Granite State Geologist

The Newsletter of the Geological Society of New Hampshire,
Summer Edition – June 2018 – Issue No. 101
Newsletter Editor: Wayne.Ives@des.nh.gov **Website:** http://www.gsnh.org/

In this issue:

MESSAGE FROM THE PRESIDENT

Summer is here and the GSNH Summer Field Trip is going to be a doozy. Ken Galli and Richard Bailey will lead an air conditioned bus tour to outcrops in the Boston Basin. Everything you need to sign up is on the website. Bring your lunch and enjoy the ride and the outing. Space is limited, so be sure to reserve a spot by getting your name and a check to Abby Fopiano early. There's a sign-up form near the end of this issue.

There's a fitting picture of Lee Wilder later in this issue from his last round of groundwater monitoring circuits that shows either: Lee, outstanding in his field; or Lee, out to pasture. (Maybe you have a better caption.) After 17 years at NH Dept. of Environmental Services, Lee has retired as of June 7 from his position in the Geological Survey as the Education and Outreach Coordinator. As part of his duties he answered questions from the public about that strange rock they have in their yard or whether they'd found a meteorite. Lee also measured the state's network of groundwater wells. Lee will be sorely missed at NHGS, but you can congratulate him on his new path in life at the next GSNH event.

There must be more Earth being made based on the amount of geology that is being discussed. I'm overwhelmed with the number and variety of things going on around the globe. I left out the Hawaii volcano eruptions in favor of other topics that you may not be hearing about.

Our next dinner meeting in October is also our annual meeting as well as an election year. The Board encourages anyone with an interest in directing the present and future of the Society to consider running for any of the positions. There are also several committees where a person could learn how the board operates and put their stamp on the Society's future. I hate to make clichés, but it really is fun, and many hands make light work. So throw your hat into the ring!

SUMMER FIELD TRIP - EXPLORING THE GEOLOGY OF THE BOSTON BASIN

Attendees will depart by bus from 29 Hazen Drive, Concord NH at 8:30 AM and return to same location by 4:30 PM on August 4, 2018. The field trip will include three stops in the South Boston (Quincy) area. Trip Leaders: Ken Galli from Boston College and Richard Bailey from Northeastern University.

Cost: $30 per person, all attendees must travel by bus

To reserve a spot for the summer field trip, contact Abby Fopiano: abigail.fopiano@des.nh.gov or mail in the sign-up form near the end of this issue.

Information on the GSNH 2018 Summer Field Trip has been posted to the GSNH Website: http://www.gsnh.org/field-trips.html

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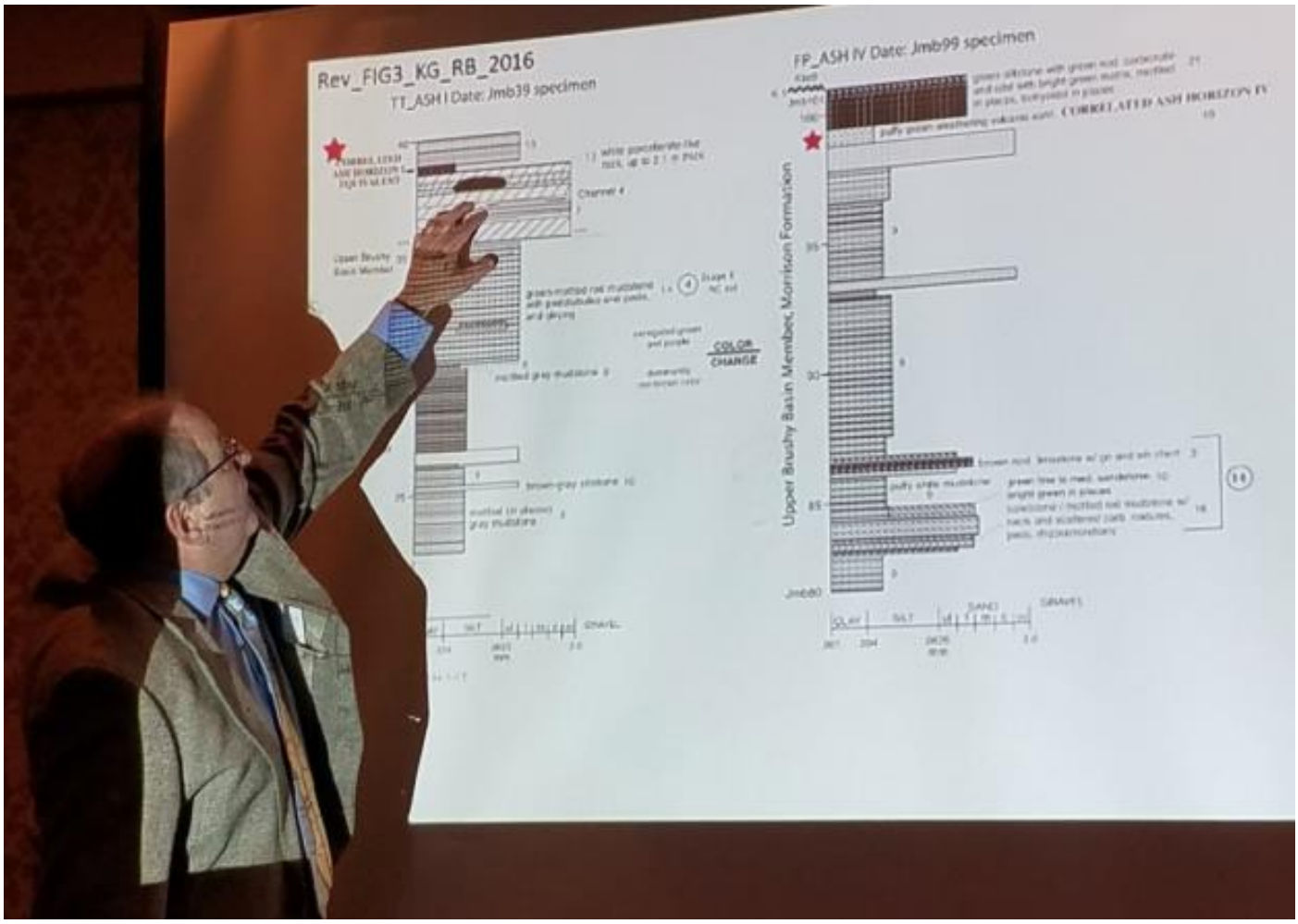
APRIL DINNER MEETINGPHOTO - photo by Abby Fopiano

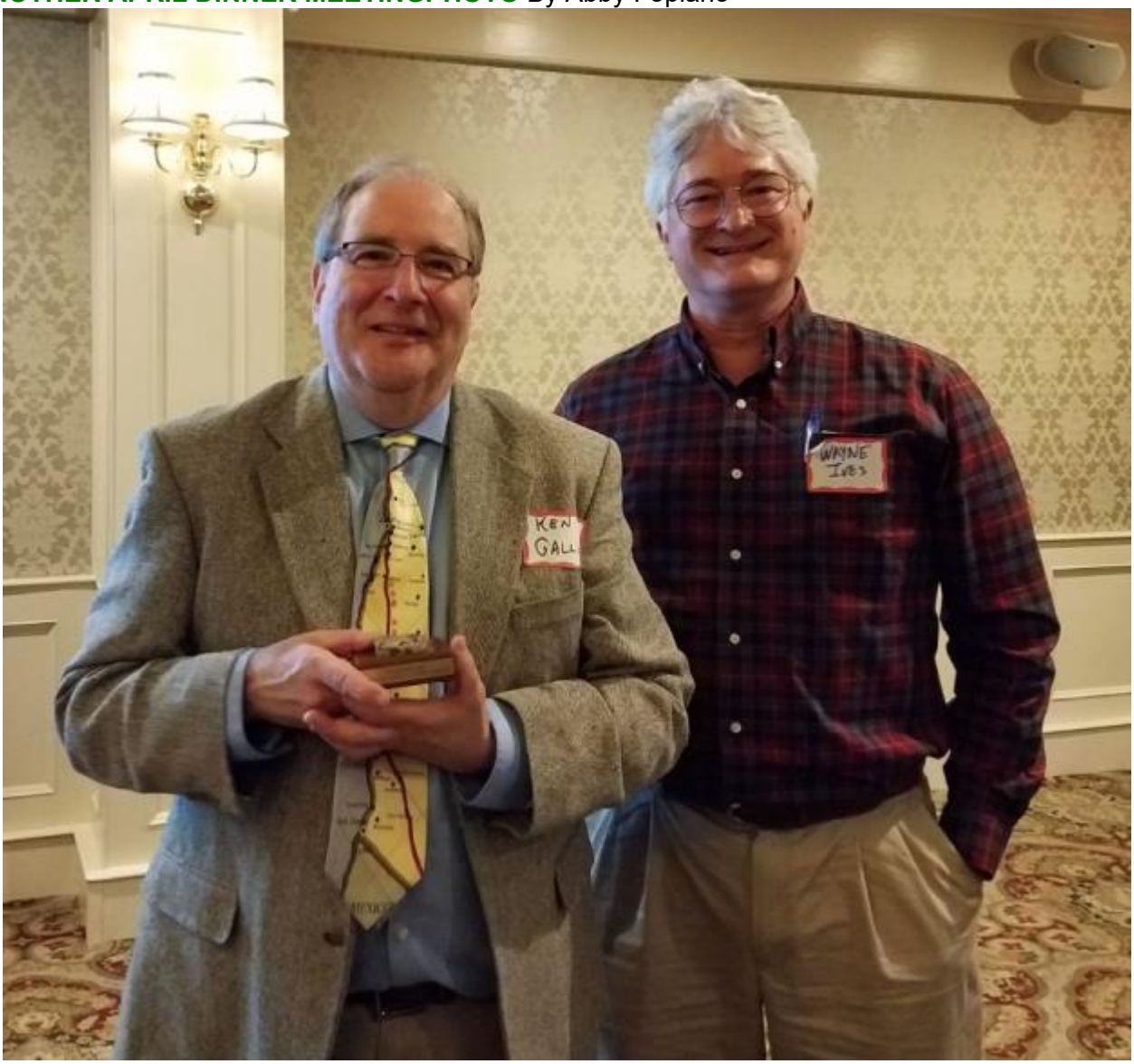


Ken Galli during his presentation at the April GSNH dinner meeting in Manchester correlates ash deposits to link formations that establish the age of the top of the Brushy Basin Member, Morrison Formation.

NEW HAMPSHIRE TOPAZ Submitted by Edna Whitmore and Lee Wilder

The Nov/Dec 2017 Vol. 92, N0. 6 issue of Rocks and Minerals Magazine has a wonderful article on NH Topaz. Written by Donald Dallaire and James Nizamoff, it covers the many NH discoveries of this splendid gem mineral. The abstract for this issue is available at: http://www.rocksandminerals.org/Back%20Issues/2017/November-December%202017/topaz-in-new-hampshire-abstract.html. The full text of this article is available by subscription only.

ANOTHER APRIL DINNER MEETINGPHOTO By Abby Fopiano



Ken Galli holds the Society's token of appreciation after the April dinner meeting given with the warm wishes of the Society and President Wayne Ives.

A GSNH TEE SHIRT WOULD SURE LOOK GOOD ON YOU!

Ask Tom Fargo or Julie Spencer about buying one at the next dinner meeting! Only about a dozen left in most sizes. Still only $18.

WHAT IS YOUR BOARD DOING? Submitted by Shane Csiki, Secretary

On Thursday, June 14, 2018, the Board of Directors met for its quarterly meeting in Hopkinton, courtesy of Lee Wilder. As always, the Board discussed a number of items.

The annual summer field trip for this year will be a tour of the Geology of the Boston Basin. The Board is procuring a tour bus for the trip, to make travel logistics in Boston easier for all. More details about the trip and registration information can be found on the GSNH website. The next dinner meeting will be held on Thursday, October 18 at the Makris Steak House in Concord. Meredith Kelly, Associate Professor of Earth Science at Dartmouth College will be the featured speaker. The January 2019 dinner meeting will also be held at the Makris Steak House.

GSNH has not had any applications for its Classroom Enhancement awards recently. Given that this presents a genuine opportunity for teachers in the state to enhance earth science education in the classroom, the Board spent some time discussing how to better market the availability of this opportunity to teachers in the state. One option discussed was to present at state workshops on the topic. The Board is open to suggestions on how to enhance marketing of this opportunity.

Our next Board of Directors meeting will be held on Thursday, September 13, 2018, at 6 PM at the New Hampshire Department of Environmental Services. All members are welcome to attend our meetings. Please let a Board member know if you would like to attend or if there is an item of interest that you would like added to the agenda.

LEGISLATIVE COMMITTEE REPORT by Thomas Fargo – June 2018

At this writing, the 2018 session of NH General Court (State Legislature) has wrapped up most of its activities. Later this summer, Legislative Study Commissions and Committees will be formed and initiate their work toward recommendations for further legislation.

During 2018, the Legislative Committee tracked 25 bills of interest. A tabulation of these bills will be posted on the GSNH website. Thirteen of these bills have been voted by the full House or Senate as "Inexpedient to Legislate" (ITL), killing the bill.

Three bills that were tracked by GSNH were related to professional licensure and regulation in NH. Of interest was HB-1685 – "*AN ACT establishing a statutory commission for oversight over occupational regulation".* This bill was passed by the full House contrary to the Executive Departments and Administration committee's recommendation to ITL. In my March update, I had predicted that HB-1685, which had the support of Governor Sununu, would pass the Senate. On April 5, 2018, the full Senate voted ITL and killed this bill.

Tracked bills that passed both the House and Senate and were signed into law included:

- HB-1592 - Requiring the NHDES to review the ambient groundwater quality standard (AGQS) for arsenic in drinking water and make recommendations for any changes to the standard to the General Court by January 1, 2019.
- HB-1651 - Establishing a Legislative Committee to study the effect of liquid de-icers and solid salt on roads and vehicles. Committee recommendations for further legislation are due November 1, 2018.
- HB-1689 – Re-establishing the pollution prevention program within NHDES.
- SB- 368 - Establishing an exemption from shoreland protection permitting requirements for maintenance and repairs of existing roads and for borings and test wells.
- SB-372 - Authorizes three license clerk positions in the Office of Professional Licensure and Certification and makes an appropriation therefor.

Final action by Governor Sununu on several bills passed by both the House and Senate is still pending. Notable among these is significantly amended SB-309 that would regulate groundwater pollution caused by polluting emissions in the air, and relative to standards for perfluorochemicals in drinking water, ambient groundwater, and surface water.

320-MILLION-YEAR-OLD BRIMHAM ROCK FORMATION IN ENGLAND DESTROYED BY VANDALS By Sean Breslin June 15, 2018
https://weather.com/news/news/2018-06-15-vandals-destroy-brimham-rocks-england

A popular rock formation known as the Brimham Rocks were reportedly destroyed by vandals earlier this month. The formation dated back 320 million years and was located in northeastern England. Authorities are asking for help to find out who was responsible for the vandalism. The National Trust said the rock formations were "created by an immense river 100 million years before the first dinosaurs walked the Earth." More on Brimham Rocks at https://www.nationaltrust.org.uk/brimham-rocks#Overview.

Teens Destroy Ice Age Landmark at Brimham Rocks in England - It took 320 million years for these amazing rocks to form and stack – but it only took seconds for vandals to cause irreparable damage.

The rocks are seen broken in pieces below the cliff after vandals destroyed the formation. (SWNS)

Authorities said the Brimham Rocks, which balanced delicately on the side of a cliff and were molded by weather for millions of years, were pushed over the edge and broke into dozens of pieces

after hitting the ground. The tourist destination owned by the National Trust attracts thousands of visitors each year, according to Metro UK.

“At around 8:45 p.m. on (Friday, June 1), a group of five young people were seen pushing a rock at the top of one of the crags," said North Yorkshire Police. "This resulted in the rock falling from the crag causing damage to the crag face. The damage this has caused is irreplaceable and it is now in a potentially dangerous condition."

A before-and-after shot shows what one of the rock formations looked like, and the empty space that remains. (SWNS)

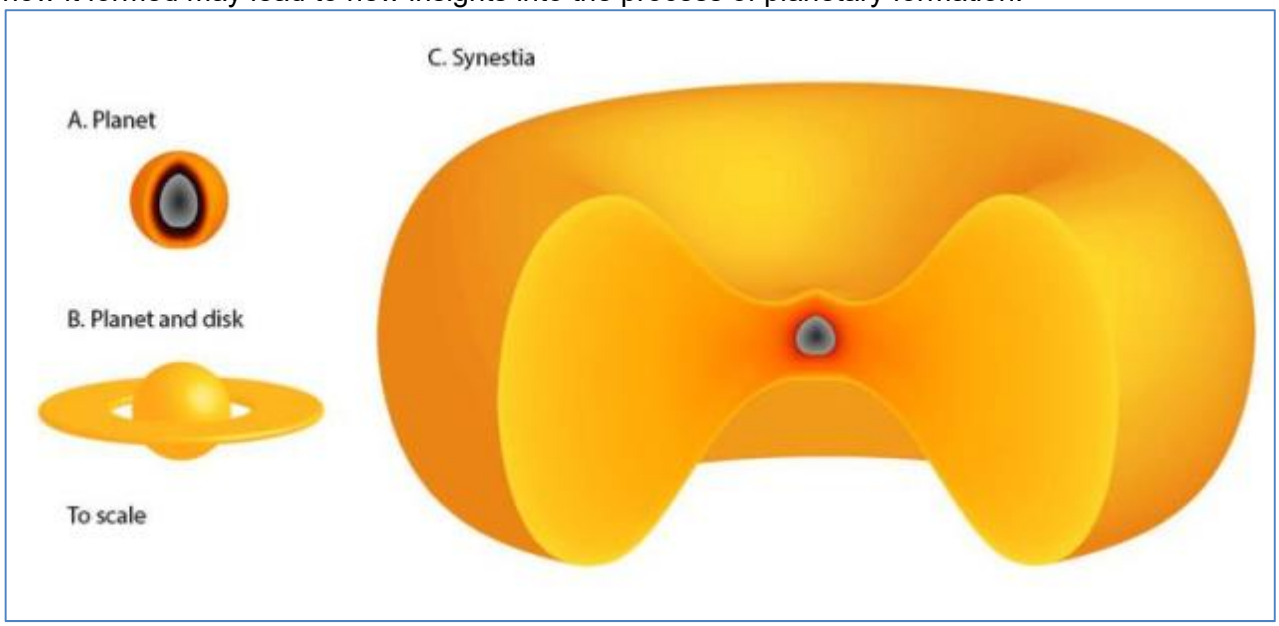
In addition to the destruction of the rock formation, the vandals also carved names and other messages into the rocks that have been denoted an Area of Outstanding Natural Beauty. "It might have been fun for some people," National Trust spokeswoman Helen Clarke told Bored Panda. "Actually, it is just completely pointless and needless."

Messages are carved into the rock near the area where the Brimham Rocks were destroyed. (SWNS)

WHAT HAPPENS AS A PLANET FORMS? A SYNESTIA! by Carolyn Collins Petersen

Updated June 26, 2017

A long time ago, in a nebula that no longer exists, our newborn planet was hit with a giant impact so energetic that it melted part of the planet and the impactor, and created a spinning molten glob. That whirling disk of hot melted rock was turning so fast that from the outside it would have been difficult to tell the difference between the planet and the disk. This object is called a "synestia" and understanding how it formed may lead to new insights into the process of planetary formation.



A computer model of a synestia, the intermediate step in Earth's formation when it was a molten, spinning glob. Simon Lock and Sarah Stewart.

The synestia phase of a planet's birth sounds like something out of weird science fiction movie, but it may be a natural step in the formation of worlds. It very likely happened several times during the birth process for most of the planets in our solar system, particularly the rocky worlds of Mercury, Venus, Earth, and Mars. It's all part of a process called "accretion", where smaller chunks of rock in a planetary birth créche called a protoplanetary disk slammed together to make bigger objects called planetesimals. The planetesimals crashed together to make planets. The impacts release huge amounts of energy, which translates into enough heat to melt rocks. As the worlds got larger, their gravity helped hold them together and eventually played a role in "rounding" their shapes. Smaller worlds (such as moons) can also form the same way.

Earth and its Synestia Phases - The process of accretion in planetary formation is not a new idea, but the idea that our planets and their moons went through the spinning molten glob phase, probably more than once, is a new wrinkle.

Planetary formation takes millions of years to accomplish, depending on many factors, including the size of the planet and how much material there is in the birth cloud. Earth probably took at least 10 million years to form. Its birth cloud process was, like most births, messy and busy. The birth cloud was filled with rocks and planetesimals [one of a class of bodies that are theorized to have coalesced to form Earth and the other planets after condensing from concentrations of diffuse matter early in the history of the solar system.] continually colliding with each other like a huge game of billiards played with rocky bodies. One collision would set off others, sending material careening through space.

Large impacts were so violent that each of the bodies that collided would melt and vaporize. Since these globs were spinning, some of their material would create a spinning disk (like a ring) around each impactor. The result would look something like a donut with a filling in the middle instead of a hole. The central area would be the impactor, surrounded by molten material. That "intermediate" planetary object, the synestia, was a phase. It's very likely that infant Earth spent some time as one of these spinning, molten objects.

It turns out that many planets could have gone through this process as they formed. How long they stay that way depends on their masses, but eventually, the planet and its molten glob of material cool and settle back into a single, rounded planet. Earth probably spent a hundred years in the synestia phase before cooling.

The infant solar system didn't quiet down after the baby Earth formed. It's possible that Earth went through several synestias before the final form of our planet appeared. The entire solar system went through periods of bombardment that left craters on the rocky worlds and moons.

If Earth were hit several times by large impactors, multiple synestias would happen.

Lunar Implications - The idea of a synestia comes from scientists working on modeling and understanding the formation of the planets. It may explain another step in planetary formation and could also solve some interesting questions about the Moon and how it formed. Early in solar system history, a Mars-sized object called Theia crashed into the infant Earth. The materials of the two worlds mingled, although the crash did not destroy Earth. The debris kicked up from the collision eventually coalesced to create the Moon. That explains why the Moon and Earth are closely related in their composition. However, it's also possible that after the collision, a synestia formed and our planet and its satellite both coalesced separately as the materials in the synestia donut cooled.

The synestia is really a new class of object. Although astronomers haven't observed one yet, the computer models of this intermediate step in planet and moon formation will give them idea of what to look for as they study planetary systems currently forming in our galaxy. In the meantime, the search for newborn planets continues.

If you want more and more detail:
https://www.ucdavis.edu/news/how-moon-formed-inside-vaporized-earth-synestia/

https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1002/2017JE005333
A preprint of the article is available on ArXiv (https://arxiv.org/abs/1802.10223).

MAINE ICE AGE TRAIL MAP ORDERING, WEBSITE from Woody Thompson

Hi All, Several people on last weekend's FOP trip asked me how to order Maine's Ice Age Trail map. Here's the U. Maine bookstore page where the map is listed: https://secure3.sequoiars.com/ePOS?form=shared3/gm/detail.html&item_number=2800979605606&cat=&store=411&design=411. Note that this is the 2nd (2007) edition, which improves on the first map that was widely distributed for free. It has geology updates, better paper, and folds together easily.

The website for the trail has been greatly improved by the Climate Change Institute, and now includes an App for your self-guided tour or class field trip: http://iceagetrail.umaine.edu/

The Trail Stops link takes you to pages with stop descriptions, photos, and the latest online version of the map itself. Note that the geologic map units are from the Maine Geological Survey's state surficial map. Most of the moraines are from that same source, with additions north of MDI from recon quad mapping by Hal Borns. Due to scale limitations and the great number of moraines, not all of them could be shown here.

My field work using LiDAR west of Cherryfield, and Duane's mapping on MDI, indicates that the western extrapolation of the Pineo Ridge ice margin (wide purple line) needs to be moved slightly to the south, such that it crosses the northern part of MDI. We'll be refining this correlation effort when more 2-m Lidar becomes available in key areas around Pineo Ridge.

Cheers, Woody Thompson

THE STRANGEST TRILOBITES – American Museum of Natural History
https://www.amnh.org/our-research/paleontology/paleontology-faq/trilobite-website/gallery-of-trilobites/the-orders-of-trilobites-order-from-chaos and https://www.amnh.org/our-research/paleontology/paleontology-faq/trilobite-website/the-trilobite-files/the-strangest-trilobites?platform=hootsuite

Trilobites feature an almost dizzying array of sizes, shapes, spines and segments. Their body plans, while all following a fundamentally similar three-lobed pattern, present an incredible diversity of design. Some trilobite species reached lengths in excess of two feet. Others never exceeded a fraction of an inch. Some had multi-faceted eyes sitting atop three-inch stalks… others had no eyes at all.

During their 270 million year trek through evolutionary time, these amazing arthropods generated more than 25,000 scientifically recognized species. The diversity of body designs presented by the trilobite class is nothing less than astonishing. In size, shape and appearance, few creatures that have ever existed display the degree of morphological variance exhibited by these Paleozoic arthropods.

Trilobites survived for over a quarter of a billion years -- plenty of time for them to develop into the more than 25,000 species so-far recognized by science. But amid that mind-boggling variety of trilo-types, there exist a number of species that are so unusual, so strange, so out-and-out bizarre that they deserve special mention. These are creatures so alien in appearance that they could easily serve as featured attractions in any Hollywood sci-fi spectacular -- but few observers would believe that such out-of-this-world life forms could actually exist. But they did… and they were among the first rulers of the earth's seas.

Imagine the likes of Actinopeltis globosus, a trilobite with a perfectly symmetrical “ball” perched on its glabella. Picture others such as Walliserops trifurcatus with a trident-like fork extending from the front of its cranadium… or Asaphus kowalewski with eyes sitting atop two-inch long stalks… or the aptly-named Dicranurus monstrosus with two monstrous “horns” sweeping back from the top of its cephalon… or Cyclopyge bohemica which possessed a single eye that literally wrapped around the entire front of its head.

Indeed, the multitude of trilobite body designs are almost difficult to fathom -- even for those who have grown extremely familiar with these primeval aquatic inhabitants. And amid those designs are some that even the likes of Salvador Dali would have had difficulty envisioning; Erbenochile issimourensis, which actually developed a shading “brow” atop it's thick inch-long eye stacks, Odontocephalus ageria with a frilled “cow-catcher” emanating from the front of its cephalon, and Asaphellus cuervoea with genal spines so long that they may have functioned like “wings” allowing this species to sail through the warm tidal estuaries it called home.

Scientists agree that these varied and unusual morphological features benefitted their host trilobite in some significant manner during the creature's daily quest for survival. It has been speculated, for example, that the “ball” atop the nose of Actinopeltis may have been used as a flotation device while the trilobite was navigating rough seas. But others surmise that the same anatomical feature might well have functioned as an egg sack. The trident attached to Walliserops may have served a variety of purposes: an anchor during storms… a grasping device while mating… a defense mechanism… or even a tool used to aid feeding.

Whether or not we ever discover the true functions that these incredibly bizarre bodily features served, the undeniable conclusion we reach is that trilobites were amazingly adaptable creatures, animals capable of evolving rapidly and effectively in order to maximize any ecological advantage. And while eye stalks, nose sacks, tridents and horns may seem incredibly unusual to us, the fact is that such developments allowed trilobites to exist for nearly 300 million years and leave behind a fossil legacy that perhaps no other creature can equal.

Learn more than you knew was possible about trilobites at https://www.amnh.org/our-research/paleontology/paleontology-faq/trilobite-website. Here's a look at some of the strangest trilobites in the fossil record:

The Ordovician trilobite *Actinopeltis globosus* presented what appears to be a ball on its nose, a feature that might have been used for flotation.

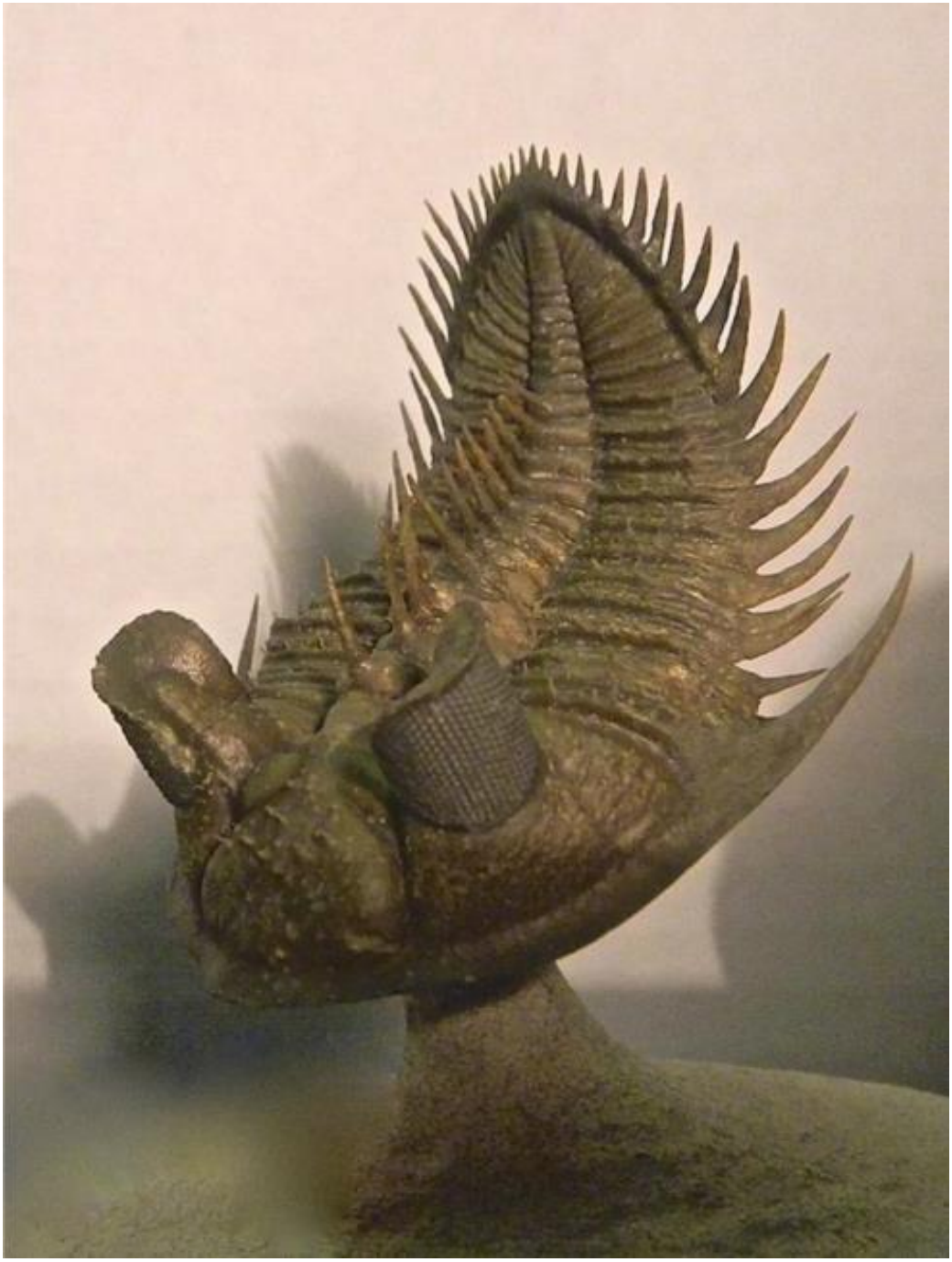
The Russian trilobite *Asaphus kowalewski* had eyes perched atop two-inch long stalks.

Dicranurus monstrosus possessed two ram-like horns that swept back from its cephalon.

Above; Odontocephalus ageria, found in the Devonian rocks of Pennsylvania, utilized a cephalic extension that resembled a cow-catcher.

Left: The Moroccan trilobite Asaphellus cuervoea had wing-like genal spines that may have allowed it to glide through ancient seas.

Walliserops trifurcatus is a Moroccan trilobite that presented a trident-like fork emanating from its cephalon.



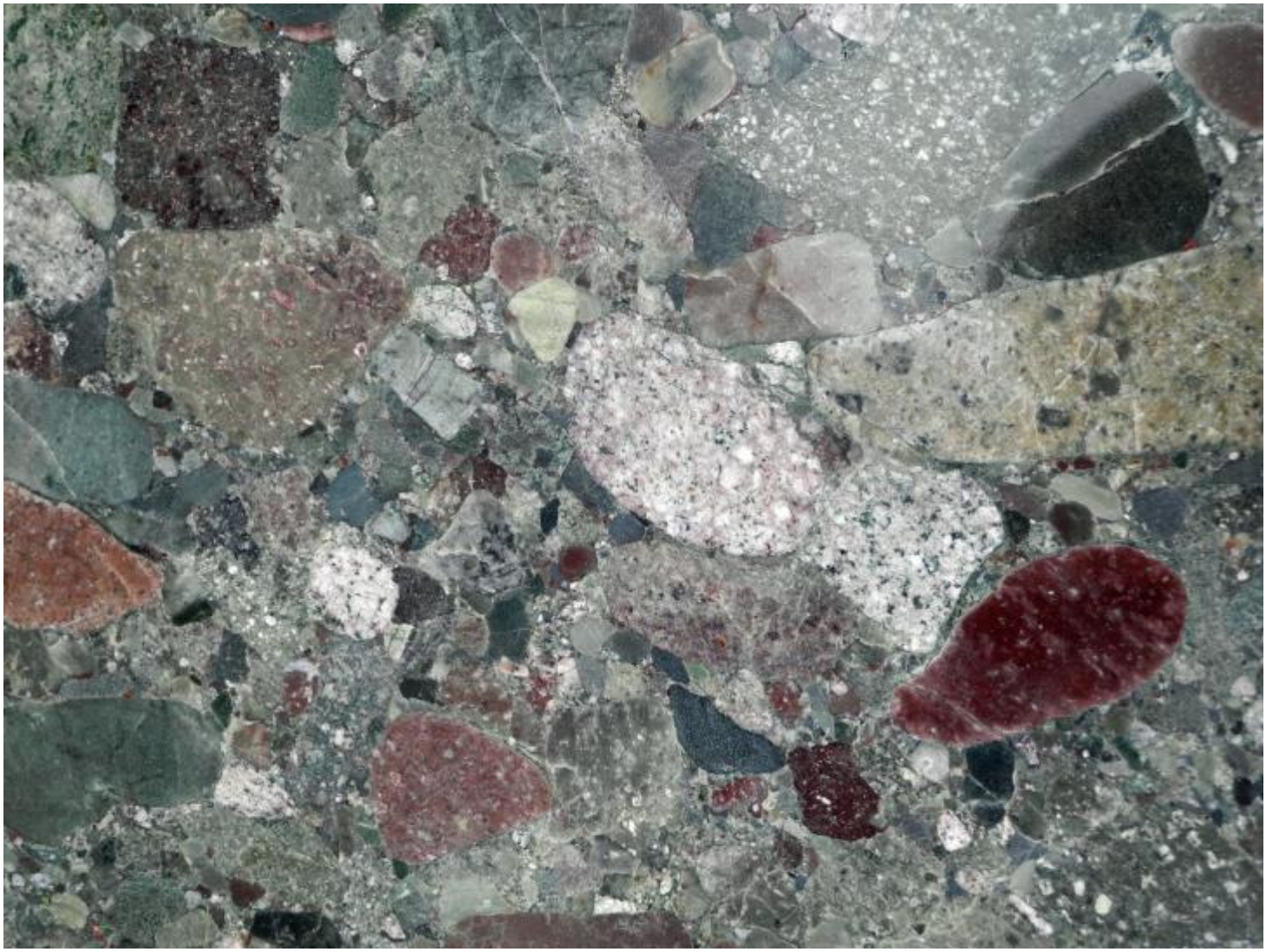
Not only did Erbenochile issimourensis possess some of the largest eyes in the trilobite world, but it also developed a pronounced "brow" to help shade them.

PHOTO OF THE BLUE LAGOON AREA IN ICELAND AND A SHOT ACROSS REYKJAVIK BAY
from Bill Abrahams-Dematte

THE ROXBURY CONGLOMERATE From blog of Dr. Jack Share http://written-in-stone-seen-through-my-lens.blogspot.com/2011/03/

The Massachusetts State Rock

The Roxbury Conglomerate is the state rock of Massachusetts, named as such in 1983. It forms much of the basement rock under the city of Boston and its surrounding environs. What's more, a great many of the older structures in Boston are constructed of it! What is the Roxbury Conglomerate? How did it form? When did it form? Why was it used as a building stone as opposed to other rocks that were more plentiful and more massive in New England? Much is known, but in spite of investigation and research that has spanned over a century, the depositional and tectonic history of the Roxbury Conglomerate and the Boston Basin, in which it is found, has remain somewhat controversial and enigmatic



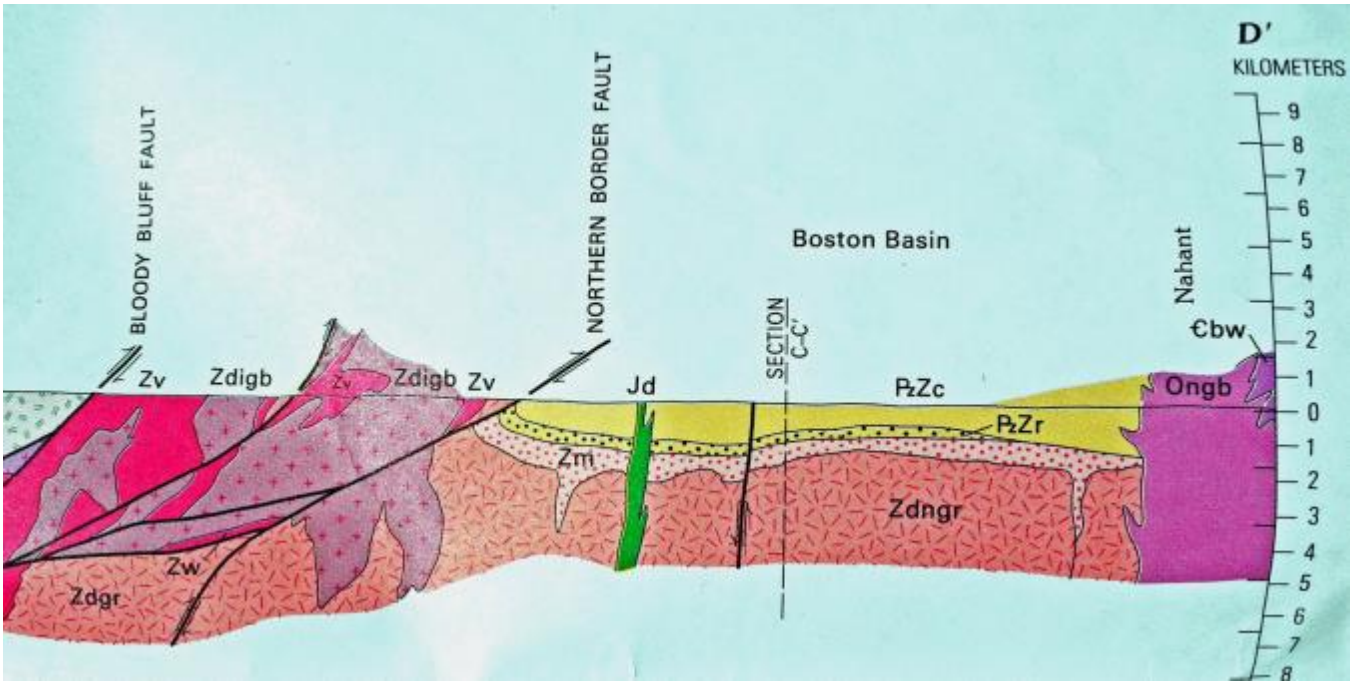
In front of the Museum of Science in Boston is a large display of rocks from all over the world, including New England. On display is a massive boulder of Roxbury Conglomerate with one side beautifully polished. Here one can see the density of the clasts as well as their varied composition.

The Lithology Of The Roxbury Conglomerate

The type locality for the Roxbury Conglomerate is the town of Roxbury, Massachusetts, a neighborhood of Boston situated to the southwest. Roxbury was founded by English colonists in 1630 as an independent community before its annexation to Boston. The town had many resources for the early colonists amongst which were stone for building. In fact the town was originally called “Rocksbury” because of the many outcrops of native Roxbury puddingstone. Its puddingstone was described by the

Boston physician and author Oliver Wendell Holmes, Sr. (his Jr. son was the Supreme Court justice) in T*he Dorchester Giant* as “plums in a pudding.”

Traditionally, Roxbury Conglomerate is divided in ascending order into the Brookline, Dorchester and Squantum Members (geochronologically constrained as younger than ca. 593 Ma). Although lithologically variable, the conglomerate can be summarized as having sediment that is poorly sorted and ranging in size from fine sand to coarse cobbles. The matrix variably consists of grayish-pink, feldspar-rich, arkosic sandstone. Clast types generally include a mix of igneous and metamorphic rock such as granite, rhyolite, quartzite and felsic rock derived from the surrounding volcanic highlands. Each rock type has its own distinctive history such as speckled granite formed by the underground cooling of magma, and maroon and pink rhyolite formed during volcanic eruptions. The clasts range in color from light blue-gray to dark gray, and pale pink to maroon.



This schematic map illustrates the cross-sectional relationship of the Boston Basin (tan) to the adjacent volcanic and metamorphic zones of Avalonia. Modified from the Bedrock Geologic Map of Massachusetts, Department of the Interior, United States Geological Survey, Goldsmith et al, 1983.

With its coarsely-ornamental appearance, high availability, suitable working characteristics, favorable physical properties and convenience of location, Roxbury Conglomerate found its way into usage in early house-foundations, Gothic churches, and landscape architecture in Boston and its immediate environs to the west and south. Those structures are unmistakable and can be seen today preserved in their stately splendor.

In talking to local Bostonians, it's surprising how many are familiar with the term puddingstone, but relatively few are aware of its architectural heritage, let alone its astounding geological provenance. Hopefully, this post will help shed more light onto the Roxbury Conglomerate, the state rock of Massachusetts.

Also, check out David Williams' blog and book for all the great geology you can discover on the urban landscape in Boston and other cities at http://stories-in-stone.blogspot.com/.

This map depicts the bedrock of the Boston Basin and that of the neighboring volcanic and metamorphic zones of Avalonia. Abbreviations for the Roxbury Conglomerate (Proterozoic Z to earliest Paleozoic) are colored tan: PzZc, Cambridge Argillite; PzZrb, Melaphyre in Roxbury Conglomerate. Modified from the Bedrock Geologic Map of Massachusetts, Department of the Interior, United States Geological Survey, Goldsmith et al, 1983.

The Roxbury Conglomerate displaying its sandstone matrix and variously-derived clasts

NH'S MIDDLE DEVONIAN "TURKEY TRACKS" From blog of Dr. Jack Share http://written-in-stone-seen-through-my-lens.blogspot.com/2015/

In 1802, a central Massachusetts farm boy named Pliny Moody was plowing the family fields in the rural hamlet of South Hadley. By chance, he uncovered a slab of rock that contained a series of three-toed footprints set in mudstone from the Late Triassic strata of the Deerfield aborted rift basin. It was the first recorded discovery of dinosaurs in North America, but the definitive connection wasn't made until 1824 in England. At the time, Pliny's colossal discovery was identified as the footprints of Noah's raven from the Biblical flood. According to the story, the specimen became the door stop to Pliny's home, which was later substantiated as non-Biblical but definitely avian by Professor Hitchcock of Amherst College, Massachusetts, a leading vertebrate ichnologist.

Lichen-encrusted, Ordovician-age "turkey tracks" in Littleton schist of Mount Monadnock in the southern White Mountains of New Hampshire

It wasn't so far-fetched that a similar find should also have a similar ornithological explanation, only not related to Noah's Flood. On the upper flanks of nearby Mount Monadnock in the southern White Mountains of New Hampshire, stampedes of four-inch long "turkey tracks" abound, called as such for over 100 years. Only there, they're in much earlier, Ordovician-age metamorphosed rock of the Littleton Formation, a gray-weathering pelitic schist and micaceous quartzite. From a taphonomous (fossil preservation) standpoint, rocks such as these that have been submitted to considerable heat and pressure at great depth - which were deposited and later deformed in the Middle Devonian Acadian foreland basin - rarely preserve fossils.

Mount Monadnock in southern New Hampshire from the west

Pliny's ichnofossils are traces or tracks of lifeforms rather than preserved organic remains, whereas Monadnock's turkey tracks are pseudomorphs or "false forms". They are crystals consisting of one mineral but having the form of another which it has replaced. Thus, sillimanite pseudomorphs regionally metamorphosed from andalusite are found within the schist that preserve chiastolite cross-shaped inclusion patterns - our turkey tracks. "Copy and Paste" the following co-ordinates into Google Earth to visit Mount Monadnock: 42°51'40.22"N 72°06'30.36"W

GUIDELINES FOR AUTHORS, EDITORS, AND PUBLISHERS OF GEOLOGIC FIELD TRIP GUIDEBOOKS

The GSIS Guidebooks Committee is pleased to announce the newly revised ***Guidelines for Authors, Editors, and Publishers of Geologic Field Trip Guidebooks*** have been added to the GSIS website. In updating the Guidelines, the Committee expanded recommendations about archiving field trip guidebooks, among other changes. We encourage members to share these guidelines broadly with local geology organizations, researchers, and enthusiasts. They are available at: http://www.geoinfo.org/guidebook%20guidelines.pdf.

DATES TO REMEMBER

July 21-22, 2018 - **57th Annual Western Maine Gem & Mineral Show**, Telstar High School, 284 Walkers Mills Rd. (Rt. 26), Bethel, ME https://www.bethelmaine.com/events/details/57th-annual-western-maine-gem-mineral-and-jewelry-show-5243

July 28-29, 2018 - **39th Annual Champlain Valley Gem, Mineral and Fossil Show**, Tuttle Middle School 500 Dorset Street Burlington, VT *2018 Show Theme: "Colorful Minerals"* Saturday and Sunday 10:00 am - 5:00 pm
http://www.burlingtongemandmineralclub.org/show.html

August 10-12, 2018 - **East Coast Gem Mineral Fossil Show** - Eastern States Exposition, West Springfield, MA https://www.mzexpos.com/east-coast-show

August 25-26, 2018 - **Capital Mineral Club Show** - Everett Arena, Concord, NH - http://www.capitalmineralclub.org/55th_annual.php

September 27, 2018 - **Annual Pedro de Alba Lecture in Geotechnical Engineering**. Guest speaker Dr. Harry G. Poulos from the University of Sydney, Australia. Also planned is a technical afternoon session with Dr. Poulos and another one or two speakers on the topic of deep foundations. Help us update our e-mail list. Jean Benoît, Professor Department of Civil Engineering University of New Hampshire Kingsbury Hall, W 177, Durham, New Hampshire 03824 jean.benoit@unh.edu.
Website for The University of New Hampshire Annual Pedro de Alba Lecture in Geotechnical Engineering - http://unh.edu/geotech/Geotech_deAlba%20Lecture.html

October 12th - October 14, 2018 - **NEIGC Preliminary Announcement** - Hosted by the Natural Sciences Department at Castleton University and The Geology Department at Colgate University. The conference location will be in Lake George, NY. Friday night reception and Saturday night banquet at the Fort William Henry Hotel. The conference will honor Bruce Selleck and William Kidd and their numerous contributions to our understanding of the geology and geological evolution of the Adirondacks, the Taconics, and the Champlain Valley. We hope to have field trips that include the bedrock and surficial geology from the Adirondacks, Taconics, Champlain Valley, and Green Mountains. If you are interested in running a field trip or if you would like more information please contact: ISBN: 978-0-922152-61-2
Tim Grover (tim.grover@castleton.edu)
Helen Mango (helen.mango@castleton.edu)
Martin Wong (mswong@colgate.edu)
William Peck (wpeck@colgate.edu)
http://w3.salemstate.edu/~lhanson/NEIGC/Conference.html

AMERICAN GEOSCIENCES INSTITUTE RELEASES 2018 DIRECTORY OF GEOSCIENCE DEPARTMENTS

The 53rd Edition provides listings of nearly 2,000 university departments, museums, federal agencies, geological surveys, and research institutions. The Directory also includes an updated title list of theses and dissertations completed by U.S. and Canadian students, starting in 2015. The new edition is $45.00 and is currently available only through Amazon.com at https://amzn.to/2GJSHXy.

FRIENDS OF THE PLEISTOCENE BAR HARBOR, MAINE From Tina Cotton

The FOP 31st annual reunion took place June 1-3, 2018 on Mount Desert Island where the surficial and bedrock geology were mapped recently by Duane and Ruth Braun. Ruth took us to the Maine Granite Industry Museum at which both leaders are volunteer docents. The museum was started by a very dynamic, engaging, knowledgeable Steve Haynes, who has been in the industry more than 40 years. He started his museum and keeps expanding it to educate the general public on the rich history of granite quarrying on the island. The museum is free, relying solely on donations. Steve thrives on demonstrating early mining methods to groups of all ages. Our group went to the abandoned Hall quarry in the Somesville granite then returned to the museum to split a large granite block. Check out the museum on the internet, especially the images.

Above: Diorama at the Maine Granite Industry Museum depicting the early days of the Hall quarry in the Somesville granite.

Left: At Somes Harbor, George Springston's finger is pointing to glacial striations as he explains the mechanics forming the crescentic gouges seen on the surface of the Silurian Somesville granite.

Below: Trip leader, Duane Braun fields questions at The Tarn, a proglacial lake, in the floor of a U-shaped valley near Rt. 3 on Mount Desert Island.

TRIP REPORT: 2018 NORTHEASTERN FRIENDS OF THE PLEISTOCENE FIELD CONFERENCE, MOUNT DESERT ISLAND, MAINE (http://www2.newpaltz.edu/fop/)

by Woody Thompson

On June 1-3 the Friends of the Pleistocene held their 81st annual field conference in Acadia National Park on Mount Desert Island (MDI). Over 60 registrants came from around New England and beyond, including New Brunswick and Quebec. The trip was led by former Pennsylvania geologists Duane and Ruth Braun, who retired to MDI a few years ago. They have not been idle during "retirement". Duane has re-mapped the bedrock and surficial geology of MDI, and he and Ruth have published a popular guidebook to the island's geology!

2018 Friends of the Pleistocene group on Mount Desert Island.

We enjoyed perfect weather on the FOP trip, and the park was not yet clogged with summer traffic jams. We visited sites that nicely illustrate the Quaternary history of MDI, including glacial erosion and sediments, sea-level change, and coastal processes, along with a dash of bedrock geology. This was the 5th FOP excursion that Duane had led, and his careful planning of stops, lodging, transportation, and other logistics resulted in an excellent trip.

Duane's mapping of MDI has benefited greatly from LiDAR imagery, which reveals subtle glacial moraine ridges and paleo marine shorelines. Some of these features were recognized by prior workers, but many more could not be seen due to forest cover and other factors. The regressive shorelines formed in late-glacial time as isostatic crustal uplift raised the land above sea level. The shorelines that we visited are marked by a series of boulder beach berms on a hillside.

Discussing sea-level history and local stratigraphy at Sand Beach in Acadia Park. L to R: Duane Braun (trip leader), trip co-leader Joe Kelley (marine geologist, U. Maine), and Michel Parent (Geological Survey of Canada and leader of last year's FOP trip in Quebec).

We also learned about the recent application of surface exposure dating (see Wikipedia!) by several researchers working on MDI and elsewhere in eastern Maine. This dating technique is used to determine the time of deposition of glacial boulders and when glacially eroded bedrock surfaces were formed. It is an important tool for establishing deglaciation chronology in places where there is no suitable organic material for radiocarbon dating of glacial events. There was a good lively discussion of this topic at our final stop on Jordan Pond.

The photos show a few highlights from the MDI trip. Next year, Byron Stone (USGS) will lead the 2018 NE FOP trip on Cape Cod! It has been many years since we last visited that area, so we hope you will be Friendly and come along. Trips are usually held on the first weekend in June. Announcements appear on our website sometime during the winter, and you can also access PDF guidebook files for past trips since the 1930s. This year's guidebook will be posted soon.

2018 FOP trip participants at Sand Beach.

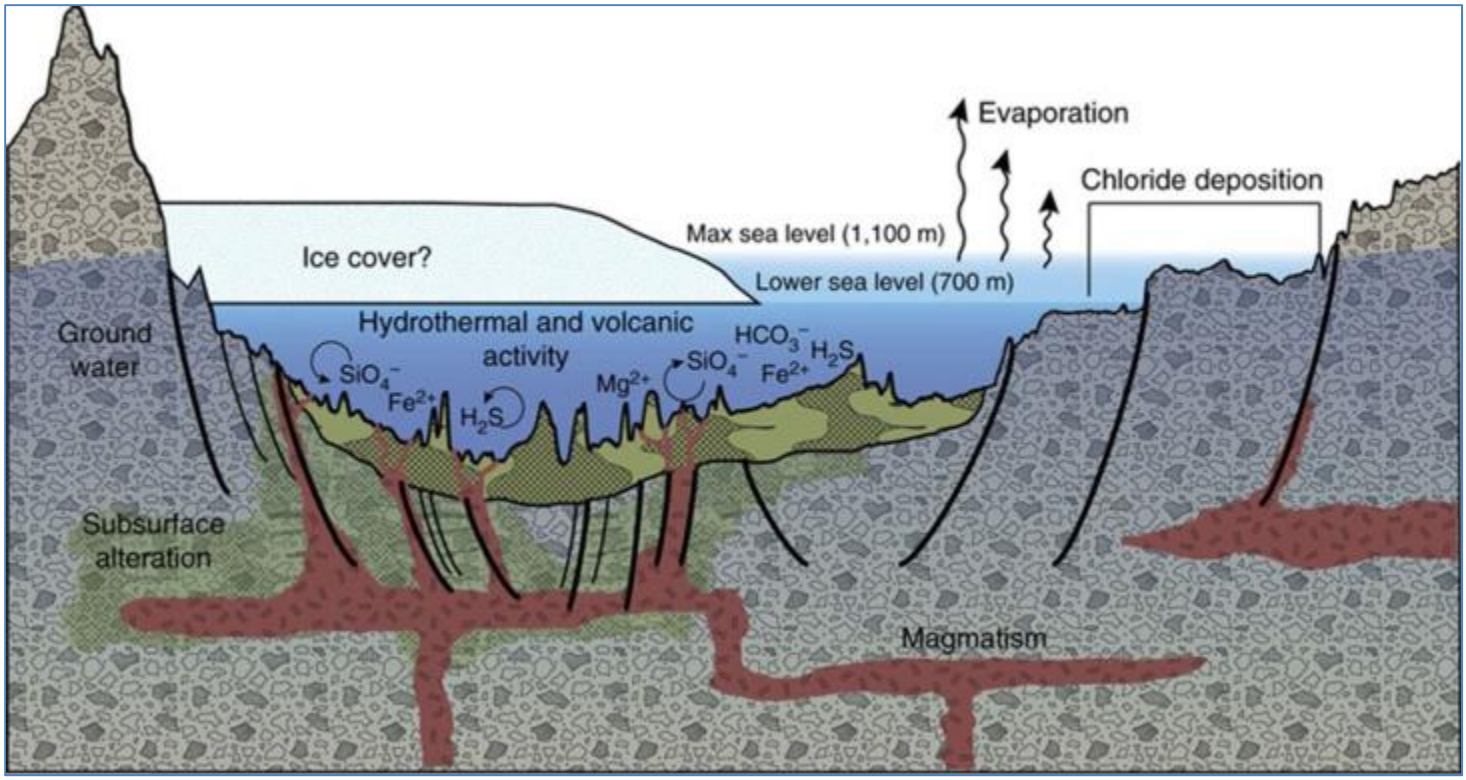
Standing on a raised beach at Stop 3, on hillside facing east shore of MDI. Note the well-rounded boulders.

FOP 2018 attendees examining a glacial erratic boulder near summit of Cadillac Mountain in Acadia National Park.

A GEOLOGIC MODEL FOR ERIDANIA BASIN ON ANCIENT MARS

https://www.jpl.nasa.gov/spaceimages/details.php?id=PIA22060

This diagram illustrates an interpretation for the origin of some deposits in the Eridania basin of southern Mars as resulting from seafloor hydrothermal activity more than 3 billion years ago.



The ground level depicted is an exaggerated topography of a transect about 280 miles (450 kilometers) long. Blue portions of the diagram depict water-depth estimates and the possibility of ice covering the ancient sea.

Thick, clay-rich deposits (green) formed through hydrothermal alteration of volcanic materials in deep water, by this model. Notations indicate deep-water reactions of iron and magnesium ions with silicates, sulfides and carbonates. Deep-seated structural discontinuities could have facilitated the ascent of magma from a mantle source. Chloride deposits formed from evaporation of seawater at higher elevations in the basin.

This graphic was included in a 2017 report "*Ancient hydrothermal seafloor deposits in Eridania basin on Mars*" in *Nature Communications*. (https://www.nature.com/articles/ncomms15978?WT.feed_name=subjects_astrobiology) pdf at https://www.nature.com/articles/ncomms15978.pdf. View all Images at https://www.jpl.nasa.gov/spaceimages/index.php?category=.

GAC-MAC-IAH 2019 CONFERENCE PROPOSALS REQUESTED

The Geological Association of Canada (GAC), the Mineralogical Association of Canada (MAC) and the Canadian National Chapter of the International Association of Hydrogeologists (IAH-CNC) are currently preparing the GAC-MAC-IAH 2019 conference, and invite you to mark these dates in your agenda: 12-15 May 2019. This conference will be held in historic Quebec City, a UNESCO World-Heritage site. Participants will have the opportunity to visit and discover the warmth and charms of this beautiful city and to explore its many attractive nearby natural sites.

Under the theme “Where Geosciences Converge”, the organizing committee wishes to promote collaboration and stimulating discussion among geologists, mineralogists and petrologists, hydrogeologists, geophysicists and geochemists. The conference will highlight the following themes:

- Geosystems and hydrogeosystems
- Resources, energy and environment
- Data science for geosciences
- Geosciences and society

We kindly invite you to submit session proposals that are related to these themes or that belong to more general themes in geosciences, which you would be willing to organize and chair. Please visit the conference website to read a brief description of each of these four themes (http://gacmac-quebec2019.ca/).

We also encourage you to submit ideas for field trips and short courses that you would like to organize. We are especially looking for field trip proposals related to a specific session.

We need to receive your proposals by May 1st, 2018, to begin planning the technical program which will be posted on the conference website and in the first flyer. The form for proposals is available on the website at http://gacmac-quebec2019.ca/en/proposal/.

We would be grateful if you could circulate this email to colleagues and students. If you have questions, do not hesitate to contact us at info@gacmac-quebec2019.ca.

See you in Quebec City!

SYNC YOUR CALENDAR WITH THE SOLAR SYSTEM -
https://www.nytimes.com/interactive/2018/science/astronomy-space-calendar.html

Never miss an eclipse, a meteor shower, a rocket launch or any other astronomical and space event that's out of this world.

June 27 Hayabusa2 arrives at the asteroid Ryugu - Launched by Japan’s space agency JAXA in December 2014, this spacecraft will arrive at the near-earth asteroid Ryugu and begin to study it for about 18 months, attempting to collect a sample from its surface before returning to Earth in 2020. Read more about the Hayabusa2 mission here: https://www.nytimes.com/2017/09/15/science/cassini-nasa-missions.html?smid=spacecal

July 12 Manhattanhenge 2018, take two
https://www.nytimes.com/2018/05/28/science/manhattanhenge-dates-time-locations.html?smid=spacecal

July 27 Total lunar eclipse
https://www.nytimes.com/2016/11/12/science/supermoon.html?smid=spacecal

Starting July 30 The Southern Delta Aquariids meteor shower
The Southern Delta Aquariids meteor shower will start in the evening of July 30 through the next day’s dawn. Learn more about the major meteor showers and how to watch them at
https://www.nytimes.com/interactive/2018/science/meteor-showers-2018.html?smid=spacecal&mtrref=undefined&gwh=D4B6450678BAB136B5A906A5985C83C6&gwt=pay

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URSULA MARVIN, GEOLOGIST OF THE EXTRATERRESTRIAL, DIES AT 96

Ursula Marvin was a geologist at the Smithsonian Astrophysical Observatory in Cambridge, Mass., when she and her colleagues were asked to examine an extraterrestrial object: a 10-pound chunk of Sputnik IV, a Soviet satellite that had crashed, superheated at 1,535 degrees Celsius, onto a street in Manitowoc, Wis., before dawn on Sept. 5, 1962.

Investigating a fragment from Sputnik IV — a less heralded part of the space program that had begun with the thunderclap of the first Sputnik's orbits of Earth in 1957 — proved irresistible to a mineralogical expert. Clinging to one end of the fragment, Dr. Marvin found, were droplets of minerals, including wustite, an iron oxide.

"Until then, wustite had been viewed as an artificial product too unstable to survive in nature," she said in an oral history interview in 2013 with Derek Sears of NASA's Ames Research Center. But when she X-rayed samples of several meteorites in the Harvard Museum, she found wustite in all of them, confirming that they were formed through iron oxidation during re-entry into Earth's atmosphere. "The wustite had always been there," she said, "but nobody had X-rayed meteorite fusion crusts before."

Dr. Marvin — who would hunt for meteorites in Antarctica and analyze moon rocks from Apollo missions — died on Feb. 12 at a nursing home in Concord, Mass.

After teaching mineralogy at Tufts for two years, she was offered a job researching meteorites at Harvard before joining the Smithsonian observatory in 1961. At the time, Dr. Marvin knew nothing about meteorites. Dr. Marvin's interest in meteorites knew no geographic boundaries. When a six-pound meteorite ripped through the roof of a house in Wethersfield, Conn., in 1982, she and other scientists arrived to inspect it the next day. She said the second meteorite, which had rolled to a stop under Wanda and Robert Donahue's dining room table, was probably from an asteroid belt between Mars and Jupiter that she called a "sort of celestial rock garden."
https://www.nytimes.com/2018/03/09/obituaries/ursula-marvin-geologist-of-the-extraterrestrial-dies-at-96.html

THE NH GEOLOGICAL SURVEY GROUND WATER LEVEL NETWORK SUMMARY Submitted by Josh Keeley of the NHGS

The NHGS is now posting its monthly groundwater levels from its network of NH Observation Wells online at: http://www.des.nh.gov/organization/commissioner/pip/publications/geologic/groundwater-levels.htm. The data for all of the wells in the NH Groundwater Level Network are shared with and posted on the USGS website at: http://groundwaterwatch.usgs.gov/statemap.asp?sc=33&sa=NH. A map of both the New Hampshire and Vermont Groundwater Level Network is at https://groundwaterwatch.usgs.gov/netmapT2L1.asp?ncd=NHV.

Lee Wilder, outstanding in his field, in Colebrook near the Mohawk River.

A VOLCANO IN NEW HAMPSHIRE? by Rachel Marie Sargent June 18, 2018

A recent story in Northern Woodlands features Society member, Nelson Eby, who assisted the author in understanding the Ossipee Ring Dike. Read the story at https://northernwoodlands.org/outside_story/article/volcano-new-hampshire

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Geological Society of New Hampshire

2018 Summer Field Trip Reservation Form

Exploring the Geology of the Boston Basin

On Saturday August 4, 2018, Kenneth Galli (Earth & Environmental Sciences, Boston College) and Richard Bailey (Marine and Environmental Sciences, Marine Science Center, Northeastern University) will lead the GSNH's 2018 Summer Field trip. We will travel by bus to three stops [1) Squantum Head, (2) Squantum south (Orchard Beach) and (3) Webster Conservation Area] as we explore the geology of the Boston Basin.

Arrive at the NHDES office's parking lot located at 29 Hazen Drive, Concord, NH at 8:00 for an 8:30 departure. We plan to return to Concord by 4:30 pm. Parking at NHDES for the day is free.

All attendees must travel in the bus. Pack a lunch as we will not be making a special stop for food. Water and soft drinks will be provided.

Complete this form and send in by July 24th.
Registration is confirmed when payment is received.
Members: $30 Non-Members: $34 Students (no children please): $20.

Name:	
Names (additional attendees):	
Contact Email:	**Contact Phone:**

Send this form with payment ($30 per person) to:

Make checks payable to GSNH

Abby Fopiano
60 Candlestick Lane
Barrington, NH 03825

GSNH accepts this reservation as an agreement with the Society for which you are responsible for payment, whether you are able to attend or not. Refunds will not be given.

Questions? Please Email abigail.fopiano@des.nh.gov

GSNH USE

Total Due/Paid:	**Check Number:**	**Date Received:**

MEMBERSHIP & RENEWAL APPLICATION

Geological Society of New Hampshire

PO Box 401, Concord, NH 03302

Name: _____ *(Please print clearly)*

E-mail: _____

***Renewing Members**: Only update this section if you have changes to your contact information (including email) or educational history.*
***New applicants:** please complete this section.*

Preferred address/email to receive GSNH Communication: ___Home or ___Business

Home Address:

_____

_____

_____

Business Address:

(Employer): _____

_____

_____

Home Telephone: _____

Office Telephone: _____

New Hampshire PG # (if applicable) _____

Education: Degrees received or in progress:

Year	Degree	Major	College or University

I volunteer to help with one of the following committees or tasks:

__ Membership Committee
__ Legislative Committee
__ Giving a talk at a meeting
__ *Regulations Committee*
__ *Education Committee*
__ Events Committee
__Communications Committee (Newsletter or Website, circle preference)
__ Other:

Membership Category:

_____ Regular Member (Annual Dues $20.00)

_____ Student Member (Annual Dues $10.00)…Please complete **Education** section above.

Make checks payable to **"Geological Society of New Hampshire."** Note that GSNH dues are not deductible as a charitable contribution, but may be deductible as a business expense. Please return this completed application form with any necessary corrections and a check for the appropriate dues to the GSNH at the address above. The Society's membership year runs from January 1 to December 31.

Signature: _____ Date: _____