Fall/Winter 2018
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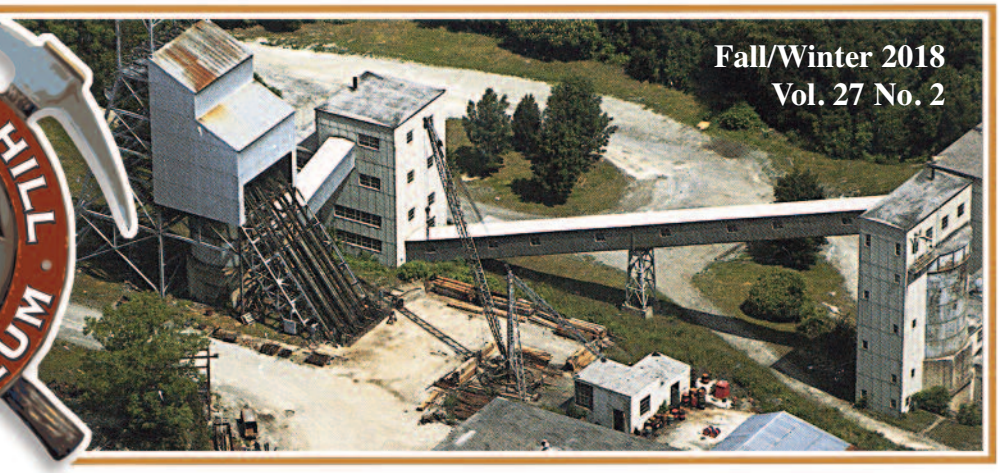

STERING HILL NEWSLETTER

Last Sterling Hill Ore Released From the Ore Bin!

This photograph of a skip dumping ore into the bin was found in a packet of construction photos of the mill complex being built. It may be one of the very first skips to be dumped into the bin, approximately 1960.

As it appears today, an estimated 300 tons of crushed ore straight from the primary crushers either on 1150 pocket or 1920 pocket.

Recipient of the 1999 Carnegie Mineralogical Award

A nonprofit foundation in furtherance of mining preservation, scientific research and earth science education.

volume 27, Number 1

Sterling Hill Mine Word Search

Megan Astor

Words are: forward, diagonal and up and down

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								K	H	B	C								
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CAGE
DRILL
HELMET
LITHOLOGY
ORE
SLOPE

COAL
FISSURE
HOLE
LUSTER
PULLEY
UNDERGROUND

CONVEYOR
FLUORESCENT
ILLUMINATE
MINE
ROCK
VENTILATION

Message from the President

Bill Kroth

We continue to pursue our mission at the Sterling Hill Mining Museum and, with the help of recent additions to our board and staff, we continue to move ahead with new ideas and new projects.

Former Sterling Hill miner and new board trustee, Doug Francisco, has undertaken a large-scale project that will give us high-grade mineral specimens and renewed excitement in our collecting dump for decades to come. A 25-foot diameter ore silo is located directly under the shaft tracks within the upper headframe. This container, called a "day bin," received ore that had only been run through the primary crusher in the mine, resulting in large-sized pieces, up to the size of bowling balls. When the mine closed in 1986, this silo was approximately 40 percent full of rich ore, especially zincite, and it has been sitting there without a cost-effective way of being unloaded; until now! Read Doug's article in this issue to see how he is removing an estimated 300,000 pounds of "lost" ore from the last days of New Jersey Zinc Company production.

In a few months, new trustee George Hutnick will be the mayor of Ogdensburg. Presently George serves on the town council and has been a tremendous help in bringing the mine and town together positively on many projects. George is helping us to install graphics on the existing railroad bridge at the entrance to our driveway and new local signage to more effectively direct traffic to our facility. We have always dreamed of having our logo on the bridge and now, with George's assistance, that will become a reality. Decades of "mixed relations" between the town and the mine seemed never likely to change. But now we are very pleased that George views our facility as a major asset to the town of Ogdensburg, and I know that our relationship will become even more positive and stronger in the future.

Our newest trustee is Bob Horn. Bob is a longtime mineral collector and is invaluable in assisting us in identifying, labeling, and pricing minerals from world-wide locations. We receive many mineral collections each year, through donations and purchases. Sorting the local material is simple, and we have many people here, such as Fred Lubbers, who do an excellent job. But where Bob really shines is in identifying and pricing the world-wide minerals. You can always see Bob setting up for our biannual garage sale. In addition, he is here most Saturdays helping with mineral processing. This function is not only important in our revenue stream, but also in providing interest to the many collectors who want "foreign" minerals for their collections.

New to the Sterling Hill Advisory Council are Dave and Cathy Astor; also residents of Ogdensburg. Dave is the Superintendent of Schools in town and is one of the key folks in our annual Haunted Halloween fundraiser. Dave is incorporating the Sterling Hill Mine into the school's curriculum. We are always honored when Dave calls and asks us to weave the story of Sterling Hill into his various science classes or to have board member, Gordon Powers, judge one of the science fairs. This spring, we even partnered in installing a new weather station for the Ogdensburg school science classes. Now Ogdensburg is part of the Weather Underground network.

Cathy Astor is a chemistry teacher at Wallkill Valley Regional High School. This summer, Cathy was a primary contributor and instructor in our GeoSTEM Academy teacher professional development program. We are fortunate to have Cathy on our Advisory Council, as she provides a valuable connection with our local high school.

While Denise and I glow in the successes at Sterling Hill, we also recognize that we must prepare the next generation to manage the facility. Presently, Winter Rosen is assisting in that task. Winter has a degree in Environmental Science, she really knows her minerals, and has been a tour guide here for three years. We could find many with those credentials, but Winter is special in

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MESSAGE FROM THE PRESIDENT

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Winter Rosen at work on the Sterling Hill Mining Museum website.

that she truly loves Sterling Hill and wants her career to be at our museum. We have seen Winter "go the extra mile" every day. When our website became unsupportable and needed a very expensive complete upgrade, Winter said: "I know that I can do it. Let me tackle it." And one week later we had a much improved, easier to navigate, and professional website that makes us proud! The bonus is that Winter is able to personally make changes to the website in a minute, eliminating the need to make changes through an expensive, external consultant. Finally, at Sterling Hill, attendance is paramount. Every week Winter maximizes our schedules, gathers the required staff, and even gives tours herself if needed to assure that we are handling the maximum number of visitors. We once thought that ten classes a day was our upper limit. But Winter has on many occasions brought in 12 classes in addition to our regular public tours. And she organizes the schedules to ensure that the tours flow seamlessly and without problems.

Our 44,000-pound slab of fluorescent ore is being prepared for display at the American Museum of Natural History in New York City, where it will be viewed by over five million visitors each year. We are expecting a substantial increase in visitation as a result. We are proud to know that we have a quality board and staff to handle this next surge!

..."there's no other place like it on Earth."

Listed on the National Register of Historic Places since 1991

Sterling Hill Newsletter

EDITOR

JEFFREY OSOWSKI

30 Plant Street • Ogdensburg, NJ 07439-1126

The *Sterling Hill Newsletter* is the official journal of the Sterling Hill Mining Museum Foundation, a nonprofit institution. It is published two times a year, in April and September.

Subscription to the *Sterling Hill Newsletter* is included with membership in the Sterling Hill Mining Museum Foundation. For details look for the membership form in this issue. If the form is missing, contact the museum for information.

Last Sterling Hill Ore Released from the Ore Bin!

Doug Francisco

The ore pass was the conduit through which profits of the New Jersey Zinc Company rose and fell (pun intended). It was a huge raise, about 15-feet by 15-feet that roughly paralleled and was close to our west shaft, approximately 50 feet away. At 1920 feet long, the ore pass was accessible on every level for dumping ore. The pass itself was continuous, but the ore flow could be controlled on every level by large steel "fingers" which could be pneumatically lowered into the flow of ore, thereby stopping it or releasing it. The mine foreman could "run the ore" and control its descent to one of the two underground crushers; one on the 1150 level and the other at the bottom of the main shaft at the 1920 level. There was a fatality a few years before I started working at the mine in 1974, when a miner fell down the ore pass. The company was installing a pneumatic cylinder for dumping the new larger three-ton ore cars, and that crew had mistakenly left an unsecured plank in the flooring. You can guess the rest.

Head frame with ore bin beneath. Photo taken in early 1960's.

The ore pass was the final destination for all of our underground work. At the end of our shift we would report to the shift boss how many cars we had trammed and dumped. This was the measure of our work, a hard number that translated to our value as workers. I can remember really productive shifts, dumping over 300 tons of ore; 300 plus tons of broken muck (ore) through the grizzly and gone. Once that happened, we never saw it again. It went on down through the dark; tumbling, crashing, breaking apart, or not until it finally went into the massive jaws of the crusher. There it was broken into softball-sized pieces, and then hoisted up in seven-ton skips to the ore bin silo on the surface under the headframe. Recently, I was able to find the framing plans for this silo in the map library in the Sterling mine office. Drawn up in 1953 and finally built in 1956, it was called the "1200-Ton Steel Storage Bin." Our preservation of all mine documents paid off. I was able to find the actual plans for the storage bin in a matter of minutes.

The bin is 25 feet in diameter and 20 feet high. There is a hopper on the bottom that fed onto a 100-foot long conveyor belt which carried the crushed product up and dropped it into the secondary crusher in the next building. The day the mine shut down some thirty two years ago, the music that we made there died. The shaft became sadly silent. The cables that pulled the loaded skips up at 20 miles per hour stopped singing, and the chorus of accompanying sounds faded quietly into the darkness. Frozen in place. Until…..thirty two years later, I climbed the series of ladder ways under the

Set of three fingers that could be raised or lowered to allow the ore to flow or to stop the flow. After the mine was sold, waste rock from the new tunnels was dumped down the ore pass to get rid of it. The white rocks in the photograph are just waste rock, which would never be allowed in the ore pass during mining operations. Ore,Ore,Ore!

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LAST STERLING HILL ORE RELEASED

Continued from page 5

headframe, pried open the rusted door, and looked down into the one-third full silo. There below me was over 300 tons of our ore -- silently, patiently, waiting. My first thought was "I have to get this out." My second thought was more emotional. Should this maybe stay here? Once taken out that was it, no more connection with the men and machinery that produced it. No more physical, touchable, tangible, record of our labor except for numbers in a ledger somewhere. Then I said "screw it ….it's coming out!"

I approach this project with a great reverence. That ore is like a crumbled tombstone. Each piece was wrestled

Curved rails atop the ore bin that allowed full seven-ton skips to dump their loads.

from its billion-year connection with the planet. Drilled into and dynamited, the muck was shoveled up and dumped and crushed and hoisted into this pot. Here it was waiting in the room where the silo emptied onto the conveyor. I climbed a small ladder and reached into the bottom of the funnel and pried out a piece. In my hand was a ten-inch piece of heavy, rich, brick-red, zincite ore. I'm in the process of reading John Kolic's journals and doing my own research to determine what work areas were being mined in the month leading up to the mine's closure, to try to pinpoint where this ore might be from, but does it really matter? It's our ore. We broke it, we loaded it, and there it is.

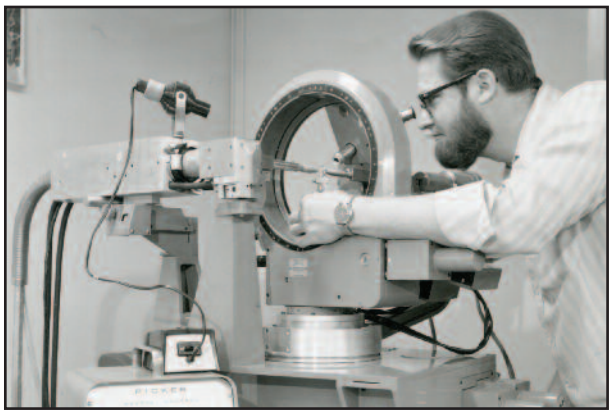
The next step was to devise a method of taking it out. The original system consisted of a huge 240-volt three-phase vibrator motor, which shook the bottom of the feeder so it would flow. Then, of course, there was the conveyor itself, also a huge electric motor. Getting these running again was not possible, so I fabricated a two- by two- by four-foot chute box with a bottom lid on a hinge with which I could control the flow. I then fastened the whole contraption to the bottom of the hopper. I secured a temporary plate to the bottom of the original box to ensure that no ore could come out while I was working there. Then I cut a two- by two-foot hole in the bottom of the original box so the ore would enter my new chute. Next I constructed a rail system, enabling me to push a loaded car out of the building, dump it into our small loader bucket, and then onto a stockpile. There are still a few bugs to be worked out, but as of this writing, I've removed about 25 tons of this rich ore, releasing it into the light of day. Hopefully it's not the end of its journey, just a continuation. This ore material will make its way into smaller and smaller boxes and people will marvel at its fluorescence and its complexities, and hopefully give a nod to the miners who brought it to them.

My method for moving the ore from the bin to daylight. An old one-ton end dump-car that was on display at the Sterling Hill entrance was brought into service once again, and it worked like a charm.

A Celebration of the Life of Pete J. Dunn - May 19, 2018

Dick Bostwick

On the wet, cool morning of Saturday, May 19, a small group walked downhill from the Franklin Mineral Museum, through the Buckwheat Dump, to the "Mill Site Pile." FMM president Mark Boyer unlocked the gate of the enclosure and let us in so the scattering of Pete's ashes could begin. This was Pete's written request to his friend Herb Yeates: "Ashes to be spread on local dumps – more damn contamination; collectors will never get away from my ghost!"



Pete Dunn using a Picker X-ray diffraction unit.

Led by Maureen Verbeek, we then left the Buckwheat, crossed Evans Street, and visited the Franklin orebody's footwall exposure near the south end of the Buckwheat open cut. Ashes again were scattered. When the gate was locked behind us, we went to our cars and drove up Buckwheat Road to the parking lot of the Franklin Firehouse, where the concrete cap of the Parker Shaft survives, hidden by weeds. A third scattering ensued. Agreeing we had done our best to honor Pete in Franklin, we drove to the Sterling Hill Mining Museum, where Bill Kroth had reserved the Christiansen Pavilion for the more formal service, or in Maureen's words, a Celebration of Life for Pete.

The stage was set: food and drink for early arrivals, mineral and memorabilia displays, a podium with microphone, and a continuous "slide show" with images from Pete's life – Pete in his Air Force uniform, Pete as an infant, Pete with friends… Maureen brought two displays: a case of Pete's "mantel rocks," large specimens from Franklin and Sterling Hill that were placed in his home where visitors were bound to notice them, and a case of Pete's possessions, notably the blue IBM Selectric typewriter on which he prepared many of his scientific papers. The third display was a case of minerals from Pete's personal collection, donated to the Franklin Mineral Museum. Earl Verbeek, the museum's curator, selected the specimens for display and also put together the Pete Dunn slide show. There was also evidence of Pete's lighter side, including the famous "ever-popular squid hat" worn when he worked at the reception desk at the National Museum of Natural History (NMNH), and Pete's humorous postings for mineral shows, which included sheets of coupons for "Free Chicken Strips" (!?!), brought by Mark Dahlman.

The Christiansen Pavilion was a welcome, warm, and waterproof sanctuary during several hours of rain and mist outside. I had accepted the role of Master of Ceremonies reluctantly, but once the crowd was warmed up and encouraged to participate, many spoke about their memories of Pete, among them Tony Nikischer of Excalibur Minerals, a long-time friend and colleague of Pete's; Kathy Hrechka, a fellow docent of the NMNH who knew Pete from their time spent helping tourists in the museum's lobby; Jack Stosez, a boyhood friend who'd driven down from the Boston area with his wife, Barbara; and Libby Bryant, who rented a room in Pete's home for many years. Others shared their appreciation of Pete and his work, notably Steven Kuitems, dentist and mineral species collector; John Sanfaçon, recently retired head of the Language Dept. at the Delbarton School, who still organizes displays for NJ mineral shows; and Earl Verbeek, who urged those present to look carefully at Pete's mineral specimens because they were not necessarily pretty. (Pete, as Earl emphasized, studied all Franklin and Sterling Hill minerals, not just the good-looking ones). Sterling Hill Mining Museum President

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PETE J. DUNN

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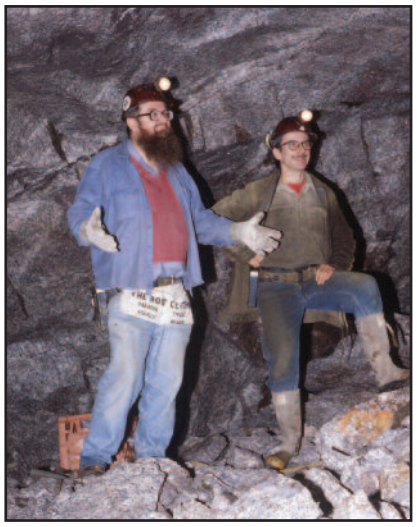
and Executive Director Bill Kroth highlighted Pete's work on Sterling Hill minerals and his friendship with miner John Kolic, then described what went into the creation of the actual Pete Dunn Memorial, waiting in the Fill Quarry to be dedicated. Maureen Verbeek spoke movingly about her long friendship with Pete, as did her children Charlie and Ellen, now grown, as Pete was frequent and welcome guest in their home.



Pete Dunn and John Kolic, 900 level, Sterling Mine, October 1990. Bernie Kozykowski photo.

Maureen knew a bagpiper and had asked him to accompany our procession to the Fill Quarry. Bagpipes and pipers are not at their best in the rain, so Maureen requested he play "Amazing Grace" inside the pavilion. The skirl of the bagpipes in this confined space may have appeased the Weather Gods, as the drizzle abated and most of us left the pavilion to follow the piper into the mist, to the tune of "The Minstrel Boy." The Dunn Memorial is past the garage and core shed, on the left just after the entrance to the Fill Quarry: a circle of stones with a gingko sapling in the center, and a stone slab engraved with Pete's name.

Why a gingko? After retiring from his long career as a mineralogist, Pete became a student of trees, and changed his e-mail handle to "treestudy." Gingko trees date back 270 million years to the Permian period, and are thought of as living fossils, not unlike the coelacanth, but unlike that bony fish, the gingko is no longer an endangered species. In short, Pete liked gingkos and requested one be planted in his name at Sterling Hill.

We gathered around the stone circle and took turns scattering the last of Pete's ashes on the gingko, on the stones, and on the potted chrysanthemums. It was a fitting time and place to say goodbye to Pete. Our walk back to the pavilion was, again, to the welcome sound of "Amazing Grace."

Ceremony at the Pete Dunn Memorial, Sterling Mine.

Comfort food had appeared during our absence, so we ate and drank and talked, and gradually the groups broke up and drifted away, each with his or her own thoughts and memories. It was still raining when the food was gone and the displays packed away.

Thanks are due to many who made this event possible. Bill and Denise Kroth and the staff at the Sterling Hill Mining Museum helped throughout, and provided the Christiansen Pavilion and much of the food. Tom Hauck transported and arranged the stones for the memorial, and planted the gingko. Earl Verbeek put together the Pete Dunn slide show and brought a caseful of Pete's minerals. Maureen Verbeek, Pete's friend and executrix, was responsible for planning and directing the event, as well as inviting many friends of Pete. Thanks also to the Franklin Mineral Museum for allowing Pete's ashes to be scattered on the Mill Site Pile, and to Steven Phillips for access to his property, the Buckwheat open cut, for the same reason. The trustees of the Franklin-Ogdensburg Mineralogical Society are also to be thanked for canceling their May meeting so FOMS members could attend the celebration of Pete's life.

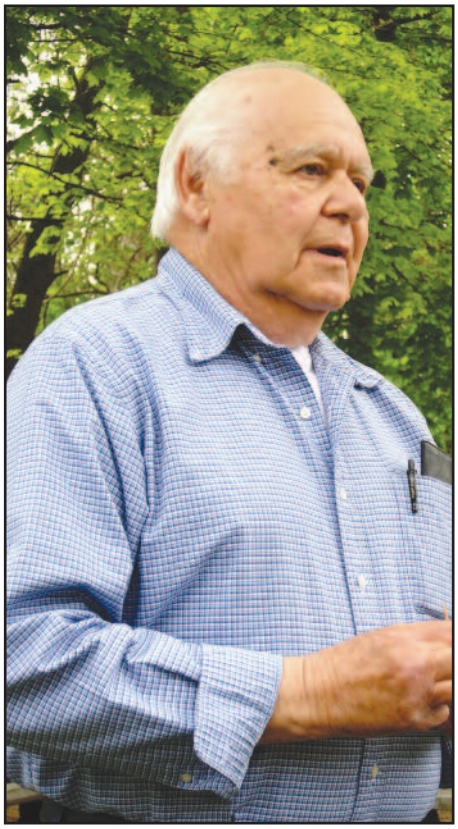
For further reading about the accomplishments, career, and significance of this undeniably great mineralogist who devoted so much of his life to researching and writing about the minerals, mines, and great men of Franklin and Sterling Hill, there are nine memorial articles about Pete Dunn in the Spring 2018 issue of The Picking Table (Vol. 59, No. 1), two in Mineral News (Vol. 33, No. 11, and Vol. 34, No. 6), and an obituary in The Mineralogical Record (March-April 2018). There are probably others.

In Memoriam: Ronald H. Mishkin

Earl R. Verbeek

One of the few remaining Franklin miners unexpectedly slipped away from us on February 3, at age 87. Ron Mishkin, well known to many as a tour guide and educator at the Sterling Hill Mining Museum, and as an authority on the history of iron mining in New Jersey, was a professional geologist with a storied past. A native of Paterson, NJ, Ron first got interested in geology when he took a night course at a local college. Later, while enrolled as a geology student at the University of Texas at El Paso (UTEP), he spent a summer working underground as a mucker in the Franklin Mine. He enjoyed that job so much that he signed on for another year of work in the Franklin Mine after receiving his bachelor's degree. In 1953 he moved to Arizona to work in the Magma Mine, a job he disliked because, as he often remarked, the mine was as hot as its name implies. Thereafter he spent the better part of two years as an exploration geologist in the Western US, a job well suited to his scientific curiosity and general love of nature. Ron also worked in two of New Jersey's iron mines: the Richard Mine in Wharton and the Scrub Oak Mine in Mine Hill. The stories of his experiences in these mines could fill a book—as indeed it might, for Ron was well along in documenting his life's story at the time of his demise.

Ron was a genial man, always ready with a story and a few jokes to try on those around him. He particularly enjoyed telling others of typical pranks that miners played on one another in the mine: of the peanut butter and grease sandwiches, or of convincing a new hire to rub a stick of dynamite on his forehead. Even before his career started, however, he was involved in perhaps the most legendary prank ever undertaken at UTEP. In brief, Ron, along with six other students, wrangled a six-foot alligator from a local pond in the dead of night and deposited the angry reptile in the office of a strait-laced geology professor. Stories differ on the reaction of the professor when he entered his office in the morning, but no one was hurt, and the prank quickly became one of the most celebrated events on campus. It remains so to this day: Search the Internet for Oscar the alligator (the Texas one, not the one in Georgia) to learn more.



In recent years, Ron was best known as arguably the most popular tour guide ever to serve in that role at Sterling Hill. His gentle demeanor and ready laugh endeared him to legions of children on his tours, and of course he had stories for them too. Many remarked on the toothpick he always had in his mouth, though few knew the reason (originally a prop to quit smoking). He was also one of Sterling Hill's most active ambassadors, delivering lectures to diverse audiences at libraries, historical societies, and schools, always seeking to entertain as well as educate. Appearing often in miner's clothes, with cap and cap lamp in place, Ron would tell of adventures underground and explain, in everyday language, how mining was done. He was a captivating storyteller to the last.

Farewell, Ron. Your wealth of knowledge and gentle nature will be missed by all who knew you.

[Ed. note: Readers can see Ron describe mining at the Sterling Mine in the Historic Mining Video on the Sterling Hill Mining Museum website at www.sterlinghillminingmuseum.org/.]

The Sterling Hill Mining Museum Acquires the Bihn Local Native American Artifact Collection

Bill Sandy

The Sterling Hill Mining Museum recently acquired a Native American artifact collection that is not only changing our understanding of the archaeology of the Wallkill River Valley; it is expanding our knowledge of the first people to settle the area, more than 11,000 years ago. And perhaps most relevant to the core mission of the museum, study of this collection can link local sites with the local ancient chert quarries.

Bill Bihn was an outdoorsman and Viet Nam veteran who enjoyed walking the plowed fields of northern Sussex County, NJ and southern Orange County, NY in search of Native American artifacts brought to the surface by the farmer's plow. With the help of his brother Bruce and friends, he amassed a remarkable collection of more than 4000 stone artifacts from about 30 sites along the Delaware River in Montague, and near the Wallkill River in Wantage and Vernon, NJ, and Minisink, NY. What makes this collection of arrowheads, spearpoints, and other stone tools so important is that Bill Bihn marked his finds with a code, so we can use his finds to analyze collections from particular sites.

Hampton Township historian Randy Pittenger was a friend of Bill Bihn, and worked with Bill's brother Bruce to make sure the Sterling Hill Mining Museum could permanently acquire the collection, so that it could be used for research, display, and education. Randy created the exhibit frames of artifacts currently on display in the Zobel Hall. He hopes to refine and improve the displays, adding more interpretations, based on our ongoing analysis.

With the help of Sussex County Community College, over the past few years, I have worked with Randy exploring and documenting archaeological sites in and around Hampton Township. We began a program of registering sites with the Archaeology Bureau of the New Jersey State Museum. As the statewide repository for site information, archaeologists routinely search the Archaeology Bureau files to understand local Pre-Contact (prehistoric) history. Randy asked me if I could identify some of the artifacts from the Bihn collection. After a quick review, it was clear to me that this collection was of great importance because it could fill an enormous hole in our understanding of sites in the Wallkill River Valley in northern Wantage. I have conducted a lot of archaeology study across the border in Minisink, NY, a place with a plethora of great Native American and fossil sites. For example, I wrote reports on the 1980's excavation of Hansen's Rockshelter, which has the most Native American pottery in the county; excavated the Historian Site, which had backfilled sweat lodges filled with stone tools, pottery, fossil crinoid beads, and was radiocarbon-dated to around 1600 years ago; and surveyed the huge and productive Eva Watch Farm site. Despite these great sites north of the line, researchers found that there were no documented sites in adjacent Wantage.

With great support from the Sterling Hill Mining Museum, I embarked on a project to study and date many of the artifacts from at least ten of the Bihn sites in

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BIHN LOCAL NATIVE AMERICAN ARTIFACT COLLECTION

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Wantage and Vernon. With the help of archaeologists Rick Patterson of Vernon and Joe Cusack of Warwick, NY, we were able to type hundreds of stone points, and the results were remarkable. We compared the Bihn points to known types that have been previously dated, thus assigning ages of use to the sites. While our analysis is ongoing, it is clear that the sites were occupied through all of the last 11,000 years. One Bihn artifact (#A1), from the Fishing Hole on the Wallkill Site is a fluted Clovis point, a hallmark of the Paleo-Indian Period. A recent study of Paleo-Indian sites sponsored by the New York State Museum reported just one documented fluted point in the Wallkill River Valley of New Jersey. We have at least two fluted points and possibly as many as four from the sites we studied. Equally remarkable are the number and variety of spearpoints dating to the subsequent and poorly understood Early Archaic Period (10,000 to 8500 years ago). Many points have been identified, spanning the rest of the Archaic Period (8500 to 3500 years ago) and extending to the Late Woodland Period (1500 to 500 years ago), when the Munsee Lenape inhabited the Wallkill River Valley.

In addition to finished projectiles, the collection contains unfinished quarry blanks, and other tools. Archaeologists Paterson and Cusack are studying an ancient chert mining complex in Vernon, with a goal of placing it on the National Register of Historic Places. They have identified specimens in the Bihn collection from that and another local quarry. This type of research seems well-suited to museum members, and participation is encouraged.

We have registered 13 of the Bihn sites in Wantage and Vernon, filling a hole in our understanding of the important Wallkill River Valley. The results of our studies prove that there are many rich and important sites in this area, spanning the last 11,000 years. The preservation of this important collection at the Sterling Hill Mining Museum will enable analysis and research for decades, and will lead to a better understanding of the story of Stone Age people and how they used the rock and mineral resources here in the Wallkill River Valley.

Element Lithium

Gordon Powers

This eighth article in the continuing series on our periodic table display in the Zobel Hall will focus on the alkali metal, lithium. The six-foot by ten-foot periodic table display in the Zobel Hall is a teaching tool that helps people understand the science behind the items they use every day in their lives and the role of mining in producing those items.

Lithium is a silvery-white metal with an atomic number of three, and like the element fluorine (addressed in the Spring 2018 edition of the Sterling Hill newsletter) is highly reactive and, as such, is never found in its pure form. It has to be stored in oil because it is reactive with water. It has the lowest density of all metals and will float in oil (see picture above). The chemical symbol of lithium is Li, and it is the 33rd most abundant element in the earth's crust.

Lithium was first detected in the mineral petalite by the Swedish chemist Johan August Arfwedson in 1817. Its name is based on the Greek word lithos, meaning stone. It was first isolated in 1821 by the English chemist William Brande, although in a very small quantity. The first bulk isolation of lithium was done in 1855 by the German chemist Robert Bunsen and the English chemist Augustus Matthiessen. Their electrolysis process led to the first commercial production of lithium in 1923. The

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ELEMENT LITHIUM

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two most common ore minerals for lithium are spodumene and petalite (both minerals can be seen in the photo above). Another major source of lithium is from evaporated salts in brine pools. The majority of the world's production comes from Australia (spodumene operations), and Argentina and Chile (brine operations). The only U.S. production comes from a brine operation in Nevada. The only local mineral containing lithium is hellandite-(Y), which can be found at Franklin. If, however, you want to collect this rare lithium mineral locally, you will have to work hard.

The first commercial use for lithium was in high temperature lithium greases for aircraft engines. Lithium found increasing use during the Cold War given its usefulness in producing tritium gas as well as a solid fusion fuel in hydrogen bombs. It also is used in specialty glasses, where it decreases the melting point and viscosity; in some metal alloys for increased strength and lighter weight; and in medical treatments for bipolar disorder and depression. Other chemical and industrial uses include air purification systems either as an oxygen generator or CO_2 filter; fireworks (red); optics; and the production of polymers and fine-chemicals. The greatest current use of lithium is in rechargeable batteries. The estimated percentages for end uses of lithium are: batteries, 46%; ceramics and glass, 27%; lubricating greases, 7%; polymer production, 5%; continuous casting mold flux powders, 4%; air treatment, 2%; and other uses, 9%. The consumption of this element has grown significantly and will continue to rise, due to the ubiquitous use of rechargeable lithium batteries in electronic devices.

As you can see, lithium finds many uses in our modern world and can impact our lives in many ways. If you look closely at the items you use throughout your day, you will see how lithium might play a part (hint: check all your devices that use rechargeable batteries). It may be greater than you realize. And as always if you collect minerals at Sterling Hill or Franklin, you will have a connection to the element, lithium.

Sterling Hill Acquires a Drone

Gordon Powers

We recently purchased a drone for occasional use, to take video of events and to view areas of the mine and grounds that normally would be inaccessible. The drone is a DJI Phantom 4 with a one-inch, 20-megapixel camera, which takes very high resolution video and still images. We are highly impressed by the quality of the equipment; it is extremely stable in flight, can be easily flown by novices, and it provides us with a capability we previously did not have. The drone and the controller are shown in the picture below.

For safety, the drone comes with obstacle detection cameras and sonar. It also uses a global positioning system (GPS) to assist in flying and has a feature that allows automatic return to the starting point if a problem is encountered. The onboard GPS also prevents the drone from flying within five miles of an airport, which is no problem in our case as the plan is to only use the drone on our property, for the limited purposes mentioned above. An example of the image quality is shown below. You can see in this image how we plan to use the drove for viewing areas not easily accessed, such as roof tops, and for viewing unusual events at the museum.

2018 GeoSTEM Academy at the Sterling Hill Mining Museum Geo-Engineering Solutions for Living on Earth

Our Earth provides us with the natural resources we rely on for our existence. However, there is a lot involved in going from "ore to store," and without engineering we would be living in a very different world. Twenty middle school and high school teachers realized that when they attended a multi-day professional development workshop in August 2018 at the Sterling Hill Mining Museum, the perfect living laboratory for modeling "ore to store" processes.

The New Jersey state standards for science education include an engineering design component, which requires that science teachers engage their students in engineering design problems. This can be daunting to a teacher not trained in engineering. Therefore, the goal of this year's GeoSTEM Academy -- *Geo-Engineering Solutions for Living on Earth* -- was to assist teachers in identifying ways to incorporate the engineering design process in their curricula by linking geoscience and environmental science concepts to problem solving. During the three-day academy the attending teachers became the learners as they compared the "processes of science" and "engineering design" to establish a common vocabulary they used while solving a problem related to monitoring local water quality in the Wallkill River near the Sterling Hill Mining Museum.

Within this dynamic academy the teachers were provided a comprehensive tour of the mine through the lens of engineering and the basics of geology. They visited two sites in Sussex County rich in both deep and recent geologic history. At these sites, they not only learned about the origin of the geologic structures, but also about the constraints (development) and opportunities (mining) posed by the geology. The teachers wore their "student" hats as they were challenged to collect data related to the problem posed at the beginning of the academy to assist them in designing solutions to their problem.

2018 GeoSTEM Academy teachers analyzing the local geology with Earl Verbeek.

The teachers provided positive feedback on the academy, remarking on the quality of the expertise of Sterling Hill's academy team and on the applicability of the content learned to their classrooms. The enthusiasm and expertise of the academy team ensured the success of the event. Bill Kroth's passion and unbelievable depth of knowledge in a wide range of fields of engineering, Earl Verbeek's knowledge of the geologic past of the region, Kate Soriano's expertise in providing professional development to teachers, Cathy Astor's expertise in chemistry education and field methods, and Kristine Rogers expertise in the functioning of our local watershed all contributed to the success of the event. Missy Holzer's

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GEOSTEM ACADEMY

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expertise in workshop design and earth science curricula provided a framework for the academy. A special thanks goes to Denise Kroth, Winter Rosen, and others from the Sterling Hill Mining Museum who provided support that ensured the academy ran smoothly. Finally, a huge thanks goes to Picatinny Arsenal for providing the funding to support the academy.

Our mission is to tell the story of the Sterling Hill Mine and to inspire lifelong learning about earth sciences, engineering, and the responsible use of the Earth's non-renewable resources. The GeoSTEM Academy is just one of the many ways we pursue that mission. We have provided the academy for several years, and we plan to continue it in the future.

2018 GeoSTEM Academy Teachers search for macroinvertebrates in the Wallkill River.

The History of the Periodic Table of Elements

Gordon Powers

Our continuing series of articles on elements is designed to highlight the educational value of the large, three-dimensional periodic table in the Zobel Hall. But where did the concept of the periodic table come from, and when was it developed?

The idea of trying to classify what makes up the world around us is probably as old as man. For instance, somewhere around 330 BCE Aristotle, based on an idea suggested by Empedocles, proposed that everything derives from a mixture of what he called roots. Plato later renamed the roots as four elements; earth, fire, water, and air. Other traditions had similar ideas. Also, some pure elements have been familiar since antiquity in their native form, including iron, copper, zinc, and tin.

The early alchemists in their search for the Philosopher's Stone, which they believed could turn regular base metals into gold, spurred discovery of some actual elements. One example is the discovery of the element phosphorus. Alchemists were fascinated that human urine had a "golden" color, and its distillation resulted in an element most different from gold -- phosphorus!

Robert Boyle in 1661 defined an element as a substance that cannot be broken into a simpler substance by a chemical reaction. The discovery of other pure elements led to efforts to classify them. Chemists looked for patterns in the properties of elements to group them. Early efforts in classification included grouping them into gases, non-metals, metals and earths, triads, and the law of octaves. Dimitri Mendeleev is recognized as the developer of the periodic table we know and use today. However, a number of other chemists (for example, Jean-Baptiste Dumas, Alexandre-Emile Beguyer de

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HISTORY OF THE PERIODIC TABLE OF ELEMENTS

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Chancourtois, and John Newlands) developed ideas on the best methods for classifying the elements that were similar to Mendeleev's model. In fact, Julius Lothar Meyer in 1868 produced a widely accepted table very similar (although it did not appear in print until 1870) to the one Mendeleev published in 1869. Mendeleev had more confidence in his periodic table than these other scientists, and he used it to predict new elements as well as to correct the atomic weights of some known elements.

The idea for the Sterling Hill periodic table came from Bill Kroth who had seen similar displays online, and felt that it would be great to have such an educational tool in our museum. The Sterling Hill periodic table highlights the mining theme by displaying the ores from which each element is produced and, most importantly, why we need each element. So in 2008 Bill, his wife Denise, and I with the help of many people (they are listed in the seventh row of the last column in our table) started acquiring samples of the elements, examples of how these elements are used, and some ore sources for the elements. The wooden frame was assembled using a biscuit cutter, lots of oak, joining biscuits, glue, and LED lights. Our periodic table has occasionally evolved, as we continue to add donated items. And we have added the new artificial elements that are being created in the continuing study of nuclear physics.

The power of the periodic table lies in its layout, which is based on the atomic number (number of protons) and electron configuration of the elements. The table helps in understanding chemical behavior and the relationships between the elements. Elements that have similar chemical characteristics are grouped in columns such as the alkali metals (column 1) or the halogen family (column 17).

One powerful example of the usefulness of the periodic table is the understanding of what happened to the famous "radium girls" who, in the 1920s, were employed to paint the radioluminescent watch dials on watches, and were poisoned by the radium. Radium is in the same column on the periodic table as calcium and, as such, the body treated it like calcium and deposited it in their bones and teeth. Each row in the periodic table has one more shell of electrons than the row above it. The higher the atomic number, the more protons (and neutrons), and this eventually leads to higher instability in the nucleus and radioactive decay of some of these elements.

This article touched very lightly on the history of the periodic table. Some suggested sources for more in-depth information include The Disappearing Spoon by Sam Kean, "The Evolution of the Periodic System" article on the Scientific American website, and "History of the periodic table" entry at Wikipedia. These were primary sources of information for this article for the Sterling Hill newsletter.

Sterling Hill Provides a Second Year of STEM Scholarships

Bill Kroth

With the success of the Sterling Hill Mining Museum comes the responsibility of sharing our resources with others as we pursue our educational mission. For a second year, we are providing scholarships to college students studying in the STEM (**S**cience, **T**echnology, **E**ngineering, and **M**athematics) fields. In the 2017-18 academic year we provided $2500 scholarships to four students. In the 2018-19 academic year we are increasing our education investment, providing $2500 college scholarships to each of seven students.

New to our STEM scholarship program this year is Jacob Janosko, an Ogdensburg resident who completed his high school studies at Sussex County Technical School. Jacob will be attending Stevens Institute of Technology in Hoboken, NJ, majoring in Electrical Engineering, one of the most difficult of all the engineering fields.

Also new to our program is Alex Kerstanski, a resident of Goshen, NY. Alex has been involved in the local mineral hobby for many years and is regarded as a superb mineral "identifier." In addition, Alex interned during the summer of 2018 at Sterling Hill doing all types of jobs, from gathering boulders for international orders to helping Earl Verbeek with mineral identification using our Raman spectrometer. Alex, who is an Eagle Scout and who received the prestigious Mastery in Science award, will be starting his freshman year at the State University of New York in Binghamton where he will study geology.

Alex ("Carbide Boy") Kerstanski identifying local minerals as a summer intern using our new Raman Spectrometer.

Liz Appaluccio, a Sparta, NJ resident, will receive one of our STEM scholarships. Liz will begin her sophomore year at Stockton University in Atlantic County, NJ, studying geology. Liz has volunteered at Sterling Hill through much of her high school years, and we are especially proud when she brings students from her college to Sterling Hill and presents a superb tour. I am always pleased to hear the compliments that she receives from her professors!

Finally, we have been so impressed with the academic and other successes of our four scholarship recipients from last year, that we are continuing the scholarships for their sophomore years. The four young ladies, all from Ogdensburg, are: Gabriella Ciasullo (Villanova, Chemical Engineering); Randi Lyn Hornyak (Stockton University, Medical/Physical Therapy); Brianna Rocks (Ramapo College, Mathematics); and Courtney Rocks (Ramapo College, Mathematics).

You may notice that we have deviated somewhat from last year's criterion of granting scholarships to Ogdensburg residents only. The 2018 high school graduating class from Ogdensburg was particularly small, and very few students expressed an intention to major in a STEM discipline. As a result, we added the scholarship category: serious, local students who plan to study geology.

Our ultimate goal is to have a "steady state" of 16 students, each ultimately receiving $10,000 for their four years of college study in a STEM discipline. At Sterling Hill, we are preserving the past, but also investing in the future. I cannot think of a better investment!

Letter from Sterling Hill STEM Scholarship Awardee

Randi Lyn Hornyak

With help of the generous scholarship awarded to me by the Sterling Hill Mining Museum, I have successfully completed my first year at Stockton University. As a STEM (**S**cience, **T**echnology, **E**ngineering, and **M**athematics) major, my course work has definitely been challenging, but also incredibly engaging and fascinating. My classes have been STEM-intensive including organic chemistry, genetics, biochemistry, and physiology. I also took a course that was a biology seminar in which scientists presented their research and educated us about different career opportunities within the field of biology. I have had incredible professors for all of these subjects. They have all assisted me when I struggled, pushed me to excel further when I succeeded, and helped me to grow my passion for the field of biology. I have not only learned in the classroom, but I have also gained essential hands-on experience through labs associated with each class. I am incredibly excited to continue my studies at Stockton University next year, as they have just opened new science and health-science buildings on campus. Both buildings have new, state-of-the-art classrooms and laboratories, with the most up-to-date equipment for both students and professors to use. As I am studying the rapidly advancing field of biology, I am incredibly fortunate to study at a university that stays updated with the developments of STEM disciplines.

While my studies are always a priority, I do take time away from the library to get involved in some of the many opportunities that my university has to offer. I am a member of Stockton's track team where I participate in the shot put, javelin, and hammer events. I placed fifth in shot put this past season at our conference championships! I also have joined the Admissions Ambassadors program, for which I do guided tours of our campus and help run other programs for prospective students and their families. I have been hired as a member of The Activity Leaders of New Students (T.A.L.O.N.S.), for which I assist in new student activities including our outdoor adventure retreat and Welcome Week activities. Through both of those organizations I am able to provide prospective and new students with guidance that I was given that led to my incredible freshman year. I also am in the Honors Program, which extends my academic and volunteer pursuits. Through the Honors Program, I participated in an alternative spring break during which I volunteered at Give Kids the World, a village in Florida that provides all-expenses-paid stays for Make-a-Wish families. I also have had the opportunity to expand my professional development through my involvement in the Undergraduate Physical Therapy Club. And I have found time to volunteer with the Special Olympics, campus-wide service days, and other volunteer events around the university. Being a part of all these teams and organizations has absolutely made my adjustment to college so much easier and made my time there all the more enriching. During my first year I was able to take advantage of so many amazing opportunities, meet incredible people, delve into my academic studies, and get involved on campus, all while maintaining a 4.0 GPA. I would like to sincerely thank the Sterling Hill Mining Museum for granting me their generous scholarship which assisted me in accomplishing all that I have my first year at Stockton University.

[Ed. note: Randi Lyn Hornyak was one of four students from Ogdensburg who were awarded Sterling Hill STEM Scholarships in 2017-18. Other awardees include Gabriella Ciasullo, Brianna Rocks, and Courtney Rocks. All four awardees have successfully completed their first year in school; and the Sterling Hill Mining Museum will continue their scholarships in the 2018-19 school year. For more information on Sterling Hill STEM Scholarships, see the article by Bill Kroth in this edition of the newsletter.]

Featured Mineral

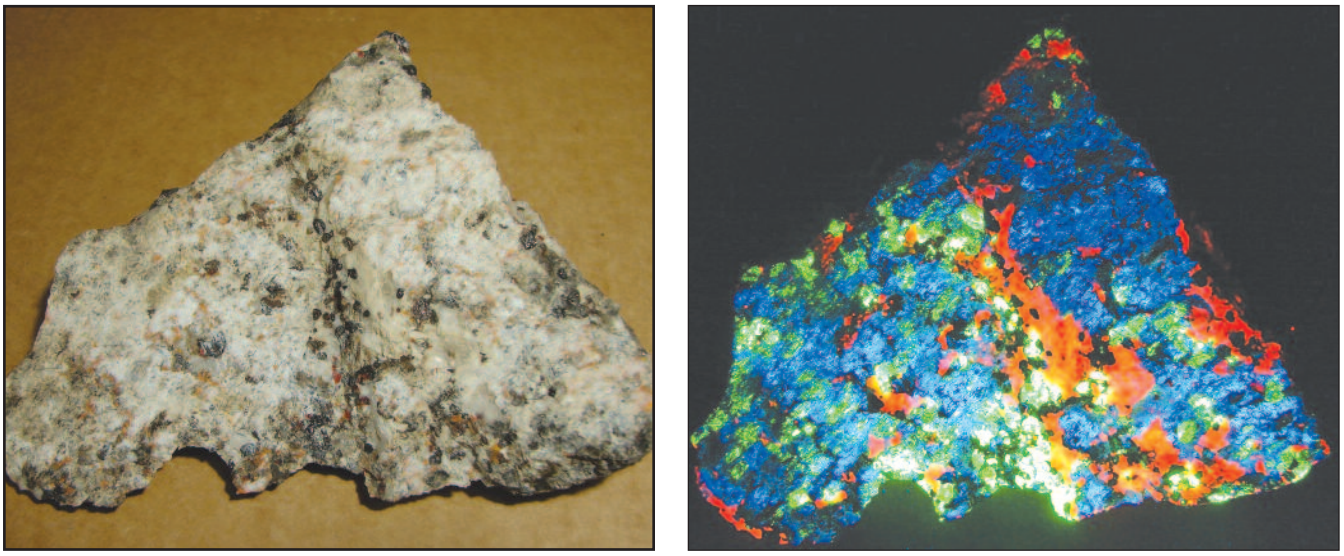
Robert A. Horn

The featured mineral for this issue of the Sterling Hill newsletter is hydrozincite, which occurs as an alteration product of the zinc ore minerals sphalerite, hemimorphite, and smithsonite. In daylight it is white, cream, or light grey in color. While hydrozincite is found most often as a crust on other minerals, it also can be fibrous or stalactitic in nature. Crystals are rare, usually very small or microscopic. Hydrozincite is found as a secondary mineral in the oxidation zone of zinc deposits. It fluoresces whitish blue to blue in shortwave ultraviolet light. It was first described in 1853 and named for its chemical content by German mineralogist, Gustav Adolph Kenngott.

My quest to find a respectable specimen of hydrozincite started in the mid 1990's at Sterling Hill. The Sterling Hill Mine Run Dump at that time was open the last day of the month, and Joe Kaiser manned the gate. I would sign in with him and pay the five dollar fee. In those days, it would cost an additional dollar per pound for any material you collected.

I often met some very interesting people while collecting minerals. Two characters I came across were Gerry McLaughlin and Claude Poli. These two collectors were having a good time collecting on the Mine Run Dump. I could hear them talking and telling stories. After a while, curiosity got the best of me, so I asked them what they were looking for. It was hydrozincite, and they were looking for the intense blue fluorescent material. They showed me some examples of the white hydrozincite which formed on the zincite and calcite. They also told me to look for specimens with a vein going through it. These two collectors gave me a crash course on how to look for hydrozincite.

I did not have much luck finding good hydrozincite in the early years. I saw some traces of electric-blue fluorescent hydrozincite, but it usually was only in small spots. I also found some dull blue fluorescent specimens. I then started to attend some of the night digs at Sterling Hill, usually twice a year. Also, the museum expanded collecting to the Passaic and Noble Pits. Armed with a new SuperBright ultraviolet lamp and battery, I started to find good hydrozincite. I did find a baseball-sized specimen with a thin bright blue fluorescent vein running through the middle. I gave the rock a quick tap with my pick along the vein, and it broke down the middle. Both



Hydrozincite (fluorescent blue) with willemite (fluorescent green), calcite (fluorescent orange), franklinite (non-fluorescent black), and zincite (non-fluorescent red). Self-collected by Bob Horn in the Passaic Pit at the Sterling Mine, Ogdensburg, NJ. This specimen is shown photographed in white light on the left; and under shortwave ultraviolet light on the right. It is four x four x four inches, and is in the collection of Bob Horn.

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FEATURED MINERAL
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sides of the rock were covered in an intense blue fluorescent hydrozincite. It was exactly what Claude and Jerry were talking about.

It certainly helps to have a good UV lamp in the field, and I like to use a UV Systems SuperBright lamp for field collecting. The Passaic Pit is an excellent area to search because large amounts of hemimorphite were at one time found there. The specimen in the photograph was found in the Passaic Pit in the summer of 2013 while I was collecting with Mike Pierce. We came across several boulders which had intense blue hydrozincite mixed with other fluorescent minerals. The specimen in the photos is four inches in each dimension. It is a truly aesthetic specimen, with fluorescent patches of electric-blue hydrozincite, green willemite, and orange calcite, and specks of non-fluorescent franklinite and zincite. Fluorescent hydrozincite specimens are easy to photograph.

If you compare this specimen with others on the internet, you will appreciate how good it is. Good luck hunting!!!

My Journey with Thomas Edison

Ray Latawiec

In a previous edition of this newsletter, I shared my experiences collecting artifacts at the Edison mining complex on Sparta Mountain. You probably surmised that this interest was the result of years of research and field work. It was. But how this interest was spurred is interesting in and of itself. At least it is to me. I hope you will find it interesting also, after I relate to you my long journey with the great inventor.

I can remember, as a young lad vacationing on Long Island, a tale that I heard from one of the locals about the beach I was combing for shells. "Look and see if you can find some black sand along the shore. Occasionally it shows up, and you'll be lucky to find some, before it vanishes. I have a magnet you can use to collect it...very special stuff...once discovered by Thomas Edison while he was here a long time ago." Thomas Edison, known to me as the *Wizard of Menlo Park* and the *light bulb guy*, was actually there at that very spot looking for the special stuff. But what was it? The magnet was the clue. Iron in the sand...had to be...and according to the locals, a potential treasure trove of magnetite. Iron ore, right here at the shore. I never recall finding any of the stuff though.

Looking a little further into the matter, I discovered Edison indeed had found a bed of fine-grained iron ore that was actually cast up by the sea. At one time, there was this black sand that extended in parts for 15 miles along the coast. The constant wave action of iron bearing rocks as far away as Connecticut ultimately deposited this sand on Long Island. This fascinated me. I am sure it did the same to Edison, because he was convinced this find would yield an almost endless supply of iron that could be smelted, creating a supply of the metal for the eastern iron market. The light bulb lit in his brain, and he embarked on an adventure to mine the sand that would ultimately become a fiasco. You see, the sea being relentless, swept away all the black sand during a severe storm, thus reclaiming the millions of tons of fine iron ore that Edison envisioned mining. But the seed had been planted in his mind, leading to his efforts at magnetic separation of fine-grained iron ore from lean country rock, which became an obsession. This ultimately led him to the highland hills of Sussex County, NJ. His "Ogden Baby" mine was born, and the New Jersey & Pennsylvania Concentrating Works took form.

Returning from trips at the Jersey shore, I knew when we were almost home, because a beacon of light illuminated the skies along the Garden State Parkway not far from our home in Linden. This, I later discovered, to be a monument to Thomas Edison, in Menlo Park, erected at

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MY JOURNEY WITH THOMAS EDISON

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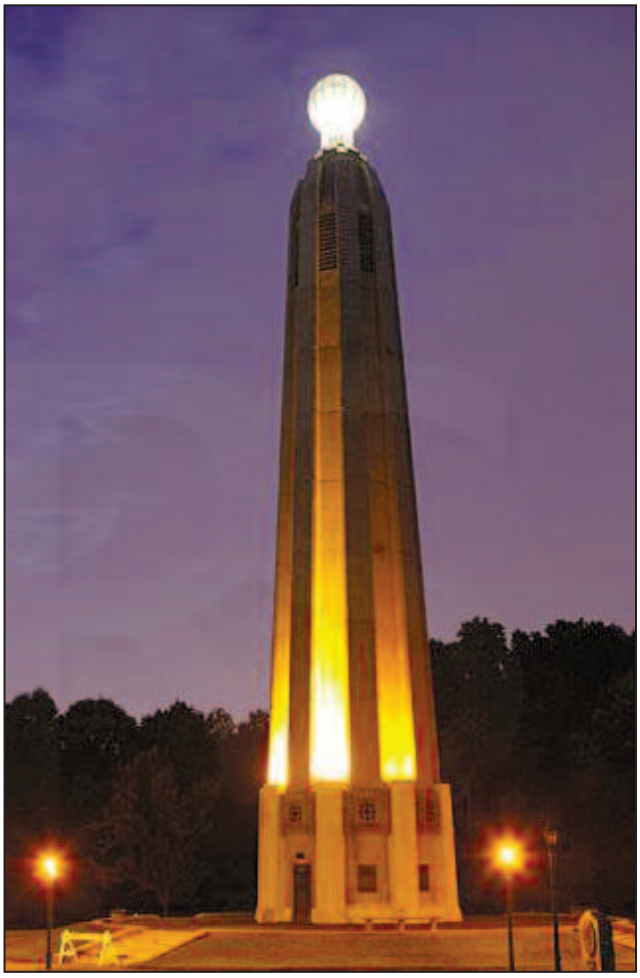
the location of his fledgling industry. This was where he and his talented staff plied their electrical wizardry. My dad brought me time and time again to the Menlo Park site, further stimulating my curiosity and facilitating my lifelong journey with the *light bulb guy*. His "signature" seemed to be everywhere. Relatives in Bloomfield, a few towns away from where I lived, told me about Edison's factories there, and my dad's friend led me to another great adventure at the Edison research and production facilities in West Orange. Visiting these places revealed the significant evolution and expansion of Edison's facilities from the days of his meager plant in Menlo Park. It was said that my grandfather worked at one of these sites and actually met the great man. Family legend has it that grandpa had Edison's autographed picture, but this was apparently lost to time.

Now the great inventor was alive in me. I have seen and touched the places where he was. Walked in his footsteps so to speak. In my own mind, I became the *Wizard of Linden*, purchasing all sorts of electric switches, bulbs, wires, batteries, and such from my earnings as a paper boy. Edison too was a paper boy at a young age. He not only delivered the paper, but he wrote and published it...what a guy! I had lights that lit up when you entered my laboratory and my inner sanctum bed room. I had also rigged up a buzzer alarm, that had a tendency to go off during the night giving all a fright. Had to dismantle that in a hurry. I tried my luck at a primitive bug zapper, but found that the only bugs electrocuted were those I forced into the chamber. I tried my hand at an electric tomato cooker, but only achieved a pulpy mess. My bike had more lights on it than a Christmas tree, and I was told it was really something to see as I rode the streets at night showing off. The buzzer from my room was fitted into my bike's pedal, so as to buzz when I completed the circuit while peddling along. I envisioned myself as a great inventor, with a career as an electrical engineer, but I soon realized this was not to be the case. Though I was destined for other things, I never gave up my fascination for Thomas Edison.



Thomas Edison monument in Meno Park, NJ.

My destiny was to become a New Jersey State Trooper. On one occasion, a special detail brought me to the Edison laboratory in West Orange. A fantastic tour was arranged for the troopers, and as I recall, Edison's desk was exactly the way he left it...cluttered with all his stuff, spanning the many inventions of his fertile mind. The purpose of our detail was revealed by the curator. We were to remove all the hazardous material that needed to be destroyed. This hazmat detail involved removing everything from bat droppings to nitroglycerin, TNT, unstable acids, experimental explosives, and unstable chemicals of all kinds. This was unsettling, to say the least, but we were accompanied by experts from the US Navy Explosive Ordnance Disposal Unit. We were assigned to transport the most dangerous stuff in special vehicles to the Earle Naval Base for destruction. The range was set up at a safe location where all the hazmat materials were disposed of in one great blast. It was an experience that I will never forget, especially since I got to see things that were not available to the general public. I actually sat in Edison's chair and put my feet up on his desk...again following in his footsteps so to speak.

The chain of events that led me to Edison's "Ogden

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MY JOURNEY WITH THOMAS EDISON

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Baby" mine on Sparta Mountain, had to do with my interest in science, and my love of rock collecting. What better place to be than Franklin, NJ, the sight of the most amazing mineral deposits? Then Sterling Hill followed, a natural progression; and the next stop was Sparta Mountain. Again, in the footsteps of the *Wizard* I found an incredible place for history, geology, and industrial archaeology that fascinates me still. When I walk through the ruins of his "Ogden Baby" mine, the child in me returns, and I become the *Wizard of Linden* once again. A strange feeling comes over me when I visit that sight. It is as if Edison was walking beside me, acting as a tour guide at his great enterprise. Although the iron mine on Sparta Mountain was failure, Edison developed many inventions there that are still in use today, as he tried to perfect the project -- magnetic separation, giant crushing machines, conveyors, and dynamos, to name a few.

The many amazing developments at Edison's Sparta Mountain concentrating works are great stories in and of themselves. I plan to write an article for a future newsletter on the development of his famous iron ore "briquette" that was a critically important part of his efforts to mine low-grade ore from the hills around his" Ogden Baby" mine. I am by no means an expert, but I am hopeful that my experiences at his facilities may inspire you also.

The inventor's desk at Thomas Edison National Park in West Orange, NJ.

Check Out the New and Improved Sterling Hill Mining Museum Website

The Sterling Hill Mining Museum website has recently been revised and significantly improved, under the direction of Executive Assistant Winter Rosen. It now has significant new information and is much more user-friendly. Please check it out at https://www.sterlinghillminingmuseum.org/.

Sterling Hill Mining Museum Mission Statement

Our mission is to tell the story of the Sterling Hill Mine and to inspire lifelong learning about earth sciences, engineering, and the responsible use of the Earth's nonrenewable resources.

What We Do

1. We inspire students to pursue careers in science and engineering.
2. We inspire people to be thoughtful and responsible stewards of our environment.
3. We are committed to preserve our historic facility, rock and mineral samples, artifacts, and records to support research and foster understanding of this unique geologic area.
4. We provide visually stimulating, hands-on experiences in earth science and technology in an historic, immersive, real-world setting.
5. We promote an understanding of human involvement in our environment and how science and technology relate to that connection.

An Update on the Raman Spectroscopy Project at the Sterling Hill Mining Museum

Earl R. Verbeek and Alan Rein

In the Spring 2018 issue of the Sterling Hill Mining Museum newsletter, we introduced readers to some fundamentals of Raman spectroscopy and its intended uses at Sterling Hill. In this issue we provide an update on our progress and discuss some of the strengths and limitations of Raman spectroscopy as applied to minerals from the Franklin-Sterling Hill area.

To date we have 789 spectra in our digital reference library. These spectra provide the "standards" for identifying an unknown mineral in the museum collection. This is done automatically by a search-match program that finds the ten nearest matches to the spectrum of the unknown mineral and for each of them provides a numerical score, from 0 to 100, of how closely the spectra match. A close match usually (but not always) indicates that the unknown mineral is the same species as that of the matching reference spectrum.

This process of creating a reference library might sound straightforward, but it is not. For one thing, more than 370 different mineral species occur locally, and many of them occur in different assemblages and have somewhat different compositions from one assemblage to another, so having only 789 reference spectra is clearly not enough. We do not yet know how many is "enough," but our early educated guess is that we will require at least triple the number of spectra we have at hand now.

A second limitation is the paucity of rigorously identified specimens to use as library standards. For example, we have on file Raman spectra for ten different specimens labeled leucophoenicite. When we view all ten spectra on the computer screen, it is obvious that most, but not all, of the spectra match. But which ones are really leucophoenicite? Most of the specimens in our museum collections are sight-identified, a risky procedure indeed for localities as complicated as Franklin and Sterling Hill. There are several ways to address this problem, all of them time-consuming, but necessary if we are to have confidence in our own library standards.

Although Raman spectroscopy is a rapid technique, requires no sample preparation, is well suited to analysis of microscopic crystals, and in most cases is nondestructive, some limitations apply. For example, when analyzing microcrystals, one must focus the laser beam into a tiny spot so it falls only on the microcrystal of interest and not on adjacent minerals. Under such circumstances it is easy to "burn" the mineral, which will then usually result in a black pit. This is the same effect that many have experienced with sunlight and a magnifying glass. The sun falling on your face feels merely warm, but focus the beam through a magnifying glass and you can ignite paper. Particular care must be taken, then, when using the Raman microscope not to damage a rare mineral species. Also, metallic minerals, as well as very dark ones, are poor candidates for Raman spectroscopy, and there are many such minerals at Franklin and Sterling Hill. It is possible to measure spectra for some such species, but the spectra are commonly of poor quality.

As with any other "black box" technique for analyzing minerals (X-ray diffraction, energy dispersive spectroscopy-EDS, etc.), it is easy to accept the results at face value, but that is exactly the wrong thing to do. In a recent example, a specimen brought to the museum for identification was duly measured and subjected to the search-match function, which returned an identification of johnbaumite. Johnbaumite, a rare but lovely fluorescent mineral of the apatite group, has an ideal chemical composition of $Ca_5(AsO_4)_3(OH)$. Locally, however, we always see some phosphorus substituting for arsenic,

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UPDATE ON THE RAMAN SPECTROSCOPY PROJECT

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and it is likewise common for some fluorine (F) and/or chlorine (Cl) to substitute for some of the hydroxyl (OH) content. Without getting into details, the Raman analysis was "blind" to the OH:F:Cl ratio in the specimen and merely identified which apatite specimen in the reference library had the closest As:P ratio to the unknown. That specimen happened to be a johnbaumite, but the unknown might well be turneaureite or svabite instead.

Despite some of the complications and limitations mentioned here, it remains true that Raman spectroscopy is one of the most powerful and convenient techniques around for mineral identification. It has already helped us correct the identifications of several dozen specimens, including a datolite specimen that was labeled nasonite, and a sussexite specimen that was labeled fluoborite. Sometimes the results are pleasurable (as when a purported fluoborite specimen turned out to be tilasite instead), but sometimes they result in the opposite, as when a $5000 specimen of "kolicite" turned out to be a zincite microcrystal specimen worth a bare fraction of that. Emotional consequences aside, it is most gratifying to have a Raman unit close at hand to help us verify or dispute our sight-identification of minerals and to use for various research projects. Two such projects are currently underway.

North Jersey Mineralogical Society Helps Sterling Hill with a Major Site Improvement

Bill Kroth

The grounds at Sterling Hill present a first impression to our visitors, and we have been working diligently to improve the appearance while maximizing the usage potential. Over the years, we have found that installing pavers is a great way to keep weeds at bay, expand usable areas, and improve our overall appearance.

We proudly host the North Jersey Mineralogical Society at several events each year in our pavilion and the adjacent area. Some months ago, Jeff Wilson and Ron Schulz of the society approached me with the idea of having their club install a paver patio in an area just south of the pavilion where several picnic benches sit on grass. Due to foot traffic, most of the grass was gone, replaced with bare soil and weeds. This was not an inviting area, and those picnic tables were only used as a last resort.

Jeff and Ron wanted a lasting memorial tribute for past society member, Sarna Strom, and thought that a patio with an engraved plaque would be a great way to pay respect. During the spring, Sterling Hill staff installed the required catch basin and drainage pipe, performed the rough excavation, and ordered all of the materials. Then in June, members of the North Jersey Society got to work on three Saturdays, placing sand and over 800 paving stones. The result was a professional-looking 12-foot by 35-foot patio. Jeff added the final touch by installing a knee-wall planter in one corner.

This patio area is now "preferred seating," and we thank the volunteers of the North Jersey Society for all of their hard work!

Cindy Strom admires the newly completed patio, constructed by the North Jersey Mineralogical Society in honor of her mother, Sarna Strom.

Our Train Is Now on Track

Bill Kroth

In the Spring 2018 edition of the Sterling Hill newsletter we reported that our electric motor (sometimes referred to as the mine train), that sat idle for decades, was nearing completion under the watchful eye of Jack Furman at the Rectifier Electric shop in Newton, NJ. With the restoration now completed and our motor returned, we have nothing but praise for the hard work that Jack and Sterling Hill trustee, Doug Francisco, have done in making our latest project a total success!

Once back on our property, Doug installed switches and outlets for power, recharging, and lighting on the motorized unit. We were unsure about which charging unit would be required or the amount of time necessary to charge the eight, deep-cycle batteries. But after about ten minutes on Amazon, we narrowed down our selection to a simple $240 golf cart charger that could supply the 48 volts to run the main motor. Though the "math worked," it seemed too good to be true that a charger smaller than a loaf of bread could provide enough power to recharge the 300 pounds of batteries. But it works perfectly.

Over the last several months, we have tested the motor and a single car that holds four passengers. We now have about 500 feet of track and one working switch that allows us to drive the train right to the shaft station. We have taken over 100 trips with special guests, Boy Scouts, and friends. I am pleased to report that the system has worked flawlessly. There have been no derailments or any other issues, and we are not anywhere near the motor's design capacity. Most surprisingly, just one, three-hour charge is good for over 100 trips!

Eventually, we would like to extend the ride to the Passaic Pit, having found a good source of inexpensive, used mine rail. We certainly plan on using the mine train as part of our Haunted Halloween school fund-raiser. Doug Francisco is assembling two additional passenger cars that will bring the total capacity to 12. We realize that our train is a special attraction and will most likely not be part of our typical tour, due to a variety of logistical concerns. But for special occasions, it is truly a magical experience that everyone really enjoys!

Our restored mine train and new passenger car bring another dimension of fun to Sterling Hill.

STERLING HILL MINING MUSEUM
Calendar of Events

Sunday, August 26, 2018
Mineral Collecting at Sterling Hill (daytime only)
9:00 AM - 3:00 PM
Collecting is allowed on the Mine Run dump, in the Passaic pit, and "saddle" areas. Bring sturdy footwear, a strong hammer (carpenter's claw hammers not allowed), and eye protection. A dark room with a shortwave ultraviolet light is provided on-site for inspection of fluorescent minerals.
Fee: $5 admission plus $1.50 for each pound of minerals taken. Fee does not include mine tour.
Age Requirements: Must be age seven or older to collect on the Mine Run dump; must be age 13 or older to collect elsewhere.

Saturday, September 29, 2018
Franklin Gem and Mineral Show
Littell Community Center, 10-12 Munsonhurst Road, Franklin, NJ
9:00 AM - 6:00 PM (indoors); 7:30 AM - 6:00 PM (outdoor swap/sell)

Saturday, September 29, 2018
Annual Show Banquet and Auction
Lyceum Hall, Immaculate Conception Catholic Church, Franklin, NJ
Banquet begins 6:30 PM; tickets are $20 per person.

Saturday, September 29, 2018
Sterling Hill Garage Sale
Christiansen Pavilion, Sterling Hill Mining Museum, 30 Plant Street, Ogdensburg, NJ
10:00 AM - 3:00 PM

Sunday, September 30, 2018
Franklin Gem and Mineral Show
Littell Community Center, 10-12 Munsonhurst Road, Franklin, NJ
10:00 AM - 5:00 PM (indoors); 9:00 AM - 5:00 PM (outdoor swap/sell)

Sunday, September 30, 2018
Sterling Hill Garage Sale
Christiansen Pavilion, Sterling Hill Mining Museum, 30 Plant Street, Ogdensburg, NJ
10:00 AM - 3:00 PM

Sunday, September 30, 2018
Mineral Collecting at Sterling Hill (daytime only)
9:00 AM - 3:00 PM
Collecting is allowed on the Mine Run dump, in the Passaic pit, and "saddle" areas. Bring sturdy footwear, a strong hammer (carpenter's claw hammers not allowed), and eye protection. A dark room with a shortwave ultraviolet light is provided on-site for inspection of fluorescent minerals.
Fee: $5 admission plus $1.50 for each pound of minerals taken. Fee does not include mine tour.
Age Requirements: Must be age seven or older to collect on the Mine Run dump; must be age 13 or older to collect elsewhere.

Saturday, October 13, 2018
Mineral Collecting at Sterling Hill
(Nighttime: Sterling Hill Mining Museum members only)
6:00 PM - 10:00 PM
Night collecting at Sterling Hill is scheduled twice a year for museum members only.
Collecting is allowed on the Mine Run dump,

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CALENDAR OF EVENTS
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in the Passaic pit, and "saddle" areas. Bring sturdy footwear, a strong hammer (carpenter's claw hammers not allowed), and eye protection. A dark room with a shortwave ultraviolet light is provided on-site for inspection of fluorescent minerals.
Fees: $5 admission plus $1.50 for each pound of minerals taken. Fee does not include mine tour.
Age Requirements: Must be age seven or older to collect on the Mine Run dump; must be age 13 or older to collect elsewhere.

Friday, October 19, 2018
Saturday, October 20, 2018
Friday, October 26, 2018
Saturday, October 27, 2018
Annual Ogdensburg School Fund-Raiser Halloween Tour
Sterling Hill Mining Museum
First tour starts at 6:00 PM, and tours run every 15 minutes until 9:45 PM
Tours from 6:00 PM to 6:45 PM are geared toward younger children and are less scary.
Admission: Age 12 and under $5.00
Age 13 and over $10.00

Sunday, October 28, 2018
Mineral Collecting at Sterling Hill (daytime only)
9:00 AM - 3:00 PM
Collecting is allowed on the Mine Run dump, in the Passaic pit, and “saddle” areas. Bring sturdy footwear, a strong hammer (carpenter’s claw hammers not allowed), and eye protection. A dark room with a shortwave ultraviolet light is provided on-site for inspection of fluorescent minerals.
Fee: $5 admission plus $1.50 for each pound of minerals taken. Fee does not include mine tour.
Age Requirements: Must be age seven or older to collect on the Mine Run dump; must be age 13 or older to collect elsewhere.

Thursday, November 22, 2018
Museum closed for Thanksgiving

Friday, November 23, 2018 - Sunday, November 25 2018
Open daily for public tours at 10:00 AM and 1:00 PM

Sunday, November 25, 2018
Mineral Collecting at Sterling Hill (daytime only)
9:00 AM - 3:00 PM
Collecting is allowed on the Mine Run dump, in the Passaic pit, and “saddle” areas. Bring sturdy footwear, a strong hammer (carpenter’s claw hammers not allowed), and eye protection. A dark room with a shortwave ultraviolet light is provided on-site for inspection of fluorescent minerals.
Fee: $5 admission plus $1.50 for each pound of minerals taken. Fee does not include mine tour.
Age Requirements: Must be age seven or older to collect on the Mine Run dump; must be age 13 or older to collect elsewhere.

Tuesday, December 25, 2018
Museum closed for Christmas

Wednesday December 26, 2018 - Tuesday December 31, 2018
Open daily for public tours at 1:00 PM

Tuesday, January 1, 2019
Museum closed for New Year's Day

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CALENDAR OF EVENTS
Continued from page 26

January 2019
Open for public tours at 1:00 PM, weekends only

Monday January 21, 2019
Martin Luther King Jr. Day
Open for public tours at 1:00 PM

February 2019
Open for public tours at 1:00 PM, weekends only

February 18, 2019
Presidents Day
Open for public tours at 1:00 PM

March 2019
Open for public tours at 1:00 PM, weekends only

Sunday, March 31, 2019
Mineral Collecting at Sterling Hill (daytime only)
9:00 AM - 3:00 PM
Collecting is allowed on the Mine Run dump, in the Passaic pit, and "saddle" areas. Bring sturdy footwear, a strong hammer (carpenter's claw hammers not allowed), and eye protection. A dark room with a shortwave ultraviolet light is provided on-site for inspection of fluorescent minerals. Fee: $5 admission plus $1.50 for each pound of minerals taken. Fee does not include mine tour. Age Requirements: Must be age seven or older to collect on the Mine Run dump; must be age 13 or older to collect elsewhere.

Saturday, April 27, 2019
Annual New Jersey Earth Science Association (NJESA) Gem and Mineral Show
Littell Community Center, 10-12 Munsonhurst Road, Franklin, NJ
9:00 AM - 5:30 PM (indoors); 8:00 AM - 5:30 PM (outdoor swap/sell)

Saturday, April 27, 2019
Sterling Hill Garage Sale
Christiansen Pavilion, Sterling Hill Mining Museum, 30 Plant Street, Ogdensburg, NJ
10:00 AM - 3:00 PM

Saturday, April 27, 2019
Annual Show Banquet and Auction
GeoTech Center, Sterling Hill Mining Museum, 30 Plant Street, Ogdensburg, NJ
Banquet begins at 6:30 PM; attendance limited to 60 people; tickets are $20.00 per person.

Sunday, April 28, 2019
NJESA Gem and Mineral Show
Littell Community Center, 10-12 Munsonhurst Road, Franklin, NJ
10:00 AM - 5:00 PM (indoors); 9:00 AM - 5:00 PM (outdoor swap/sell)

Sunday, April 28, 2019
Sterling Hill Garage Sale
Christiansen Pavilion, Sterling Hill Mining Museum, 30 Plant Street, Ogdensburg, NJ
10:00 AM - 3:00 PM

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Sterling Hill Mining Museum

30 Plant Street • Ogdensburg, NJ 07439-1126

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For more information contact:

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Mines,
Metal & Men Site

Home of the Thomas S. Warren Museum of Fluorescence, the official fluorescent museum recognized by the Fluorescent Mineral Society