

THE
MYSTERY OF
THE
ADIRONDACK
DOME
JOE MALAVE
PAGE 3

CAMBRIAN
SEA FLOOR
IN NY
RENEÉ
AUBRY
PAGE 8

BEST PD
EVER!
PAUL LEVIN
PAGE 9

GOT
MINERALS?
RENEÉ
AUBRY
PAGE 9

NAGT
OEST
AWARD
RENEÉ
AUBRY
PAGE 12

CREATING
VIRTUAL
FIELD TRIPS
SEAN
ELLISON
PAGE 12

UPCOMING
ROCK AND
MINERAL
SHOWS
RENEÉ AUBRY
PAGE 14

NYESTA NEWS



2022 Field Conference Announcement

NYESTA is excited to announce that our 8th Annual Geologic Field Conference will be held on Tuesday, July 19th through Thursday, July 21st at SUNY Oneonta! A humongous thank you to Dr. James Ebert and the fabulous faculty in the SUNY Oneonta science department that are willing to host this annual experience.

For more information and registration go to our website at <https://www.nyesta.org>.

President's Message

Hello NYESTA membership! My name is Paula Eisenberger and I will be president for the next two years. I'm so excited to be part of this wonderful organization! I live in Western New York and this year I teach Earth Science and Forensics.

These last two years have been a challenge for all of us but I am so excited to say we have an amazing conference planned for this summer despite all the challenges!

I would also like to get some feedback from you about programs you'd like to see offered by us. We are thinking of getting a speaker to talk about integrating the new standards with our current curriculum and offering this either online or in person. Here is a link to a survey:

<https://docs.google.com/forms/u/0/d/1oKvpQRXsDPHq-bBJ2xyp5Fx98DBH3QPN6BNUNCJM64/viewform?>

We will also be putting a permanent nomination form on our website for distinguished teachers. We want to hear from you about teachers in your area that you feel should be recognized.

Nomination Form:

<https://docs.google.com/forms/u/1/d/1TO8Wq3PfPQsiUkrivYCWhLHeSRpoFNaKcZvNNXqpY/>

My goal in serving you as your president is to increase membership participation and help us all transition to the new standards. I am always open to hearing from you and look forward to the next two years of working together!



nyesta.president@gmail.com

Editor's Message

SEAN ELLISON

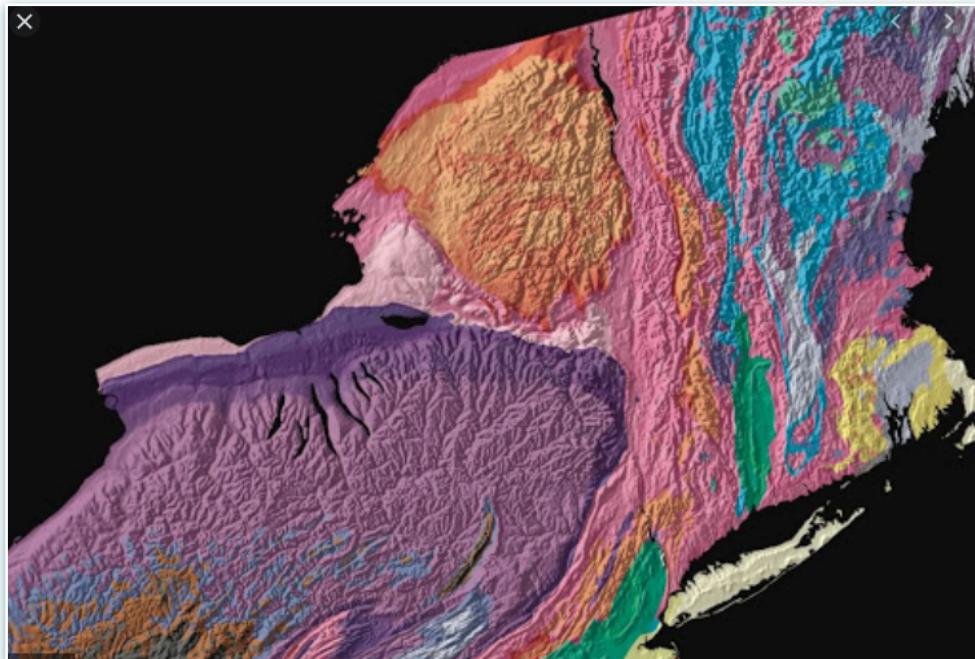
Putting the newsletter together is always a team effort, but I would be remiss in not recognizing the effort of Joe Malave in helping to make this one happen. Joe was in the role of editor for most of the time we were assembling this and asked me to help get it across the finish line when his family needed him. Don't miss his incredible article on the formation of the Adirondack dome! Likewise, Reneé Aubry is all over this newsletter with what must be a record FOUR articles! Thank you also to Paul Levin for sharing amazing opportunities for professional development. I've been lucky to attend most of these myself and can attest to how much they have benefited me in the classroom.

We are at a point in our organization where it is time for us to start looking to you, the members, to also have an opportunity to contribute your voice to the newsletter. In the coming issues we hope to start creating places where you can share what you are learning or doing in and outside of your classroom. If you have anything you would like to contribute to the next newsletter, please forward them to me at nyesta.webmaster@gmail.com. We look forward to hearing from everyone!

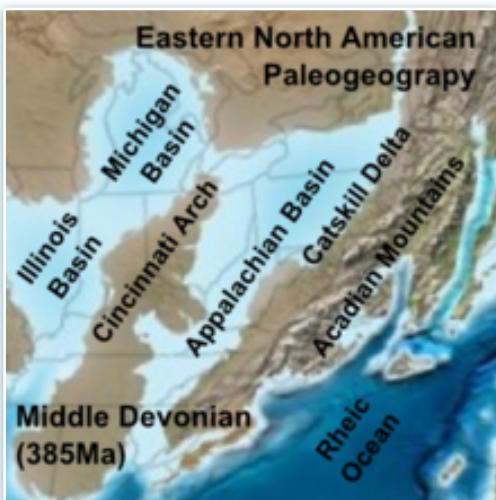
The Mystery of the Adirondack Dome

JOE MALAVE, NYESTA MEMBER

Many years ago, as an undergraduate student studying geology, I repeatedly asked my professors how the Adirondacks formed? I would say it looks like a giant batholith! I never received the same answer from my professors, and they were hedging their answers. Their answers ranged from a highly complex history to a work in progress.. At this point, and a lifetime of thinking about it, I know why they gave me those answers. However, it didn't stop me from asking



Geologic map of the Northeastern US. The Adirondack Paleozoic dome is shown in yellow surrounded by regions of younger Cambrian (red-orange) and Ordovician (pink) rock. Cambrian rocks can also be seen in some of the valleys of the Adirondacks.



what caused the uplifting of the present-day Adirondacks and when did it happen? Why is the Adirondack landscape region so round? Why are the peaks of the Adirondacks sharper than the Catskills and the mountains of New England?

I should start with a brief history of New York State and the surrounding region. This region's geologic history involves forming and rifting two major supercontinents, Rodinia and Pangaea. The region is imprinted with rocks from the Grenville orogeny as the supercontinent Rodinia formed. Weathering would reduce the ancient mountains to a flat surface. Rodinia's breakup led to sedimentary rocks forming in the Iapetus Ocean. As time passed, a volcanically active series of island arcs accreted/sutured to the east of the Adirondack region, which included the

Taconics to the south and New England to the east on the ancient eastern edge of the Laurentian Craton.

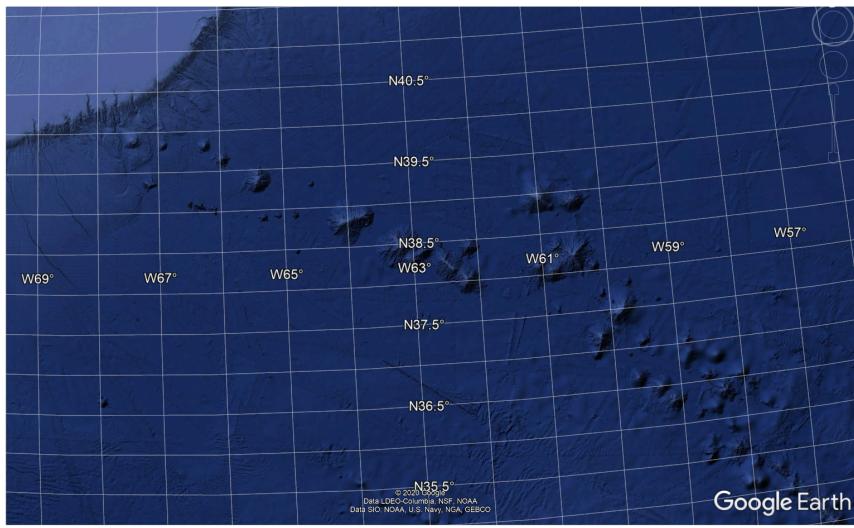
Adirondack Dome cont.

Much time and weathering of the region would pass before the area began its second significant uplift, the Appalachian Orogeny, as Pangaea started to form. During the paleozoic, an inland sea covered the broad plateau to the south, depositing thick beds of sediment, which later solidified into the broad sedimentary layers of the Appalachian Plateau. I'll skip past some details and cut to the near present for a moment. In the last 2 million years, the more recent glacial periods carved cirques and horns into the Adirondacks of today while subsequently modifying the entire surface of New York State, leaving many glacial remnants.

If you look at the NYS Earth Science reference tables, you can see the region's rocks are very old, late Proterozoic in age, and you can find all of the three basic rock types in the area. One of the rocks of the highlands is anorthosite. However, looking at the rocks in the photo below, you can find slight gneissic foliation. You can also find garnet crystals embedded into the plagioclase matrix of anorthosite, so they can be termed 'meta-anorthosite' (credit the term to Sean Ellison's former professors at SUNY Potsdam).



'Meta-anorthosite' found in the Adirondacks. Visible foliation and garnet crystals support evidence of metamorphism.



New England Seamounts visible via Google Earth.

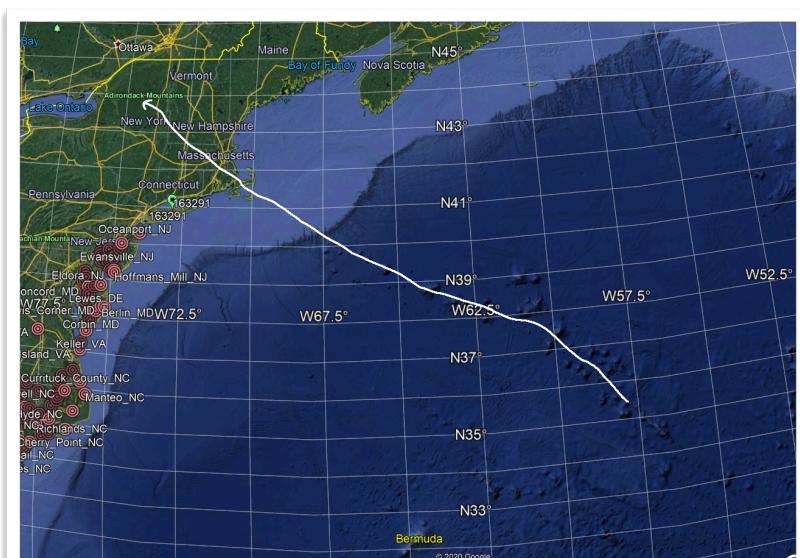
Adirondack Dome cont.

Years went by, and my geologic interest took me in different directions, and my thoughts of the Adirondacks were deep in the back of my mind. Then, one day in 2005, while setting up a lesson for my Earth Science class using Google Earth as a teaching tool for the first time, the New England Seamounts stuck out. It felt like I was looking at the New England Seamounts for the first time.

I had seen them before on

maps, but this time they intrigued me. They struck me as similar to the Emperor Seamounts attached to the Hawaiian Seamounts. A moving plate best explains the formation of those seamounts over an active mantle flare or hotspot. I looked at the New England Seamounts, and they had an orientation of interest. I took a more comprehensive view of the region, and a light went off. Did the hotspot that formed these seamounts form the Adirondack dome? Was there a relationship? It would have been easier to solve if the volcanoes that formed the seamounts went directly to the Adirondacks, but they stopped at the edge of the continental shelf. However, for me, it was a Eureka moment!

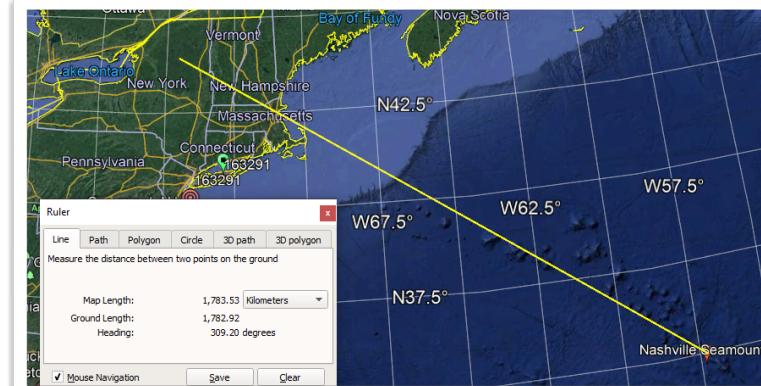
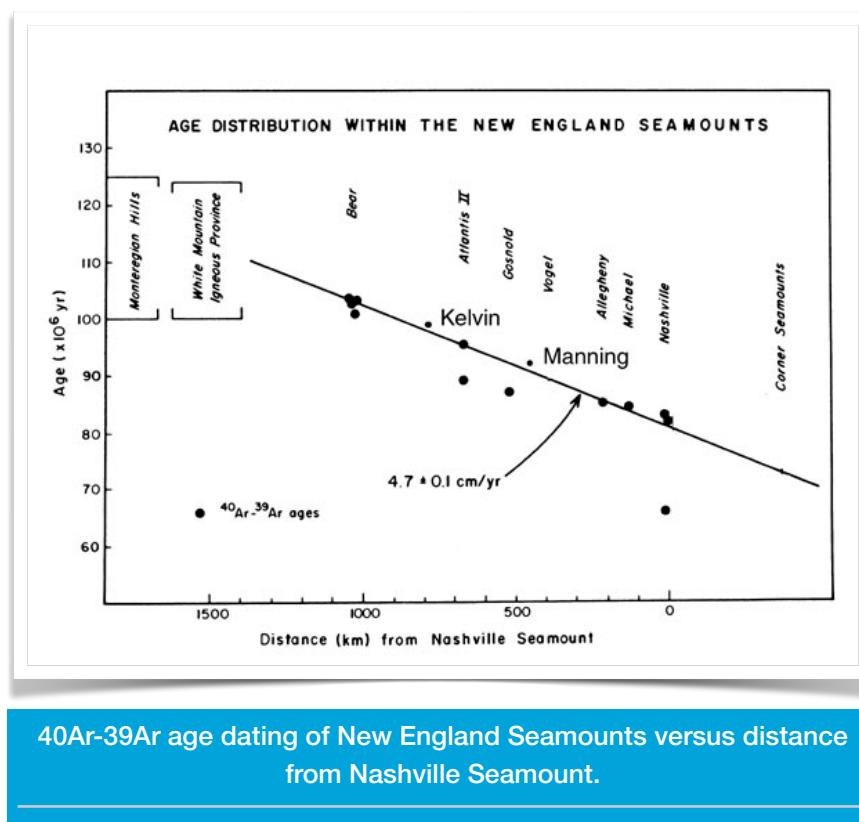
The line shows the seamounts' trend assuming that the hotspot that formed them is also related to the formation of the Adirondack dome. Remember, ocean crust is much thinner than continental crust, so the effects of a hotspot are more pronounced in the ocean crust. (The arrow drawn is not the direction the hot spot moved) So, imagine the present Adirondack dome area as having been heated by a hotspot that dwelled under the Adirondack region for tens of millions of years. But when? Finding out the age of the seamounts will help.



Northwestward trend of New England Seamounts align with the Adirondack dome.

Adirondack Dome cont.

Research uncovered this graph showing the seamounts' age increasing from the lower right to the upper left (as measured from the Nashville seamount). So I went back to Google Earth. The Adirondacks are roughly 1700 km from the Nashville seamount from a quick measurement using the measurement tool. The chart above puts the hot spot under the Adirondacks 115 million years ago or during the Cretaceous.



Northwestward trend of New England Seamounts align with the Adirondack dome.

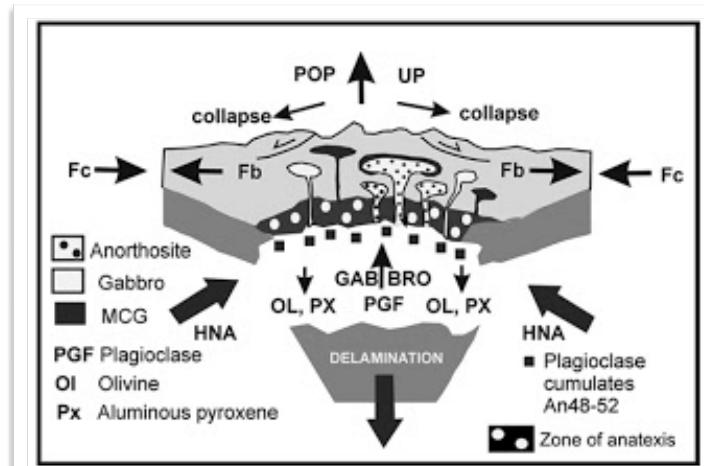
The Atlantic basin was much narrower during that time, and the seamount path can also show the plate's relative movement. So as the science went, more questions followed my original questions. Why wasn't the rest of the continental plate affected by the hotspot?

Why are the Adirondacks younger than when this hotspot dwelled under the region? I could not explain it. However, I ran into a fascinating article and an illustration summarizing the model suggested in the report.

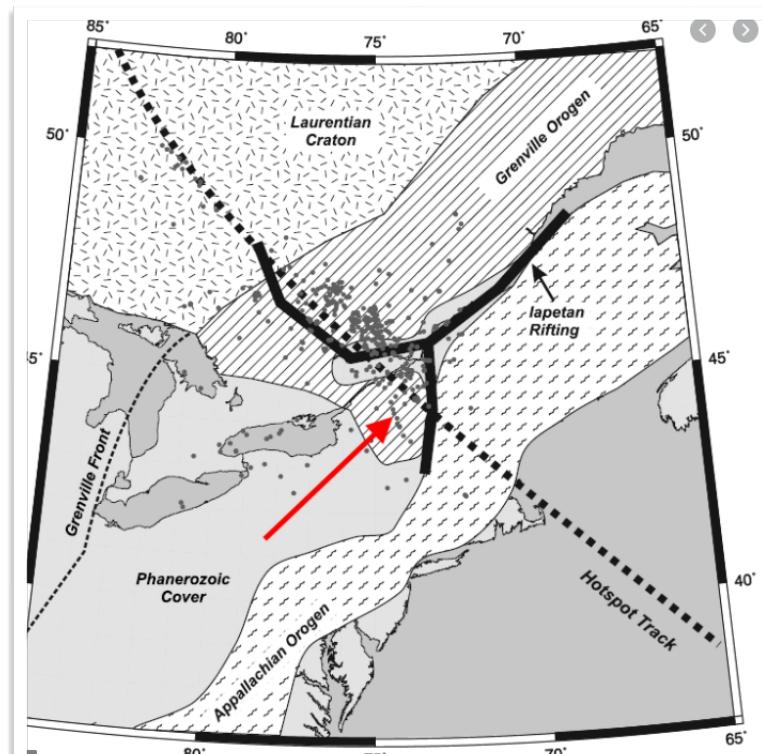
What if the lithosphere under the Adirondacks is thinner than the surrounding region? Would that allow heat from the mantle to affect the area called the Adirondack dome? Could this heat cause the uplift of the modern Adirondack dome, more the surrounding region?

Adirondack Dome cont.

A scientific theory based on the current Adirondack rocks, and their modern form, proposes that the lithosphere delaminated under the Adirondack region. That was in part due to the ancient hotspot hypothesis. The hotspot's heat could have separated the solid mantle from the lower lithosphere, leaving the hotter plastic mantle in direct contact with the crust in the area of delamination. As the hot spot paused under the Adirondack region, the lithosphere delaminated, and the plastic mantle expanded with less restriction, like a rising batholith. The effect of a batholith without a giant batholith!



Overthickened collisional orogen undergoing lithospheric delamination, consequent orogen rebound and collapse along low-angle, normal faults during late phases of orogenesis. (From McLelland, 2010)



Estimated track of Great Meteor Hotspot passing beneath Adirondack region. (From McLelland, 2010)

A more detailed study of the possible hotspot track for the Great Meteor Hotspot is shown in the illustration to the left. Notice the location of the triple junction near the Adirondacks. Generally, triple junctions are regions with significantly more heat flow and separating plates unless it's a failed triple junction. A modern-day example of an active triple junction is at the East African rift. The triple junction (on the map to the left) also leads to another idea that helps explain the current uplift. Current scientific estimates of the age of the Adirondack dome's uplift range from 20 million years to 5 million years and continue into the present. Since the hot spot's effect on the Adirondacks occurred in the Cretaceous, is mantle convection still upwelling in the delaminated crust region?

Adirondack Dome cont.

Some say a hotspot is causing the uplifting of the modern-day Adirondack dome. As seamount age evidence suggests, the North American plate moved away from the Great Meteor Hotspot. Is it possible that the modern Adirondack dome is related to lithospheric delamination due to the Great Meteor Hotspot and heat rising from the failed triple junction? While Occam's Razor pleads for a simple explanation such as a new hotspot, the dome is certainly round enough for that to be plausible. I hope this gets you thinking about the various possibilities. It's an idea that won't rest in my mind. If you have more to add on the subject, or you would like to critique my thoughts, please write another article for the next edition of the newsletter! Happy geologic thinking!

Cambrian Sea Floor in New York

RENEÉ AUBRY, NYESTA TREASURER

Should you find yourself in the area of Saratoga, NY, be sure to make a stop at Lester Park (Lester Park Rd, Greenfield Center, NY 12833). There you will find the first stromatolites that were described in North America, conveniently located just at the side of the road. The age of these amazing fossils is 490 million years old (late Cambrian). They are found in the Hoyt limestone, a shallow tropical sea carbonate deposit. Stromatolites were some of the first fossils and were formed by cyanobacteria (blue-green algae). At Lester Park, these stromatolites have been planed down by the glaciers, and so they are seen as if from above and the inside cabbage-like structure can be seen. The Hoyt family of the late 1800s used this local limestone for agricultural lime, and the abandoned kiln used to burn the rock is located across the street. If you go, do not damage or collect any of these rocks or fossils. They are now used as an educational site, overseen by the New York State Museum. This was one of the cool stops during the July 2021 post-Covid NYESTA summer gathering. Stromatolites are on the Earth Science Reference Tables.

<http://www.nysm.nysed.gov/research-collections/geology/resources/lester-park>

I don't know who this man is, but the video gives a nice overview of the area:

<https://www.youtube.com/watch?v=02h-PM22rCl>



Best Professional Development Ever!

PAUL LEVIN, NYESTA MEMBERSHIP OFFICER

As Earth Science teachers we are always looking for professional development that is challenging and brings us to places that we haven't been to before. I know I am not alone when I tell you that these three experiences are some of the best that you will find.

**GCAMP
by Texas
A&M**

<https://geogeo.tamu.edu/academics/camps-outreach/gcamp.html>

GCamp is an approximately 17 day field camp experience that will have you travel around the southwest of the United States. Imagine traveling with 30 other science teachers, several top notch professors and getting to explore and collect samples. During my experience I traveled through Texas, Colorado and New Mexico. After spending the first two nights in College Station, we spent the next 15 days on the road, traveling by tour bus from site to site. As we traveled we would stop at various spots and learn about the geology, geomorphology and history of the area. We stopped at places like Capulin Volcano National Monument, Colorado National Monument, Ouray, CO, Black Canyon of the Gunnison, White Sand National Park, and the Carrizozo volcanic field. The trip ends with many great experiences and a new group of lifelong friends.



Got Minerals

RENEÉ AUBRY, NYESTA TREASURER

June of 2021 saw the opening of the new Mignone Hall of Gems and Minerals at the American Museum of Natural History in New York City. The old exhibit, while among my favorites at the museum, was definitely tired and in need of a facelift. The new hall does not disappoint! Spectacular geodes of amethyst from Uruguay greet you at the entrance to the hall. The wall displays are still organized by chemistry, something we science geeks can appreciate. Some of the old favorites



are still there, but the hall has been completely renovated and expanded. There are now approximately 5500 specimens, including some huge crystals of tourmaline (Brazil), pyrite

(Peru), stibnite (China), and others.

Best PD Ever cont.

NASA Stratospheric Observatory for Infrared Astronomy (SOFIA) - Airborne Astronomy Ambassador Program



<https://www.seti.org/aaa>

This program has changed since I attended 5 years ago. In general, you will be immersed with wonderful resources from NASA and SETI. During my experience, we did virtual lessons with the SETI contacts (Educational Experts), took a graduate level astronomy course, and of course the best part, traveled to Palmdale, CA for two flights on NASA SOFIA. When I participated in the program, I had to apply with a partner, who in my case was another teacher from my school. When we flew on our missions we were with 2 other sets of SOFIA Ambassadors. Being from New York it was very interesting adjusting to the time change and flying all night long one day and being up the next, and then trying to do it all over again.



Got Minerals cont.



New are displays explaining the geology of the minerals, such as pegmatites and our famous New York Gore garnets (see article on the Hooper Mine from NYESTA's summer gathering 2021. Garnet is on the earth Science Reference Tables).

New to me was the cut slab of orbicular granodiorite from Australia. It was amazing and something I had never seen before.

In the Hall of Gems, a display I do not remember from the previous hall, is a great exhibition of cut gemstones together with their corresponding rough crystals. The 563.4 carat Star of India from Sri Lanka (star sapphire) shines as bright as ever.



Best PD Ever cont.

American Meteorological Society -DataStreme and Project Ocean/Project Atmosphere

<https://www.ametsoc.org/ams/index.cfm/education-careers/education-program/k-12-teachers/>

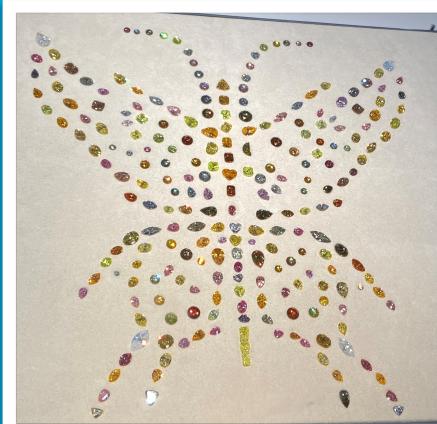
The American Meteorological Society runs two different amazing types of professional development. The first is DataStreme, which offers three different types of class, on Earth's Climate System, Ocean and Atmosphere. These classes are run asynchronously with a mentor. The second offering are a week-long intensive in person classes. Project Ocean held in Chestertown, MD and Project Atmosphere help in Kansas City, MO. There are online portions prior to your trip to these facilities, you then participate in your week-long workshop, and after you return home you are responsible for some additional work and making a presentation.

When I attended, I was able to receive graduate credits or CTLE for these wonderful programs. I highly recommend taking a look at the deadlines for applications and don't be afraid to apply a second time if you don't get in the first time, as they can be highly competitive.



Got Minerals cont.

Also in the hall is the "Butterfly of Peace," a stunning array of colored diamonds arranged in the shape of a butterfly.



When I visited, there was a temporary exhibit of jewelry, each piece of which was modeled after the animal world. It was spectacular!



As you are on your way out, do not miss the giant slab of fluorescent minerals from Franklin, NJ, that was cut specifically for the new hall. It is unbelievable. And

finally at the exit is a phenomenal cut of 35 million year old petrified wood from Oregon. And while you are there, be sure to find the huge ammonite that has been opalized. You'll find it near the 79th Street entrance. It is one of my personal favorite items in the museum.

I have chosen just a few items to highlight. There are so many amazing specimens in this hall, that I hope you have a chance to visit soon. It is well worth the trip.

See a short video here: <https://www.youtube.com/watch?v=NoKfwM1XsDk>

NAGT Outstanding Earth Science Teacher Award – Nominate your peers (or nominate yourself)!

BY RENEE AUBRY, NAGT EASTERN SECTION TREASURER AND NEW YORK COUNCILOR

National Association of Geoscience Teachers – Eastern Section offers the Outstanding Earth Science Teacher Award every year. At crazy times like these, when we all feel down and out, wouldn't it be great to win a national award? Do you know a deserving Earth Science teacher? Are YOU the deserving Earth Science teacher? We KNOW how hard you work and how much you love teaching. Apply for the OEST Award and get some well-deserved recognition. One OESTA is awarded for each state each year. In addition, Eastern Section has a Section Award, chosen from the state winners. I won it in 2009. Is this your year? Awardees attend the Eastern Section meeting (wherever it might be held) for free on Saturday. The conference is amazing. Great people. Great field trips. And the famous Geoauction. Interested in applying? Information can be found at https://nagt.org/nagt/awards/oest_nomination_eastern.html

For more information contact NAGT-ES Awards Chair Chris Roemmele at croemmele@wcupa.edu

This year's deadline of February 1 has passed, but you can still submit your nomination now for next year's award. You can still join us for this year's conference in Berkeley Springs, WV in May.

Creating Virtual Field Trips

SEAN ELLISON, NYESTA PUBLICATION

When it was announced in late March of 2020 that school would be closing down, I wanted to create content for my students that would be engaging and relevant even while we were not in the same space together. I grabbed my phone and tripod and hit the road. Over the course of two days I recorded myself visiting several rock outcrops to put together virtual field trips for my students.

Putting Them Together

My goal was to use the geological formations of our area to review content with as many real world examples as possible. At that point it was still thought we would be back in time to take the Regents exams so I wanted to keep that material as fresh as possible. I identified locations by looking through Roadside Geology of New York by Brad VanDiver and through field trip guidebooks put together by the New York State Geological Association. The Roadside Geology series is available for every state and I highly recommend picking up a copy for your area. The New York State Geological Association makes all of their field trip guidebooks available for free at their website, <https://www.nysga-online.net/>.

Prior to heading out the door, I identified several sites I wanted to visit. For each location I wrote a storyline that I wanted to tell. What rocks were present? How did they form? What was the sequence of events that made this location look the way it does? Doing this helped me create a list of shots I knew I was going to need to once I reached the location.

NAGT Cont.

See conference and award information in the Eastern Section Winter Bulletin at https://d32ogoqmya1dw8.cloudfront.net/files/nagt/sections/eastern/winter_2022_nagt-es_bulletin_cb.pdf

Interested in joining NAGT? Join here: <https://nagt.org/nagt/membership/index.html>

Want to get involved? NAGT-ES is looking for a secretary and another NY Councilor. Feel free to contact me for more information at raubry@otunet.com Hope to see you there!

Virtual Field Trips cont.

My original idea was to get a shot of me bringing attention to a detail about the location, posing a question based on content we had covered, and then explaining the answer by showing charts and graphs I had brought along as well as a large whiteboard on an easel. The combination of wind blowing my papers around and cool temperatures freezing my whiteboard markers quickly put an end to that. I made a quick decision to record that part when I got home. This was around the time that travel was being restricted so I made sure to try and record all of my footage over a two day period with both lasting from sunrise to sunset.

Once I was back home I recorded the explanations to my questions and added details I realized I had left out while in the field. I cut out bad takes and spliced everything together using iMovie which comes free with MacOS. Once I had everything finalized I uploaded my video to EdPuzzle and inserted the questions I was posing on screen.

Assigning lessons

Due to equity issues with students lacking access to the internet at home my school encouraged asynchronous learning for our classes. I assigned my completed videos on a daily basis and worked to keep each video under 15 minutes, knowing student attention spans would be challenged by anything longer. I supplemented with selected practice exam questions that were based on the content covered in the video.

Student feedback and results

Once I started posting my videos, I wasn't sure how students were feeling about this style of learning due to the lack of one-on-one time we normally have in the classroom. However, I soon started receiving emails from student like this:

I'm writing this email to show my appreciation and thank you. The online work, especially the Edpuzzles have been very helpful in keeping this all fresh in my mind. The videos are very thorough and have helped me understand just like if we were in the classroom and you were teaching us about it. I just wanted to tell you I appreciate the effort to do that!

While online learning is not for every student, a majority of students were very successful in completing the assignments with a high level of accuracy.

Future Use

Now that I have these videos completed, I want to figure out how I might make use of them in my classroom in the future. When we do find ourselves back in the classroom these can be assigned as review activities for the end of a class period or assigned as homework. I want to look into visiting

Virtual Field Trips cont.

more sites in the area and create a library of virtual field trips to have as teaching tools both in and out of the classroom.

While I won't know the effect it had on their achievement, I know my students looked forward to my assignments. Considering the stresses we were all going through, I was glad to know I gave them something to enjoy.

Upcoming Mineral and Fossil Shows 2022

RENEÉ AUBRY, NYESTA TREASURER

Do you love minerals and fossils? If so, try to make it to one of these Mineral and Fossil shows. There are always lots of vendors selling items from 50 cents to \$50,000. Personally, as a teacher, I can't afford the \$50,000 items, but they are still amazing to see. My budget is somewhere in between those numbers, and I never fail to find something to add to my collection. I do have a weird thing for ammonites. But I digress.

The NJ show is from May 11 through 15 at the NJ Expo Center in Edison, NJ. If you go, talk to the people at the table for the NY Paleontological Society. Twenty dollars there will get you membership for a year for the entire family, and they run really great field trips. See information about the show at <https://nj.show/> and the NYPS at <http://www.nyps.org/>

The other show is during the summer. It is the East Coast Mineral and Fossil Show in West Springfield, MA. The dates are August 12-14. This is another show that is well worth attending. Here is the website: <https://www.mineralshowsllc.com/fall-east-coast-show/>

In either case, if you go, be sure to tell the vendors that you are an Earth Science teacher. Many will give you some items for free for your classroom, or give a discount for purchases. There are many locations that have smaller shows, so watch for information more local to you. Enjoy and maybe I'll see you there!

