THE PICKING TABLE

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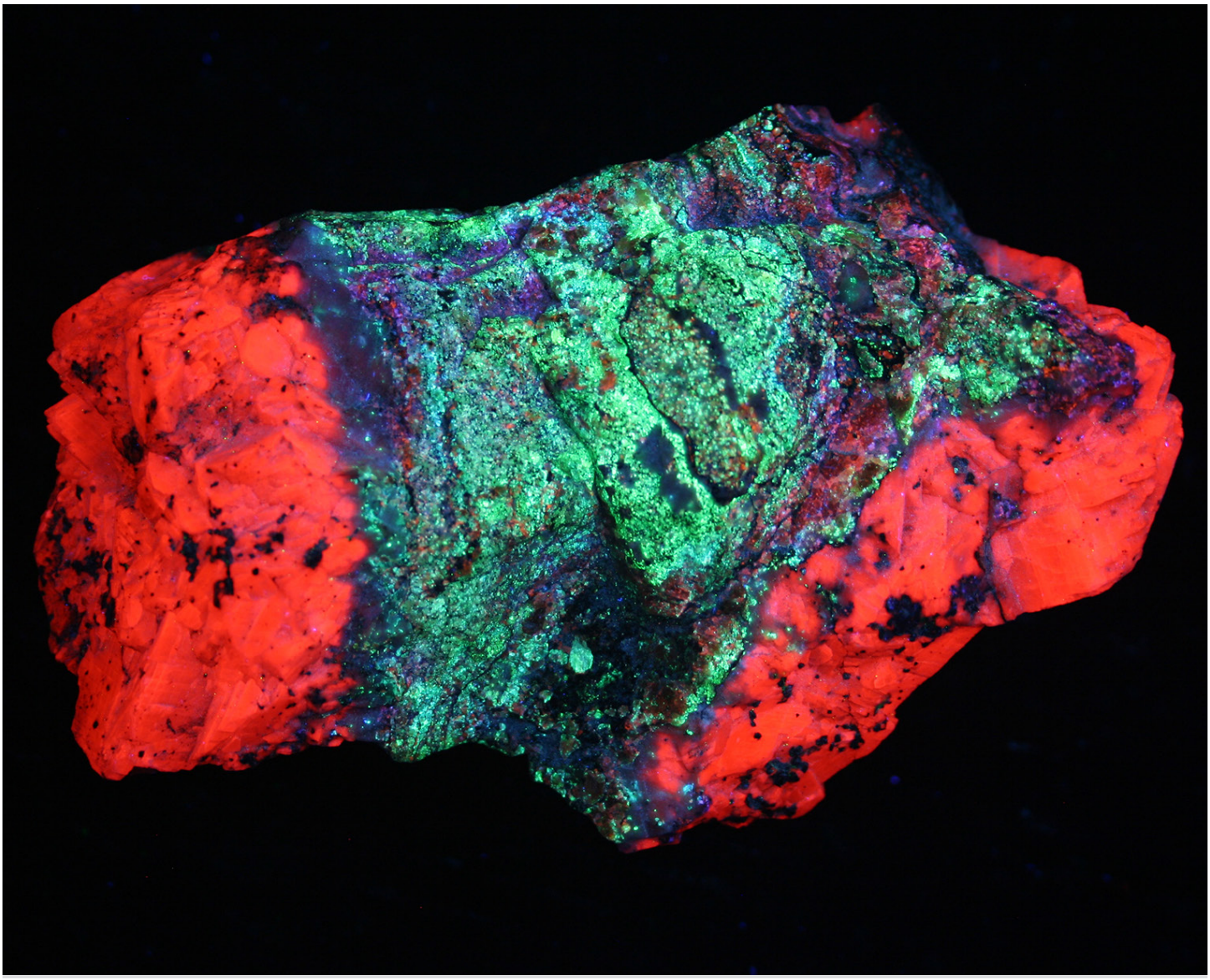

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THE PICKING TABLE

VOL. 62, NO. 2 – FALL 2021

About the Front Cover

Our cover features an outstanding specimen of green-fluorescing sphalerite in calcite, under combined longwave, midwave, and shortwave UV light. Specimen dimensions: 11.4 × 7 × 3.8 cm (4.5 × 2.75 × 1.5 inches). Chris Luzier has provided a photographic essay on this unusual species, its various fluorescent responses, and mineral associations.

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The Picking Table is the official publication of the Franklin-Ogdensburg Mineralogical Society, Inc. (FOMS), a nonprofit organization, and is sent to all members. *The Picking Table* is published twice each year and features articles of interest to the mineralogical community that pertain to the Franklin-Ogdensburg, New Jersey, area.

Members are encouraged to submit articles for publication. Articles should be submitted as Microsoft Word documents to James Van Fleet at javanfleet8@gmail.com.

The views and opinions expressed in *The Picking Table* do not necessarily reflect those of FOMS or the editors.

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FRANKLIN-OGDENSBURG MINERALOGICAL SOCIETY
Fall and Winter 2021 Activity Schedule

WWW.FOMSNJ.ORG **COMPILED BY TEMA J. HECHT**

Due To The Covid-19 Pandemic, Check Online Media For Confirmation Of All Events.
Proper Wearing Of Masks And Social Distancing Required For All Activities.

SATURDAY, SEPTEMBER 18, 2021

9:00 AM – NOON
FOMS Field Trip
Collecting at the Balls Hill iron mines
(owned by Technology General Corporation).
Directions: From Franklin Avenue, take Cork Hill Road
500 ft. south to its junction with Maple Road on the right,
then park as directed and walk to collecting site.
Members are cautioned to beware of old mine openings and stay out of them; some are quite narrow and deep.

1:30 PM – 3:30 PM
FOMS Meeting,
Franklin Mineral Museum.
Lecture: TBD

FRIDAY-SUNDAY SEPTEMBER 24-26, 2021

****Franklin Mineral Museum**
Mineral Sale in Kraissl Hall
For more information, please call: **(973) 209-7212**.

SATURDAY AND SUNDAY SEPTEMBER 25-26, 2021

****65TH ANNUAL FRANKLIN-STERLING GEM & MINERAL SHOW**
Sponsored by the Franklin Mineral Museum.
Franklin Fire Department
137 Buckwheat Road
Franklin, NJ 07416
9:00 AM – 5:00 PM Saturday (indoors)
10:00 AM – 4:00 PM Sunday (indoors).
The ticket price covers the show, *The Pond* outdoor swap,
and admission to the Franklin Mineral Museum:
$7.00 per day for adults, $5.00 per day for children (12-16).
Admission for children under 12 is free.

***The Pond Swap-and-Sell*, sponsored by the FOMS,**
takes place outdoors in the Firemen's Memorial Park and Pavilion
from 9:00 AM – 5:00 PM on Saturday, and from
10:00 AM – 4:00 PM on Sunday. Show admission required.

SATURDAY AND SUNDAY
10 AM – 3:00 PM
****Garage sale at the Sterling Hill Mining Museum**
For more information, please call: **(973) 209-7212**.
Or you can visit the website at
www. sterlinghillminingmuseum.org

SATURDAY
6:00 PM – 10:00 PM
****Night Dig on the Buckwheat Dump,**
for the benefit of the Franklin Mineral Museum.
Admission $12.00 adults, $10.00 children 3-12 years of age.
Poundage fee charged. Call for details: **973-827-3481**.

SATURDAY AND SUNDAY OCTOBER 9-10, 2021

9:00 AM – 5:00 PM
****NORTH JERSEY MINERALOGICAL SOCIETY SWAP**
Sterling Hill Mining Museum.
ADMISSION FREE.

SATURDAY, OCTOBER 16, 2021

9:00 AM – NOON
FOMS Field Trip
Collecting at Limecrest-Braen Stone Quarry,
Limecrest Road, Sparta, NJ.
Meet 15 minutes before starting time at the gate.
We will enter as a group and the gates will be closed.
Hard hats, leather shoes (preferably steel-toed),
gloves, and glasses required.

NOON – 1:15 PM
Future Rockhounds of America
Franklin Mineral Museum.
Parents are welcome to attend.
For questions please contact Mark Dahlman at:
fra@fomsnj.org or 301-428-0455.

1:30 PM – 3:30 PM
FOMS Meeting,
Franklin Mineral Museum.
Lecture: *From the wilds of N.J., dinosaurs in the suburbs*, by Derek Yoost.

6:00 PM – 10:00 PM
****Night Dig on the Buckwheat Dump,**
for the benefit of the Franklin Mineral Museum.
Admission $12.00 adults, $10.00 children 3-12 years of age.
Poundage fee charged. Call for details: **973-827-3481**.

SATURDAY, OCTOBER 23, 2021

12 NOON – 4:00 PM
****Franklin Mineral Museum**
Mill Site Pile dig
For more information, please call the
Franklin Mineral Museum: **973-827-3481**

FRIDAY AND SATURDAY OCTOBER 22-23, 2021

****Sterling Hill Mining Museum Halloween Tour**
Admission charged.
For more information, please call
Sterling Hill Mining Museum: **(973) 209-7212**

SATURDAY, OCTOBER 30, 2021

****31ST Annual *ULTRAVIOLATION***
Show-Swap-Sell Session
featuring fluorescent minerals *only*.
First United Methodist Church, 840 Trenton Road,
Fairless Hills, Pennsylvania.
9:00 am – 4:00 pm, $2 donation (children 12 and under are free).
"If your rocks don't glow, you're at the wrong show."
Table space available.
For information call Lee McIlvaine at 215-713-8020
or e-mail: uvgeologist@yahoo.com

SATURDAY, NOVEMBER 6, 2021

6:00 PM – 10:00 PM
****Night Dig on the Buckwheat Dump,**
for the benefit of the Franklin Mineral Museum.
Admission $12.00 adults, $10.00 children 3-12 years of age.
Poundage fee charged. Call for details: **973-827-3481**.

SATURDAY, NOVEMBER 20, 2021

9:00 AM – NOON
FOMS Field Trip
Collecting at the Old Andover Iron Mines, Limecrest Rd.
Hard hats, leather shoes (preferably steel-toed), gloves and glasses required.

NOON – 1:15 PM
Future Rockhounds of America
Franklin Mineral Museum
Parents are welcome to attend.
For questions please contact Mark Dahlman at:
fra@fomsnj.org or 301-428-0455.

1:30 PM – 3:30 PM
FOMS Meeting,
Franklin Mineral Museum.
Lecture: *Willemite In Daylight: It's Not Just a Green-Fluorescent Mineral*, by Chris Luzier

Events of interest to FOMS members will take place throughout the season at the Franklin Mineral Museum (website: www.franklinmineralmuseum.com and telephone: 973-827-3481) and the Sterling Hill Mining Museum (website: www.sterlinghillminingmuseum.org and telephone: 973-209-7212).

Call, or visit their websites for further information.

Scheduled activities of the FOMS include meetings, field trips, and other events. Regular meetings are held on the third Saturdays of March, April, May, June, September, October, and November, and generally comprise a business session followed by a lecture. FOMS meetings are open to the public, and are held at 1:30 PM, usually in Kraissl Hall at the Franklin Mineral Museum, 32 Evans St., Franklin, NJ (check listings for exceptions). Most FOMS field trips are open only to FOMS members aged 13 or older. Proper field trip gear required: hard hat, protective eyewear, gloves, sturdy shoes.

**Activities so marked are not FOMS functions but may be of interest to its members. Fees, and membership in other organizations, may be required.

Schedule information, including fees, is subject to change without notice.

Thanks go to Stephanie Koles, Bernard Kozykowski, Ralph Bonard, Mark Dahlman, Lee McIlvaine, the Franklin Mineral Museum, and the Sterling Hill Mining Museum for this information.

President's Message

GARY KERSTANSKI
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glowrocks703@gmail.com

As my term as President comes to a close I would like to thank everyone who helped along the way and volunteered their time. Any organization is only as good as its members. We have been very fortunate through the years to have some highly dedicated people. However, I extend my invitation to all of you to support our society in any way you can. Maybe you can write an article for *The Picking Table* about your favorite dig or specimen. You may want to give a presentation at a meeting or just volunteer at a club event. Whatever you choose, it will be welcomed and appreciated.

Our fall show, co-sponsored with the Franklin Mineral Museum, took place without restrictions. Let's keep our fingers crossed that the winter does not see a resurgence of Covid-19 and we can have our spring mineral show once again, co-sponsored with the Sterling Hill Mining Museum.

So, as I turn everything over to our new slate of officers, I ask that you give them all your continued support.

Stay safe and thank you all.

Message From the Managing Editor

JAMES VAN FLEET
222 MARKET STREET
MIFFLINBURG, PA 17844
javanfleet8@gmail.com

I hope our readers have noticed that *The Picking Table* has been filled with new voices lately! It's all about FOMS members and Franklin/Sterling Hill mineral collectors exploring their interests, digging into this deep subject, mining the rich history and geology of… well, you get the idea. As an editor, I have been blessed with many regular contributors who provide the content we need. But I have also found that if I ask the right person, he or she will come through with something new. The invitation is open — if you want to share your knowledge with us, please consider writing something. If you don't want to write, send us suggestions for articles or features you would like to see in the *PT*. A sharp photograph of an interesting rock is always welcome, too.

This issue we take a moment to remember FOMS members who have passed, but had a lasting impact on our hobby. We also lament the absence of a tradition: Our spring mineral show, previously co-sponsored by FOMS and the Sterling Hill Mining Museum, has been cancelled for two years in a row (for obvious reasons). In July, John Postas organized a "Pond Swap and Sell" modeled on the Franklin Pond meetings of old, to benefit the Franklin Mineral Museum. The fall Franklin Mineral Show was a success, including some excellent exhibits. Look for a show report in the next issue of *The Picking Table*.

Franklin Mineral Museum Report

MARK BOYER
PRESIDENT, FRANKLIN MINERAL MUSEUM
32 EVANS STREET
FRANKLIN, NJ 07416
markaboyer@earthlink.net

As New Jersey gradually emerged from pandemic restrictions, the Franklin Mineral Museum opened this year on Fridays, Saturdays, and Sundays, offering our visitors all of our regular attractions and activities. This was made possible through the dedication of our loyal staff: Chrisann Lucciola, Jean Castimore, Fred Fox, Bill Harpell, Steve Misiur, John Christiano, Assistant Managers Andy Richter and Debbie Rohde, and Manager Carol LaBrie.

Despite (or maybe because of) the reduced operating schedule, we have been very busy. The gem-panning and fossil-dig activities have been especially popular this year. To foster more interest in collecting, as well as generate revenue, we scheduled monthly night digs on the Buckwheat Dump. These have attracted lots of families and young people, mostly newcomers to rockhounding. For the more seasoned and advanced collectors, the digs on the Mill Site pile have also contributed to the museum's success this year, and we thank trustee John Postas for organizing this activity.

In July, the museum received a Sussex County Historic Marker award. The award was presented by Sussex County Historian Bill Truran at the New Jersey State Fair on August 7. The historic marker will be located along Evans Street in front of the museum, and it will describe the history and significance of the Buckwheat Open Cut and the Taylor Mine. We thank trustee Judy Williams for spearheading this project.

On July 31, the museum sponsored a swap-and-sell event at the Franklin Borough ballfield. Similar events in this location have been called "Pond Swaps," "THE Pond," etc., because of their proximity to the Franklin Pond. Again, thanks to John Postas for organizing this event.

A number of projects to our museum facilities took place this year: The empty space under our main fluorescent mineral display has been turned into a much-needed storage space, with sliding doors for easy access. The result is both functional and attractive. The museum thanks Corey Houghtaling and his brother, Steven, for volunteering their excellent carpentry work. Another project was the reorganization of the curator's office, performed by volunteer Lois Verbeek, whom we thank for her help in making this space more functional and inviting.

Curator Earl Verbeek is continuing with his mineral research and writing activities. This summer he was ably assisted by two interns, Elaine Whetstine and Aaron Adsit. Elaine performed much mineral analysis and identification work and Aaron spent his time mapping and researching the "saddle" area at Sterling Hill. This work keeps our museum active and relevant in the mineralogical and geological sciences.

Thanks to the efforts and skills of Steve Misiur, we have maintained steady eBay and website offerings of mineral specimens and other items, and our online mineral sales have been brisk all year. Our mineral sales agent, Steven Phillips, is continuing to hunt down new material to offer our customers. We also thank volunteer Steve Sanford for his assistance in specimen identification.

Our annual fall mineral show, to be held on September 25 and 26, is on track for bringing back indoor dealers to the Franklin Firehouse. And importantly, we will resume the tradition of having displays of our beloved Franklin minerals, which was the original intent of the show. Many thanks go to Gary Moldovany for organizing this event. In conjunction with the show, the museum will have a sale of Franklin minerals from newly acquired collections.

Finally, a special thank you goes to retired trustee Lee Lowell for his many years of service as museum treasurer, collections manager, and chair of numerous committees. The museum owes a debt of gratitude to Lee for doing the unglamorous and seldom-recognized work that is necessary to an organization's success. We know it "wasn't easy being Lee," and we will always be indebted for his service to and support of the museum.

All in all, this year is shaping up to be a profitable year, coronavirus restrictions notwithstanding. With new ways of doing business, we have weathered the coronavirus-related economic stress quite ably. Your support of the museum and participation in our activities contribute to our success. Please check out our website and Facebook page for our museum schedule and announcements of special events, including Mill Site pile digs and night digs.

Happenings at Sterling Hill

BILL KROTH
PRESIDENT, STERLING HILL MINING MUSEUM
30 PLANT STREET, OGDENSBURG, NJ 07439

While the one-year-plus "Covid Pause" gave us an opportunity to tackle many projects on our to-do list, we re-opened, as scheduled, on July 1, 2021. As we had no idea how many people would show up, we carefully limited that number by means of a reservation system we are still using. While this system requires us to answer the phone and record customer information, we now know how many tour guides we will need for each tour. The number of guides on our staff has shrunk to about half its pre-Covid level, as many guides are making more in unemployment/stimulus benefits than they earned here. That seems to be a recurring theme country-wide in all service industries that require part-time workers. With this situation, we are now open for public tours from Wednesday through Saturday, but will book groups such as camps and larger families on any day of the week. We hope to have enough staff in the next month or so to be open seven days a week, especially on Sunday, a traditionally high-volume day.

With Covid still a major concern, we have closed our Gift Shop but have left the building's Snack Bar and restrooms open, and have installed movable partitions to direct customers from the building's north door towards the restrooms. The Gift Shop itself is closed and all transactions are made through the south window across from our sluice. The sluice and collecting dump are open and that slightly offsets the loss of revenue from our Gift Shop.

On the whole our visitors are understanding, though some seem to have short fuses and argue with each other and with our staff. We are criticized for being too cautious and not being cautious enough; for wearing masks that muffle our words and not wearing masks so that we can be heard. Many people who make inquiries by phone are looking for guarantees that they will be 100% safe from Covid if they visit. We calmly reply that perhaps they should visit at a later time when Covid is no longer a major health concern. Our paramount concern is protecting our staff.

Many families usually visit us during the summer, and over the past few weeks we have been averaging about 125 people total over the five 1:00 PM tours—not too bad. However, only five camps have visited over the summer and we have only two schools booked for the entire Fall season. Before Covid, our school bookings were maxed out a year in advance at ten groups per day! We hope that when schools get back to in-person learning programs, normalcy will return and school visits to Sterling Hill will come back to previous levels. For our business and our country's future, schoolchildren remain our greatest resource.

The news I'm reporting is not good, but Denise and I are encouraged and bolstered by the people who have volunteered to help keep Sterling Hill alive and improving. Here's a partial list::

Wayne Franek, Ogdensburg resident and neighbor, mows our lawns and week-whacks our paths several times a week. We had so few visitors last year that we had little need to manicure the property, and our vegetation got out of control. However, Wayne's persistence has restored our site to its former park-like setting

Bruce Bannon, a geologist now living in Scottsdale, Arizona, volunteered at Sterling Hill for the month of August. He'd been a Sterling Hill miner, so was able to give tours as well as doing numerous hands-on jobs around the property, including painting, rock sorting, and carpentry. Bruce visited several months ago for a mine tour, and I noticed the large and unusual gold ring he wore. Bruce was a professional football player for the Miami Dolphins, and that ring was for the team's victory in the 1974 Super Bowl! His familiarity with our mine and his geological knowledge quickly enabled him to give tours, and when I'd tell our unsuspecting visitors that their guide was a sports celebrity, a special connection was apparent.

Doug Francisco, now from Van Nuys, California, was a Sterling Hill miner and is now a SHMM Board Member. He spent the entire month of July on many key projects that required skills beyond the norm. Doug lowered and set in place, in the north end of our flooded stope, the "trim slabs" from the American Museum of Natural History (see the "Trimmings" article on p. 8). He gathered over 80,000 pounds of rock from the Passaic Pit for sale to museums in China. With boulders and soil he built a ramp to load 20 tons of fluorescent rock into a 40-foot-long container that was shipped in July, with the next shipment slated for October. Doug also performed major site-wide cleanups: he recycled steel and fluorescent lighting tubes, gathered the trimmings from our granite countertops, and removed the old wooden ventilation building over the flooded stope to replace it with a new structure. The blasting demonstration room has been much improved by Doug, who installed there the rocker shovel used to remove broken rock after a blast, plus a large cone-shaped air handler and a warning whistle. Doug and Board Member Gordon Powers worked

Ogdensburg resident and volunteer Wayne Franek was an electrician for the local school system. Now retired, he now spends several mornings each week taking care of our grounds.

Ogdensburg resident and former science teacher Dominic Zampella assists with tours and cabinetry projects several days each week.

Ogdensburg resident and good friend, excavating contractor Fred Rowett, has been helping us for decades with his skill and his machines on countless projects. "As I always say, we have tackled jobs we had no business doing, simply because Fred was with us!"

together to modify our sound track for the blast, so the sound of the warning whistle is now included. The full story of the blast needed to extend a mine drift is now complete, and easier to understand.

Fred Rowett, Ogdensburg resident and excavating contractor, loaned us the use of his machinery, including a large front-loader and a track-mounted excavator that enabled Doug Francisco to complete many of his July tasks. Fred has been a major help for decades with countless projects, and has a unique talent for building rock walls. He just constructed a real beauty at our entrance to the upper property. Seeing that, I have asked Fred to construct a small rock-lined pond and waterfall, adjacent to our parking lot to the south of the 10-stamp mill. That work will start when our tree-frog tadpoles mature and leave the 750-gallon plastic tank left over from a previous personal project. Last but not least Fred, who is one of our tenants on the upper property, is spearheading a a much-needed improvement to that area: the resurfacing and repaving of the access road. Fred has canvassed our tenants to chip in approximately $18,000 to cover half the cost of that roadwork, and will also coordinated the patching and paving. Sterling Hill will cover the other half of the cost.

Dominic Zampella, Ogdensburg resident and retired science teacher, now spends several days per week giving tours and using his excellent woodworking skills to construct, restore, and modify many of our display cabinets. While we often take display cabinets for granted while concentrating on what is in them, our museum has more than 200 such cabinets and they do indeed require the skills of a craftsman such as Dominic.

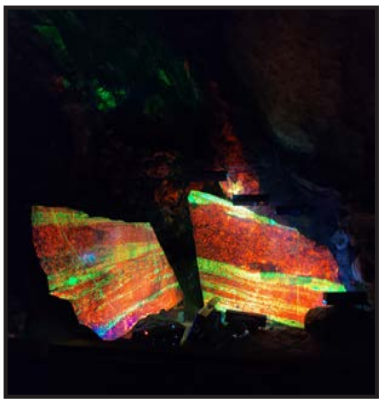
Still in great shape, Bruce Bannon was a miner here in the early 70s and graduated Penn State with a degree in geology. He also played pro football for the Miami Dolphins and was part of the winning Superbowl team in 1974. Bruce donated time during the entire month of August giving tours, painting exhibits, and performing a dozen other helpful tasks.

Many others have helped over the year, and their friendship, support, and efforts keep us encouraged and looking forward to surpassing previous levels of accomplishment. The Sterling Hill Mining Museum is a unique and important national treasure, and I am sure that with all our improvements and perseverance, we will eventually surpass our pre-Covid levels!

"Trimmings" From the American Museum of Natural History Return to Sterling Hill

BILL KROTH
PRESIDENT, STERLING HILL MINING MUSEUM
30 PLANT STREET, OGDENSBURG, NJ 07439

During November 2017, the Sterling Hill Mining Museum and the American Museum of Natural History (AMNH) embarked on an ambitious and rewarding project—the excavation and removal of a 44,000 pound slab of fluorescent ore from our Fill Quarry. The purpose of mining this slab was to present a world-class example of fluorescing minerals to the public at a soon-to-be built addition to the American Museum of Natural History in New York. The collaboration with all parties, including the Italian stonecutters was well documented in our Spring/Summer 2018 *Sterling Hill Newsletter*, and it was certainly one of my most memorable experiences at the SHMM.



The returned trimmings from the American Museum are right at home in our old stope and now are part of our regular tour. *Photo by Alex Kerstanski.*

Due to construction delays and Covid closings, the opening of the AMNH Mignone Halls of Gems and Minerals did not officially occur until mid-June, 2021. During that time-span, we more or less forgot about the slab and concentrated on our own issues here at Sterling Hill, knowing that the great unveiling would eventually happen.

We were informed that the slab, as removed from our Fill Quarry, surpassed allowable floor loadings for the new addition to the AMNH, so it was shipped to Minnesota for a "butterfly cut" that made the slab thinner, but with the same surface area. The view on display to the public would be unchanged.

Several months ago, I was contacted by Dr. George Harlow of the AMNH, who stated that the "trimmings" were available, and all we at Sterling Hill had to cover were the transportation costs from Minnesota. The AMNH was also going to keep a small portion of the "trimmings" for their special purposes. Weeks later, George contacted me and stated that their museum would cover all costs! JK Crane, the original crane company that removed the slab, would be driving the trimmings back to Sterling Hill, where we could rent a crane to unload them. This news was amazingly good!

What made the situation even better is that the AMNH and JK Crane supplied a crane truck at no cost. The "trimmings" consisted of two huge slabs, each approximately five feet by six feet. They were clean, flat, and perfect and hardly what I considered "trimmings." Our estimate is that both slabs together weigh more than 10,000 pounds.

Denise Kroth and Doug Francisco came up with the idea of locating these slabs in our flooded stope area, where our "Zoolander" movie props were displayed. Since the filming in 2001 of that cult classic, the display had deteriorated and had served its useful life. Some of the "fake rocks and timbers" were repurposed in other displays and the area was cleaned up to receive the two slabs. This location was ideal since the slabs could be simply lowered into place by means of a crane and the area already had ample electrical outlets and UV lights.

During mid-July, John Gumbs and Doug Francisco set the slabs in place with a large crane and in subsequent days used jacks and hoists to move them into their final positions. Right now, illumination is provided by 140-watt shortwave UV lamps mounted on chains. More permanent fixtures are being fabricated to support the 210-watt weatherproof shortrwave UV lamps being developed by Engenious Designs, our official supplier of UV lamps.

The official opening of the Mignone Halls of Gems and Minerals took place on June 12, and our slab is certainly one of the main attractions. Advertising has appeared throughout the city showing the beautiful red-and-green banding of our calcite and willemite slab. I can honestly say that it has become an icon of the new AMNH Mineral Halls. Many visitors state that their reason for visiting us here at the mine is because of their seeing the slab in New York and reading the excellent description of its origin and our museum, only an hour away.

We are proud to have been asked to provide the slab to the AMNH, and are thankful for their generosity in giving the "trimmings" back to our mine!

The Breakdown of Franklinite

STEPHEN SANFORD
740 ROUTE 23 NORTH
SUSSEX, NJ 07461

Franklinite is a stable mineral over a wide range of temperature and pressure conditions, from those operative during the Ottowan Orogeny 1045 to 1024 million years ago (Volkert et al., 2010), when our two zinc orebodies experienced temperatures of about 769° C (Peck et al., 2006) at a depth of 15-18 km, to the near-surface conditions of low pressures and low temperatures prevailing today. However, at two different locales within Sterling Hill, franklinite (ideally $ZnFe_2O_4$, but also containing appreciable Mn as a substitutional impurity) has broken down to yield daughter species. These environments are the Mud Zone, and the North Ore Body. Both were subjected to powerfully oxidizing fluids.

The Mud Zone is the near-surface expression of an elongate, steeply inclined, roughly cylindrical mass of breccia consisting of mixed and generally highly weathered rock fragments. Details of its genesis remain unclear and largely unstudied. Robert Metsger (2001), former Resident Geologist at the Sterling Mine, classified it as a saprolite. In a true saprolite, the rock has been thoroughly decomposed in place, and although its mineralogy may have been totally changed by weathering, textural details of the original material are preserved. Although much of the rock in the Mud Zone is now out of place, and mixed rock types are present in many places, the material within the Mud Zone corresponds to a saprolite in the mineralogical sense in that deep weathering has taken place within it. Rock fragments that on textural grounds almost certainly were pieces of disseminated zinc ore have in many places been altered to a claylike material that is easily deformed by hand. Near the surface, glacial sand, silt, and clay commonly infiltrated into open spaces between the fragments of decomposed rock, but there was no such interstitial sediment lower down. The Mud Zone bottomed out at 680 feet below adit level. A much larger saprolitic body lay just beyond the hanging wall of the East Limb down to 1200 level. Because of its proximity, it was a constant worry to mine management; if mining breached the hanging wall, the mine would be catastrophically flooded.

The instability of franklinite was discussed by Moore (1875), who wrote that its breakdown in the Mud Zone had led to the formation of chalcophanite, $ZnMn_3O_7 \cdot 3H_2O$. Years later, Dunn (1995) pointed out that franklinite, upon decomposition, had yielded up its iron, zinc, and manganese to make goethite, FeO(OH) (Fig. 1); hemimorphite, $Zn_4Si_2O_7(OH)_2 \cdot H_2O$ (Fig. 2); and hydrohetaerolite, $ZnMn_2O_4 \cdot H_2O$ (Fig. 3). These three daughter products of franklinite are characteristic species of the Mud Zone.

In similar fashion, the North Ore Body has been subjected to strongly oxidizing conditions by fluids migrating through the rocks. Unlike the Mud Zone, which is basically a near-surface feature, this latter region is in the deepest part of the Sterling Mine. The North Ore Body has a suite of characteristic minerals, especially adjacent to the Zero Fault. There in the hanging wall of the South Limb, the breakdown of franklinite has freed up iron to form hematite, Fe_2O_3 (Fig. 4); zinc to form orange, fine-grained zincite, ZnO (Fig. 5); and manganese to form pyrochroite, $Mn(OH)_2$ (Fig. 6). Strongly oxidizing, magnesium-rich hydrothermal fluids that channeled through the Zero Fault, which in this area truncates the orebody, altered and dolomitized the calcite matrix of the adjacent rocks as they

Figure 1. Goethite from the Sterling Mine Mud Zone. Specimen dimensions: 8 × 7.5 × 7 cm (3.1 × 3.0 × 2.8 inches).

Figure 2. Closeup of hemimorphite crystals from the Mud Zone, Sterling Mine. Specimen dimensions: 9.5 × 7 × 2.5 cm (3.7 × 2.8 × 1 inches). Horizontal FOV is 8 cm (3.1 inches).

passed through. These fluids are probably responsible for the near-universal partial serpentinization of nesosilicates such as willemite and tephroite, resulting in the typical red and black colorization of the ores.

The Mud Zone and the North Ore Body are the exceptions to the otherwise impressive stability of franklinite, which in most parts of the Sterling Mine orebody has survived for nearly one billion years under a wide range of geologic conditions. Where oxidizing fluids were able to affect the rocks, however, the breakdown of franklinite led to the formation of a series of secondary, lower-temperature minerals such as those discussed above.

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All photos by Stephen Sanford.

Figure 3. Hydrohetaerolite from the Mud Zone, Sterling Mine. Specimen dimensions: 8 × 7.5 × 3.5 cm (3.1 × 3.0 × 1.4 inches).

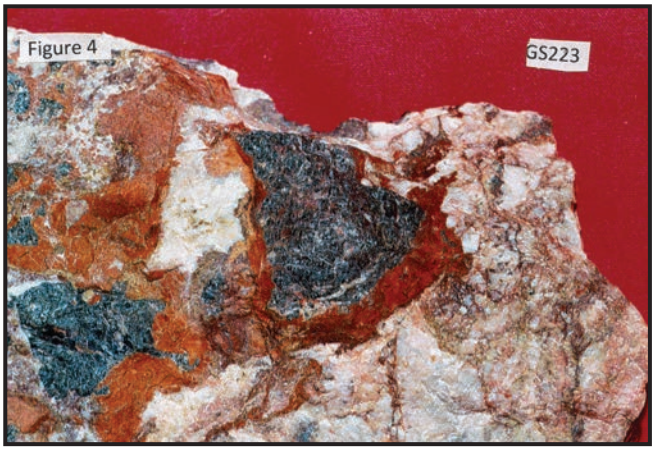

Figure 4. Hematite and partly serpentinized ore in a dolomitized calcite matrix. North Ore Body, Sterling Mine. Specimen dimensions: 9.5 × 8 × 2.5 cm (3.7 × 3.1 × 1 inches). Horizontal FOV is 8 cm (3.1 inches).

Figure 5. Orange zincite reaction rims around partly altered franklinite. North Ore Body, Sterling Mine. Specimen dimensions: 11.5 × 7 × 6 cm (4.5 × 2.8 × 2.4 inches). Vertical FOV is 4.8 cm (1.9 inches).

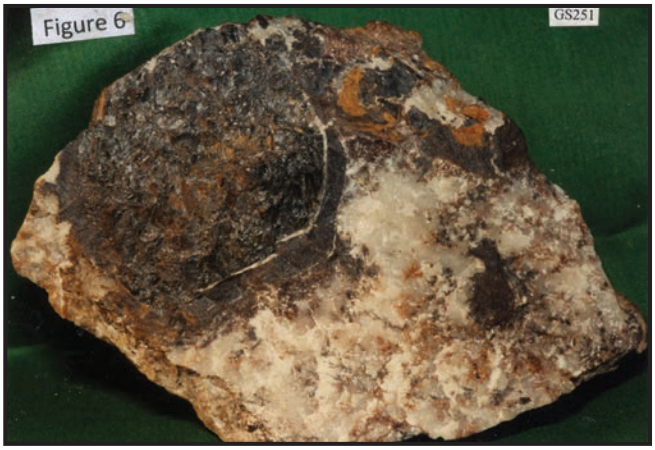

Figure 6. Pyrochroite in dolomite/calcite matrix. The pyrochroite forms a rim around a large franklinite grain. North Ore Body, Sterling Mine. Specimen dimensions: 13 × 9 × 3.5 cm (5.1 × 3.5 × 1.4 inches).

In Memoriam

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LASZLO PALINKAS

September 6, 1952 – February 28, 2021

Laszlo "Laci" Palinkas passed away in his Budapest home February 28, 2021, from complications of cancer. He was 69. Laci was well-known in Hungary as a successful mineral dealer with a large personal collection, and a passion for collecting fluorescent minerals.

Laszlo Palinkas was born on September 6, 1952, in Budapest (Hungary, Europe). He graduated from a high school in Nyiregyhaza (Hungary) as geography teacher and cultural manager /andragogist in 1975. Building on his interest in rocks kindled by courses in geography and mineralogy, he turned to the collection of minerals. During his time in Budapest, he met his wife, with whom he had two children, Rorbert Palinkas ("Robi") and Marton Palinkas ("Marci").

Simultaneously with his work assignments, he maintained his mineral collecting hobby, leveraging his time to collect mineral specimens. Laci founded his enterprise "Koorszag" ("Stoneland") in 1987 and operated as an active mineral dealer until his death, selling at local and regional gem & mineral shows in Denver, Munich (Germany), Sainte-Marie-aux-Mines (France), Tisnov (Czech Republic) as well as in various towns in Hungary. He was the organizer of the famous Budapest Mineral Show organized annually in August and visited by thousands of exhibitors and visitors from all around the world.

Laszlo regularly visited Franklin-Sterling Hill gem and mineral shows both in spring and autumn. He was an active member of the Hungarian Friends of Minerals (MAMIT), and Fluorescent Mineral Society of America.

He introduced lots of innovation in business and also provided significant funding for the publication of several books on mineralogy. He generously supported local artists and painters. Laszlo leaves behind a legion of friends and fellow collectors who knew him for his humble, self-effacing style and generosity.

JERRY H. DAY

September 21, 1935 – April 28, 2021

Jerry H. Day of Franklin, New Jersey, passed away on April 28, 2021 after a long illness (non-Covid related). Jerry lived all his life in Sussex County, first in Hamburg, then in Franklin, where he raised his family. He served in the U.S. Army, and retired after more than 50 years with Accurate Forming in Hamburg as a tool and die maker/machinist/foreman.

He was a member of the Franklin-Ogdensburg Mineralogical Society, and a regular fixture at our local mineral shows, where he sold spheres he cut himself, made from the local ore. Jerry was known to his neighbors as the "Rock Man," because of his extensive collection of Franklin minerals, which he collected locally and turned into jewelry, sand art, spheres, and signs. I spoke with his son Daniel to find out more about Jerry's interesting take on the hobby. He had connections to the mines; Jerry's grandfather on his mother's side was Ralph Jensen, a Franklin miner. His home was in close proximity to the mine property. One of Jerry's early interests was collecting local bottles, and he only came to be interested in the minerals later.

Dan remembers him as a hands-on inventor, typical of his generation — "if there wasn't a tool built, he built it himself." He used his own homemade UV lights, which he would take into the local woods, and "come home with five-gallon buckets full of rocks." In fact, Dan asserts that Jerry "never bought a rock in his life, he bartered and traded." Jerry was well known for his mineral spheres, cut and ground from local calcite/willemite ore. He made his own sphere-grinding equipment and rock tumblers.

Jerry Day will also be remembered for his bottles of sand art. This sort of creation has been a Franklin area fad for more than a century, and examples can be seen in the collections of both the Franklin Mineral Museum and the Sterling Hill Mining Museum, and in many private collections. Dan let me in on a secret, his father used to grind up mineral specimens with old-fashioned twist-handle meat grinders. One can imagine the effort of sorting the mineral sand by color, and packing it into bottles in precise patterns. I believe Jerry may have been the last living local practitioner of his art!

Sand Art in a Bottle

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Sand art bottle by Andrew Clemens. It features an American spread-winged eagle underneath a 36-star flag. The reverse of this same bottle features a bouquet of flowers. It sold at auction in October 2018 for $132,000. Photo courtesy and permission of Hindman Auctions, Ohio.

As we noted in this issue, with the passing of Jerry Day, a particular form of art may have lost its last local practitioner. Creating sand art in bottles has been a hobby and form of folk art for over 100 years. A famous artist was Andrew Clemens (1857–1894) of Iowa, whose creations now fetch tens of thousands of dollars at auction (Sucholeiki, 2016). Clemens collected his sand samples from the banks and bluffs of the Mississippi River valley (Wikipedia).

Closer to home, the practice of filling bottles with sand art was made uniquely "Franklin" when miners and collectors used sand composed of willemite, calcite, franklinite, rhodonite, and other colorful local minerals. Looking at these "folk art in a jar" creations, one might imagine the painstaking work of grinding a mineral specimen to the consistency of sand, and sorting the grains by color, even before the fine work of filling a bottle with sharp geometric patterns. Monomineralic, monochromatic mineral specimens from the mining district are not common, except for calcite. Suffice it to say, these creations were a labor of love!

It may not always have been such a chore. One former Sterling Hill miner informed me that back in the day, one could visit the sorting shed, where Wilfley tables did the work! A Wilfley table is "a sand table that separates heavy mineral particles from lighter gangue by means of longitudinal riffles impeding the downward flow and a horizontal reciprocating motion carrying the heavy particles off the end of the table" (Merriam-Webster Dictionary). In other words, ore that had already been crushed was sorted mechanically, and could be collected by the bucketful from the end of the table. We should remember also that black, magnetic franklinite or magnetite could be easily sorted and extracted from crushed ore.

Here's a representative sample of sand art bottles from Franklin, from the collections of the Franklin Mineral Museum and the Sterling Hill Mining Museum.

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Sand art bottle created by Jerry Day, with his label. *Photo by Jim Van Fleet.*

A larger sand art bottle by Jerry Day, with his label. *Photo by Jim Van Fleet.*

Sand art bottle from the sales stock of the Franklin Mineral Museum, 17.5 cm tall.

Sand art bottle from the Sterling Hill Mining Museum collection, 17 cm tall.

Sand art bottle from the Sterling Hill Mining Museum collection, 14.5 cm tall.

Sand art bottle from the Sterling Hill Mining Museum collection, 26.5 cm tall.

A more elaborate sand art creation from the sales stock of the Franklin Mineral Museum, 9 cm tall.

Sand art bottle from the Sterling Hill Mining Museum collection, 11 cm tall.

Sand art bottle from the Franklin Mineral Museum collection, 17.5 cm tall.

All photos on this page by Earl R. Verbeek.

Green-fluorescing Sphalerite: A Franklin/Sterling Hill Rarity

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Sphalerite from the Franklin and Sterling Hill mining district has many daylight and fluorescent color variations, with local nicknames such as "golden sphalerite," "mahogany sphalerite," and "layer-cake sphalerite."

There is a variety of sphalerite that has not been seen by many collectors, which I find to be one of the most beautiful and striking local varieties of fluorescent sphalerite. Sphalerite that fluoresces green is rare, and is not seen in many Franklin/Sterling Hill collections. It may be that it is just not recognized by, or even known to, many mineral-collecting enthusiasts. Its daylight appearance is similar to that of gray/silver sphalerite veins, in calcite matrix, that are commonly found on the Buckwheat Dump in Franklin, N.J. Most of the specimens of green-fluorescing sphalerite from Franklin are in this assemblage, but there are also variations at each mine. Under shortwave UV light (254 nm), the sphalerite can be nonfluorescent, or fluoresce green, and might be confused with fluorescent willemite. Under longwave UV (365 nm or 368 nm), green-fluorescing sphalerite exhibits what I would describe as a bright, mint-leaf-green fluorescence.

Some of the best specimens of sphalerite fluoresce a range of colors, including pink, orange, blue, and lavender, in addition to mint-leaf green. Besides the green fluorescent response under LW UV, this sphalerite can also fluoresce well under midwave UV (302 nm). Depending on the specimen and coverage of green-fluorescing sphalerite, some specimens fluoresce under all three wavelengths of UV light, and MW can elicit the best fluorescent response. The MW UV fluorescent response can also appear more of an olive green to yellowish green, an unusual response for any fluorescent sphalerite specimen.

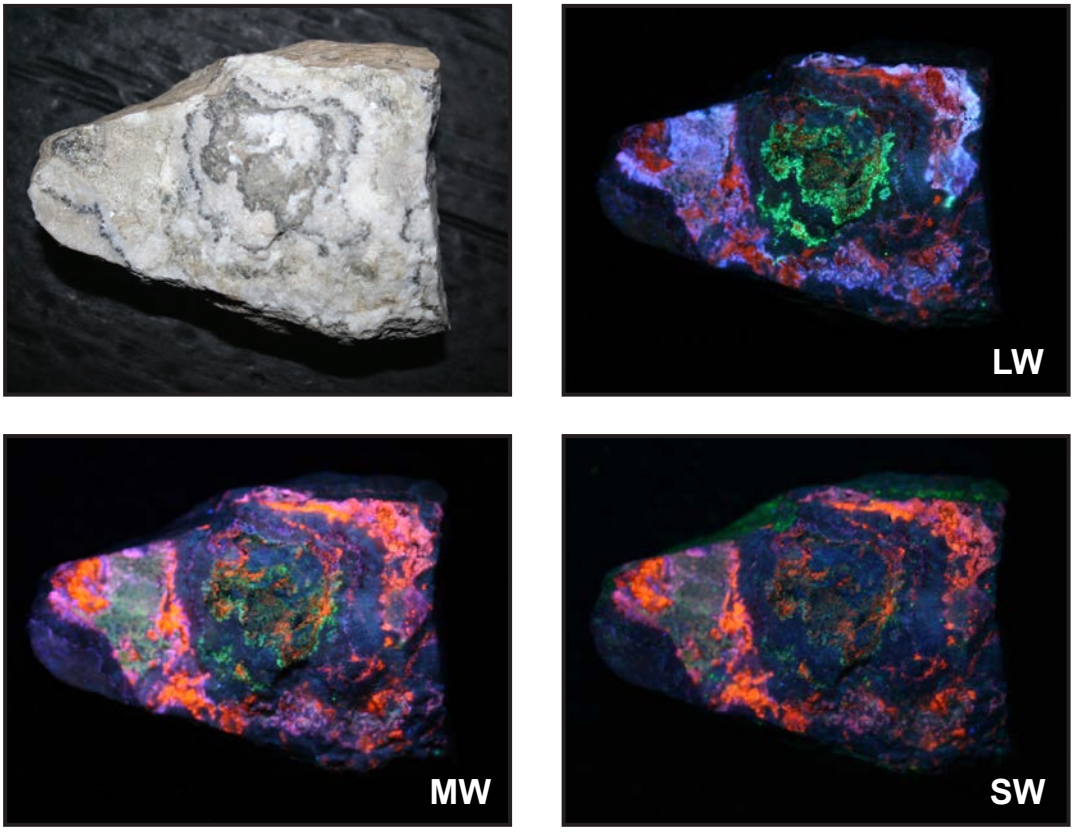


Figure 1. This is an exceptionally brightly fluorescent sphalerite specimen from Franklin, with ribbons of blue-fluorescing sphalerite that surround a core of green-fluorescing sphalerite. Orange-fluorescing sphalerite is intermixed with the green-fluorescing sphalerite in the center. The changes in vein thickness and texture, and the variations in fluorescent response, make this an attractive sphalerite specimen from Franklin. Specimen dimensions: 10.8 × 7.6 × 5 cm (4.3 × 3 × 2 inches).

Another feature of green-fluorescing sphalerite is that many of the specimens are intimately intermixed with thin veins, locally nicknamed "ribbons," of the cleiophane variety of sphalerite. Cleiophane, an iron-free variety of sphalerite, often fluoresces bright blue to lavender purple. The cleiophane adds additional fluorescent colors to the usual Franklin/Sterling Hill sphalerite orange and pink fluorescent response. Dick Bostwick explains cleiophane this way: "The varietal name *cleiophane*, which originally was given to colorless iron-free" sphalerite from Franklin (Henry, 1851), is used locally to mean blue-fluorescing sphalerite, though much orange-fluorescing sphalerite from both orebodies is colorless and most local sphalerite is iron-free (Bostwick, 2017). The author uses "cleiophane" throughout this article as it is commonly used by Franklin mineral collectors, to specifically describe sphalerite fluorescing blue and lavender. Of course sphalerite's fluorescent response can change in hue and brightness under different UV wavelengths. I find that green-fluorescing sphalerite, and blue-fluorescing cleiophane, seen together under LW UV light, are hard to compare to any other fluorescent mineral from Franklin and Sterling Hill. Some of the best specimens can have up to six colors of sphalerite fluorescence, with beautiful patterns and a variety of hues.

On casual inspection, a green-fluorescing sphalerite specimen might be mistaken for green-fluorescing willemite. With experience, a rich example of green-fluorescing sphalerite is easy to distinguish from willemite. This photographic review of specimens should help a collector know what to look for. It makes all the difference when you have the benefit of being able to view examples closely and see the differences firsthand. I have assembled an assortment of green-fluorescing sphalerite specimens, and will caption each one with my observations on assemblage, appearance, fluorescent response, and sometimes even specimen history.

An exciting aspect of green-fluorescing sphalerite from the Franklin/Sterling Hill district is that the majority of specimens were *found and collected* on the mineral dumps of the area, including the Mine Run Dump at Sterling Hill and the Buckwheat Dump at Franklin. There are still some remarkable specimens found on both dumps every year, including on the Mill Site pile behind the Franklin Mineral Museum, and on the Taylor Road Site near the Franklin Mineral Museum. There is potential for the reader to be able to collect their own specimen of this rare material with some hard work, digging, and a good eye for sphalerite and its host rock or matrix associations.

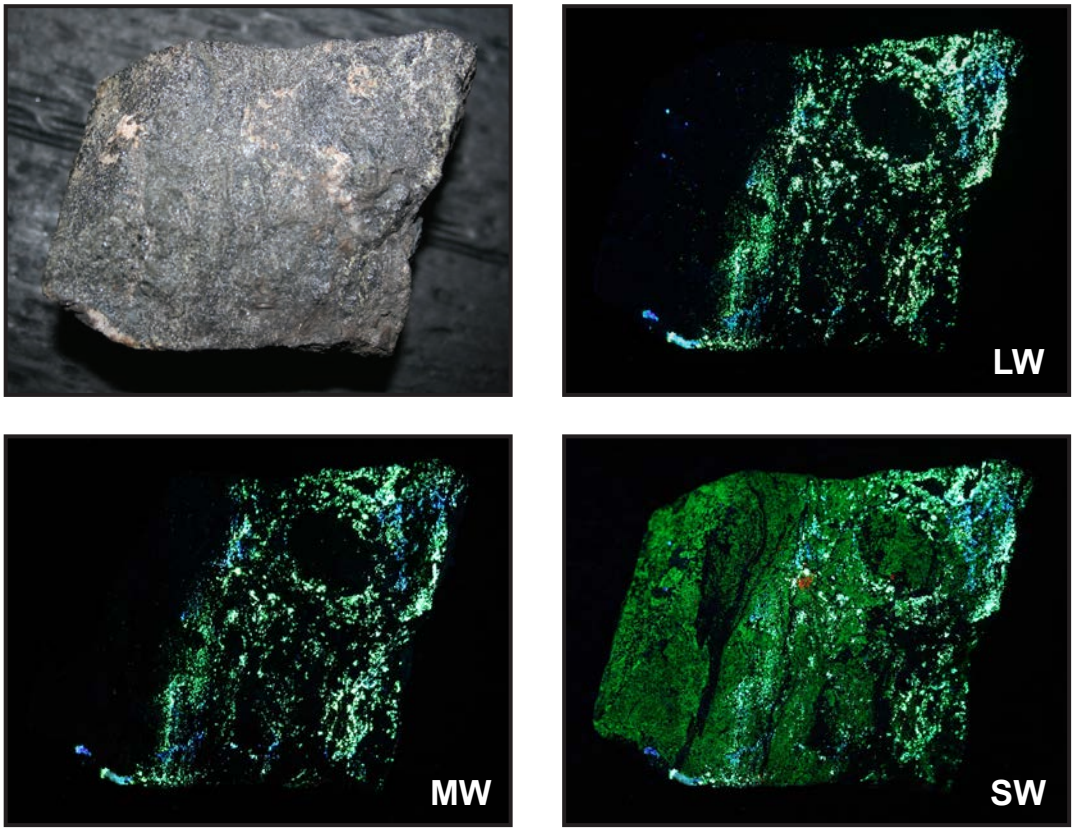


Figure 2. One of the brightest examples of green-fluorescing sphalerite that the author has seen. This is reportedly from the Taylor Road site, a rare locality for this variety of sphalerite in Franklin, N.J. This rich specimen of green-fluorescing sphalerite is associated with disseminated grains of willemite that can be seen clearly in the SW UV photo, but which do not fluoresce under LW and MW UV light. The different hue of green-fluorescing sphalerite can be readily distinguished from the willemite in this example. A diagnostic feature of green-fluorescing sphalerite is an unusual brief silvery phosphorescence or afterglow, followed by green phosphorescence which can last from a few seconds to almost half a minute. This response can appear under all three wavelengths of UV light and can be used to distinguish green-fluorescing sphalerite from the willemite. Specimen dimensions: 9.1 × 7.6 × 6.3 cm (3.6 × 3 × 2.5 inches).

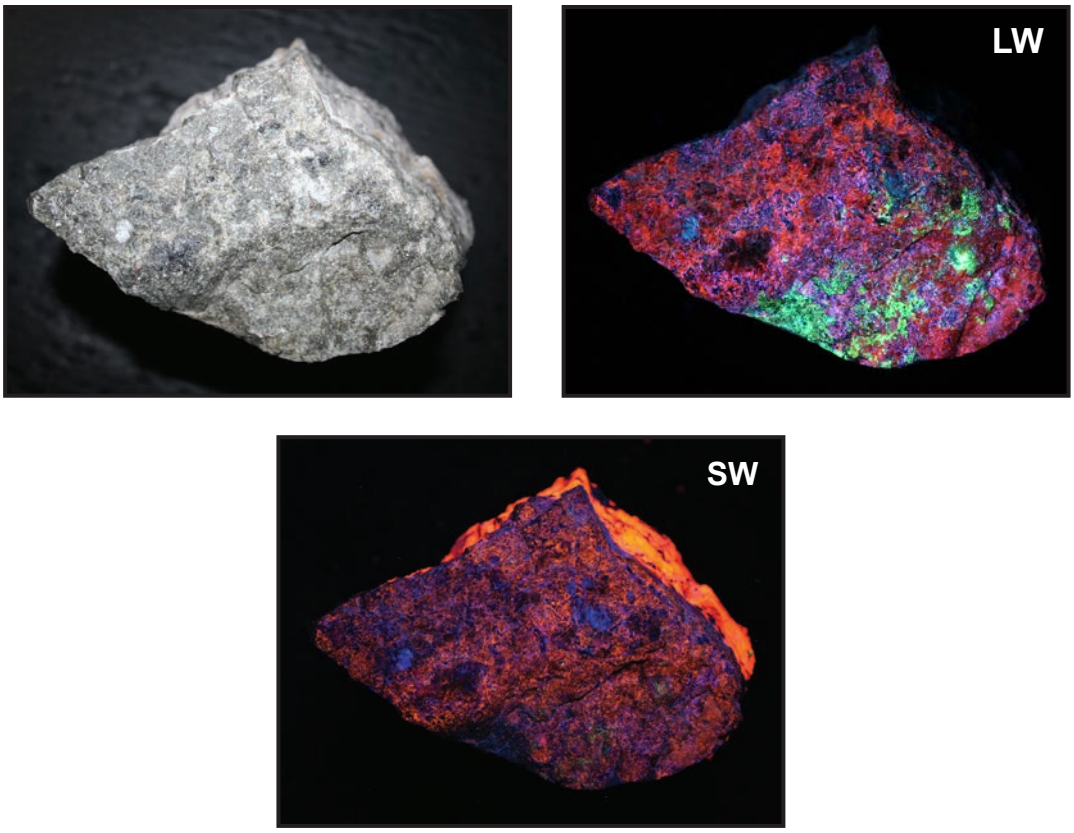


Figure 3. This large specimen has an exposed vein of glassy sphalerite on a calcite matrix with franklinite grains but no willemite. It is a Buckwheat Dump specimen that is showier in daylight than most of the specimens of gray/silver-veined sphalerite in a calcite matrix. Under UV light, the sphalerite fluoresces shades of pink, orange, blue, lavender, and green. Specimen dimensions: 15.2 × 8.9 × 7.6 cm (6 × 3.5 × 3 inches).

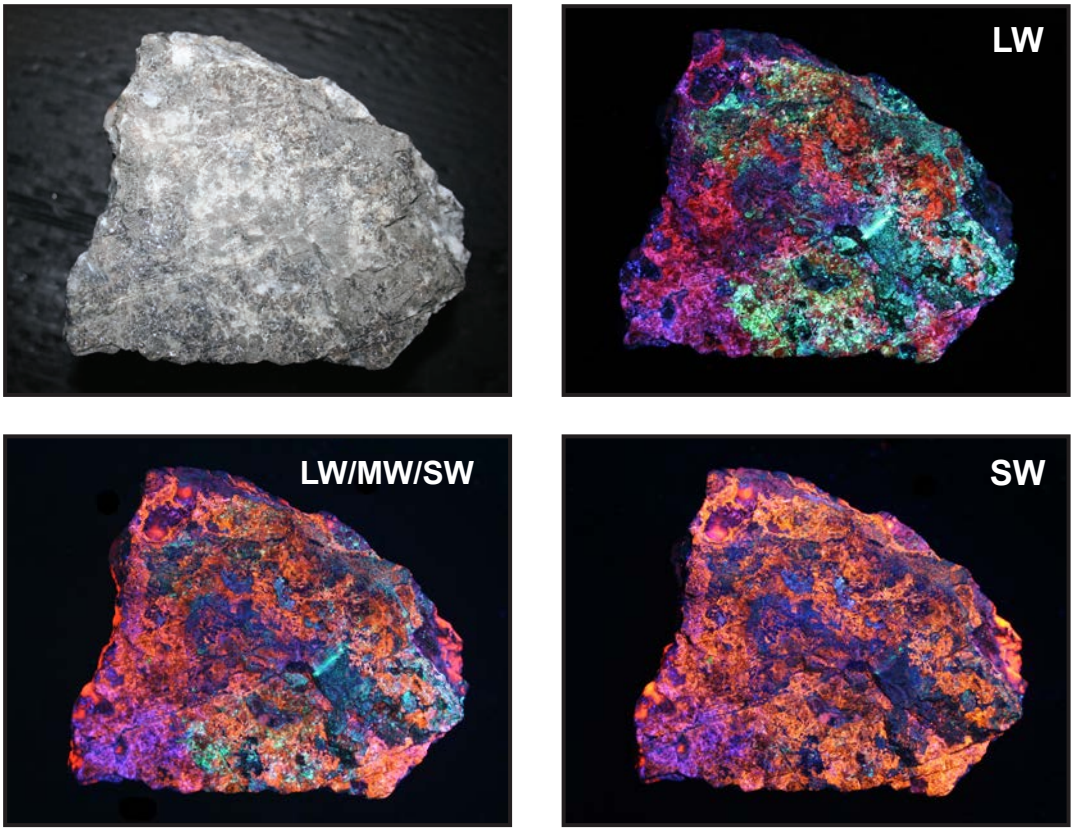


Figure 4. Another example of green-fluorescing sphalerite, collected on the Buckwheat Dump behind the Franklin Mineral Museum. Most of the green-fluorescing sphalerite from Franklin, N.J. is gray/silver daylight color sphalerite in veins, commonly associated with grains of franklinite, and rarely with disseminated willemite in small grains, in the calcite matrix typical of many Buckwheat Dump specimens. This specimen contains silver-colored sphalerite in daylight with some glassy and gemmy areas on the edges of the exposed vein face. This piece is in the typical calcite matrix, associated with pale green "shot ore" willemite grains, with no franklinite present. The sphalerite on the vein face fluoresces mostly green, with blue and lavender highlights from cleiophane sphalerite, along with orange- and pink-fluorescing sphalerite. It should be noted that there is no willemite present in the sphalerite vein, only in the calcite matrix. Specimen dimensions: 13.2 × 11.4 × 7.6 cm (5.2 × 4.5 × 3 inches).

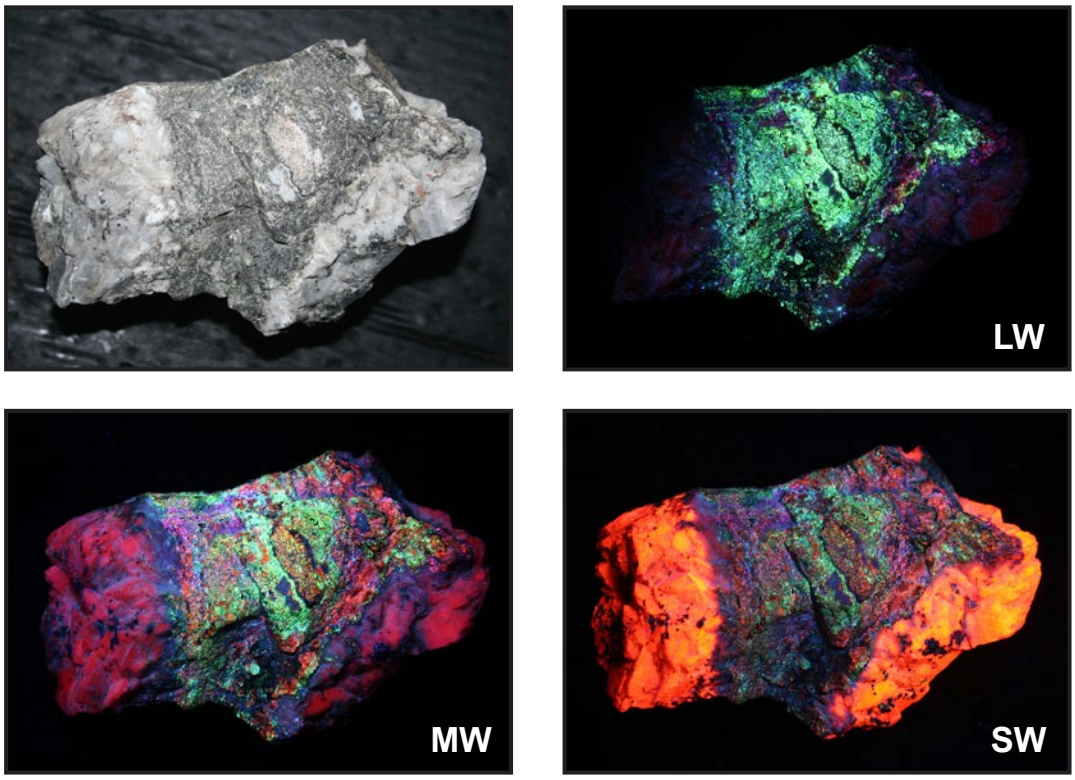


Figure 5. Franklin specimens of green-fluorescing sphalerite may have been first *recognized* in 2001. They were obtained from a large boulder that Nick Zipco had acquired many years earlier and sold in 2001 to Fred Lubbers before the spring mineral show at Franklin. According to Mr. Lubbers, Nick had the large, approximately 25-pound specimen on the trunk of his car with his standard masking tape label reading "odd fluorescent sphalerite." The boulder, of typical massive calcite, had rich coverage of gray/silver sphalerite veins. The veins showed an unusual greenish, silver/cream fluorescent response that didn't look right for willemite, and in fact there was no sign of willemite in the boulder. Fred opened up the specimen along a few of the veins, and discovered more sphalerite in the center of the boulder. He was able to gather some fine cabinet specimens of green-fluorescing sphalerite, virtually unheard-of at the time (Lubbers, personal communication). Figure 5 shows a specimen from the Nick Zipco boulder, with a wide band of green-fluorescing sphalerite, electric blue- and lavender-fluorescing cleiophane, and orange- and pink-fluorescing sphalerite flanked on each end by calcite that fluoresces bright orange-red in MW and SW UV. There is no willemite present in this example. All of the green fluorescence shown is sphalerite. Specimen dimensions: 11.4 × 7 × 3.8 cm (4.5 × 2.8 × 1.5 inches).

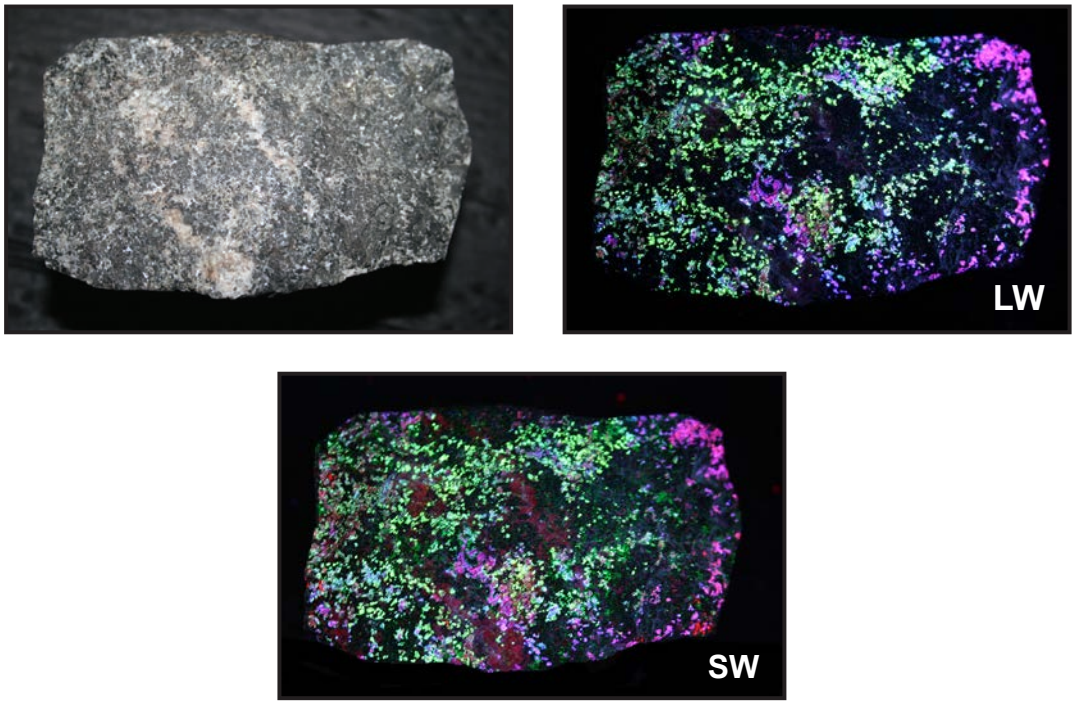


Figure 6. There seem to be far fewer specimens known of green-fluorescing sphalerite from Sterling Hill than from Franklin. Fred Lubbers collected this specimen from the Mine Run Dump at the Sterling Hill Mining Museum. According to Mr. Lubbers, there were only four or five pieces with green-fluorescing sphalerite, broken from a roughly 35-pound boulder. All that appeared on the outside of the boulder were small grains of cleiophane and two odd-looking "willemite" veins. This turned out to be green-fluorescing sphalerite, not willemite. A piece of this boulder is currently on display in the Franklin Mineral Museum. This specimen also can be seen in *The Picking Table*, vol. 58, no. 1, Spring 2017 issue, page 18. Specimen dimensions: 10.8 × 8.3 × 6.3 cm (4.3 × 3.3 × 2.5 inches).

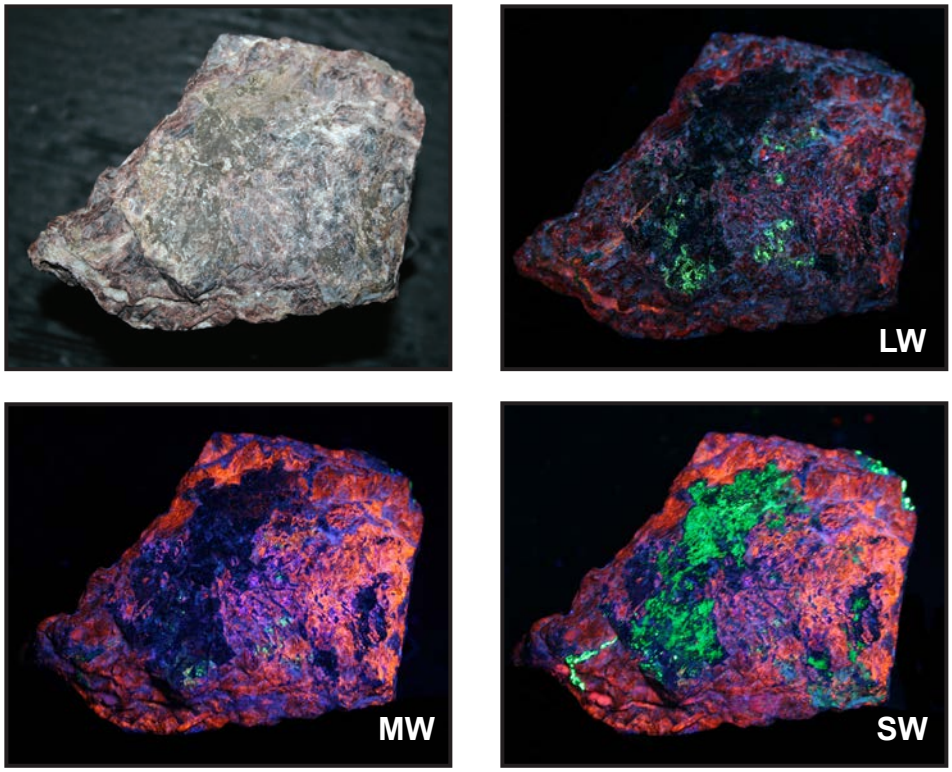


Figure 7. This is an unusual example of green-fluorescing sphalerite, on a vein of “mahogany” sphalerite. That vein is in a rich example of zinc ore with franklinite, calcite, and masses of willemite. This specimen was collected by the author from the Sterling Hill Mine Run Dump in June of 2008. Green-fluorescing sphalerite together with “mahogany” sphalerite is a rare association. The vein itself has the typical fluorescent response of "mahogany" sphalerite, with orange and creamy yellow highlights. Note the fluorescent v-shaped willemite vein in the “mahogany” sphalerite vein face, along with willemite grains across the face. There is very little SW UV response from the green-fluorescing sphalerite in this example. Under MW or LW it becomes visible. Specimen dimensions: 8.9 × 7.3 × 5.7 cm (3.5 × 2.9 × 2.3 inches).

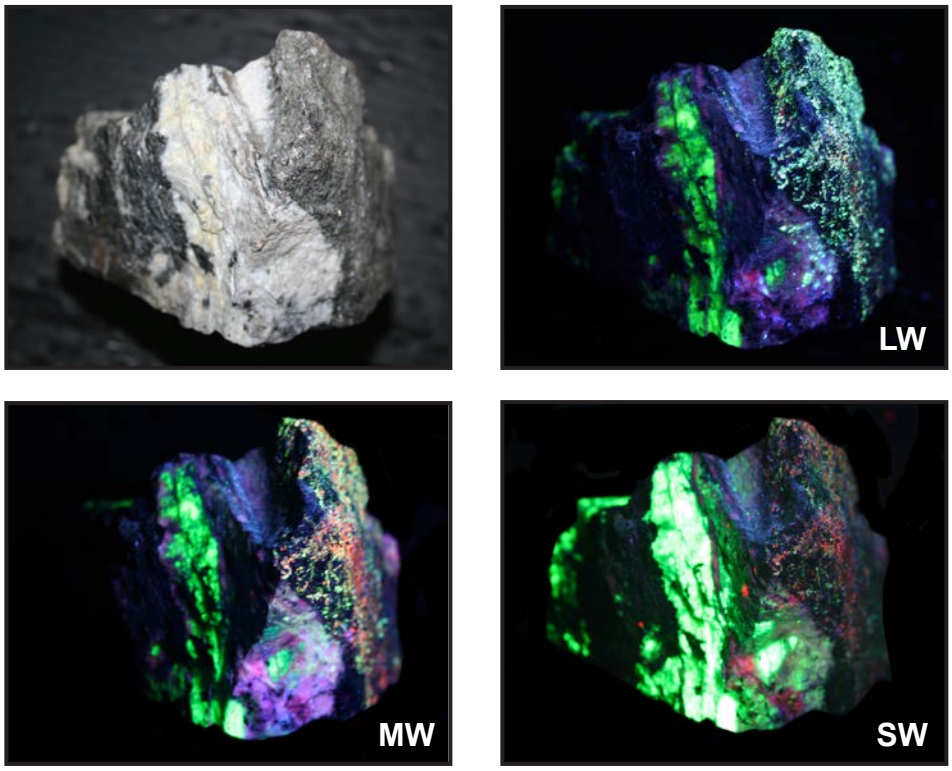
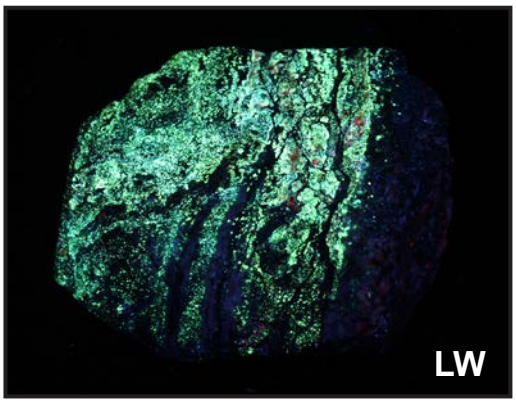
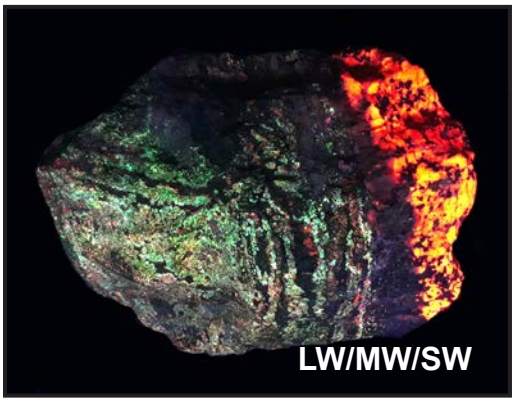


Figure 8. This specimen shows a vein surface of green-fluorescing sphalerite adjacent to willemite veins. This example of Sterling Hill willemite is pale yellow in daylight, and its typically bright fluorescence can be clearly seen under all three UV wavelengths. The exposed vein surface of green-fluorescing sphalerite occupies the right end of the specimen. Few of the green-fluorescing sphalerites that the author has viewed are associated with willemite, and if there is willemite present, it is fairly easy to see the difference in the fluorescent response of the two minerals, especially under SW illumination. Under SW, the green fluorescent response of the sphalerite is normally quite weak or absent. Specimen dimensions: 8.9 × 7.6 × 7 cm (3.5 × 3 × 2.8 inches).





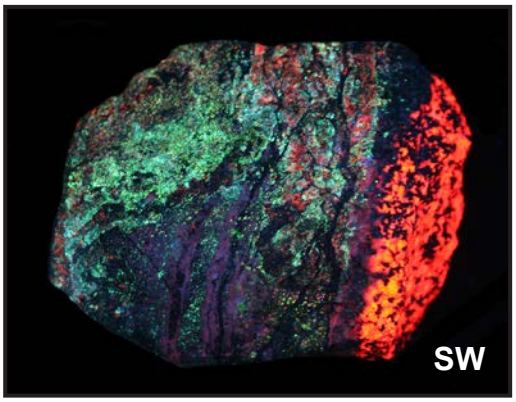
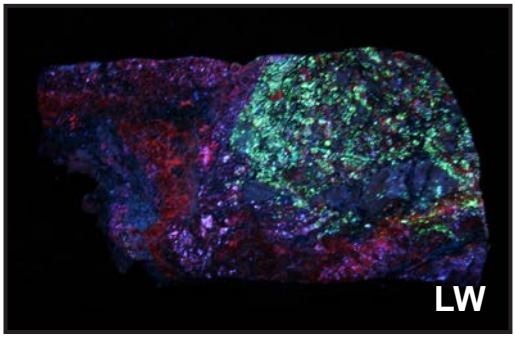
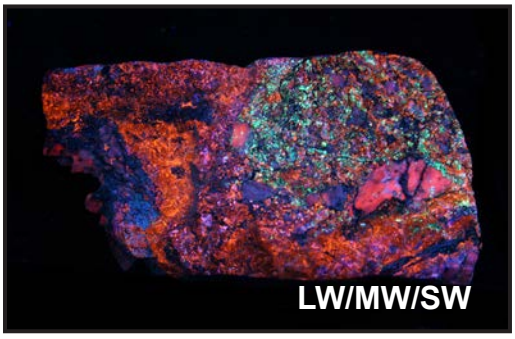


Figure 9. This is a very rich example of green-fluorescing sphalerite from Franklin, associated with calcite that fluoresces brightly in both SW and MW UV. Veins of green-fluorescing sphalerite cover approximately 80% of the specimen. There is no willemite associated with this specimen. Some collectors consider sphalerite a "longwave-only" fluorescent mineral, but as with many sphalerite specimens, the display under a combined three wavelengths of UV light is quite dramatic. With the advent of better lamp and filter technology in the past decade or so, UV lamps have become more powerful, and the fluorescent response easier to see and appreciate. When sphalerite from the area is viewed under SW, MW, and LW UV, the fluorescent response can vary, even within different areas of the same specimen. The fluorescent response when viewing sphalerite under all three wavelengths together has always been one of the authors' favorites. Specimen dimensions: 12 × 9.5 × 6.3 cm (4.8 × 3.75 × 2.5 inches).





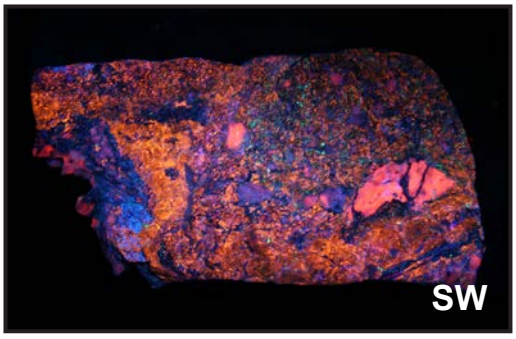


Figure 10. This is a thick vein of green-fluorescing sphalerite, blue- and lavender-fluorescing cleiophane, and orange- and pink-fluorescing sphalerite from the Buckwheat Dump. In addition to the calcite matrix, there are also some brecciated calcite masses embedded in the sphalerite display face of this Franklin specimen. Specimen dimensions: 10.2 × 6.3 × 4.4 cm (4 × 2.5 × 1.8 inches).

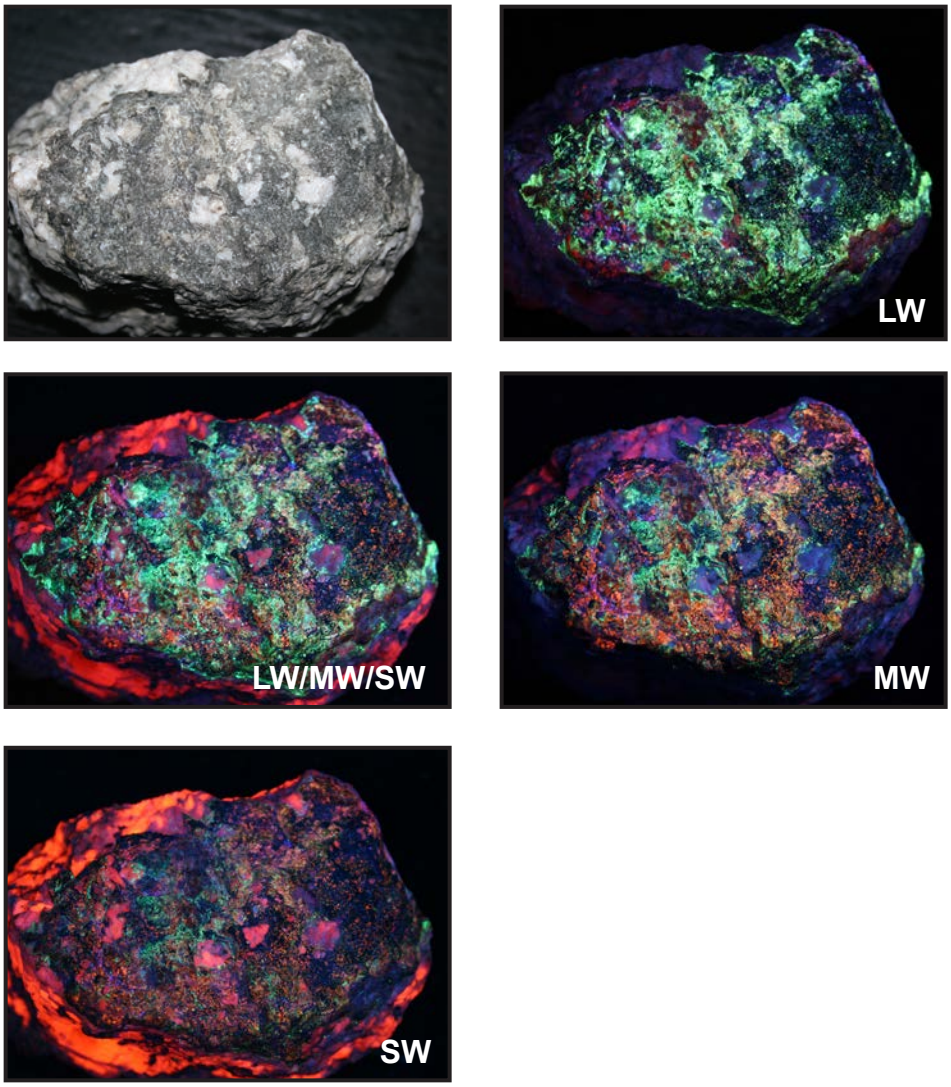


Figure 11. A very aesthetic specimen of green-fluorescing sphalerite with cleiophane in calcite from the Buckwheat Dump in Franklin, N.J. This has good coverage of sphalerite on an exposed vein surface; silver/gray daylight veins, cutting a calcite matrix. In these specimens the calcite itself can be fluorescent or non-fluorescent depending on the UV wavelength used, and the manganese content of the calcite. Specimen dimensions: 10.2 × 8.9 × 7 cm (4 × 3.5 × 2.8 inches).

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Specimens provided by Chris Luzier, photographs by Chris Luzier and Jim Van Fleet.

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The Camptonite Dike at Franklin — What Is It Really? (Part One)

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HISTORICAL BACKGROUND

On the Buckwheat Dump in Franklin we see all those dark, seemingly uninteresting rocks that sit in stark contrast among all the pieces of white Franklin Marble. Some of these specimens get looked at, but most collectors will leave them just where they are since they don't seem to offer anything of interest. Many of the dark rocks on the dump come from an igneous dike that cuts right through the Franklin orebody. That dike is classified as a lamprophyre, in allusion to the mica phenocysts commonly found in it. As a petrologic term, this name was first introduced by Gumbel (1874), and derives from the Greek word *lampros* (glistening), and *porphyry*, defined as "an igneous rock of any composition that contains conspicuous phenocysts in a fine-grained groundmass" (Jackson, 1997). During the 19th and 20th centuries, lamprophyres were a source of confusion for geologists. They did not know how to classify these rocks because their unique compositions did not fit in with the nicely devised schemes used for the more common igneous rocks, which utilize feldspar type and the amount of quartz or feldspathoid present. In the 19th century, when the science of petrology was still developing, it seems that any peculiar-looking dark igneous rock which couldn't be classified was lumped with the lamprophyres, with each new find given a name that very often was European as most of the serious petrographic work being done at the time was in Europe. This led to a long list of rock names that were not easy for English speakers to pronounce. It also led to confusion as multiple names were assigned that later were shown to be the same rock species. Early to mid-20th century petrologists were aware of this list of varietal names and its inherent obscurity, so little effort was made to pursue identification other than to generalize the naming of such rocks as basalt or diabase, or a lamprophyre. Not until after 1970 was there a serious effort to simplify lamprophyre classification. Petrologists like Nicholas Rock, Roger Mitchell, R.W. Le Maitre, Albert Strekeisen, and M.J. Le Bas (Rock, 1991; Wooley, 1996) looked at a rapidly increasing amount of geochemical analyses and concluded that all these lamprophyres could successfully be grouped into families or clans. (More on that later.)

In Franklin, early geologic literature shows the use of several names (diabase, mineete, and camptonite) for the same dike. Nineteenth-century geological nomenclature was less than uniform, and different names were assigned to the same rocks by different analysts. The first published mention of the dike was by B.K. Emerson in 1882. He called it a "dyke of micaceous diabase," using the British spelling of dike. After Emerson's article in the *American Journal of Science*, nothing was published until 1893, when J.F. Kemp repeated Emerson's term and added the term "kersantite." Kemp was comparing the Franklin dike to another dike west of Hamburg which he called a "kugel-minette," referring to a rock found in Germany that displayed small rounded spheroids that resembled shot ("kugeln"). A year later F.L. Nason reiterated the identification of "micaceous diabase." In 1898 the U.S. Geological Survey released *Bulletin 150*, within which J.P. Iddings called the Franklin dike a "minette." In 1908 the *Geological Atlas of the United States* was published. Within this set of compilations was GF-161, *Franklin Furnace Folio*, by Arthur C. Spencer and others. It contained a report by J.E. Wolff on the "Post-Ordovician Igneous Rocks," where the term "camptonite" was first used for the dike in the Buckwheat Pit. Wolff presented the first quantitative chemical analysis of the dike. Camptonite as a petrological term had earlier been defined in a work by H. Rosenbusch in 1897; this was the first use of a non-European name for lamprophyre rocks. Twenty-seven years passed before the dike was mentioned again. Charles Palache wrote his now-famous monograph about Franklin/Sterling Hill minerals (Palache 1935), in which he mentioned "a few camptonite dikes," and referred to the geologic description given in the 1908 USGS *Folio*. A few years later, C. Milton referred to all the basic dikes in the Franklin-Hamburg area as "kugel-minettes" (Milton, 1938). For the next half-century, geologic reports and maps would always refer back to the pre-1940 authors.

Though no mention of the dike appears in Franklin mining or geologic literature until 1882 (Emerson), its existence must have been known prior to that, at least in the western side of the orebody where the soil cover had been removed, exposing the entire length of the "vein." A number of pits and trenches had already been dug prior to 1861 (State of New Jersey Court of Chancery, 1861). The dike rock, though it was in the way of mining efforts, was left undisturbed. About 500 feet to the southeast, an outcrop in the buckwheat field atop Mine Hill led miners to uncover a large portion of the eastern or "back" vein around 1850 (State of New Jersey Court of Chancery, 1861). The first New Jersey Zinc Company decided in 1866 to mine the eastern

vein, stripping the overburden off all the way to the dike. At that point the entire extent of the dike across the top of Mine Hill must have been known. Unlike the western vein, no surface exposures of ore could be seen on the north side of the dike, so it was assumed the east vein ended at the dike. Because of this, mining of the east vein was limited to the south side of the dike, giving the dike a major role in Franklin's mining history. When Moses Taylor took over all east vein mining in 1880, he took his mine underground by sinking a shaft and developing several levels, all of which terminated at the dike. Once the northward extension of the east vein was discovered in 1882, Taylor's mine was expanded by punching several passages through the dike (Nason, 1894). One passage went through at the floor level of the open cut, and thus became the main adit to workings on the north side of the dike for many years. (That passage shows prominently in all the photos of the north wall of the cut taken in the 1890s.) On the north side of the dike a huge underground chamber was excavated, continuing the mining trend northward and downward. The intervening dike rock remained in place until 1910 or shortly thereafter, in spite of a massive removal of rock that resulted in the full development of the Buckwheat Pit as we know it today. A 1910 photo in the Franklin Mineral Museum archives clearly shows the dike rock in place. When the dike rock that was between the two parts of the Taylor Mine was removed, many boulders from it ended up on the Buckwheat Dump. Today a narrow cut through the dike can still be seen at the northeast corner of the open pit, with the remaining portions of the dike still clinging to the north wall of the pit (Figure 6).

GEOLOGY

The length of the dike is just over 400 feet, and its thickness averages 18 to 25 feet. When the Buckwheat Open Cut was at its deepest, about 400 vertical feet of dike rock had been exposed, down to the keel of the orebody. Water now hides at least 100 feet of the dike in the deepest part of the pit (Phillips, Steven, oral commun., 2021). Sections of the dike are missing along the north wall, and the literature does not reveal details on rock removal along the wall, so it's unclear whether these sections were removed during excavation or fell on their own. Large pieces of the western portion of the dike, ten or more feet in diameter, have fallen down the slope at the northwestern corner of the Buckwheat Pit. In the years to come the remaining portion of the dike will likely break apart, and drop into the water.

When discussing the camptonite dike at Franklin, I need to go into more detail about lamprophyres, a family of rocks unlike those in the standard classifications of igneous rocks, but deserving their own classification scheme. Petrologically, lamprophyres are mafic igneous rocks characterized by phenocrysts of pyroxene, amphibole and/or biotite, with feldspar only in the groundmass. They are for the most part alkaline, meaning they have a disproportionate amount of the alkali elements sodium and potassium, enough so they can be either ultrasodic or ultrapotassic, respectively. They are silica undersaturated, sometimes extremely so. They have higher amounts of H_2O and CO_2, and this is primarily what separates them from the other igneous rocks; they are hydrous and carbonated. Water is present within the molecules of biotite and amphibole, and without water these rocks would just be basalts, or alkali basalts to be precise. Lamprophyres are typically gray to black in color (they are *mafic*), and because their phenocrysts are so perfectly formed they are called *panidiomorphic* ("completely idiomorphic" or "crystals having the proper form"). They are neither lava flows nor deep plutons, but are instead intrusive bodies forming at moderate to shallow depths, in that part of the Earth's crust known as subvolcanic or hypabyssal. Lamprophyres occur in small-volume bodies, mostly as dikes and sills. They are not diabase, as that rock is anhydrous and shows a peculiar crystal texture known as *ophitic*, which is not seen in the Franklin dike.

The lamprophyre dike at Franklin intrudes the Franklin Marble as well as the orebody (Fig. 1). It is oriented northwest-southeast, 314°/134° with respect to true north. Good exposures of dike rock can be seen within the Buckwheat Pit, and a number of dike boulders can be found on the Buckwheat Dump. Wolff (1908) states that eighteen smaller dikes were found near the main dike in the pit. These would account for the thin black seams found within marble on the dump. In all cases a sharp contact with surrounding rock is characteristic. There is no thermal metamorphism evident in the marble or ore. Very fine crystallization of dike rock is found close to the contacts, this is the "chill zone". This is in contrast to granite

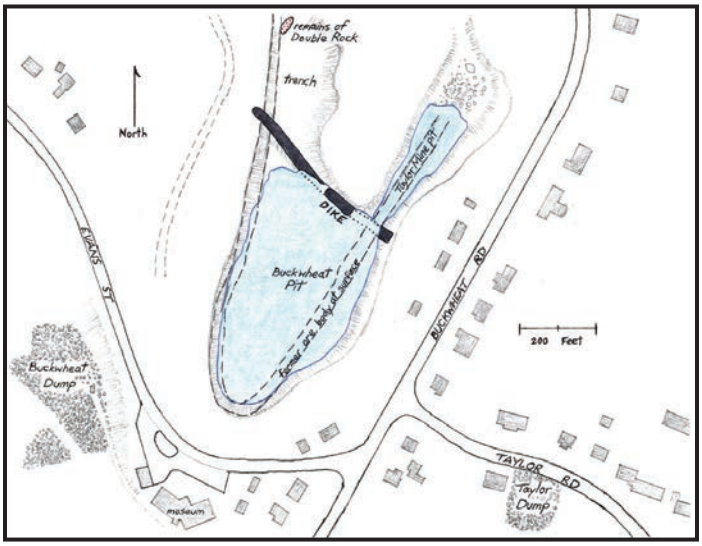

Figure 1. Map of the Buckwheat Pit and environs, Franklin, N.J. *Drawing by David Vonderheide.*

pegmatite contacts in Franklin which show strong alteration several feet into the marble and ore. It seems as if the magma was intruded rapidly and its heat absorbed very efficiently by the surrounding rock. Lamprophyre melts have temperatures between 1000°C and 1200°C, as modeled using thermodynamic applications. These values are well above the calculated peak metamorphic temperature for the Franklin Marble and the orebody (about 770°C, Peck, et. al., 2006), so thermal metamorphism in the marble would be expected, but apparently did not occur (see Figure 3). If the country rock temperature was relatively low at the time of intrusion, even allowing for thousands of feet of sedimentary cover (Eby, 2021), also allowing for the heat capacity of marble, which is high, the contact thermal effects are attenuated. There is also an additional explanation for the lack of observable thermal metamorphism. In the case of thin dikes, they have a small enough volume that cooling can proceed quickly once the magma intrusion has come to a halt. Compare this with the granite pegmatite contacts mentioned earlier. Magma that is moving through rock without slowing down (its movement is unimpeded) brings a continuous supply of heat from its deep source. In the Buckwheat lamprophyre dike the magma may have been injected quickly, keeping much its heat on the way up through the Earth's crust, but its heat was dissipated before it could alter minerals in the marble or the ore. On the other hand, hot hydrothermal fluids from the magma did accomplish some mineral alteration, and this is a subject that will discussed in the second part of this article.

` There are xenoliths in the dike, which seem to be composed only of franklinite-willemite-zincite ore and marble which may have explosively spalled into the magma due to the thermal shock, but did not travel far within the cooling dike. Conspicuously absent are deeper-source xenoliths from the lower crust and mantle. Either this means that deep-source xenoliths could not be carried higher in the crust, or perhaps such xenoliths were absent. Ocelli ("eyes") of calcite-albite are found within 18 inches of the north contact of the large dike. The ocelli may represent drops of immiscible felsic silica-carbonate liquid that separated from the magma and were in the process of floating upward when the dike solidified. The ocelli in some places are elongated due to flow of the surrounding magma.

Other lamprophyre dikes can be found in all parts of Sussex County, the closest to Franklin being near Hamburg and McAfee. All of the dikes are connected to a common magma source at depth. An igneous body of nepheline syenite that crops out northwest of Beemerville is believed to be physically connected to the same magma source as the dikes in eastern Sussex County (Drake et al., 1996; Ghatge et al., 1992). The magma intrusion was the result of stresses that stretched the crust, allowing fractures to open that reached all the way downward into the upper mantle. Some of the fractures, possibly all of them, predated the Taconic orogeny that ended 440 million years ago. Compression that raised the ancient Taconic mountains apparently reversed, allowing relaxation/extension to tear at the crust from Sussex County to Westchester County (Ratcliffe, 2006). Down in the mantle, decompressing rock led to melting. In addition to decompression, it's possible that another source of heat, like a transient mantle hot plume, was at work. Deep fracturing and melting worked together to allow magma to move upward. As it rose, decreasing

Figure 2. Buckwheat Pit as it appears today. Looking northeast. *Photo by David Vonderheide*.

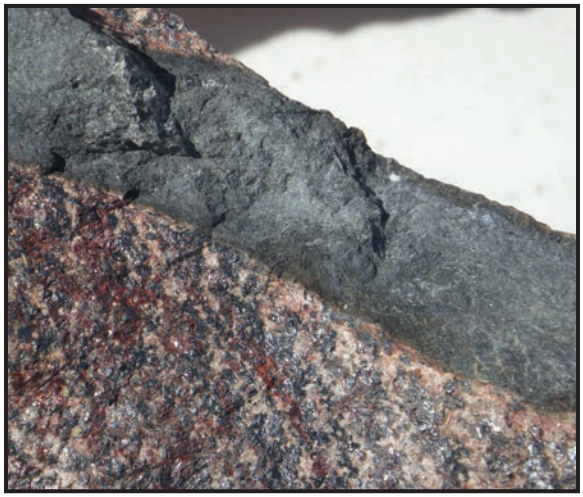

Figure 3. Contact between lamprophyre and ore, Buckwheat Pit. *Photo courtesy of Corey Houghtaling.*

Figure 4. Lamprophyre (camptonite) up close. Note the phenocrysts of biotite mica. *Photo by David Vonderheide*.

Figure 5. Remaining portion of the dike at its western end in the Buckwheat Pit. *Photo by David Vonderheide*.

Figure 6. Lamprophyre dike, looking northwest from the Taylor Mine through-cut. *Photo by David Vonderheide*.

Figure 7. Dike looking east: middle portion is missing, revealing a wall of Franklin Marble. The through-cut into the north chamber of the Taylor Mine is at the far end. *Photo by David Vonderheide*.

temperature and pressure allowed minerals to crystallize; the first to reach saturation in the Franklin dike was pyroxene. At a point, water dissolved in the magma reacted to form biotite crystals. These grew to become the phenocrysts we see in many dike boulders. From the uppermost portion of the magma chamber(s) in the crust, secondary smaller sills and dikes intruded outward into adjoining rocks that now underlie the modern Sussex County landscape. One of those injections went through the Franklin orebody. Magma intrusion may have been quite rapid, the evidence found in the very small crystals and sharp, nonreactive contacts between lamprophyre and the adjacent marble.

All of the Sussex County Ordovician-aged intrusions are part of a larger east-west trend that extends to northern Westchester County, New York, and possibly into northeastern Pennsylvania, known as the Cortlandt-Beemerville magmatic belt (Ratcliffe, 1981; Eby, 2004). Magma began intruding at the end of the Taconic Orogeny in the late Ordovician period, the intrusive activity working its way westward after mountain-building had ended. In Sussex County, rocks ranging in age from Mesoproterozoic to Ordovician were intruded, but the younger Shawangunk Conglomerate (Silurian) was not. The Shawangunk covers the nepheline syenite near Beemerville, and we know the Shawangunk was above Franklin as its continuation to the east is found as the Green Pond Conglomerate in Morris and Passaic counties. At that time there was some 9000 feet of sedimentary rock lying above Franklin, and though the magma likely continued upward, it can't be known with certainty how far it penetrated. The Beemerville intrusive is at the top of the Cambrian-Ordovician sediment pile, in the upper Martinsburg Formation, where some of the dikes reached to or near the surface and interacted with wet shales. Explosive eruptions occurred that left behind pipes filled with broken rock (volcanic breccia). These structures are known as diatremes. Was there a diatreme or perhaps even a small volcano 9000 feet above Franklin at the surface that existed in late Ordovician time? Without evidence we can only speculate. In the second part of this article the author will describe the results of fieldwork and mineral lab analysis work that was done in 2021.

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Correspondence with Dr. Nelson Eby, University of Massuchusetts at Lowell, Mass., was thought-provoking and very helpful. Dr. Eby also examined thin sections of the dike rock, identifying, photographing, and describing its minerals for this study.

Museum president Mark Boyer graciously gave time to let me view archival photographs at the Franklin Mineral Museum. We discussed the role the dike played in Franklin Mine history as revealed in the photographs.

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Shown above is a specimen of pink “cherty” sussexite interlayered with yellow to white willemite, both part of a vein assemblage on a matrix of altered, granular, franklinite-willemite ore. The significance of this specimen is that it is from Franklin, not Sterling Hill (the yellow vein willemite is the giveaway). It was once in the collection of John Kolic (his no. 401), and before that, Tom Fitzpatrick (his no. 316). This fine example was purchased by Mr. Kolic from Ewald Gerstmann on March 14, 1981 and is now specimen SHMM-2288 in the collection of the Sterling Hill Mining Museum. A comparable specimen, FMM-7049, is on display at the Franklin Mineral Museum. Specimen dimensions: 7 × 6.5 × 4 cm (2.8 × 2.6 × 1.6 inches). *Photo by Earl R. Verbeek.*