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STERLING HILL NEWSLETTER

Recipient of the 1999 Carnegie Mineralogical Award



Can you guess who this is in the photo, and what he is doing? For the answer, check page 10 of this newsletter.

www.sterlinghill.org

A nonprofit foundation in furtherance of mining

preservation, scientific research and earth science education.



President's Message

Bill Kroth

As they say in real estate, location is key. As a museum or similar attraction, ATTENDANCE is the most important factor. All aspects of a museum's health are a function of the number of people who visit. At the Sterling Hill Mining Museum, we get no federal or state funding; so, admission ticket sales, gift shop and snack bar sales, and mineral sales are our life-blood, and they all are tied into attendance.

My last President's Message was somewhat pessimistic as I feared that the COVID pandemic would result in long-term permanent damage to Sterling Hill. Not only was our visitation horrible, but getting staff to give tours was very difficult. Now, however, I honestly have faith that we will spring back to pre-pandemic levels. I base this statement on the fact that our public tours have bounced back nicely. Typical weekend attendance is approximately 140 visitors, and weekday visitation is approximately 130. I realize that these levels are occurring during the summer months; however, weekend spring attendance was similar. Although our camp and home school visitation during the summer months was down by approximately 30%, those levels were not as bad as I thought they would be. So, with that good news we now see our cash reserves growing somewhat each day.

School visitation has always been our major business, and that is a different story. Prior to the COVID pandemic, we were averaging eight to ten classes each day during the school year. We had sufficient staff, transportation was available, fuel costs were lower, parents weren't concerned about social distancing, and cancellations were not occurring when one child in the school group became ill. School bookings still remain weak as only a few were scheduled for September and October. We are emailing teachers and offering special discounts, but no matter what we do, the schools have their own issues to tackle, just to get back to "normal." Once they do, Sterling Hill class visits will be back within their sights. We have developed a "sterling" reputation, and we are sure that it is just a matter of time before schools return to us for an incredible educational experience.

Meanwhile, we are taking advantage of our beautiful property to sponsor other groups to bring notoriety and visitation to Sterling Hill. As a car aficionado specializ-

ing in Corvettes myself, I have contacted several car clubs, and we are well on our way to having many clubs hold meetings at Sterling Hill this fall, including a tour of our museum and mine. So far, we have had the Mustang and Porsche Clubs use our property, and we included a private tour stressing the importance of mining for vehicles and transportation.

In August, we hosted a Police Benevolent Association Food Truck Festival (PBA Local 404 fund-raiser) sponsored by the local Ogdensburg and Franklin Police departments. Over 1000 visitors came for that five-hour event on a beautiful Sunday afternoon (in addition to our regular mine tour guests). Twenty food trucks specializing in all types of cuisine set up in our parking lots, two bands played, and people set up beach chairs to enjoy a beautiful day at our facility. While some of our staff were nervous about the number of expected visitors, I knew that the police would have everything under total control. The event came off without incident; not even a single bee sting! I never would have expected that food trucks could bring such a crowd, and must admit I was a little skeptical at first. But now I am a believer, and we will surely be doing this on a regular basis.



More than twenty vendors set up shop in our parking lot for a PBA sponsored fund-raiser event. Photo by Sterling Hill tour guide, Tyler Kurtz.

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PRESIDENT'S MESSAGE

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We have several movie shoots booked for our mine tunnels this coming fall. These events always are welcomed, not only for the revenue, but for a nice change of pace from our focus on geology and mining.

We do all that we can, "looking outside of the box" at this time until schools get back on the visitation track. Our health as a museum is improving, and every new school booking is a sign that we are on our way to a full recovery! 🐛

Bill Kroth is a retired geotechnical and civil engineer who has been involved with the Sterling Hill Mining Museum since the early 1990s. Bill developed a love of minerals in the 7th grade and an interest in amateur astronomy in high school. Now in his "golden years" with plenty of "retirement time" Bill and his wife, Denise, are at Sterling Hill every day hoping to pass their love of science to the current generation and to help make the museum a world class attraction.

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 non-renewable 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.

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



Listed on the
National Register of Historic Places since 1991

Sterling Hill Newsletter

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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.

Confessions of a Sometimes Miner

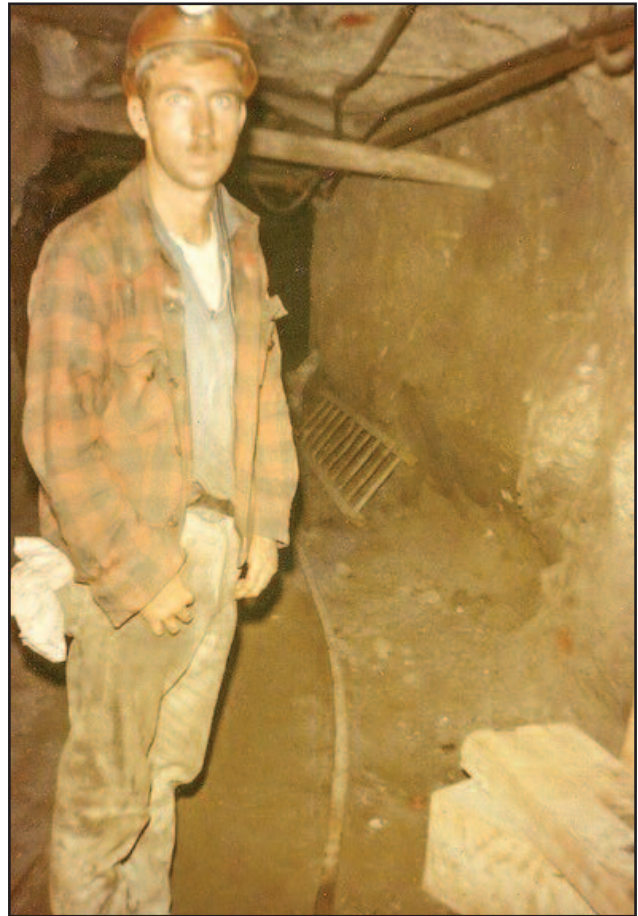
David de Wit

It was the summer of 1969. I had just been released from Army basic training (as required for my six-year enlistment in the National Guard), which was a very unexpected break in my first year of teaching, and I needed a job.

I got my first introduction to the Franklin District mines while in high school when our science club went collecting on the Buckwheat tailings dump. The fascination with fluorescent rocks would stick with me for years. My best friend's stepfather, miner Joe Nagy, told us tales of working in the Franklin mine, which only added to the lure of adventure that had influenced my job choices in those days.

So off I went to the mine office, hired on the spot by a former middle school classmate, Eugene Kline (who, unfortunately, lost a leg working at the Sterling Mine). I got my steel-toed boots, hard hat and arrived at the change house, ready for work the next morning. When I appeared as a new hire at the adit cage, I got lots of sideways glances reserved in those days for anyone of my "problem generation." I would later learn that what prompted my cool receptions was more a question about my reliability as a "partner" in the mine than hostility toward anyone young. No one offered greetings, handshakes, or introductions. I was there, but not yet a "miner." Did they know that my day job was as a science teacher in a middle school? No one asked, and I did not volunteer any information. The shift boss kind of herded me along with the group to the adit level. One step through the adit door, and you knew you were going into an alien environment. The damp-earth cool air fit like a glove, sound was altered, water was dripping.

I passed some kind of test by keeping my mouth shut as I climbed to the top step of the man-cage. This was my first test, and I would soon come to understand why. Riding that cage was like the New York City subway, only you were on top of the car! The shaft stations flew by, one after the other with almost stroboscopic speed. I was not surprised that the once-over scrutiny I experienced in the change house was even more intense as we exited the cage to go to work. Many new employees had taken the ride down, only to get back on to take the next ride up, and out of the mine for good. To exit and never



Miner David de Wit.

to be seen again. If, on that first descent, you made it to the 1850-foot level and weren't visibly shaken, you were looked upon more favorably. You just might make the grade.

My first job was to work the ore cars, tramping ore. My partner was a college student, who several weeks later was to lose use of his thumb to a piece of loose rock sliding down a scaling bar. He got to drive the train, and I got to fill and empty the ore cars. Ore was produced all over the many levels above us. All of it had to be moved to the ore pocket at the 1850-foot level and hoisted to the surface during the night shift. My job was to pull the lever on the hydraulic chute and fill each car in turn with ore, take the ride to the correct ore pass, and tip each car's load down the hole. No one told me that opening a

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CONFESSIONS OF A SOMETIMES MINER

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chute to fill a car with ore also filled the adjacent air with choking ammonia fumes resulting from blasting. Was this another test to see if you could take it? The prospect of “bad air” appearing quickly was a valuable lesson learned.

After a while my tramping days were over, and I was sent to work with a miner as part of a two-man crew in the North Ore Body. By some quirk of nature, a limb of the main ore body had been torn away and displaced about quarter of a mile north. Going to work was now a cage ride to the 1850-foot level, and a hike down the 1850 drift tunnel to a new cage lift, which dropped me to the stope at the 2100-foot level. A stope is a “room” drilled and blasted out of solid rock. Rocky rubble covered the floor, dangling roof bolts hung from an unknown ceiling, a mish-mash of pipes and hose adorned the walls; this “room” made the drifts seem elegant. This was where you drilled and blasted mother nature’s treasures and claimed them for your own. My partner, Franklin Kramer, was a former dairy farm milker with whom I would spend many weeks. We never had a conversation. I think he was deaf from many years of drill running. He taught me how to drill and blast and slush ore.



Miner Franklin Kramer inserting a rock bolt into the bore hole.



Miner Franklin Kramer drilling a hole for the rock bolt.

During lunch break, I amused myself by prospecting with a battery-powered black light. I snuck a camera in my lunch pail and took pictures. By the end of each day my lunch pail was loaded with rock samples. I was now an accepted member of the miner family, and my collection joined the dozens of garage collections throughout Ogdensburg.

We had shot several rounds over a period of weeks, until our drill no longer would reach the ore vein. It was time to fill the stope up to a working level with cement and fill. Since I had no boots and it was a one-man job, I was sent to work on a pillar while my partner, Franklin, sloshed around, building a new higher floor in our stope. In the larger stopes, pillars were left to make the roof bolts more effective in holding up the ceilings. Once the ore was removed and the stope filled and capped, miners would remove the pillars by drilling downward. Pillars were often pure ore, and this particular pillar was pure zincite, a red mineral resembling glass. There was a wooden fill fence on two sides and an ore pass at your feet; the whole affair held together with six by six inch square-set timbers. As you might expect, none of this arrangement made you feel secure. To top it all off, when you drilled and blasted, you destroyed the last elements of the square-set.

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CONFESSIONS OF A SOMETIMES MINER

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After blasting you had to quickly rebuild the square-set before things started changing. All this without slipping and following the loose ore for a hundred-foot ride down the ore pass. After a few days, I was glad to be back at the 2100-foot level, only to repeat what we had done for weeks -- drill, blast, slush.

I always cherish my days in the mine, especially the people I worked with -- working class Sussex County men; former Franklin Mine Hungarian workers, waiting for retirement; hot shots working for bonus and laggards hiding in the dark; even a convict recruited from a West Virginia prison. All added to my understanding of people willing to make their living in dangerous and challenging

environments. Never again would I look at a zinc die-cast object without an appreciation for the hard work required to put that object in my hands.

My most memorable day, was July 20, 1969, leaving the adit after the night shift. The first rush of outside air was the overwhelming perfume of humid midsummer. I went home, had dinner, and watched Neil Armstrong walk on the moon. 🐼

David de Wit has worked as a tour guide at the Sterling Hill Mining Museum for several years. He has been a science teacher for 26 years, and a sales and marketing executive for national and international companies for over 20 years. His summer as a miner in 1969 was an unforgettable lifetime experience.

“Squiggle”

Doug Francisco and Earl Verbeek



This photo was taken by miner Doug Francisco in 1979 while mining in the 1020 longitudinal stope, in the west limb of ore, near the keel of orebody, along the footwall contact of ore. This feature is known locally as a "Squiggle," which is a series of folds in a zincite-rich layer within otherwise granular, calcite-rich ore, only a foot or two above the contact with the Franklin Marble. The zincite layer is generally six to eight inches thick, but is variable laterally.

You can see a similar “Squiggle” in Zobel Hall near the lockers, as shown in the photo on the right. 🐼



Squiggle in Zobel Hall.

Doug Francisco, a trustee at the Sterling Hill Mining Museum, is a graduate of the Brinker School of Surveying and Mapping. For 12 years he was a miner at Sterling Hill; and he worked for 30 years in heavy highway bridge construction. His love for Sterling Hill runs deep.

Earl R. Verbeek spent his career as a research geologist for the U.S. Geological Survey in Lakewood, Colorado, and retired to New Jersey in 1998. Subsequently he served as Resident Geologist of the Sterling Hill Mining Museum and as Curator of the Franklin Mineral Museum.

Why Not Pump Out the Mine?

Bill Kroth

In all the tours I have given over the past 30 years I can't recall one when I've not gotten asked: "Why don't you pump out the mine?" This question most commonly is asked when the tour group views the "lake" on the tour, near the old stope. Even one of our former miners stated a few months ago that if he ever won the big lottery, he would use his winnings to pump out the mine!



Since the mid-1990s the groundwater level in the mine has been at equilibrium, relatively constant at an elevation of approximately 20 feet below the adit (tour) level, at 593 feet above sea level. Originally, when the mine property was purchased from the New Jersey Zinc Company in the late 1980s, the water level was over 1000 feet deeper and increasing in elevation at approximately one foot per day. Much effort was expended bringing minerals and left-behind equipment to the surface before it was lost to the rising water. A surprisingly effective rescue resulted, and we now can see these machines and tools displayed along the tour and spread around the property. Beautiful slabs of white fluorescing barite, orange wollastonite, and tan johnbaumite were among the prized minerals rescued. Today, we can accurately say that 99% of the mine is below water.

The idea of dewatering the mine at the Sterling Hill Mining Museum was indeed tried in the mid-1990s. The cost of electricity needed to run the pumps to "save" a few more levels (down to 340 feet) was several thousands of

dollars a month, even if most of the pumping would be done at night, when the electricity rates would be lowest. Our insurance provider had major concerns about the deeper levels, specifically, the safe conveyance of visitors to those depths. They were fine about keeping everyone on a single grade level; as long as stairs and lifting devices were not involved.

Please remember that when the property was bought by Dick and Bob Hauck, the upper adit level as shown to our general public visitors consisted of only a 400-foot straight run to the West Shaft Station, the lamp room, the ore pass with grizzly, and the explosives magazine room. Tours entered and exited the mine through the same passageway, and as you can imagine, things became disruptive when one group approached or passed another. For safety exiting, only one passage existed although in a real emergency the West Shaft could have been used via a fifth compartment stairway to the south.

Our first expansion on the adit level (taking only three months to complete) was the 240-foot-long tunnel completed in 1990 that added the fault exposure, Rainbow Room, exit to the Passaic Pit, and blasting demonstration room. For the most part, tours still used the same main entrance, but the extra length and additional safety exit to the Passaic Pit were major improvements. At that time, we still had the hopes of utilizing the lower levels as part of our tour. The water was rising approximately one foot a day, and the idea of saving a few of the upper levels by utilizing the highest existing pumps was in our minds.

In the mid-1990s reality set in after seeing the cost of pumping and our insurance provider's resistance to utilizing the lower levels. Our 240-foot-long tunnel proved to be very successful in giving our visitors a longer and more comprehensive tour. The new Rainbow Room became one of our most popular attractions; and has even been used for several weddings! Several years passed, and we discovered the flooded stope just south of our main parking lot and a 150-year-old, 65-foot-long tunnel leading north from the Passaic Pit. At that time, we made the decision to incorporate these new features into our existing adit level tour and abandon any thoughts of utilizing the lower levels that would require electric pumping. So, in the late 1990's, our final tunneling project was completed giving us the Edison Tunnel with an additional exit/entrance, the flooded stope ("lake"), another (perfectly horizontal) entrance to the

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WHY NOT PUMP OUT THE MINE?

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Kolic Geotech Building, our seismograph exhibit, and what now is our American Museum of Natural History fluorescent slab display. Our Landmesser tunnel/ramp to the flooded stope is perfect for wheelchairs and strollers. That increase (our biggest to date) added 780 lineal feet alone, giving us a grand total of 1857 feet (or 0.35 miles) of underground tour route. This arrangement made the mine component of our tour the longest in time duration. Now, along with Rock Discovery, our two museums, and improved pavilion, we have the ability to conduct up to 12 school tours daily. We have enough!

It is clear that, based on cost and safety, there are compelling reasons for not pumping out the mine. But are there any drawbacks to pumping out the mine from an engineering standpoint that would put us in peril even if we didn't take general public visitors to the lower levels? That answer is a definite "yes."

As a retired geotechnical engineer specializing in soil and rock mechanics, one important and basic principle is paramount.... a change in the groundwater level changes the stresses in the soil and rock below. This pertains equally to nearby buildings as well as to the mine.

Our first concern deals with a change in stress applied to the rock and soil "skeleton" below the surface as the water level changes. An easy analogy to aid in comprehending this principle concerns a 200-pound man standing in an empty swimming pool on a bathroom scale. The scale reads 200 pounds, and his full weight is being supported by his skeleton. He can stand this way for a few hours, but then he starts to tire rapidly as his muscles and bones become stressed as he supports 200 pounds. Now we add water to the pool and with each inch of water rise, the scale reads less and less. It is becoming easier and easier to stand as his skeleton is becoming unloaded and his muscles have less work to do. As the water reaches nose-level he looks down at the scale, and the scale now reads only a few pounds. His body/skeleton is nearly fully supported by the buoyancy of the water, and he can easily stand for days if required. This upward buoyancy force is termed "neutral stress or porewater pressure."

The same situation exists for the buried rock and soil below grade in any mine. As our water level naturally rose since the mine closed, the "skeletal" structure of the soil, rock, and any other man-made supports became unloaded and less stressed. While not quite as dramatic as our man in the swimming pool example (since rock and soil have higher densities), the difference is indeed signif-

icant (from 25 to 35 percent), and we get a stress reduction as the water rises to fill the mine. This "credit" due to the natural saturated condition helps to lessen what are called the skeletal or effective stresses that could cause collapse, settlement, consolidation, and subsidence of the lower levels.

A second safety concern is averted by allowing all of the lower levels to become submerged, reducing the dangers of a water surge that could carry upwards to the tour route. We can easily picture this by using a cup of tea for our analogy. Picture dropping a walnut into a full cup of tea from a height of a foot; a surge and splash would result. You would probably have a good percentage of tea displaced out of the cup since a liquid is not compressible. Now if the walnut were held with two fingers within the liquid of the tea cup and we dropped it; there would be no surge because the liquid was already displaced. There would barely be a ripple! Similarly, if a rock slab or rock/soil wall were to drop from any significant height from above into any submerged level of the mine; the displacement of water would create a contained surge of water with amazing force. This exact phenomenon occurred during the 1990s when a ceiling wall fell into the lower level and created a surge of water so powerful that it bent one of our Load-Haul-Dump (LHD) machines into a pretzel. Fortunately, our workers were on a lunch break at the time; otherwise, there would have been many injuries or worse. So, by allowing as much of the mine as possible to be underwater; we reduce the chances of such a "drop displacement." Our "walnut" is already below the surface; if and when it releases, hardly a ripple or surge would occur.

Another concern is geared more toward the Franklin Mine than the Sterling Mine and that deals with man-made wooden supports. The Franklin Mine primarily used timber supports while the Sterling Mine mostly used hydraulic fill, consisting of a Portland Cement concrete mixture incorporating waste gravel. Old photographs do show the use of huge timbers in the Sterling Mine, but the amount was small compared to the Franklin Mine. Wood is a great and economical means of support. It will last indefinitely and maintain maximum strength if kept totally dry or totally wet. I remember inspecting a wooden piling foundation on a historically protected building just east of Wall Street near the Brooklyn Bridge in Manhattan years ago. These massive logs were installed in the 1700s and were constantly below the water table. They looked and performed just like freshly fallen trees. I was amazed as I tried to push an awl probe into the wood to test its condition. I could barely get a quarter of an inch of insertion pushing the point with all of my strength! All of the wooden supports that now reside under the water

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WHY NOT PUMP OUT THE MINE?


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table in Franklin and Sterling Hill are perfectly preserved and continue to provide the support needed to negate collapse or subsidence. Dewatering would expose the wood to a dreaded damp condition (neither fully dry nor fully wet), and rot would compromise them in a matter of years.

Our final concern deals with the pumping discharge itself and its impact on the Wallkill River. While the mine was in operation, all water was discharged into the Wallkill River just east of Plant Street. At this point of the river, we had what could be called a large stream. Any major change in added flow, temperature, or chemical composition could have a major effect on the stream's ecosystem. The New Jersey Zinc Company used a settlement pond (now the ballfield by Bridge and Plant Streets) to slow the flow velocity in order to settle out soil particulates. This produced less turbidity and soil load in the discharge. Dewatering operations from both the Franklin and Sterling mines actually had a positive effect on the health of both Franklin Pond and the nearby Wallkill River. The increased flow of cold water from pumping increased the dissolved oxygen content and fish (even trout) flourished. In our case, both calcium and zinc are "friendly" elements, and their concentration within the

discharged water was at safe levels. As a teenager, I swam in Franklin Pond, and the water was much colder and clearer than the neighboring lake of my summer home a few miles away. Today, without the contribution of mine dewatering, a spray aerator may be seen in the middle of Franklin Pond attempting to add oxygen to that body of water in order to keep it healthy.

We have had several studies done on the groundwater within the Sterling Mine over the years by professionals in industry and academics. Research by several students from local universities examining our water bolsters what others have concluded.....we have great water here! Our water is extremely pure (although hard as expected) with no anomalies of zinc, lead, arsenic, or any other dangerous metals present. While this is wonderful news, current environmental laws are brutal (but necessary) when discharging into any waterway. The expense and effort of permits, monitoring, reporting, etc. would put the final nail into the pumping out the mine coffin.

Nature knows best...let the groundwater be. It is a stabilizing force. Let's simply keep the wonder of those miles of hidden and submerged tunnels to our imagination. Instead, any lottery winnings could be simply shared with the author! 

Dr. Kurt Nassau Lab-Created Crystals

Jeff Osowski

Dr. Kurt Nassau was born in Austria in 1927. He was able to escape to England before the Nazi occupation of that country. Dr. Nassau attended grammar school and university in England before coming to the United States. He served in the army as a medical researcher at Walter Reed Hospital, and then earned a Ph.D. in Physical Chemistry from the University of Pittsburgh. Dr. Nassau joined Bell Laboratories in 1959 where he earned a worldwide reputation for his research in crystal growth and structure. He also became a leading expert in the fields of colors in crystals and in mineralogy. For 30 years, he performed research at the famed Bell Laboratories (later Lucent) at Murray Hill, New Jersey on crystal chemistry and physics, crystal growth, glasses,

lasers, semiconductors, ferroelectrics, and fiber optics. He retired from Bell Labs as Distinguished Research Scientist in 1989. He taught undergraduate courses at the University of Pittsburgh, and taught graduate courses as a Visiting Professor at Princeton University. Dr. Nassau published over 450 articles in peer reviewed journals and held 17 patents. He wrote eight books, covering topics such as crystal growth and color in crystals.

Shortly before his death in 2010, Dr. Nassau generously donated his collection of natural and synthetic gems, books, journals, paper weights, and scientific equipment to the Sterling Hill Mining Museum. Dick Hauck, Bob Hauck, Bill Kroth, and I were invited to his home in Hunterdon County to gather and transport his valuable

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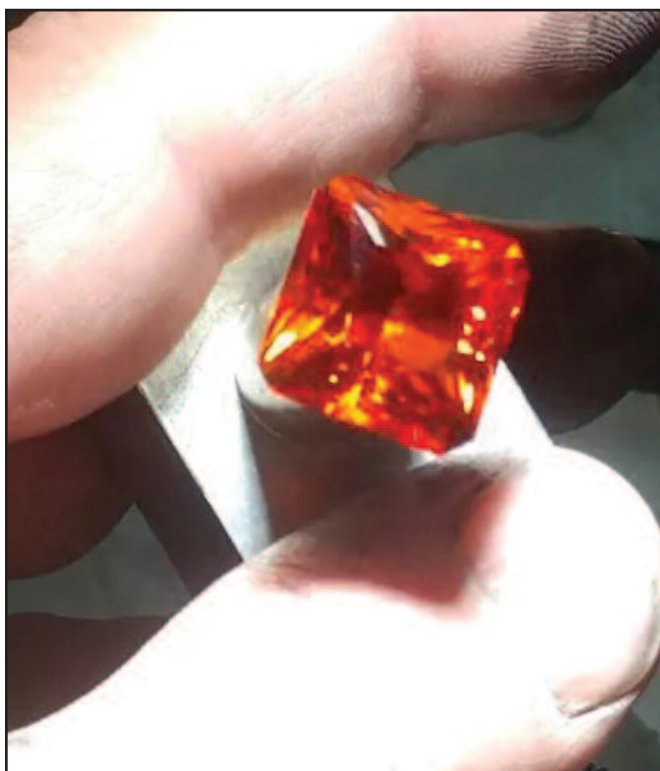
DR. KURT NASSAU LAB-CREATED CRYSTALS

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collections to the Sterling Hill Mining Museum. Many of those objects now are displayed in a special case in Zobel Hall, honoring his incredible scientific achievements. That case holds only a small amount of the crystals Dr. Nassau donated to Sterling Hill. I recently had the honor of organizing the additional collection of crystals that now are housed in cabinets in the museum's GeoTech Center. Some are identified, but many are not. They all are incredibly beautiful and rare.

With Bill Kroth's permission, I took one of these beautiful crystals to my good friend and master jeweler, Jason Baskin of Flemington, NJ, who works at the Gem Vault (Wm. L. Brewer Jewelers), in Flemington, NJ. Jason generously volunteered to facet the crystal, and his masterful work, the 46.5 carat faceted crystal, is pictured on the right. Jason reports that he faceted the rough, lab-created crystal into his own version of a princess cut. The stone has a great scintillating and wonderful light return, which means that the light entering the top of the stone bounces around and returns to the eye of the viewer. In a poorly cut stone, light may be lost from the bottom or sides of the stone. Jason also notes that the gemstone has very little distinction (grey, black, or dark areas within the sparkle pattern of the stone). Jason cut and polished the stone in eight to ten hours on a Graves Mark 4 faceting machine, and the facets were brought to their final polish using 50,000 diamond grit on an eight-inch lead/tin lap.

Though we are not certain, we believe it is a cubic zirconia, stabilized and colored by yttrium. The faceted crystal can now be viewed in the Kurt Nassau display in Zobel Hall, along with many other items from his collections.



We at the Sterling Hill Mining Museum are extremely grateful for Dr. Nassau's donations, and for the wonderful faceting work of Jason Baskin. Please come to the Sterling Hill Mining Museum to see this incredible gem. 🐛

Jeff Osowski, PhD, is Vice President of the Sterling Hill Mining Museum Board of Trustees. He has had a long and varied career in the education and science realms, including Vice President for Learning and Teaching at Liberty Science Center; Vice President for Education Policy at the New Jersey State Chamber of Commerce; Assistant Commissioner and State Director of Special Education, both at the NJ Department of Education. He also has been a school district administrator, psychologist, and teacher.

The cover photo of this newsletter shows Dr. Earl Verbeek, working underground in the Sterling Mine, during the period 1989-1991, when he would periodically vacation "back East." During this time, he worked with Marilyn Grout studying faults in the mine. You can see that Earl is holding a Brunton compass for measuring fault orientations and slip directions. Ultimately, Earl and Marilyn documented 1157 faults. The cap he is wearing dates to his caving days at Penn State in 1966. By the time of this photo, Earl had "graduated" from the carbide lamps with which he had started, to the electric cap lamp you see here. He is wearing a heavy coat because studying faults required close scrutiny of the rock, so not much movement was possible; thus the chill seeps in after a while.

Element Cobalt

Gordon Powers



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

Pure cobalt is a silvery-gray ferromagnetic metal. Cobalt has an atomic number of 27 and is not found in its pure elemental form in nature aside from small deposits in meteoric iron. Its chemical symbol is Co, and it is the 31st most abundant element in the Earth's crust.

The name cobalt derives from the German kobald, meaning goblin, which is the name German miners used for the ore of cobalt. The Swedish chemist Carl Brandt, is recognized with discovering cobalt in the 1730s. Cobalt has

been used since the bronze age to provide a blue color in glass and ceramic glazes.

According to the U.S. Geological Survey (USGS), 70% of the world production of mined cobalt comes from Kinshasa in the Democratic Republic of the Congo. Cobalt's primary ores are cobaltite and erythrite; however, most cobalt is mined as a byproduct of copper or nickel. The recycling rates for cobalt in the United States are estimated to be 24% of consumption.

One of the largest uses of cobalt in the world is in rechargeable batteries. China is the world's leading consumer of cobalt, with more than 80% of its consumption for rechargeable batteries. An estimated 42% of the cobalt used in the United States is in superalloys, mostly in aircraft gas turbine engines where its high temperature strength is important. Other metallic applications include cemented carbides for cutting and wear resistant applications, powerful magnets, and electroplating for hardness and corrosion resistance. Due to its brilliant blue color, cobalt is used in porcelain, paints, dyes, glass, and enamels. The radioactive isotope Cobalt-60 is used as a gamma ray emitter for cancer radiotherapy, for medical equipment, for food sterilization, and for industrial radiography to confirm weld integrity. Cobalt also plays an important biological role, as it is an essential trace element for the metabolism in all animals, and is a key component of vitamin B12.

There are many uses of this important element in today's world. Look a little closer at the items you use throughout your day to see how cobalt plays a part. And if you want to collect minerals containing cobalt at Sterling Hill or Franklin, look for erythrite which as mentioned earlier is one of the ore minerals of cobalt. A good resource for a listing of local minerals containing specific elements is the Franklin-Ogdensburg Mineralogical Society (FOMS) website at:
http://www.fomsnj.org/Franklin_Mineral_PeriodicTable.aspx

Gordon Powers, a trustee at the Sterling Hill Mining Museum, worked for the US Army as a civilian mechanical engineer for almost 39 years before retiring in 2017.



Raise Bore Machine

Doug Francisco

Miner Wilbur Benner is shown in this photo standing next to the hydraulic control panel for mine's raise bore machine.



This machine left a perfectly round, straight, three-foot diameter hole from one level in the mine to another. The levels in the mine were usually one hundred feet apart vertically; but on the 57-degree angle of the ore and the shaft, they were more like 120 feet apart. Doing this work mechanically with the raise bore machine eliminated the use of explosives and also eliminated the need to physically drill these raises nine feet per day, which was a dangerous and time-consuming task. A hand-drilled raise might take three to four weeks to complete, while the raise bore machine finished the job in the same time, but without the attendant issues of a miner drilling, blasting, and destabilization of the surrounding ground.

Here's how the raise bore machine worked. From the level below a nine-inch diameter hole was drilled according to a carefully surveyed plan to the level above, where the bit would pop out into a work area. The steels used in

this phase were locked in place after the bit came through the floor. A concrete pad was poured around the drill hole, for the raise bore machine at the Sterling Mine. This was anchored in place. The large three-foot diameter bore-hole bit was hauled to the level below and attached to the drill steel column. The raise bore machine then was attached and began rotating and pulling the large bit upward. I believe the steel lengths were four feet in length. After the raise bore machine had pulled up a four-foot section, that steel was removed from the column, the machine was hooked back up to the remaining column, and boring began again. This process was repeated until the large three-foot diameter bit broke through at the raise bore machine base. All the cuttings from this drilling fell to the floor below and had to be cleaned up every few days. The photo below shows a raise bore hole, complete with ladders and pipe.

The Sterling Mine shared this machine with the New Jersey Zinc Co. mine in Friedensville, PA; so, it would disappear for months at a time then return to be used to drill yet another raise. 🐛



A Major Fossil Donation Made to the Sterling Hill Mining Museum

Bill Kroth

Several months ago, the Sterling Hill Mining Museum received a fantastic fossil plate of dolomite from my good friend Al Lang of Ilion, New York in Herkimer County. Al owns the premier location for Eurypterid fossils consisting of over 70 preserved acres, just 20 minutes from the famous Herkimer “Diamond” occurrences. This plate, measuring 35 inches by 21 inches, and weighing 110 pound, contains a dozen Eurypterius Remipes, the state fossil of New York. These creatures lived during the Silurian Period reaching their peak approximately 420 million years ago; then disappeared in the mass extinction during the Permian Period, approximately 250 million years ago. The name comes from the Greek word for “broad wings,” referring to their flat profile and large swimming paddles. Creatures in this genera could reach eight feet long; the species in our plate belonged to a much smaller group and were typically a maximum of eight inches long. Their main body consisted of a shell much like a horseshoe crab, a flexible segmented tail, and two forward paddles, similar to present-day scorpions. Eurypterids are sometimes referred to as “Sea Scorpions.”

Eurypterids were globally distributed and lived for long periods, but they are surprisingly rare in the fossil record, as specific conditions were required to preserve their exoskeletons. They were widespread in the shallow brackish seas that covered much of New York State during Silurian times. The closest present-day relatives are horseshoe crabs. Lang’s quarry is considered the best collecting location for Eurypterid fossils, and many seen in the great museums were collected there.



An artist’s depiction of the Eurypterid species now in our new display. It is amazing (and terrifying) that certain types of Eurypterid could grow larger than a man!



The Eurypterid fossil donated by Al Lang is prominently displayed on the north wall at the main entrance of the Zobel Museum. The beautiful red oak case was designed and built by Sterling Hill volunteer, Dominic Zampella, a master woodworker.

On a personal note, I met R. A. Langheinrich (Al Lang) almost 30 years ago through a mutual acquaintance (Pat Radomsky, a volunteer at Sterling Hill). It was Al who inspired my love of and provided my education about meteorites. Al owned Lang’s Fossils and Meteorites, which was one of the top sellers of meteorites in the 1990s and 2000s. I never became a “fossil addict,” but I was hooked on meteorites, and I have Al to thank for that pleasure in life! We at Sterling Hill certainly thank Al and his wife Iris for this major gift.



Then and Now

Doug Francisco and Gordon Powers



This first photo is a view of the Sterling Mine lower yard, taken some time after 1980. The tracks (going north from the adit entrance) had been removed. They no longer were in use because fill was delivered by truck at the time this photo was taken. On the right side of the photo, by the tower is a raise covered with a grizzly rail. A raise is a vertical or inclined excavation that leads from one level, or drift, to another. Raises may also extend to the surface. Trucks would dump the fill (mostly from the Grinnell Quarry in Sparta) into piles seen in the lower left of the photo; a bucket loader would dump the fill into this raise. The raise terminated 180 feet down onto a conveyor belt in the mixing station, where the sand or grits as they were called, were mixed with water and by gravity flowed through pipes to wherever the backfill was needed.

On the left side of the photo above is a shed where the propane controls were accessed. The train tracks went between two concrete pads (the museum's ten-stamp mill is erected there now) where banks of propane heaters were arranged. These heaters would heat and thaw out frozen material in the bottom of the rail cars. The cars would then proceed to the raise and be unloaded. Before the propane heaters, at the end of the mine shift, you could hear the fill crew banging on the bottom of the cars with sledge hammers to loosen the frozen material.

There were two other raises where fill was dumped, which fed the north fill series and the south fill series. These raises are seen just north (to the right) of the adit entrance at the bottom of the slope. One is open, and one has been sealed. These were in use before the hydraulic fill system

THEN AND NOW

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was implemented in the late 1960s. These raises ran to the bottom of the mine, but fill could be hauled from chutes on any level and trammed to the work areas where fill was needed.

This second photo, was taken with the Sterling Hill Mining Museum drone from a similar vantage point as the historic photo. The drone picture was taken from a little lower altitude than the original picture, but with a wider lens encompassing a larger field of view. Of the other two raises mentioned above, the left side of one of them is visible to the right of the yellow man cage, the

other one is hidden by the trees. Also visible in the picture is the ten-stamp mill on the concrete pads. One other notable point of interest is the condition of the conveyor tower exterior. In the old picture from the 1980s the coating is starting to deteriorate, and some areas of corrosion starting to show. In the drone picture the condition of the exterior is much improved as the museum had it painted in the early 2000s. It is uncertain if the 1980s picture was taken from a plane or helicopter, but from the apparent low altitude a helicopter seems more likely. What are your thoughts? 🐼

Ask a Miner

Doug Francisco



Each edition of the Sterling Hill Mining Museum newsletter will include this Ask a Miner feature. We have gathered questions from curious students who have visited Sterling Hill. Doug Francisco, a miner at Sterling Hill from 1974 to 1986, will answer the questions.

What kind of dynamite did you use in the mine?
Marcelo, 5th grade, Ogdensburg Elementary School

In my 12 years working underground in the Sterling Mine I used many tons of explosives. Blowing up rocks was my favorite thing to do. We had to use the strongest dynamite available because our ore was very hard. Some ore and minerals on our planet are softer than others, but the ore in the Sterling Mine was so hard that we needed high-power explosives to break it to the size we needed for easy handling. The dynamite I used back in 1974 was in the form of hard sticks; if it got wet it would not work very well. Over the years, inventors and makers of dynamite made great improvements in the power and form of explosives. The improved dynamite I was using in 1986 was soft and in tubes, like sausage. It was much safer than the old dynamite, and it worked well underwater.



Box of stick powder. These sticks were hard, and you could break a stick in half if you needed less power in your blasting.



Modern TOVEX dynamite. It was waterproof and very safe until you put a blasting cap in it; then it became a very powerful tool for blasting rock.

Do critters like bats live in the tunnels? Adrianna, 6th grade, Ogdensburg Elementary School
Were there any animals, like coyotes in the mine? Giordana 6th grade, Readington Middle School, Readington Twp., Hunterdon Co., NJ

Both of you asked pretty much the same question -- whether there were any critters in the mine. The only way we could get underground was to climb up or down ladders. Animals like foxes or skunks or coyotes could not climb the long ladders to get down into the mine (thank goodness!). There were some mice and some rats, but they were not all over the place. It was not a very friendly place for animals. A hundred years ago the miners would feed the rats because these critters could sense a dangerous lack of oxygen or fires. If they were running away, it meant you should run away too!

There were bats in the upper levels of the mine. There were plenty of places for a bat to sleep so they never really went deeper than the first level. I personally don't like bats. One time on the highest level of the mine (180 feet deep), my helper and I were walking down a tunnel, and from behind me he threw a wet glove on my neck and shouted "BAT!" I yelled and ran around in circles yelling "GET IT OFF, GET IT OFF!" Somehow, he thought that was hilarious, and told everybody about it. Some friend! 🐉

Students

We would like to feature your questions about mining and the Sterling Hill Mine in future Ask a Miner articles.

Please send your questions to:
jvotmo@comcast.net

Include your first name, grade level, and school.

Thanks

John Kolic's Sterling Hill Mining Diaries

Doug Francisco

The previous set of John's diary entries took us through June 21, 1994. This next batch starts then, and takes us through September 28, 1998. In this series, John is drilling in the new tunnel, the Landmesser drift, which is a declining tunnel. It was advanced on the decline to intersect with an old stope developed by the Passaic Mining Company in the late 1800s. In this old stope we have recently installed two huge fluorescing slabs, remnants from the new display in the American Museum of Natural History in New York City. These slabs are a great addition to the mine tour route.



John Kolic in the drift with an LHD.

In this series of diary entries, John records the completion of work in the old stope, where we now have a display with a newly-painted two-boom jumbo drill, along with the start of a raise, and other mining equipment salvaged from the mine.

John also records in this series much of the work he did in the ruins of the old Great Sterling Mill, that now houses our Warren Museum of Fluorescence. Many entries in this set of diaries seem the same, but then mining is inherently repetitive work.



John Kolic working at the site of the Great Sterling Mill.

We are so very grateful for John's work to develop the Sterling Hill Mining Museum and for his meticulous recording of his work as a miner. 🐜

STERLING HILL MINING MUSEUM Calendar of Events

The Sterling Hill Mining Museum currently is open for tours only on Saturdays and Sundays at 1:00 PM. **Reservations are required, so please call in advance as tour spaces are limited. Reservations are not available online.**

Private tours are available for groups of at least 15 paying people. We will try to accommodate your request on the day of your choice if we have staff and space available. Please call to discuss details, availability, and to make reservations. Reservations should be made at least two weeks in advance.

We are open for school tours, scout groups, and birthday parties. Please call for more information.

Mineral collecting on the Mine Run Dump is available and is recommended for avid rock collectors age 18 and older, but not for children. Sluicing for minerals and fossils would be a better option for children.

Please contact the museum at (973) 209-7212 to make reservations (required) for tours. Please check the Sterling Hill Mining Museum website (<https://www.sterlinghillminingmuseum.org/>) for updated information and announcements.

October 21, 2022

5th Annual Halloween Tour (Fundraiser for Ogdensburg Elementary School)

5:00 PM to 6:00 PM “not so scary” tour

6:00 PM to 10:00 PM “scary” tour

Check our website for more info as we get closer to the date.

October 22, 2022

5th Annual Halloween Tour (Fundraiser for Ogdensburg Elementary School)

5:00 PM to 6:00 PM “not so scary” tour

6:00 PM to 10:00 PM “scary” tour

Check our website for more info as we get closer to the date.

STERLING HILL MINING MUSEUM Calendar of Events

November 24, 2022 Closed for Thanksgiving

November 25, 2022

Open 10:00 AM to 3:00 PM. Tours at 1:00 PM

December 25, 2022 Closed for Christmas

December 26 through December 31, 2022

Open 10:00 AM to 3:00 PM. Tours at 1:00 PM

January 1, 2022 Closed for New Year's Day

January 16, 2023 (Martin Luther King's Birthday)

Open 10:00 AM to 3:00 PM

Tour at 1:00 PM

February 20, 2023 (President's Day)

Open 10:00 AM to 3:00 PM

Tour at 1:00 PM

Sterling Hill Mining Museum

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Membership Chairman

Sterling Hill Mining Museum

30 Plant Street

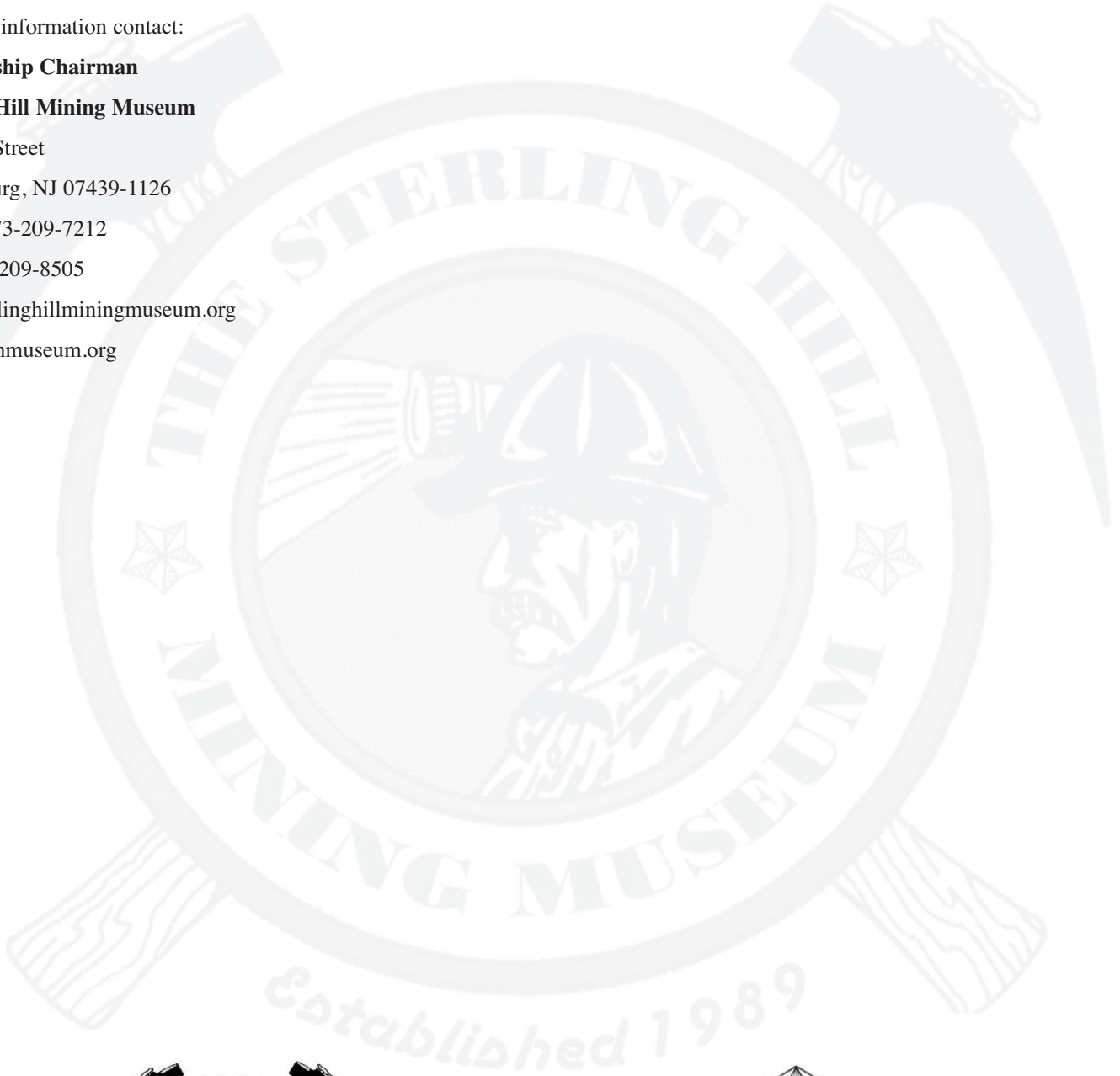
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