern subduction zones.



POSTERS

P1
FIRE HISTORY OF ACADIA NATIONAL PARK
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Unity College, Earth and Environmental Science

This Acadia National Park paleoclimate and fire history reconstruction consisted of extracting samples and analyzing and counting charcoal fragments retrieved from lake sediment cores from The Bowl. Raw counts were converted into charcoal accumulation rates (CHAR), graphed and used to represent a record of fire occurrence throughout the past ~15,000 years. This information was then analyzed and studied to better understand how the post-glacial environment evolved in coastal Maine, including the landscape's response to the Younger Dryas period, and the early-middle to late Holocene era climate trends. It was discovered that burning, and the frequency of the burning, was relatively insignificant due to the location's marine-influenced climate; supporting a cool and moist environment rather than a fire supporting dry and hot climate. Overall, the research supported the theory that fire activity in Acadia National Park was minimal since 15,000 Yr. BP., but the record does include signs of the fire response to major climate events such as the Younger Dryas and 8,200 events (periods of Holocene cooling). Records such as this allow predictions to be made for future climate conditions. This

particular charcoal data collection and analysis project was a component of a larger multi-proxy study of environmental change in Acadia National Park by Dr. Kevin Spigel.

P2
BIODIVERSITY AND DISTRIBUTION OF BENTHIC FORAMINIFERA OF HARRINGTON SOUND, BERMUDA: THE EFFECTS OF DEPTH RELATIONS, GRAIN-SIZE VARIANCE, AND WATER TRANSPORT
Le, Nam; Rueger, Bruce (namle@colby.edu)
Colby College, Geology

Harrington Sound is an almost completely enclosed basin acting as a subtropical/tropical lagoonal sediment trap. As a prominent body of water in Bermuda, it serves as a carbonate-rich system comprising of carbonate sediments, reef patches, and carbonate-producing organisms. One of the most prominent microorganisms in Bermuda reef/lagoonal settings are foraminifera, specifically benthic groups like miliolids such as Quinqueloculina spp. and Triloculina spp., sessile species like Homotrema rubrum, and rotaliids such as Elphidium spp. and Ammonia beccarii. Over the years, studies have examined these particular characters in tropical settings like Bermuda; however, factors explaining their selective abundances require further investigation. The goal of this study is to understand the biodiversity and distribution trends of these foraminifera groups in tropical lagoonal settings by assessing variables like depth, grain-size, and water transport. Bottom sediment samples (n=15) were collected at water depths from 3 m to 24.75 m using an Eckman dredge. All samples were sieved using 1 mm and 0.125 mm sieves; due to the size of foraminifera, only samples below 1 mm and above 0.125 mm were examined. Sample mass variation was accounted for by standardizing mass based on smallest collected sample. Quinqueloculina spp. & Triloculina spp., Homotrema rubrum, Elphidium spp., and Ammonia beccarii species counts were performed using the 300-count test after randomizing sample selections with a sediment splitter. Using R-Studio, simple linear regression models, polynomial regression models, and ANOVA tests for difference in means were conducted on each species to examine the association between species count and depth. Grain-size analysis required grain sorting using sieving machines, ultimately to understand hydrodynamic sorting. Referencing depth abundance trends published in previous studies, outlier counts can explain for water transport. Based on preliminary analysis with depth relations, Quinqueloculina spp. & Triloculina spp. and Homotrema rubrum exhibited abundance differences in different depth intervals, Elphidium spp. modeled a second-order polynomial regression, and Ammonia beccarii displayed a negative linear association. The next step of the study is assessing if statistical significance changes when variables like grain-size and water transport are added to the prediction models.

P3
QUANTITATIVE ANALYSIS OF UNITY COLLEGE SOILS
MacDonald, Emily (emacdonald15@unity.edu)
Unity College, Earth and Environmental Science

Unity College has a campus with a lot of undeveloped spaces which range in purpose and use from agricultural to athletic and recreational to forest. Since soils support all of the vegetation growth above the surface, an understanding of the physical and chemical characteristics of the soil is key to proper management of these areas. The other major role of soil is its impact on water's movement across the landscape which can lead to changes in the topography of the landscape through erosion. The goal of this project was to see how the chemistry of soils on the Unity College campus changed through the growing season (May – September) as well as evaluate the physical qualities of the top 6 inches of soil (e.g. top soil). Using this information to better understand what kind of soils are on the campus, how they change over the growing season, and if there are any causes for concern is important for developing management plans for the sustainability of the College's soils. Results of this project suggest that the soils on campus are of average quality and exhibit chemical changes over the course of the growing season as they should.

[Winner Best High School Presentation]

P4
ASSESSING MICROPLASTIC POLLUTION FROM THE EFFLUENT OF THE BANGOR WASTEWATER TREATMENT PLANT
Bloomer, Alexander (alexanderbloomer00@gmail.com)
Bangor High School, STEM Academy

As an emerging environmental contaminant, microplastic pollution has only just started to be documented on a large scale. This paper reports the discovery and identification of microplastics in both the influent and effluent of the Bangor Wastewater Treatment Plant and recommends adjustments to the listed NOAA methods for the identification of microplastics. Samples were collected on two days, 12 October 2017 and 30 January 2018. On the 12th, 1 sample was collected from the influent and effluent sites and on the 30th 4 samples were collected from both. Analysis of influent samples found a minimum of 40.7, a maximum of 1079.1, and an inclusive average of 498.8 microplastics per liter. Analysis of effluent samples found a minimum of 1.6, a maximum of 39.4, and an inclusive average of 12.5 microplastics per liter. Fourier Transform Infrared (FTIR) analysis of large particles found fragments whose infrared (IR) spectra shared 82% resemblance to polyethylene and clumps of particles and fibers that shared 79% resemblance to polyvinyl chloride and 77% resemblance to polyurethane. Using total measured flow rates for the days of collection, the effluent was calculated to release a minimum of 2.35107, a maximum of 1.27109, and an average of 4.90108 microplastics per day into the Penobscot River. The removal rates of microplastics that entered the plant had a minimum value of 96.1%, a maximum of 99.4%, and an average of 97.7%.

P5

BEDROCK GEOLOGIC MAPPING AT CHANDLER MOUNTAIN OF NORTH MAINE WOODS

Ward, Caleb; Brooks, Zachary; Gudde, Elise; Hrynuk, Connor; Pratt, Gannon; Bonczyk, Sam; Wang, Chunzeng (caleb.ward@maine.edu)
University of Maine at Presque Isle, Earth and Environmental Sciences

Chandler Mountain is geologically significant because it represents one of only a small handful of igneous plutons in Northern Maine. In the fall of 2017, out team mapped the pluton and its country rocks as our Bedrock Geology class project, in order to supplement Ward's ongoing fieldwork in the area with Dr. Wang. Noteworthy findings include outcrops of intrusive contact and a newly-discovered basal conglomerate member of the Saboomook Formation. In addition, drone aerial mapping was conducted on exposed pyroclastic layers with typical soft-rock deformation structures. The result of this mapping effort has effectively redrawn the geologic map of the area around Chandler Mountain. The Chandler Mountain pluton is low in elevation and nearly half of it is overlaid by Chandler Lake. The pluton is a round, medium-grained porphyritic biotite granite, with an exposed area of 6.5 km2. Part of the pluton contains dark mafic enclaves. Phenocrysts are feldspar and biotite. Grain size becomes smaller toward the margin, suggesting marginal facies. To the west of the pluton is a suite of volcanic rocks (dominantly tuff with minor basalt and diabase) named "Munsungun Lake Formation" in the 1985 state bedrock geologic map. This suite has been found to be Ordovician in age. To the east of the pluton is Devonian Seboomook Formation sandstones and slates. The previously undocumented basal conglomerate member of the Seboomook Formation was found on the south side of the pluton, within the contact zone. The basal conglomerate member is neatly bisected by the Chandler Mountain Pluton. Emplacement of the Chandler Mountain pluton resulted in significant thermal contact metamorphism, causing its country rocks to be hornfelsed as far away as 1.5 km. As such, differential weathering produced the crescent-shaped, half-ring Chandler Mountain ridge on the west side and crescent-shaped, lower ridges on the east side. The ridges occur along the hornfelsed country rocks. The Ordovician volcanic rocks were also impacted hydrothermally during the plutonic process and intensive sulfide mineralization was observed within the hornfelsed volcanic rocks and the granite along the western contact zone. These sulfides include mostly pyrite, chalcopyrite, and bornite.

P6

THE ORIGIN OF GARNETS FROM THE NORTH JAY AND CAPE COD HILL PLUTONS, WEST-CENTRAL MAINE

Leonard, Brianna; Fletcher, Joshua; Gibson, David (brianna.leonard@maine.edu)
University of Maine at Farmington, Geology

The North Jay and Cape Cod Hill plutons (NJ and CCH respectively) are two-mica, peraluminous granite intrusions that outcrop in west central Maine. They are similar petrographically being medium-grained, light grey equigranular granites with biotite + muscovite, microcline, plagioclase and quartz – a typical "S – type" mineral assemblage. In addition, they contain minor amounts of garnet, which occurs sporadically throughout these granites but also within xenoliths of schistose material (surmicaceous enclaves) and small gt + bt knots. Therefore the question addressed in this presentation is whether the garnets are magmatic or inherited xenocrysts? Three main parameters can be utilized to determine the origin of garnet in granitoids – their crystal habit, composition (including any zoning), and geothermometry. Garnet in the NJ and CCH granites are varied in crystal habit and can be anhedral with numerous inclusions of quartz and feldspar or more euhedral in form. Those that have a more euhedral disposition are often almost totally surrounded by biotite and could represent xenocrystic knots. Initial compositional data from the NJ pluton indicate that these garnets plot close to almandine + spessartine corner on the discrimination diagrams of Krippner et al. (2014). Likewise the more euhedral garnets are compositionally zoned, most notably with regard to Ca and Y concentrations, whereas the anhedral garnets are compositionally homogeneous. Preliminary geothermometry calculations reveal temperatures < 6000C, which would suggest that they are inherited from a metamorphic source rather than magmatic in origin. However, more data will enable us to critically assess if these garnets are xenocrystic and inherited from the disaggregation of surmicaceous enclaves or if some of the garnets actually crystallized from these peraluminous melts.

P7

TIMING OF THE LAST GLACIAL MAXIMUM IN CENTRAL ASIA FROM A MORAINE SEQUENCE IN THE FAR EASTERN TIBETAN PLATEAU

Lindsay, Benjamin; Putnam, Aaron; Strand, Peter; Radue, Mariah; Dong, Guocheng; Kong, Xianghui; Sheriff, Maya; Stevens, Jessica (benjamin.lindsay@maine.edu)
University of Maine, School of Earth and Climate Sciences

The transition from the Last Glacial Maximum (LGM) to the current interglacial period represents the most dramatic climatic change in the past 100,000 years. This time period provides clues as to how Earth's climate will respond to future anthropogenic perturbations. Current CO2 levels are increasing faster than ever before in the history of mankind, and in order to better predict future climate changes, we must first obtain a more complete understanding of Earth's natural climate sensitivity. I am developing a chronology of mountain glacier fluctuations in the interior of Asia, where paleoclimate data are sparse. Because changes in mountain glacier extent in this region are driven by atmospheric temperature, these moraines record past millennial-scale climate changes. Here, I present a glacial geomorphologic map and 10Be surface-exposure age chronology of a moraine system in a formerly glaciated valley within the mountains of Litang County on the eastern Tibetan Plateau of China. Geomorphologic mapping was conducted by

interpreting satellite imagery, structure from-motion imagery, digital elevation models, and field observations. We interpret the mapped moraines to document the millennial-scale pulsebeat of glacier advances in this region during the peak of the local LGM. I determine the age of one such LGM glacier position to be 20,784 ± 365 years ago. This finding opposes suggestions that East Asian Monsoon strength is the dominant driver of glaciations in the Himalayas, as it reveals a near maximum sized glacier during a period of weak East Asian Monsoon, as registered in Chinese cave records.

P8

LATE-GLACIAL MARINE PALEOECOLOGY IN NORRIDGEWOCK, MAINE

Paradis, Michael (michael.j.paradis@maine.edu)
University of Maine at Farmington, Geology

As the Laurentide glacier retreated north at the end of the last glacial period, central and coastal Maine were flooded by the ocean. Clay deposits in Norridgewock Maine hold a record of abundant mussel, clam, barnacle and other marine fossils that likely lived in a shallow, tidal post-glacial Kennebec "Bay". But what did this "bay" look like? What can the sediments and faunal assemblages tell us about the deposition in this area? Located in central Maine ~70 km inland from the present shoreline, the fossiliferous muds are located at an elevation of 75m on the western bank of the Kennebec River. Exposed gravel pit faces and ground-penetrating radar data collected show nearshore marine beds prograding towards the Kennebec River. Although much of this site is thinly bedded silts to very fine sands, the fossils are restricted to clay-rich beds at the eastern end of the deposit. The fossil assemblage here is low in diversity, dominated by 6 to 7 species, but they are in high abundance. Some of these fossils include: Mytilas Edulis, Hiatella artica, Trichotropis borealis (Boreal Hairy Shell), and Macoma balthica. The fossils are laterally limited and appear to be concentrated in pockets, finding large quantities in one section but then no fossils just 5 cm away. Microfossils are present in the formation as well but not in large quantities. Microscopic analysis of the sand fraction showed large amounts of angular quartz grains, which may have inhibited microfossil preservation. Taken together, these data indicate preservation of shallow-water fauna in a tidal-flat environment on the margins of a more active fan-delta near the shore of this embayment.

P9

PETROGRAPHY, AGE, AND PROVENANCE OF MAFIC DIKES, WESTERN MAINE

Mason, Daniel, Rerrick, Chase; Gibson, David; Mark, Darren (daniel.mason1@maine.edu)
University of Maine at Farmington, Department of Geology

Basaltic (sensu lato) dikes intrude the high-grade metamorphic rocks, the Songo granodiorite, the Sebago granite and the Sebago Granite-Migmatite domain of western Maine. Collectively they constitute a major dike swarm, although it is unclear if they comprise one or multiple pulses of dike emplacement. Similarly, their provenance is also problematic as they could be related to the CAMP magmatism, assumed to be ~ 200Ma and tholeiitic in composition, or associated with the Coastal New England (CNE) suite, an older (~ 230Ma) mantle plume source of alkaline affinity. This study presents further field, petrographic and geochemical data for dikes that outcrop to the east of Sebago Lake along with preliminary Ar/Ar ages. Combining this data with previous data for the dikes that outcrop to the north enables a critical assessment of the geochemical affinity, age, and provenance of these basalt dikes across western Maine. The basaltic dikes range in thickness from less than 1 meter to 4 meters across and have well developed chilled margins. They are mostly aphyric in texture, although some of the larger dikes are coarser grained in their centers and should be termed diabase. Some porphyritic examples are also observed containing small centimeter-sized, randomly oriented plagioclase lathes. In thin section, many of the dikes may contain titan-augite, although this needs to be confirmed with microprobe data. Another set of dikes that cross cut the basalt/diabase dikes are trachybasalts compositionally and contain glomerocrysts composed of plagioclase and aegirine. These dikes are most likely related to nearby alkaline stocks. Geochemically, the basaltic dikes are mostly alkaline in composition, plot in the "within plate" alkali basalt field on trace element discrimination diagrams and display the high TiO2 levels observed in dikes of the CNE suite. However, there are notable exceptions to this, with some of the dikes not conforming to this pattern. Indeed, new preliminary 40Ar/39Ar integrated ages of 228.4± 4.9Ma and 197.0±1Ma may suggest two pulses of dike emplacement. Therefore, while most of the basaltic activity can be related to the older CNE suite, there may be some representatives of CAMP magmatism in this part of northern New England.

P10

AN INVESTIGATION OF PALEO AND MODERN CHANNEL CONDITIONS ON SANDY STREAM, UNITY, MAINE

Porter, Matthew; McCarthy, Emily; DuBois, Morgan; Burnell, Meghan; MacDonald, Emily; Silvia, Alyssa; Schmidt, Dillan; Jacques, Arthur; Harris-Jones, Brian; Oliver, Ethan; Leavitt, Jordan; Suehiro, Den; Hopkins, Sierra (mporter15@unity.edu)
Unity College, Earth and Environmental Science

The 2017 Geomorphology class at Unity College investigated paleo and modern channel oxbow cutoffs that exist throughout Sandy Stream's watershed. This investigation determined the cross sectional area (CSA) and the discharge at a recurrences interval of 1.58 years or Q 1.58 of modern and paleo channels, as well as the age of paleo channels. LiDAR imagery was used to locate oxbows. An Oakfield core was used to determine the cross sectional area of the four paleo channels. The core was driven incrementally until encountering a layer of sand, referred to as clean sand. This denoted the bed of the paleo channel. Wood samples collected from just above this layer were sent for radiocarbon dating analysis, providing a relative timeline of

when the stream was cut off. Auto level surveying produced CSAs for eight modern channels. Using the mean section method CSA graphs were constructed for both modern and paleo channels. Two of the modern channel graphs had to be discarded due to discontinuities. To determine the Q 1.58 of channels, a model was constructed from UGSG stream gage data at 20 sites in Maine. This data was analyzed by PeakFQ utilizing the Log Pearson Type III method. This model was used to find the discharge of the paleo channels based on their CSA values assuming channel forming conditions remained constant. Compared to the mean modern CSA values the paleo channels were between 18% lower to 21% higher. Refinements to the model are required for the possibility to predict future Sandy Stream conditions based on the paleo information.

[Winner Best Student Poster]

P11

HYPER-CRYPTIC THRUST FAULTS IN THE RUMFORD INLIER, SADDLEBACK WIND, CARTHAGE, MAINE

Neal, Bryce; Reusch, Douglas; Bradley, Dwight; Strauss, Justin; Gibson, David (bryce.neal@maine.edu)
University of Maine at Farmington, Geology

The Bald Mountain-Saddleback Wind massif, located in west-central Maine, is critical to understanding two contentious aspects of Maine Acadian geology: the Rumford allochthon and relationship of the Day Mountain Formation, a thin to medium-bedded quartzite-pelitic schist sequence of presumed Devonian age, to the Littleton Formation and "Seboomook Group", which for decades has been correlated with the type Seboomook section in northern Maine. Explanations for the origin of the Rumford allochthon vary, with some authors suggesting a regional-scale extensional detachment with or without thrusting, while others have questioned its existence altogether. Detailed bedrock mapping of the extensive ledges on Saddleback Wind has led to the recognition of a new marker, the Royal Flush beds, three times repeated on hyper-cryptic thrusts. The southeast-topping Royal Flush beds thin upward in the thrust pile, respectively 2.1 m, 1.3 m, and 1.0 m thick, and northwest-topping limbs are commonly half the thickness of their presumed initially upright counterparts. Asymmetry of tight to isoclinal fold pairs is common with anticlines consistently located southeast of synclines, thus supporting previously inferred northwest vergence. Sand/mud ratios in the Royal Flush protoliths are constant, hence the observed upward thinning is more likely due to differential shear during thrusting rather than initial stratigraphic proximal to distal variation in thickness. Detrital zircon data were also collected from the Day Mountain Formation on Saddleback Wind and the New Vineyard Quarry in New Vineyard, ME. Results suggest a 450 Ma Late Ordovician maximum depositional age for rocks on Saddleback Wind and a 420-430 Ma Ludlowian-Pridolian maximum depositional age for rocks in the New Vineyard Quarry, contradicting the Rumford allochthon hypothesis and instead suggesting a Rumford inlier. In light of these findings, the stratigraphy and structure of west-central Maine need to be reevaluated.

P12

CARBONATE BIOSTRATIGRAPHY IN RAT TRAP CAVE BERMUDA

Whitcraft, Don; Rueger, Bruce (dwhitcra@colby.edu)
Colby College, Geology

This study analyzed a 9 cm core from Rat Trap cave, a 17-meter deep submarine cavern near the caves opening in Harrington sound. Grains identified consisted predominantly carbonate skeletal remains of marine organisms that had been deposited in the last 1.6 Ka. Grain-size ranged from 0.250 to 150mm. All taxa found are benthic and considerable biodiversity exists within the population as indicated by the Simpson Index value of 0.87. Organisms involved in carbonate production in the core are ranked by abundance: bivalve (36.1%), bryozoans (19%), serpidulae (11.2%) sponge spicules (7.2%), gastropods (1.6%), Foraminifera (1.4%), echinoids (1.3%), and a smaller abundance (<1%) of Brachiopods, anthropods, and ostracods. We also found a significant component of carbonate mud (15.5%) cemented by an algae, which is early carbonate rock development. While total grain abundance is an indicator of limestone production, it is not the only factor. Taxa volume and chemistry also play a role in total carbonate production. For all grains analyzed, bivalves and echinoids were the only groups that showed a trend, both increasing with depth. The study of carbonate producing organisms is important because Bermuda is a limestone island in the North Atlantic, largely built upon such carbonate-skeletal remains. The study of these grains can provide insight into depositional history and paleontology. Further, this is an undisturbed cave setting that could be used as a calm water proxy for sediment accumulation elsewhere.

P13

THE PALEOECOLOGY OF GREAT DUCK ISLAND WITH AN EMPHASIS ON CHARCOAL ANALYSIS

Gemma L. Venuti; Hall, Sarah; Nurse, Andrea (gvenuti@coa.edu)
College of the Atlantic, Human Ecology – Geobiology

An analysis of a two meter sediment core collected from Great Duck Island (GDI), a 220 acre island in the Gulf of Maine, Hancock county, reveals paleoecological events spanning thousands of years. Through incremental sediment analyses by x-ray imagry, geochemistry,charcoal abundance, pollen and Sporormiella identification, this core enables reconstruction of the paleoecological and paleoclimatological story of GDI including information on nesting seabirds, human activity, vegetation characteristics, and storm records. This core is part of a larger study involving a transect of 10 off-shore island cores from Gulf of Maine locations that will ultimately identify nesting seabird activity and changes in sea surface temperatures across the Gulf. The GDI core is mainly composed of peat with the lower ~25 cm comprised of gray glaciomarine clay. We constrain ages for portions of the core using a combination of Pb-210 dating and radiocarbon dating of organic materials. Preliminary results suggest sedimentation rates on the order of

~0.1cm/yr for the upper ~20-30 cm of the core. Preliminary results reveal three localized zones of abundant charcoal at depths of 30 cm, 51 cm, and 65 cm suggesting several fire events, all of which occurred more than 150 years ago. We present our preliminary data alongside the known historical record of climate and human activities as well as some longer histories from regional archaeological, climatological, and ecological records.

P14
MULTISCALE ANALYSIS OF THE INCAPUQUIO FLOWER STRUCTURE: TECTONOCLIMATIC IMPLICATIONS FOR THE FOREARC OF SOUTHERN PERU
Rodriguez Padilla, Alba Mar; Hall, Sarah R.; Benavente Escobar, Carlos; Venuti, Gemma; Rosell, Lorena; Garcia Fernandez Baca, Briant (arodriguezpadilla@coa.edu)
College of the Atlantic

The Atacama Desert of the western Andean margin spans the southernmost part of Peru and Chile. We focus on the landscape of the southern Peruvian forearc, where good preservation due to hyperaridity since at least 3Ma reveals a dynamic region shaped by active tectonic and climatic processes. The asymmetric, positive Incapuquio flower structure is the most prominent structure dissecting the forearc north of the Arica bend, and it encompasses a set of neotectonic transpressional structures connected at depth that contribute to topography building. This study conducts micro, outcrop-scale, and remote structural and geomorphic analysis of four major fault strands or fault zones within the Incapuquio flower structure. We provide new data on the architecture and kinematics of these fault zones, and discuss its implications for the spatiotemporal evolution of tectonic deformation in the forearc and pre-existing tectonophysical models. Our data reveals a complex system encompassing faults with very different maturities and a diverse range of kinematics. In the forearc, tectonic processes intimately coexist with climatic processes. Despite the persistent hyperaridity, the Subandean Western flank that hosts the Atacama is subject to climatic variability from the El Niño Southern Oscillation (ENSO). Periods of hyperaridity are punctuated by flash events of high precipitation that lead to large scale flooding that can rework the landscape to a large extent. The timing of these floods may be associated with ENSO events, yet in general remains poorly understood. We analyze the morphology and stratigraphy of a set of braided channels and abandoned terraces dissected by a recent rupture of the Purgatorio fault to reconstruct the timing and characteristics of recent precipitation events that have shaped the area, and contribute to establishing a more complete record of the timing of ENSO events in the forearc.

P15
ECOHYDROLOGY OF FOUR MOUNT DESERT ISLAND WATERSHEDS
Gallardo García Freire, Patricio; Hall, Sarah R.; Henkel, Brian L.
College of the Atlantic

During the summer of 2017, as part of the Wild Acadia Project, four watersheds in the eastern side of Mount Desert Island were characterized by their physical and geomorphic features. We monitored stream stage height, measured discharge, surveyed stream channels, measured water quality parameters, performed pebble counts of the stream beds, mapped the streams using GPS, and sampled for bacteria counts along sections of Stanley Brook, Jordan Stream, Cromwell Brook, and Duck Brook. Field data was compiled into a GIS to produce higher resolution stream network maps. We produced stream rating curves for three of the watersheds, applicable for future nutrient and sediment load studies. Near the mouth of Duck Brook, we surveyed the geometry of stream channel and associated terraces in order to investigate the erosion induced by the Route 3 culvert. These data can be utilized by multiple local and regional stakeholders interested in resource management, restoration, conservation, and education.

ORAL PRESENTATIONS

O1, 3:45-4:00
THE EFFECTS OF INFILTRATION AND INFLOW ON UNITY COLLEGE'S SEWER SYSTEM
MacDonald, Emily; Carullo, Sally; Cates, Cassandra; DuBois, Morgan; Harris-Jones, Brian; Norback, Gunnar; Silvia, Alyssa; Stewart, Sean (emacdonald15@unity.edu)
Unity College, Earth and Environmental Science

Working on behalf of the Unity Utilities District (UUD), students in Surface and Groundwater Hydrology designed a project to determine whether runoff from rainfall is entering the sewer system on Unity College's campus. The project was created because increased flow was seen at the pumping station located on Quaker Hill Road following rainfall events. High and low baseline flow conditions were determined by measuring flow depth and calculating discharge using the Manning's Equation. Rhodamine dye packs were placed around campus at locations where runoff occurs in order to trace water's entry into the sewers. Water samples were collected after rhodamine dye packs were deployed and tested for concentration (ppb). Low concentrations (~2ppb) were detected in the effluent, however there were no significant deviations in flow volume. Groundwater levels declined over the duration of this study, reflecting the abnormally low precipitation experienced. Results suggest there may be limited surface water entry into the sewers.

O2, 4:00-4:15
CALCIC PALEOSOLS IN A STRATIGRAPHIC CONTEXT FROM QUAGGASFONTEIN, EASTERN CAPE PROVINCE, SOUTH AFRICA: IMPLICATIONS FOR LATE PERMIAN CLIMATE
Kus, Kaci; Gastaldo, Robert (kbkus@colby.edu)
Colby College, Geology

The Karoo Basin, South Africa, contains a reportedly continuous stratigraphic record spanning the terrestrial vertebrate extinction event equated with the Permian-Triassic boundary (PTB). The current hypothesis links this major loss in biodiversity and vertebrate turnover to a global change in climate towards aridification. Rapid climate change is interpreted to be reflected by a changeover from (1) greenish (Permian) to reddish (Triassic) mudrocks, (2) a transition in the river architectures from meandering to braided regimes, and (3) wetland to calcic-bearing paleosols. Here, we present geochemical results on a 1.3-meter calcic paleoVertisol interval found ~34 meters below the vertebrate-defined PTB as described by previous workers. This interval differs from contemporaneous paleosols because of the presence of abundant stage II pedogenic carbonate nodules. Previous workers hypothesized that such calcic paleosols formed during the Early Triassic after the extinction event(s). As such, their presence below the biozone boundary is surprising. The physical properties of the paleosol interval are described both in the field and with thin-sections, and geochemical trends are identified through a 1.3-meter profile. Thin sections of the siltstone, sampled at 10-cm intervals, were described to identify primary structures, fabrics, and diagenetic features. The geochemical proxies used in this study include: percent total organic carbon (TOC), molecular weathering ratios, and mass balance techniques. Percent TOC was measured at Colby College, and ICP-MS elemental data on bulk-rock composition were acquired at ALS Global Laboratory. Four calcium-carbonate nodules taken from different stratigraphic heights were analyzed for δ13C and δ18O at Southern Methodist University. The calcic paleoVertisol section, one of several identified below the vertebrate-defined boundary, contains at least four stacked-soil horizons. Geochemical data indicate probable pedogenic overprinting of each soil horizon which exhibit a drying trend. Mean annual precipitation (MAP) estimates transition from 1107.08 mm/yr at the base of the interval to 98.39 mm/yr at its top, supporting the interpretation of a seasonal climate. Calcium-carbonate cemented nodules collected from the paleoVertisol interval have δ13C values ranging from -5.44 ‰ to -8.62 ‰, and were almost certainly precipitated under well-drained conditions. The data suggest that the onset of change in paleoclimate began much earlier in the Late Permian than previously hypothesized.

[Winner Best Student Oral Presentation]

O3, 4:15-4:30

GEOCHEMICAL DIFFERENCES IN CALCIC HORIZONS DUE TO PARENT MATERIAL AND ANTHROPOGENIC WATER INPUT IN SOUTHEASTERN ARIZONA

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Colby College, Geology

Calcic soil horizons, which are ubiquitous features in desert environments, serve as significant carbon sinks. Yet, despite their abundance in semi-arid environments, calcic soils are enigmatic for two reasons: (1) some authors hypothesize that dust input does not, independently, control the geochemical properties of these soils; and (2) few studies have been conducted to determine how these calcic soils change geochemically with respect to irrigation. A 2017 pilot study used portable x-ray fluorescence (pXRF) to determine the geochemical properties of calcic soils in Southeastern Arizona (SEAZ) and address these questions. However, this technology has not been widely employed to evaluate soils, and, until the accuracy and resolution of these data are constrained, pXRF data must be crosschecked with other instrumentation, such as x-ray fluorescence (XRF). The current study addresses whether pXRF and XRF data obtained from the same soil samples are comparable. Building on these results, the project has determined the extent to which parent (bedrock) material influences the composition of calcic horizons when compared to dust input, and how irrigation affects their geochemical composition. As such, calcic soils sourced from basalt, rhyolite/andesite, limestone, and mixed alluvium were collected from SEAZ and analyzed using pXRF and XRF. Values of major elements obtained using pXRF were lower than the same samples evaluated with XRF, leading to the conclusion that one must exert caution when using pXRF analyses on soils. The XRF data show that there are clear geochemical differences between the calcic horizons originating on different parent materials, which suggests that dust input does not, solely, control the formation of calcic soils. And, the geochemical composition of irrigated soil does not significantly differ from non-irrigated soil, which indicates that the effects of irrigation on desert soils are largely inconclusive at the present.

O4, 4:30-4:45

STRUCTURE AND KINEMATICS OF THE JEFFERSON OLIVERIAN DOME IN THE SOUTHERN HALF OF THE MT. CRESCENT 7.5' QUADRANGLE, NEW HAMPSHIRE

Merrill, Thorn K.; Niiler, Kurt, Eusden; J. Dykstra; O'Sullivan, Paul (kniiler@bates.edu)
Bates College, Geology

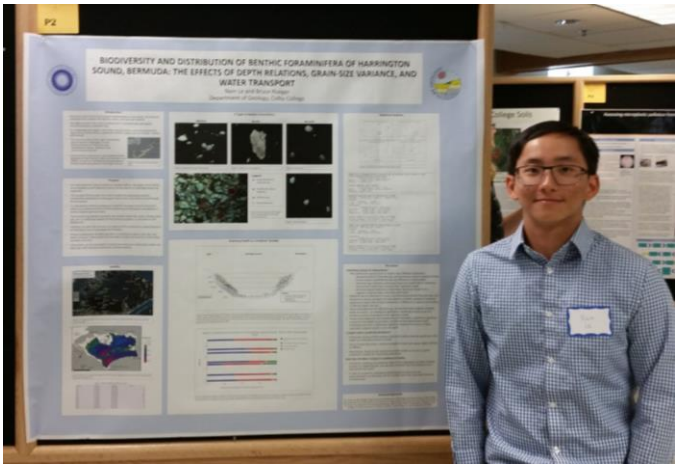
New detailed structural mapping and zircon geochronology in the southern half of the Mt. Crescent 7.5’ quadrangle in Randolph, NH was completed for the USGS/NHGS StateMap program in an effort to better understand the geometry and deformation history of the Jefferson Dome, a mantled gneiss dome that is part of the Bronson Hill Anticlinorium. Overall structures support a Devonian Acadian or Neoacadian timing of deformation for the dome with subsequent Alleghenian shearing, followed by later Permian or Triassic brittle faulting. Structural data in the form of foliations in the Jefferson Dome were collected for this study. Three different types of foliations were found: 1) no foliation; 2) single foliations that are likely dome related and 3) mylonitic S-C foliations defining cross cutting shear zones. The zones of no foliation are somewhat randomly distributed throughout the Dome. Similarly the dips of the singly foliated rocks are variably distributed across the Dome. Equal area projections of the dome foliations indicate a classic anticlinal dome shape with a trend and plunge of 62º, 8º. However, the spatial distribution of the foliation data does not

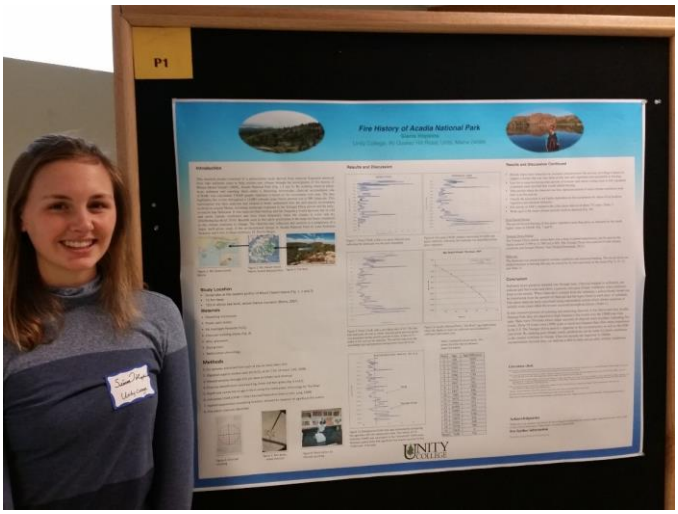
support the simple dome shape. Narrow zones with abundant mylonitic foliations that present S-C fabrics and sigma porphyroclasts striking NE-SW show primarily reverse dip slip shear and cut the single and no foliation zones. These represent a complex array of shear zones. Newly mapped silicified pods up to 10 m in width are indicative of late brittle faults striking NE-SW and NW-SE. Kinematic indicators for the faults are absent.

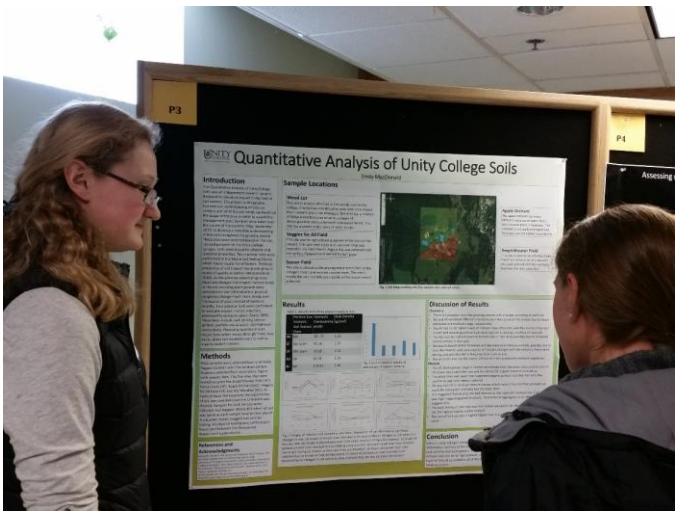
O5, 4:45-5:00
BEDROCK MAPPING OF THE SOUTHERN PORTION OF THE 7.5' MT. CRESCENT QUADRANGLE, NORTHERN NEW HAMPSHIRE
Niiler, Kurt; Eusden, J. Dykstra, Jr.; Merrill, Thorn K.; O'Sullivan, Paul B. (tmerrill@bates.edu)
Bates College, Geology

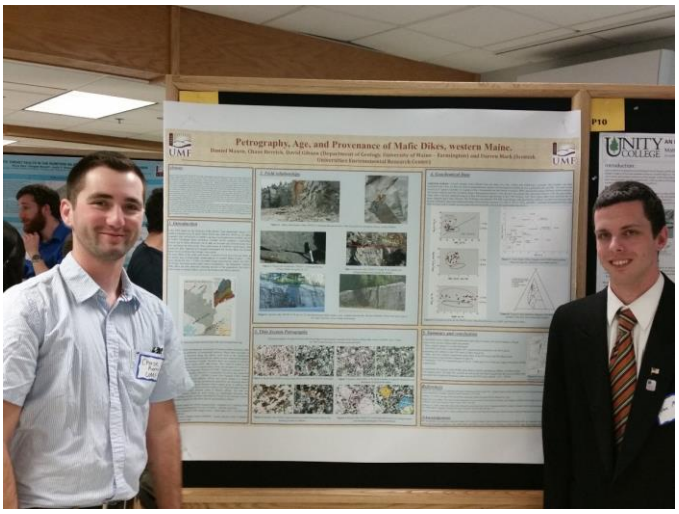
New bedrock 1:24,000 mapping and complimentary zircon geochronology in the southern half of the Mt. Crescent 7.5' quadrangle in northern NH along the Bronson Hill Anticlinorium and within the Jefferson Dome was completed as part of the USGS/NHGS StateMap program. The mapping reveals the following: 1) a variety of gray to pink, variably foliated Ordovician Oliverian granites; 2) several narrow, highly sheared lenses of Ordovician Ammonoosuc Volcanics within the Oliverian suite; 3) a previously undiscovered metasedimentary xenolith; 4) Ordovician weakly to non-foliated syenite; and 5) the crescentic-shaped Jurassic Mt. Crescent ring dike. Regions of silicified zones marking late brittle faults were also found and correlate to those found in the SW adjacent Mt. Dartmouth 7.5' quadrangle. Rare Jurassic mafic and rhyolitic dikes were also mapped and correlate to those found in the nearby Jefferson 7.5' quadrangle. Crystallization and detrital zircon U-Th-Pb ages were determined for five samples from the study area. These five samples included three from the Oliverian granites, one from the granite porphyry of the Mt. Crescent ring dike and one from the metasedimentary xenolith found in the southwest corner of the quadrangle. Two of the three samples believed to be part of the Oliverian yielded concordant zircon ages of 440.1 +/- 2.6 Ma and 447.2 +/- 2.5 Ma, supporting their inclusion as part of the Ordovician Jefferson Dome. The third Oliverian sample yielded a concordant zircon age of 334.0 +/- 2.2 Ma, surprisingly indicating a Carboniferous age of intrusion. This sample also contained older zircons that were Ordovician in age, suggesting that it inherited them from the surrounding Oliverian Jefferson Dome rocks during intrusion. The sample of the Mt. Crescent ring dike yielded a concordant zircon age of 178.4 +/- 1.1 Ma, supporting its previous age designation. The metasedimentary xenolith yielded a maximum depositional age of 429.3 +/- 7.0 Ma, suggesting that it is Silurian and further that the enveloping coarse granite, previously designated as Ordovician, is no older than Silurian in age.

MEETING PHOTOS

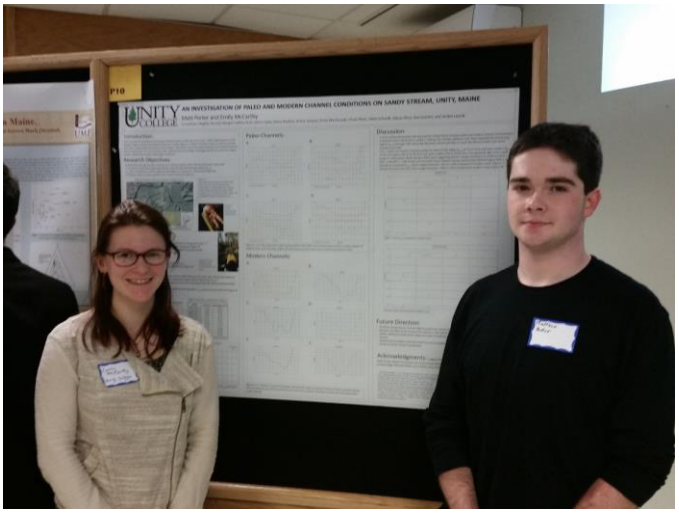







Petrography, Age, and Provenance of Mafic Dikes, western Maine.
UMF
UNITY COLLEGE


WALTER A. ANDERSON
STUDENT AWARD


AN INVESTIGATION OF PALEO AND MODERN CHANNEL CONDITIONS ON SANDY STREAM, UNITY, MAINE
UNITY COLLEGE


Walt
Anderson

UPCOMING EVENTS

Date	Event	Location	Organizer
July 27-29	2018 GSM Summer Field Trip	Northern Maine, west of Ashland	Chunzeng Wang
August 6-13	2018 Grand Canyon Rafting Trip	Lee's Ferry, Arizona	Fred Beck and Alison Jones
September 10-13	69th Annual Highway Geology Symposium	Portland, Maine	Highway Geology Symposium
October 12-14	110th New England Intercollegiate Geological Conference – joint meeting – 90th Annual New York State Geological Association Field Conference	Lake George, New York	Colgate and Castleton Universities (William Peck and Timothy Grover)
October 14-20	Earth Science Week www.earthsciweek.org Theme Days:	Check the website for events near you	American Geosciences Institute
	International Earthcache Day Earth Science Literacy Day Earth Observation Day National Fossil Day Geoscience for Everyone Day Geologic Map Day International Archaeology Day	The Maine State Museum hosts Maine Earth Science Day for school groups on Tuesday of Earth Science Week	
November 4-6	Exploration, Mining and Petroleum Conference	Fredericton, New Brunswick, Canada	New Brunswick Department of Energy and Resource Development
November 9	2018 GSM Fall Meeting	Augusta Civic Center	
March 17-19, 2019	2019 Geological Society of America Northeastern Section 53rd Annual Meeting	Portland, Maine	Steve Pollock
March 28	2019 Maine Sustainability & Water Conference	Augusta Civic Center	Senator George J. Mitchell Center for Sustainability Solutions
May 12-15	GAC-MAC Annual Meeting 2019	Québec City Convention Center	Geological Association of Canada – Mineralogical Association of Canada

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 modern 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 a field trip). A newsletter, ***The Maine Geologist***, is published for all members three times a year. The Society year runs from Aug. 1 to Jul. 31. Annual dues and gift or fund contributions to the Society are tax deductible. There are four classes of membership:

2018 FEE SCHEDULE

$ 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	$_____
Institutional Members	$ 20.00	$_____
Associate Member	$ 10.00	$_____
Student Member	$ 5.00	$_____
Contributions to GSM		$_____
(please write gift or fund on check)		
TOTAL ENCLOSED		$_____

Name _____

Address _____

_____

_____

Make checks payable to:
Geological Society of Maine
Bruce Hunter, GSM Treasurer
44 Old Fairgrounds Rd
Readfield, ME 04355

Email Address _____

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

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.
Items for inclusion in the **Newsletter** may be directed to:

THE GEOLOGICAL SOCIETY OF MAINE
c/o Amber Whittaker, Newsletter Editor
Maine Geological Survey
93 State House Station
Augusta, ME 04333-0093
amber.h.whittaker@maine.gov

2018/2019 SOCIETY YEAR BEGAN August 1
PLEASE SEND DUES TO <u>TREASURER</u>.

THE GEOLOGICAL SOCIETY OF MAINE
c/o Bruce Hunter, GSM Treasurer
44 Old Fairgrounds Rd
Readfield, ME 04355

PLEASE PAY YOUR DUES!

THE GEOLOGICAL SOCIETY OF MAINE EXECUTIVE COUNCIL

President	Henry Berry	(2018)	Maine Geological Survey, henry.n.berry@maine.edu
Vice President	Sarah Hall	(2018)	College of the Atlantic, shall@coa.edu
Secretary	Lisa Jacob	(2018)	Sevee & Maher Engineers Inc., ljj@smemaine.com
Treasurer	Bruce Hunter	(2018)	Maine DEP, bruce.e.hunter@gmail.com
Newsletter Editor	Amber Whittaker	(2018)	Maine Geological Survey, amber.h.whittaker@maine.gov
Directors	Steve Kelley	(2018)	Haley & Aldrich, skelley@haleyaldrich.com
	Martin Yates	(2019)	University of Maine, yates@maine.edu
	Mike Deyling	(2020)	CES, Inc., mdeyling@ces-maine.com
Historian	Fred Beck	(2018)	F.M. Beck, Inc., fmbeck@fmbeck.net

PARTICIPANT INFORMATION

2018 SUMMER FIELD TRIP, July 27-29

Geology of the North Maine Woods

PARTICIPATION - A FULL WEEKEND

This year's field trip is in a remote area, over an hour's drive from paved roads. Once we leave the school in Ashland Friday evening we will be together for the whole weekend, away from the distractions of civilization. Therefore, it is essential that you think ahead, bring everything you will need, and come prepared to stay. If you have any questions or concerns, it is your responsibility to get in touch with the trip organizer, Prof. Chunzeng Wang of the University of Maine at Presque Isle, as soon as possible before the trip. We will meet at the Ashland District School, 180 Presque Isle Road (Rt. 163) in Ashland, to be ready to leave by **5:00 pm Friday, July 27**. We will ride together in 12-passenger vans, accompanied by 2 or 3 pickup trucks to take our equipment and supplies. There is no room at the camp or on the field trip for extra cars, so we will leave them at the school until we return Sunday afternoon.

LODGING

Special arrangements have been made for us to use a private lakefront camp on beautiful Rowe Lake, in T11 R8. There is a log cabin on the property but we will be tenting. It is your responsibility to have a tent, sleeping bag and pad, flashlight, and other necessary camping gear. There is plenty of space for tents by the lake. We will have time to set up before dark when we arrive Friday evening.

The camp has no electricity, so please bring a flashlight. Obviously, there are no electronic charging stations or electric coffee makers or electric toasters or televisions either. Don't even think about cellphone reception! Water pumped from the lake can be used for dish washing only. There is no toilet. There is an outhouse for your use, and a lake for your swimming enjoyment.

EATING

Community meals will be provided on Friday and Saturday nights. If you have special dietary requirements, please inform the trip organizer and/or bring your own food. Breakfast and lunch both Saturday and Sunday are on your own. You must bring drinking water or beverages. There is no drinking water available at the camp. Because of the size of the group, individual access to the kitchen is not realistic. There are no refrigerators, so it is best to bring foods that don't need to be kept cold, but if you do, you may bring a small cooler with ice or a cooler that you can share with others to save space. You may bring a portable camp stove to use in your own area for cooking breakfast. Open fires will not be permitted except possibly in the designated fire ring, and not if there is a southerly wind. Plan to keep waste to a minimum, as you will need to carry out all your trash and garbage.

OTHER THINGS TO BRING

In addition to camping gear, bring adaptable clothing and footwear for whatever weather the day might bring. Insect repellent, sunscreen, and water are essential. The geologic field stops are near roads, so there will not be much walking required. There will be time in the evenings and early mornings for optional activities of your own choosing and at your own risk, such as swimming in the lake or using the boats that are available, so bring any related gear you may want.

ACKNOWLEDGMENTS

Thanks to the Ashland District School for use of their parking lot. Thanks to Unity College, College of the Atlantic, and the Maine Geological Survey for providing vans and to volunteer truck drivers for transportation. Thanks to landowners for allowing us access to geologic sites. And a special thanks to the owners of the camp on Rowe Lake for allowing us to use this lovely spot as our base camp for the weekend!

REGISTRATION FORM

2018 SUMMER FIELD TRIP, July 27-29

Geology of the North Maine Woods

REGISTRATION DEADLINE: Friday, July 13th.
You **MUST** register for this field trip for planning purposes.
Space is limited.

PARTICIPANT INFORMATION

Name(s): _____ _____

Mailing Address: _____

_____

Contact email: _____ Phone: _____

REGISTRATION FEE

Number of participants registering on this form ____

$10 per participant (thanks to GSM sponsors!) $ _____

OPTIONAL ADDITIONAL ITEMS

GSM MEMBER DUES (if owed) Reg $20 / Assoc $10 / Stud $5 $ _____

[Check here if a new member ☐]

DONATION TO WALTER ANDERSON FUND (tax deductible) $ _____

TOTAL ENCLOSED: $ _____

REGISTRATION INSTRUCTIONS

1. To save your spot on the field trip registration list, complete this form and send it as an email attachment to BOTH Bruce Hunter and Prof. Chunzeng Wang at

bruce.e.hunter@gmail.com and chunzeng.wang@maine.edu

2. Then print out the completed registration form and mail it with a check for the total amount made payable to *Geological Society of Maine* at the address below by **Friday, July 13th**. [Please don't bring money to the field trip!]

Bruce Hunter
GSM Treasurer
44 Old Fairgrounds Rd
Readfield, ME 04355

Questions about the field trip? Email Professor Wang at chunzeng.wang@maine.edu.
We leave the Ashland District School at **5:00 pm**, Friday, July 27