THE PICKING TABLE

JOURNAL OF THE FRANKLIN-OGDENSBURG MINERALOGICAL SOCIETY

Vol. 44, No. 2—Fall 2003

$15.00 U.S.

Inside This Issue:

- How to photograph fluorescent minerals
- An interview with Dr. Pete J. Dunn
- Articles on genthelvite, pararealgar, and more!

The Franklin-Ogdensburg Mineralogical Society, Inc.

President
C. Richard Bieling
315 Oak Street
Palmerton, PA 18071

Vice-President
Fred Young
234 Warbasse Junction Road
Lafayette, NJ 07848

Second Vice-President
Greg Jacobus
36 Post Blvd.
Carteret, NJ 07008

Secretary
Tema J. Hecht
600 West 111th Street, Apt. 11B
New York, NY 10025

Treasurer
Denise Kroth
240 Union Avenue
Wood-Ridge, NJ 07075

Assistant Treasurer
Steven C. Misiur
309 Fernwood Terrace
Linden, NJ 07036

Slide Collection Custodian
Edward H. Wilk
202 Boiling Springs Avenue
East Rutherford, NJ 07073

Liaison with the Eastern Federation of Mineral and Lapidary Societies (EFMLS)

Delegate	Joe Kaiser
Alternate	Richard C. Bostwick

Committee Chairpersons

Auditing	William J. Trost
Field Trip	Edward H. Wilk Warren Cummings (assistant)
Historical	John L. Baum
Identification	John Cianciulli
Mineral Exchange	Richard C. Bostwick
Nominating	Philip P. Betancourt
Program	George Elling
Spring Swap & Sell	Chester S. Lemanski, Jr.

Membership Information

Anyone interested in the minerals, mines, or mining history of the Franklin-Ogdensburg, New Jersey, area is invited to join the Franklin-Ogdensburg Mineralogical Society, Inc. (**FOMS**). Membership includes scheduled meetings, lectures, and field trips, as well as a subscription to ***The Picking Table.***

Membership Rates for One Year:

☐ **$15** **Individual**

☐ **$20** **Family**

Name: ____________________

Address: ____________________

City: ____________________

State: ____________ **Zip:** ____________

E-Mail Address: ____________________
(Optional)

Please make check or money order payable to **FOMS,** and send to:

Denise Kroth, Treasurer, FOMS
240 Union Avenue
Wood-Ridge, NJ 07075

THE PICKING TABLE

Vol. 44, No. 2—Fall 2003

About the Front Cover: One of the best Franklin bladed rhodonite specimens. This was from the R.B. Gage collection, now Franklin Mineral Museum specimen no. 2192. Approx. 5.25″ × 2.5″ × 2″ (13 × 6 × 5 cm), with crystals as large as 1 cm in length. Mr. Gage's original specimen label indicates that he acquired this piece in 1927 for $17.50. It was donated to the museum by Steven Philips in 2003. Photo by Gary Grenier with special thanks to Dick Hauck for his assistance.

Production and Publishing
Jay Lininger, Matrix Publishing Company

Subscription to *The Picking Table* is included with membership in FOMS. For membership, back issues, and information, write to:

Denise Kroth, Treasurer, FOMS
240 Union Avenue
Wood-Ridge, NJ 07075

The Picking Table is the official journal of the Franklin-Ogdensburg Mineralogical Society, Inc. (FOMS), a nonprofit organization. *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. Articles related to the minerals or mines of this district are welcome for publication in *The Picking Table.* Prospective authors should address correspondence to:

The Picking Table
Attn: Mark Boyer
25 Cork Hill Road
Ogdensburg, NJ 07439

The FOMS Executive Committee also publishes seasonally the *FOMS Newsletter*, which informs members of upcoming activities and events sponsored by FOMS and other local mineral-related organizations.

FOMS is a member of the Eastern Federation of Mineralogical and Lapidary Societies, Inc. (EFMLS).

FRANKLIN-OGDENSBURG MINERALOGICAL SOCIETY, INC.

FALL 2003 ACTIVITY SCHEDULE

Saturday, Sept. 20, 2003
9:00 A.M. to Noon—FOMS Field Trip—Collecting at the Passaic and Noble Pits, Sterling Hill Mining Museum; fee $1.00/lb.
10:00 A.M. to Noon—FOMS Micro Group, Sterling Hill Mining Museum.
1:30 P.M. to 3:00 P.M.—FOMS Meeting and Lecture, Franklin Mineral Museum:
Structure and Extensive Metamorphic Remobilization of the Balmat Zinc Ore Bodies in the Northwest Adirondacks, N.Y., by Bill DeLorraine

Saturday, and Sunday, September 27 & 28, 2003
*47TH ANNUAL FRANKLIN-STERLING GEM & MINERAL SHOW
Sponsored by the Franklin Mineral Museum.
Franklin Middle School, Washington Ave., Franklin, N.J.
9:00 A.M. to 6:00 P.M. Saturday; 10:00 A.M. to 5:00 P.M. Sunday.

The Pond Swap-and-Sell, sponsored by FOMS, takes place outdoors on the school grounds from 7:30 A.M. to 6:00 P.M. on Saturday and from 9:00 A.M. to 5:00 P.M. on Sunday. Show admission required.

The FOMS Annual Banquet starts at 6:30 P.M. on Saturday at the Lyceum Hall of the Immaculate Conception Church, Main St., Franklin. The meal is an all-you-can-eat buffet; soda, tea, and coffee are included. B.Y.O.B. After the banquet, there will be an auction for the benefit of FOMS.

*"Garage Sale" of minerals, etc., at the Sterling Hill Mining Museum on Saturday and Sunday from 1:00 P.M. to 3:00 P.M. The Mine Run Dump and Passaic and Noble Pits will also be open for collecting from 9:00 A.M. to 6:00 P.M. on Sunday (fee charged).

Saturday, October 18, 2003
9:00 A.M. to Noon—FOMS Field Trip—Collecting on the Buckwheat Dump at the Franklin Mineral Museum.
1:30 to 3:00 P.M.—FOMS Meeting and Lecture, Franklin Mineral Museum:
A New Method of Color Comparison for Fluorescent Minerals, by Don Halterman

Saturday, October 26, 2002
*14th Annual ULTRAVIOLATION, a Show-Swap-Sell Session featuring fluorescent minerals only.
First United Methodist Church, 840 Trenton Road, Fairless Hills, PA.
9:00 A.M. to 4:00 P.M. "We'll leave the lights OUT for you."

Sunday, October 27, 2003
*9:00 A.M. to 3:00 P.M.—Mine Run Dump collecting and Outdoor Flea Market, Sterling Hill Mining Museum.

Saturday, November 1, 2003
*6:30 P.M. to 9:30 P.M.—Night Dig on the Buckwheat Dump, for the benefit of the Franklin Mineral Museum. Doors open at 6:00 P.M. for check-in and mineral sales.

Saturday, November 15, 2003
9:00 A.M. to Noon—FOMS Field Trip—Collecting at Eastern Concrete Materials Quarry, Hamburg, N.J.
1:30 to 3:00 P.M.—FOMS Meeting and Lecture, Franklin Mineral Museum:
The Mesoproterozoic Graphite Deposits of the North Jersey Highlands, by Albert Tamashausky

Saturday, November 22 through Saturday, November 29, 2003
*Holiday Sale of minerals at the Franklin Mineral Museum for FMM members.

Sunday, November 30, 2003
*9:00 A.M. to 3:00 P.M.—Mine Run Dump collecting (fee charged) and Outdoor Flea Market, Sterling Hill Mining Museum.

Most FOMS field trips are open only to FOMS members aged 13 or older.

Proper field trip gear recommended: protective eyewear, gloves, sturdy shoes. Quarry trips, helmet required.

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

Franklin Mineral Museum News

John Cianciulli, Curator
Franklin Mineral Museum
P.O. Box 54, Franklin, NJ 07416

Museum Property and Grounds

The Franklin Mineral Museum Inc. continues to make good progress into the future. The big news is the gifting of two historically significant properties by two separate benefactors. At our last regular board meeting, Reggie and Steve Phillips from R.S. Phillips Steel, LLC, donated to the museum a section of the Trotter mine property (about 1/3 of an acre), which includes the famous Trotter shaft. One might say "the museum got the shaft," but in a good way! Also during our June meeting, Louis S. and Karen Cherepy donated their property off Taylor Road in Franklin to the museum. This property, just shy of 1/3 acre, is the site of one of the wooden towers of the Taylor mine aerial tramway. The tramway, built in 1907, was used to haul ore from the early workings of the Taylor mine. In later years, the tower was destroyed by fire, leaving behind its footings and a pile of ore that was measured in 1938 at 80 feet high. Today about 20 feet (in depth) of rock remain at the site.

The most noticeable improvement on the museum grounds is the new Mildred B. Harden Memorial Pavilion. Completed at the end of August, this is the close of a two-and-a-half-year odyssey! Filled with picnic tables, the pavilion provides shade from the sun and shelter from the rain for museum guests, as well as a gathering site for museum events.

Acquisitions

The museum recently acquired a world-class bladed rhodonite with water-clear barite crystals from the Franklin mine, from the R.B. Gage collection. The mineral gageite was first described from Franklin and named in Gage's honor in 1927. The museum also acquired a wendwilsonite crystal specimen from Morocco to put in Bill Welsh's collection of worldwide minerals.

Mr. Francis Gregus, retired science teacher, donated an entomological habitat box that has many new insects and butterflies; it is displayed in Welsh Hall. An authentic piece of coal from the Titanic, from the Bill and Mary Welsh collection, is now on display. Speaking of ships, Mr. and Mrs. Rudi Theis from Sparta, New Jersey, donated an ornate wooden scale model of the British warship "Sovereignty of the Sea," commissioned by King Charles in 1667. The model is an exact replica assembled by Mr. Theis, a retired engineer from the German Air Force. The Wildonger family of Allentown, Pennsylvania, donated one ton of "red and green" ore, that was collected on the Buckwheat Dump 40 years ago. The museum also purchased the remainder of the Gary Grenier, Robert C. Linck, and Steve Kiss collections.

Sales

The museum has established an e-Bay account. So far, this is a successful venture, although it is a tremendous amount of work. I would like to thank Carol Cianciulli, Anne Wronka, Lee Lowell, Greg Jacobus, Phillip Persson, and Paul Shizume for their help and support. DSL has been installed into the curator's office. Many thanks to Al Grazevich with help from young Phillip Persson for running the cable from the front office to the back. Special thanks to Mike Donders for lending us the cable checker. The DSL helps the posting of the e-Bay items go much quicker. The sales page on our website is up and running. An Internet posting service posts our site on 1,700 search engines and E-bulletin boards. You can view our site at: http//www.franklinmineralmuseum.com.

Research

A paper on a new mineral to the area, pararealgar, has been submitted for publication by Jim Rumrill and Tony Nikischer. Baumhauerite has been rediscovered. Amphibole studies are still ongoing by Fabio Bellatrechia and PAIVA. Yeatmanite is no longer unique to Franklin; it has been found in Sweden and Canada. Johnbaumite/svabite has been found in Sweden. A ferric-iron analog of hematolite from Sterling Hill is currently being re-studied. Light brown, brittle radiating plates with red friedelite from Franklin are being studied. Manganese oxides with at least four different phases of MnO have been rediscovered at Sterling Hill.

Other News

The Borough of Franklin returned a borrowed Zinc Co. exhibit, an original mineral exhibit from the Neighborhood House. Congressman Scott Garrett requested and received a collection of Franklin-Sterling minerals for exhibit in his Washington, DC, and Belvidere offices. A fluorescent exhibit of Franklin-Sterling minerals was shipped to Don Snyder in Washington State to be displayed in August. The museum has assembled two exhibits for the New Jersey State Fair at the Sussex County Fairgrounds that were on display the first week of August at the fair in the County building and the Snook building. I want to thank Franklin Mayor Ed Allen, Tom Webb, Al Grazevich, and Fred Young for their assistance in setting up these displays. ⚒

Rocks & Minerals

America's oldest popular mineral and fossil magazine

Minerals, mineral localities, and mineral shows
Mining art and microminerals
Reviews of mineral and mining literature
Museum notes and announcements
Calendar of mineral events, and much, much more

Rocks & Minerals is published bimonthly by
Heldref Publications
Annual subscriptions are $48 for individuals and
$91 for institutions
To subscribe, call 1-800-365-9753 or write:

Rocks & Minerals
Heldref Publications
1319 Eighteenth St. NW
Washington, D.C. 20036-1802

Making Mineral History . . .

MATRIX

A JOURNAL OF THE HISTORY OF MINERALS

The first magazine devoted exclusively to the history of minerals, mineral people and historic mineral locations. MATRIX is a high-quality multi-colored, quarterly periodical featuring well-researched original articles and written in a non-technical format. Articles are richly-illustrated with historic photographs and full color specimen photographs. It is a magazine which appeals to serious mineral collectors, mining history afficionados, and those with an interest in the heritage of the nature sciences.

$24.00 per volume (domestic)
$30.00 per volume (foreign)

MATRIX Publishing Company
POB 129
Dillsburg, PA 17019-0129

e-mail: jlininger@matrixpublishing.com
website: www.matrixpublishing.com

The Franklin Mineral Museum

Evans Road/P.O. Box 54, Franklin, NJ 07416
(between Main Street and Buckwheat Road)
Phone: (973) 827-3481
www.franklinmineralmuseum.com

Exhibiting by means of guided tours, Franklin-Sterling Hill mineral specimens, educational exhibits in mining methods and history, including a life-size replica of underground workings, artifacts, gemstones, zinc uses, and a 32-foot-long fluorescent display. Included in the tours is the Jensen-Welsh Memorial Hall built especially to contain the Wilfred Welsh collections of fossils, Native American relics, and worldwide minerals and rock specimens assembled for teaching purposes.

Mineral collecting on the Buckwheat Dump. Ample parking and picnic grounds. Two special collecting areas for small children and the handicapped.

Offering for sale: minerals, fluorescent specimens, mineral sets, agate slabs, onyx carvings, UV lamps, hammers, lenses, mineral books, T-shirts, patches, postcards, and refreshments.

Operating Schedule:
Open to the Public
March - Weekends Only
April 1 to December 1
Monday through Saturday: 10 AM - 4 PM
Sunday: 11:30 PM - 4:30 PM
Closed: Easter, July 4th, and Thanksgiving
Groups by reservation, please

Separate admission fees to the Buckwheat Dump and the Minera Museum. Admission to museum includes guided tour. Special collecting areas by appointment: additional fee charged.

Franklin, New Jersey
"The Fluorescent Mineral Capital of the World"

www.FOMSNJ.org

The contents of The Picking Table are licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

News From Sterling Hill

Joseph Kaiser
40 Castlewood Trail
Sparta, NJ 07871

A new observatory dome is planned for Sterling Hill just to the left of the entrance road to the property. This area includes a large parking lot that will make for easy access to the dome. The 15-foot-diameter white observatory dome will be electrically controlled. It will have a 20-inch reflector telescope purchased by Bill Kroth, who will help manage the program. The observatory is planned to be opened by Spring 2004.

The Thomas S. Warren Museum of Fluorescence is working on the Hesselbacher Room, which will have new display cases. These cases will show off small mineral specimens as well as some specialty items. It is hoped that this will be ready in 2004.

Don Halterman has been working in the saddle area between the Passaic and Noble pits on minerals associated with a heavily weathered galena vein. He is identifying secondary minerals in this weathered zone. Among the material recovered here are beautiful groups of hemimorphite crystals along with cerussite and anglesite, as well as others as yet unidentified. There might be in this area some species new to the growing list of Sterling Hill minerals.

John Kolic has been working on the north wall of the Passaic pit. This is an area near an ore zone that is corroded and has been faulted. Vugs of calcite, calcite crystals, and sphalerite have been found. John is continuing to prospect in this very promising area.

Check the website www.sterlinghill.org to view the current status of ongoing events. ⚒

Field Trip Reports

Steven M. Kuitems, DMD
14 Fox Hollow Trail
Bernardsville, NJ, 07924

Buckwheat Dump, Franklin, NJ; 4-19-03

Much of the collecting effort was spent searching for newly exposed blocks of ore from recent turn-over efforts on the dump site. Several collectors were rewarded by finding high-quality willemite, both as banded ore and subhedral masses up to 5 cm across in calcite and franklinite. Many fine fluorescent pattern pieces were seen, including one tephroite-willemite exsolution mass 10 × 14 cm. Several pieces of hardystonite, willemite, and calcite were discovered with a nice three-color fluorescence of violet, green, and red under shortwave ultraviolet (UV) light. Other ore specimens seen were franklinite crystals to 1.5 cm in calcite and dark red zincite (<1 cm) disseminated in granular ore. One of the more unusual specimens recovered was a 6 × 10 cm mass of vuggy granular willemite, zincite, and franklinite ore in contact with a small stringer of camptonite. The tiny vugs were filled with microcrystals of willemite, chlorophoenicite needles, and pyrochroite.

Several collectors concentrated on working the gray dolomite boulders. No unusual species were reported but several fine crystals of quartz up to 1 cm were found as well as numerous sphalerite crystals up to 4 mm. Several attractive pieces of pyrite were recovered where the tiny pyrite crystals seem to have formed in thin open fractures in the dolomite and when broken open along the seam create a sparkling golden surface on the normally drab dolomite.

The Sterling Hill Passaic Pit and Mine Run Dump, Ogdensburg, NJ; 5-17-03

From the Mine Run Dump several interesting willemite, calcite, and hydrozincite ore pieces were seen in which there was a shearing effect on the main face of the specimens. This produced a streaked green, red, and blue effect with several nonfluorescent areas when viewed under shortwave UV light. One odd combination fluorescent piece from this site was a wollastonite, calcite, and hydrozincite specimen that fluoresced orange, red, and blue under shortwave UV light. My suspicion was that the hydrozincite was a post-mining deposit on the rock surface while in proximity to rich, but weathered, willemite ore.

The greatest interest was focused on the Passaic pit and the new workings of John Kolic at an outcrop of ore on the surface of what appears to be the top of the mud zone. This rock is very altered, porous, and dark brown to black in appearance. There are open pockets up to 10 × 12 cm and many are filled with white calcite in a variety of forms from tiny micros to clusters with crystals up to 3 cm. In addition, plates and rosettes of chalcophanite up to 3 mm were seen and numerous manganese oxide minerals filled in the pores where the original calcite and willemite have been weathered away. Some of the remaining grains of calcite in the less weathered rock appear pale gray to light dull brown in daylight and have a diminished fluorescence. Under shortwave UV light, the willemite grains have a fuzzy green edge-effect in surrounding calcite.

While searching the dregs of the genthelvite-containing skarn rocks, isolated grains of chalcocite (up to 1 cm) were found, usually in contact with galena masses, in a quartz and rhodonite matrix. Upon examination of these areas under magnification, small grains and leaves of native silver were found that when freshly exposed were either bright metallic white or yellow. These distinctly yellow grains may be electrum, a mixture of gold and silver. Both types have occurred on the same specimen. The maximum length of one of these grains was 4 mm, while most were 0.5 to 1 mm.

The finding of the chalcocite grains may provide the answer to the origins of the copper needed to form the secondary copper minerals found in the outermost weathered zone of this formation. Therefore, it might be worthwhile to check out your specimens under the microscope for traces of chalcocite and look at the borders of these grains for traces of silver. Happy hunting! ⚒

Miners Day and Volunteer Appreciation Day
May 5, 2003

Tema J. Hecht
600 W. 111th St., Apt. 11B
New York, NY 10025

This year, Miners Day and Volunteer Appreciation Day was better than ever with cooperative weather, fabulous food, and the famous Franklin Band, plus young "old miners" and older miners in attendance. After lunch we assembled behind the museum for our national anthem and the pledge of allegiance. Once again, Dick Bostwick was our master of ceremonies. He began by reminding us that Franklin holds a "deep and abiding importance out of all proportion to its size. You're famous whether you want to be or not." He also pointed out that without the men who worked in the mines, the men whose day this was, there never would have been a Franklin Mineral Museum (FMM).

Steve Phillips, museum president, thanked its staff and board of directors for their help and support. He also applauded Al Grazevich for working so hard to bring so many miners together that day. Steve then announced the wonderful surprise that the Franklin Town Council had donated the Buckwheat Dump to the FMM.

Museum curator John Cianciulli spoke to us and thanked all who volunteered at the museum and its mineral show. The volunteers included: Greg Anderson, Larry Berger, Richard Bieling, Richard Bostwick, Mark Boyer, Robert Boymistruk, Daniel and Megan Durham, John Ebner, Roman Gaufman, Al Grazevich; Elna, Richard, and Robert Hauck; Tema Hecht, Greg Jacobus, Joe Kaiser, Ray Klingler, Joe Klitsch, John Kolic, Nina Kulsar, Dr. Paulus Moore, Steve Misiur; Casey, Judy, Neil, and Scott Phillips; Claude Poli, Philip Persson, Larry Schnoor, Paul Shizume, Earl and Maureen Verbeek, Ed Wilk, and Anne Wronka. John then eulogized Bill and Mary Welsh, citing their commitment and generosity to the museum. Bill passed away in November of 2002, and as John said, the Welshes will be sorely missed. A minute of silence was observed in their honor.

Tom Turner, superintendent of the Franklin School, announced several Future Scientist Awards. Each year the FMM gives these awards, accompanied by a $100 U.S. Savings Bond, to science fair prize winners from area schools. This year's awardees included two from the Hamburg school: Marissa Bruno with "Barriers to Evaporation," and Constance Rueckel with "How Does the Telephone Work?" Other winners were the Hardyston School's Ryan Wiggins, whose project was "Phobias," Franklin's Jurij Hirniak with "Electrolysis," Immaculate Conception's John Reeth IV with "Growing Chyme," and Ogdensburg's Rachel Heintz, with "Hydrogen Fuel Cells." The FMM also awarded a $300 scholarship to Michael Elmuccio from Wallkill Valley Regional High School. Michael demonstrated excellence in science throughout his high school years and was involved in community support projects; he will be attending Penn State, majoring in chemistry.

Dick Bostwick announced two worthy additions to the FMM's Hall of Fame: Lawson Bauer, chief chemist for the New Jersey Zinc Co. at Franklin and the discoverer and co-describer of a number of minerals new to science; and Bill Welsh, the science teacher and museum benefactor whose accomplishments are described in the spring 2003 *Picking Table*.

Dick then described the complex web of people and museums that make up the mineral-appreciating community at Franklin and Sterling Hill. He observed that Franklin today has its mineral museum and its historical museum, and Ogdensburg its mining museum. These are not just warehouses for minerals, mining memorabilia, and historical documents. They are nonprofit community centers with many vital educational and commercial functions. At these institutions, you can learn what rare minerals look like, how the local ores were mined, and who mined them. You can also see superb examples of the minerals that have made the name Franklin famous all over the world. There you can also buy and sell minerals, and talk about them with the museum staff and other collectors. Museums also have curators to whom you bring your "mystery minerals." Here at the FMM, our curator John Cianciulli often does dozens of mineral identifications a week, while watching for the odd, the unusual, and the new. At this time, "The List"—the list of verified mineral species from Franklin and Sterling Hill—is still the largest in the world for a mining area of this size. John curates the museum's collections and every year is instrumental adding more species to The List.

Dick added that all new minerals start as unknowns, sometimes ugly ones. He said, "There is rarely a direct line that turns these things into minerals" and showed us a piece of znucalite from Sterling Hill. This was known to the miners as "green slime" or "snot on a rock." It was

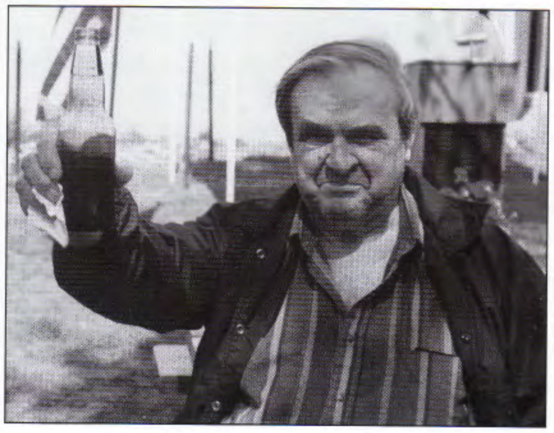
Paul Rizzo, John Antal, and Joe Mancik

Tom Sliker, former Sterling mine boss

Ron Riley and the missus

John Paiva

Andy Gangarcik (right) and friends



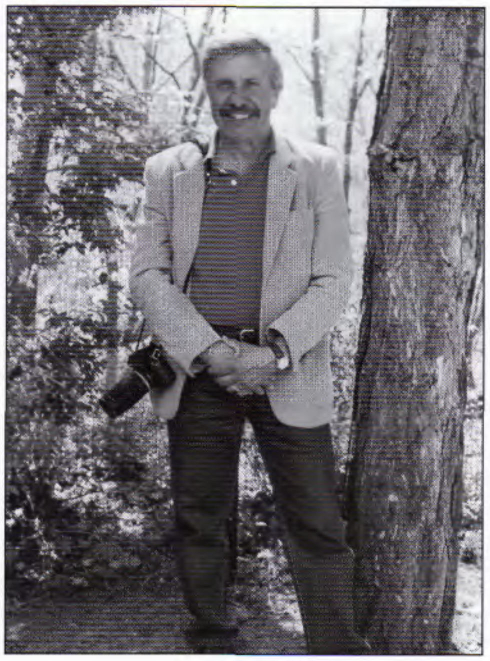
Jules toasts the miners

found as pale-yellow coatings on a wall in the North Ore Body, and it fluoresced green. The miners took it out of the mine because it was something different and was probably worth money. Pieces were sent to several scientists, with poor results. The coating was a common mineral, but with a small amount of something strange. There was not enough of it to analyze. The yellow color and green fluorescence could be due to uranium or other causes. There matters rested, while specimens were sold as an unknown. Then crystals of a new mineral were found on a mine dump in Czechoslovakia. It was a zinc uranium calcium mineral, named znucalite. That name is formed from the chemical symbols for zinc (Zn), uranium (U), and calcium (Ca). Pete Dunn at the Smithsonian proved the identity of our "green slime" with the new Czech mineral, adding one more species to The List. Sometimes this is how it happens.

Dick concluded his remarks by saying that the discovery of new minerals, whether minerals new to science or minerals new to the Franklin-Sterling Hill area, is rarely simple. It depends on chance and time, and the network of scientists, curators, miners, and collectors, of which we have such a wonderful collection right here in Franklin. The system works because all of us participate. Dick added, "I would like to applaud all of you for being a part of this."

After Dick was finished, the incredible Franklin Band played a medley of marches and popular music. Many of the miners stayed to reminisce. All of us took home good memories. ⚒

Ray Klingler and Ozzie



Al Grazevich

All photos by Tema Hecht.

Trotter Dump! Buckwheat Dump! Sterling Hill!

Franklin & Ogdensburg, New Jersey

April 24 & 25, 2004

Along with the 32nd Annual NJESA Gem & Mineral Show and Outdoor Swap & Sell !

The Delaware Valley Earth Science Society (DVESS) and the North East Field Trip Alliance (NEFTA), in cooperation with the Franklin Mineral Museum and Sterling Hill Mining Museum, invite you to share an international collecting experience. This field trip has attracted dedicated collectors from across the globe. Be one of them this year! Read the following terms, and then contact the coordinator below to reserve your spot . . .

Trotter Mineral Dump

Saturday • April 24th

Facilities fee: $20
Daylight Hours: 9a.m. to 7p.m.
Night Hours: 7:30p.m. to 11p.m.
Daylight pound rate: $1/pound
Nightlight pound rate: $2/pound
Owner will provide: running water; restroom facilities; darkroom for admiring your flourescent minerals; electricity (in darkroom); off-road parking area.
Age limit: No one under 9 years old will be permitted on the site.

Buckwheat Dump

Saturday • April 24th

Facilities fee: (included in Trotter fee)
Daylight Hours: 10 a.m. to 4 p.m.
Night Hours: Sorry, NO night dig
Daylight pound rate: $1/pound
Nightlight pound rate: no digging
Will provide: restroom facilities; darkroom for admiring your flourescent minerals; electricity (in darkroom); off-road parking area.
Age limit: Children must be accompanied by an adult.

Sterling Hill Dig

Sunday • April 25th

Facilities fee: $10
The $10 fee will be collected on-site by the Sterling Hill Mining Museum at time of first entry (bring cash!) and will be credited against poundage fees.
Daylight Hours: 9a.m. to 3p.m.
Night Hours: Sorry, NO night dig
Daylight pound rate: $1/pound
Will provide: restroom facilities; darkroom for admiring your flourescent minerals; electricity (in darkroom); off-road parking area.
Age limit: No one under 13 years old will be permitted on the site.

Please note -- each of the three sites above is operated by a different group or organization, so there are different facilities, fees, rules, etc. for each site - as shown in the sections above. In addition, there are rules and requirements that are common to all three sites and to the "dig" in general - these are below:

- **Tools and UV lights will be available for purchase at the Franklin Museum and the Sterling Hill Mining Museum.**
- **Both Trotter and Buckwheat will have excavation / turnover of fresh NEW soil areas for your digging pleasure.**
- **Attendance is by advance reservation. Sign up early! See below for details. We MUST have at least 100 people. and . . . in case you are wondering, it IS "rain or shine" -- so come prepared !! Maximum of 200 this year.**
- **Local hotels/motels fill up quickly, so if you are staying in the area overnight be sure to reserve early.**
- **All collectors must carry liability insurance that covers damage to the property, such as the insurance offered by the EFMLS to its affiliate clubs. Your club must co-sponsor the activity in order to be covered by Federation policies. If you have no other means of insurance, you may join the DVESS to get it. Proof of personal liability is acceptable. Collectors enter any site at their own risk and must sign a hold-harmless liability waiver when registering.**
- **Standard Federation safety rules apply – safety goggles and durable footwear are mandatory (no sneakers or sandals). Work gloves are strongly recommended. Note the age requirement at each site.**
- **All guests at Trotter/Buckwheat sites receive a $1 discount coupon for tour of Sterling Hill Mining Museum (good only on Sunday, April 25th)**

To register right away, send $20 per collector
made out to DVESS, to Jeff Winkler at
55 White Way, Pompton Lakes NJ 07442
email: **TripMaster@UVworld.org**
phone: 973-835-2582

Official web site for "Trotter 2004" is
www.UVworld.org
Visit the web site to find trip info, pictures, area maps, hotel/motel info, update news, number registered, etc.
Also stop by and visit **www.DVESS.org**

The Art of Fluorescent Mineral Photography, With Special Attention to the Minerals of Franklin and Sterling Hill

PART I

Gary Grenier
P.O. Box 1184
Laurel, MD 20725

Introduction

For many years I have been an amateur photographer who specializes in mineral photography. While taking photographs of minerals in daylight has rewarded me with a number of interesting challenges and successes, none has given me quite as much enjoyment and personal satisfaction as fluorescent mineral photography. Fluorescent minerals provide the photographer a unique opportunity to experience and then express mineral artistry at its best. Certainly the visual effects of these minerals rival the experimentation with color and form that characterize the work of many avant-garde artists. There are some who feel these minerals' brightly intense and vibrant colors have hypnotic properties. For these and other reasons I have pursued the photography of fluorescent minerals and describe it as an art that requires a keen sense of color and pattern balance, and good technical understanding of photographic equipment and techniques.

In this first of two parts, I will share with you film selection guidance, single-lens reflex (SLR) camera and digital camera techniques, and ultraviolet lamp selection guidance. In the second part I will provide a table of shutter speed bracket data for manual SLR cameras, a Question & Answer section, and specific guidance on how to shoot particular Franklin and Sterling Hill fluorescent assemblages. Both parts will assist you in taking your own fluorescent mineral photos and images. In addition, I will discuss the equipment and film that I prefer to use when shooting fluorescing minerals. I will also provide helpful suggestions and examples that demonstrate both successful and failed attempts to capture fluorescent images.

1: Equipment for Photographing Fluorescent Minerals: Cameras, Filters, and Ultraviolet (UV) Lamps

Your equipment choices include 35mm SLR cameras, digital cameras, and video cameras. The basic equipment I use for successful photography of fluorescent minerals includes:

- A 35mm SLR camera with a stock 50mm lens or a macro 50mm or 100mm lens
- A UV haze 2A filter
- ISO 100 slide or print film
- At least one hand-held or display UV lamp with a minimum output of 6 watts

• Single-Lens Reflex Cameras (manual SLR or made before 1992)

The most popular camera for still photography, and my choice for photographing fluorescent minerals, remains the 35mm SLR camera. Most SLR cameras permit lens changes, which give you more options than the standard 50mm lens. A macro lens and other close-up lens attachments permit the lens to get within centimeters of the subject and still be in focus. Regardless of the brand, SLR cameras have a much greater variety of lenses, attachments, filters, etc., than most digital cameras.

The basic requirements of this type of photography are fairly simple to acquire and set up. You will need a 35mm SLR camera and a lens that permits close-up photography. The older cameras have a "B" shutter speed setting (manually controlled shutter speed) and internal metering up to exposure times of 1 second. Most new auto-focus cameras have internal metering for exposures of up to 4 seconds, which is sufficient for most of the Franklin and Sterling Hill minerals that you may photograph. The lens you select is not critical unless the specimen that you intend to photograph is very small. For most "hand specimens," the stock f/1.2 to f/1.8 50mm lens that comes with the camera is often sufficient. However, an f/4 50mm to 100mm macro lens is the most often used close-up lens. Auto-focus lenses should be checked to make sure their minimum focal length is well under 1 meter; those with a 1-meter minimum are inadequate for mineral photography.

Once the camera and lens are selected, you will need a sturdy tripod and UV haze 2A filter for the lens. The filter is essential for correct color balance with any C41 process film that you buy, whether print or slide film, when it is used to photograph fluorescent minerals.

Before we move on to digital cameras, there is one aspect of digital technology that applies to SLR cameras using film. Today most photo labs can make a CD of your film images during the film processing. This CD allows you to computerize your images for publication and sharing across the Internet. A considerable benefit of computerizing your images is that it offers ready access to them through your computer, without opening a book. Another benefit is the savings in storage space and photo album costs.

• Single-Lens Reflex Cameras (automatic modern SLR made after 1992)

It is likely that most photographers are using modern 35mm and digital cameras that are more automatic than manual and have built-in very sensitive multizone metering with auto-focus lenses, auto-aperture, and auto-shutter speed setting. These cameras provide the photographer significant advantages over the older manual predecessors. Among the improved abilities of the modern SLR are longer shutter speeds, integrated multi-point exposure metering in low light, and that they are fully operable in manual or automatic modes. For most of the automatic cameras, setting them to manual involves switching the shutter to manual and the auto-focus off. However, most automatic cameras can now achieve shutter speeds from 30 seconds to over 8 minutes. Additionally, setting the camera to aperture priority or manually selecting an aperture setting such as f/8 can allow the photographer to effectively skip manual bracketing and shoot one good photograph. In most cases the resulting single photograph will be acceptable.

If you prefer to use bracketing (explained in greater detail later in section 4) with modern automatic cameras, you will need to refer to your owner's manual and seek how to set up the APB, or Aperture Priority Bracket. This bracket is an automatic setting that will shoot three shots at 1/2 to 2.5 aperture intervals. Shooting a preset 1-second, 2-second, and 3-second bracket is not widely available in all automatic cameras and is not discussed further here. If you do not want to program an APB setting or set the camera shutter to manual and shoot a manually counted spread of mixed shutter durations, modern automatic cameras can provide another shooting variable through the aperture control. The aperture control can be set to f/8 and then the camera can be set to overexpose or underexpose at that f-stop by using the (+) or (−) by 0.5 or 1 f-stop increments. Whichever type of control you select to create a spread or bracketed result, you will need to record your settings so that when you compare the resulting photos or slides you will have some idea of what worked well and what did not.

Even though automatic cameras simplify the camera settings, permit the photographer to skip the bracketing technique, and have a much more sensitive and wider range of light-sensitive built-in light meters, fluorescent specimens will continue to be tricky. These colorful combinations of strong and weak fluorescent responses will challenge the photographer and the camera regardless of the age of the equipment. Brightly responding minerals will quickly saturate the film (as with a bright willemite), while others, like some calcites, will take a much longer exposure to be seen on film. When both bright and dim fluorescent responses are present on the same specimen, it is nearly impossible to correctly balance the exposure time to capture both responses. Therefore, you must train your eye to recognize fluorescent intensity and attempt to find specimens that have species that provide matching intensities. This is a significant challenge for the photographer, one at which you may become a specialist in recognizing the multicolor multispecies specimens simply for their photographic value.

• Digital Cameras

Digital cameras have become very popular and are quickly finding their place in the family camera bag. Some digital cameras now have many of the advanced features of 35mm film cameras. They are also readily and inexpensively available and provide you with an alternative to shooting film. The issues of metered long exposures and low-light focusing have largely been resolved. However, you will have to be careful when selecting a digital camera for mineral photography, and fluorescent mineral photography in particular.

One of the drawbacks of most digital cameras is that they cannot accurately reproduce fluorescent color in low-light, long-exposure conditions. Another is that the only product of the digital camera is a computerized digital image, not the film slide or negative you get from using your 35mm SLR. Digital prints can be produced on a good color printer with photo-grade paper. However, a complete, high-quality combo of digital camera, computer, and printer is at present expensive and not for the average photo enthusiast.

There are other drawbacks to digital cameras. Most do not have interchangeable lenses, and the best ones available do not allow close-ups below 12 inches. Digital cameras do not allow the full manual control that may be necessary for fluorescent mineral photography. Also, the standard filters for UV photography color-balance control (e.g., haze 2A) rarely fit the lenses. However, in most cases lenses can be added like filters to digital cameras that have threaded fittings.

The lack of low-light exposure control will vary in each digital camera and can be a significant obstacle. For example, whether the camera is set to aperture priority or program mode, when the CCD sensor registers low-light values, the camera will automatically lengthen the exposure time and increase the ISO film speed equivalent. This increase in film speed equivalence, over which you may lose control, will cause poor image quality. This is due to the digital camera simulating a large-grain-size film base in low-light conditions. The purpose of larger grain size in films is to react faster to light, but it is at the cost of image quality. Thus, when digital cameras simulate large-grain film, the images look very grainy, poorly focused, and dim. However, these particular digital camera drawbacks are not insurmountable, and the better the digital camera, the less this is a problem.

One of the most notable problems of digital cameras is the failure to capture weak fluorescence accurately. Film is better in reproducing a broader spectrum of color at the 4- to 6-second range. Digital cameras tend to push warm colors to green, and some pinks, pale yellows, and lighter warm shades to gray after 1 to 2 seconds of exposure. This is in part due to current CCD technology having between 8-bit and 12-bit capacity, which depends on the camera manufacturer. All digital cameras are not created equal in this regard and must be studied to be sure that long-exposure color control can match that of film.

On the positive side, advancements in personal photo printers now permit your digital images to be printed with quality comparable to that of film. A drawback to digital image production is that there is no easy home method to produce slides from digital images. Even so, unlike images on film, digital mineral images have many advantages. These include:

- a digital record of your specimens
- integration with database catalog software
- publishing on websites on the Internet
- sharing with other researchers
- readily and easily created prints

• Video Cameras

The other piece of photographic equipment that you may want to consider for mineral photography in general is the VHS, 8mm, or digital video camera. Video cameras are increasingly popular, due in part to the smaller 8mm tapes and new digital formats. Other significant features include 3× to 22× optical zoom lenses and up to 400× digital zoom, as well as LUX low-light recording without the need for color correction. In addition, the use of a good video capture card in your computer will permit you to stream your video into a computer file. Most capture card software will permit you to single-frame capture your video feed into separate photo files. Also, playing your video back through a VCR and TV permits immediate gratification and re-recording.

In any event, the electronic product of the video camera still requires the use of a computer to generate a transferable image or printed paper copy. My preference for the 35mm SLR camera is based in part on the utility of the print and slide images obtained with them.

• Ultraviolet Lamps

Rather than discuss all the manufacturers and styles of UV lamps, I will list the lamps that I have used to good effect. Most UV lamps with 6 watts or more per tube are effective. Four-watt UV lamps, especially the battery-operated units, will not provide sufficient light to produce photographs without setting the lens aperture wide open and shooting with at least ASA 400 speed film. I have used all of the following lamps with success:

- UVP 6-watt hand-held lamp, 115V line-operated; called the "paddle lamp" by many users because of its shape. Available in shortwave (UVG-54), multiband shortwave/longwave (UVGL-55), longwave (UVL-56), midrange (UVM-57), and with dual 6-watt shortwave and longwave tubes (UVGL-58)
- Raytech Model 18 display lamp, 15-watt single tube, 115V line-operated, available in shortwave (SW-18CB), longwave (LW-18), and split longwave/shortwave (LS-18CB)
- UV Systems SuperBright 2000 hand-lamp, high-intensity tube, operates on 12V DC with battery or 115V line transformer. Available in shortwave (2000SW) or longwave (2000LW)
- UVP Model 225D display lamp, 115V line-operated, 50 watts (two 25-watt tubes), available in shortwave (UVS-225D), longwave (UVL-225D), midrange (UVM-225D), and shortwave/longwave (UVLS-225D)

When you work with shortwave or midrange UV lamps, I strongly recommend the use of UV-blocking goggles to protect your eyes. Although eyeglasses provide protection through the lenses, they do not guard against UV coming in from the side.

It is important to note that, up to a point, camera settings remain the same regardless of the model of UV lamp or its proximity to the specimen. In fact, you can use two 9-watt lamps together and not materially change the camera settings or shutter duration bracket that you would use with one 9-watt lamp. This is partly due to the bracketing technique for exposure times, which will be explained later in detail in section 4. Also, the fluorescent output of a specimen is inherently limited and does not increase in direct proportion to the power of the UV lamps that you use. However, if you add a brightly fluorescent background and illuminated more of the specimen, such as the sides, this will increase the overall amount of light reaching the film, and you will be able to reduce the shutter time or be able to use a higher f-stop. An advantage of using several UV lamps is that it allows you to illuminate more of the specimen and background, thereby reducing exposure times and *reciprocity failure*. Additionally, by taking advantage of the extra brightness you may be able to gain greater depth of field by increasing the f-stop. Most specimens will appear brighter as bigger and more powerful UV lamps are used together or separately, however each specimen is different and may or may not benefit from using a brighter UV light source.

2: Films: Prints or Slides?

You will have many film choices and most of the films that you select will work. It is important to remember that not all film emulsions are created equal and each will present different characteristics. Your camera store sales representative can usually assist you with film information, as well as supplying photographic magazines that review films periodically. For the best results, I use daylight-balanced films for UV photos and slides. These films all use the same C-41 process for developing. Most of the variances in the films are totally predictable and minor. Since we are shooting long exposures of 2 to 6 seconds, we need to be aware of the film grain and use film with a speed of ISO 100 or less. Films with speeds greater than ISO 100 can be used under special circumstances. Acceptable films include those from Kodak, Fuji, Konica, and Polaroid, and from chain stores that sell film under their brand name. Camera stores often produce their own brands in containers that do not reveal the original manufacturer. These films will provide excellent results provided they fall within the ISO ranges that you are estimating the exposure for, and require the C-41 process to finish.

Choosing between slide or negative film is often based on the final use of the image. However, I have found that the slide films, particularly Kodak Ektachrome and Fuji Provia, produce the best results for slides *and* prints, as it is possible to make excellent prints from slides. I use ISO 100 films, whether print or slide films, due to their fine grain. The lower the ISO rating, the better the photo will enlarge, and not lose detail and color fidelity. Also, during long exposures the color emulsion layers tend to form large grains, which cause loss of resolution and color accuracy in the resulting slide or photograph. For the sake of maintaining predictable results, only ISO 100 speed films were used in the writing of this article.

You will find that slide films more consistently produce the expected results. This is due to the lack of print processing and human intervention associated with paper photographs. During the typical C-41 automated print process, the processor settings are intended to bring out more magenta for life-like flesh tones, which is an automatic machine setting established at the start of the shift. In addition, the processing equipment averages the exposure for the print based on the background/foreground contrast. This may cause the print to be underexposed or overexposed by one full f-stop. Older processing equipment must be set by and managed by human technicians who control questionable exposure settings for prints.

Most human film-processors do not understand what they are looking at and will guess at the correct exposure and in some cases at the correct focus point on the negative as well. If you use one-hour processing, be prepared to wait for the film so you can provide constructive guidance to the operator as the prints come out of the machine. Taking time to speak with your photo processor may help him or her understand what you are trying to achieve, and reduce the number of times you have to request reprinting before getting the acceptable prints. Once you have taught a photo processor what to look for in an exposure, such as color balance and focus, he or she usually becomes cooperative and can be relied on for repeat business.

If you are shooting minerals against a black or low-light background, it is prudent to shoot at least the first frame of a roll in daylight, so the full borders of that shot appear on the developed roll. If the backgrounds are all dark and the image borders are not immediately apparent to the processor, they are likely to make prints that overlap the images on the film, and then chop the film into sections that cut squarely across your images.

Reciprocity failure is a problem inherent in all emulsion-based films as well as digital cameras. It is the direct result of the long exposures required to capture fluorescing minerals on film. Reciprocity failure is not corrected by mechanical or photographer intervention except to reduce the number of seconds of exposure. The shorter the exposure, the fewer reciprocity failure effects you will notice in your photos or slides. Since this problem cannot be avoided in UV light-source photography, it is important to understand how it works and what you can do to compensate or reduce the effects. All film emulsions are made to be sensitive to light within certain light-to-time performance ratios. The ISO rating provides a guide to the speed with which the film will absorb light relative to other films. Unfortunately, this rating will not reveal how sensitive the film emulsion is during the long exposures, or what low-light conditions are necessary for mineral photography under the UV lamp. The longer the exposure times, the more prevalent the color shifting, and the more the speed, or absorption rate, of the film will change. Reciprocity failure effects are not unpredictable, but you may have to experiment and discover the exact color shifting that you get based on your specimen, camera equipment, and film selection.

New processes and film emulsions are being tested and offered all the time and can be found on the Internet with a little research. Kodak has perfected a film for underwater photography that has proven useful for UV photography. It does not require the use of the UV haze 2A filter. In addition, certain sensitivity and reciprocity failure problems encountered with ordinary daylight films have been reduced. Unfortunately, these improvements are not directly relevant to the problems of UV light-source photography.

3: Background Materials and Equipment Setup

How well you prepare to take your photographs will determine the success or failure of the effort. Among the best places to take UV light-source photographs is a basement or closed garage. The most important reason is maintaining a darkened room during the session, without interruptions. The second is that a concrete slab floor transmits the least amount of a vibration to the table and tripod, which is important during long exposures. Any vibration transmitted to the camera will cause the photo to be out of focus regardless of camera or film.

After you have selected the location for your photo shoot and determined that darkness can be maintained, you will need a sturdy tripod to carry the camera. I use either a tabletop or floor model tripod depending on the size of the minerals being photographed. For the most part, if you select a 100mm macro lens, you will need a floor-mount tripod that is large and heavy enough to limit the incidental vibrations of the surroundings. In any event, the final selection depends on the space and table available to set up the specimens for shooting. Remember, the majority, if not all, of your photos and slides will not be magnified at even 1-to-1 ratios. Rather, they will be 1-to-5 or 1-to-10, as you will be capturing the entire specimen and some background.

The backgrounds that you select can be textured, fluorescent, or nonfluorescent as you choose. Papers ranging from bright to dull to nonfluorescent can be purchased in a variety of sizes from your local arts and crafts stores. Take a hand-held battery-operated UV lamp with you to your local art supply store and fluoresce the papers in the racks to make your selections. You can find an amazing variety of pastels, vivid to hot colors, tans, creams, and blue fluorescent papers. Textures are a matter of taste.

Another place to hunt for fluorescent background materials is a fabric store. While many fabrics will fluoresce bright blue-white, thanks to a high cotton content and the presence of optical brighteners, others will fluoresce pale to dull blue and have negligible lint content. The lint in the fabric is a major distraction since most lint fibers will fluoresce a bright blue-white. When using any fabric as a fluorescent background it is important to not lay the material on any cotton surface as it will pick up lint that you will later see fluorescing bright blue-white along with your specimen in the picture. When shooting with a fabric background, air-dust the surface clean under UV prior to placing the specimens.

Since you will have many choices in color, brightness, and texture of fluorescent backgrounds, how do you choose the right one? There are some commonsense rules about colors, and there is a standard color wheel that shows color complements. These color relationships should not be ignored as a more pleasing photo or slide is the result. The color wheel will help you but should not be considered a limitation on your own sense of color matching or balance. Equal to the issue of selecting the contrasting or complimenting color for your background is the need to determine the brightness of the background for each specimen.

A brightly fluorescent background can add to the colorful presentation or totally ruin the value of the photo as a record of the fluorescing mineral. The negative results of using a colorful fluorescent background should be weighed carefully before shooting. One result is that the glow from the fluorescing paper can override the fluorescence of the minerals on parts of the specimen near the paper. A related phenomenon is that of the paper and mineral fluorescences combining on film to yield washed-out colors that your eye saw neither in the specimen nor its background. Obviously a certain amount of trial and error is necessary to achieve the best relationship of fluorescent background to specimen.

In addition to selecting moderately fluorescent and brightly fluorescent backgrounds, you will need weakly fluorescent and nonfluorescent backgrounds. The latter will become your default, test, and "cannot fail" backgrounds. Since they are nonfluorescent or nearly so, these backgrounds will not influence either the fluorescence of the specimen or the photographic result. Thus your exposure control, emulsion sensitivity, reciprocity failure, and film processor will control the validity of your color response on film, not your backgrounds mixing with or washing out the colors of your specimen.

It is always wise to take a few test shots with a new background paper at the end of a roll and leave your setup until the roll is developed. After you have seen the test results of a couple of shots, you will know if that background can or should be used in the future. Once you have selected an assortment of background materials that you can rely on, including a nonfluorescent or weakly fluorescing blue background, you are ready to proceed to the final setup for taking your photographs.

Place your background vertically against a wall or prop and drape the remainder of the material horizontally toward you to create a seamless backdrop for your photos. Plexiglas stands that hold background materials and specimens can be purchased from better camera gear suppliers, but you can do the same thing with a couple of pieces of plywood and a few screws.

Depending on your tripod height, you may need to elevate your specimen so that the camera is within zero to 20 degrees of eye level with the specimen. This becomes important for a couple of reasons. First, you need to match the plane of the camera's film to that of the flattest surface of the fluorescing specimen. Depending on the film, your lens aperture may not provide a depth of field that allows more than a small part of the specimen to be in focus. Second, you will need to position your UV lamp at an angle to reach all of the front face of the specimen. Whether you hand-hold the lamp or position it with some kind of clamp or stand, locating the lamp vertically above the specimen will not achieve this result. Rather, you will need to position the lamp closer to 90 degrees to the plane of the display face of the specimen. In essence, angle the camera slightly downward at a specimen that is leaning back at a slight angle. To give the correct visual aspect to the specimen and the shadows behind it, position the UV lamp close to the specimen while keeping the lamp just above the camera and out of the picture.

I use a variety of nonfluorescent props to assist in the positioning of the specimen. Props should not be seen in the photo and are usually placed to the rear of and underneath the specimen. However, before I place the specimen on the background I will have examined it carefully under UV to determine the best, or most photogenic, side. Then I give the specimen and background material a thorough air-brushing to dislodge any loose debris or cotton packing still stuck to the specimen. Once the specimen has been placed on the background, it is ready to be photographed and work with the camera can begin.

The following discussion on setting up your camera is primarily for those who do not have cameras with automatic metering governing shutter speeds of up to 4 or 6 seconds. However, some of the following observations can be applied to all cameras. To finish setup of the camera, you will need to take control of your shutter speed by switching to the "B" manual setting and attaching a cable release that allows you to trigger and hold open the shutter from a distance. At this point you should have already attached the UV haze 2A filter to your camera lens.

A bright daylight lamp with a shut-off switch should be available to provide light to focus the camera. After focusing the camera, turn off the daylight lamp and switch to the UV lamp(s). Once you have switched to UV light, it will be the only light on in the room. The fluorescent response from the specimen usually provides enough light to work your equipment. The setup is complete and you are ready to shoot using UV light.

4: The Method

Once you have positioned the specimen on the stand, aim your camera. Some photographers prefer to have a 10% rim of background surrounding the specimen, and others prefer to shoot "features" or selected parts of the specimen. This will be your choice and style. I prefer to shoot both and select from the best images.

Next, focus your camera on the specimen and cock the camera shutter. Switch off the daylight (focusing) lamp and switch on your UV lamp. Then move the UV lamp in as close to the specimen as possible without its being in the picture. You may achieve this by using an overhead directional stand or holding the lamp by hand.

Shooting accurate and attractive fluorescent mineral photos is easily repeated from specimen to specimen by using the method called *bracketing*. Bracketing is a simple technique for catching the best exposure for a lens f-stop setting when these settings cannot be predicted with certainty. By shooting a series of photographs at different exposures, you hope to catch at least one proper exposure. There are two brackets that you may choose for any given specimen.

The first bracket is that of time. Most of my experience with UV photography has shown the best results come within half an f-stop of the best exposure by using a three-shot bracket at 1-second intervals. For example, if your first shot is 3 seconds, then the next should be 4 seconds, and the third 5 seconds. You control the exposure time with your shutter's cable release and a timing device. I use a stopwatch, but other devices are readily available with low-level illumination that is sufficient to read by but will not influence the photo.

The second bracket is that of f-stop setting. Here again you should use a repeatable three-stop range of settings. On most lenses, "one-click" increments of the lens aperture adjustment ring will change the setting by one full f-stop. For example, increasing the f-stop setting by one click per step would give you bracketed settings of f/4, f/5.6, and f/8. I seldom use f-stop bracketing since I prefer to have the f-stop remain a control number and not a variable. Furthermore, depth of field, or the depth from front to back of the specimen that will be in focus, remains constant if the f-stop is constant. However, changing the f-stop is seldom of concern unless extreme close-ups are undertaken. For the purposes of this article, f-stop bracketing is not used.

With a fully manual camera, where bracketing is done by changing the shutter speed, it is important to know that you will be experimenting with exposure times. You may choose different time increments and different starting durations of the bracket, depending on the brightness of the specimen/background combination. In any event, you should be prepared to take notes of your shots in the specific sequence they are made, as you will need to match those notes with the sequence on film of the negatives or slides. Those notes will become important to you when you want to repeat successful results, or need to shoot again and change the bracketed time.

Successful fluorescent mineral photographers must rely largely on the trial-and-error method of estimating exposures, as the intensity of fluorescent minerals is highly variable. Hand-held or in-camera meters are usually not sensitive beyond 2 seconds and should be avoided except when photographing the brightest fluorescent specimens. In cameras that predate the mid-1990s, in-camera meters were not made to judge the full spectrum of light. Most light meters are sensitive to the blue and ultraviolet parts of the spectrum. As a result, camera built-in and hand-held light meters can and do often give incorrect readings on the actual available light or fluorescent light response. In some of the newer camera models, the range of available shutter speeds has improved dramatically; this takes the guesswork out of shooting most specimens under UV light. This should be a specific research point when deciding on which new camera to buy.

Most photographers now use 35mm and digital cameras that are more automatic than manual and have very sensitive multizone metering. To use modern cameras, you will need to set the shutter to manual, turn off the lens auto-focus feature, set the program mode to aperture priority, and then select the aperture setting (for example, f/8). In most cases, the resulting single photograph will be acceptable. However, if you want to use bracketing with modern automatic cameras, you will need to refer to your owner's manual and seek how to set up the Aperture Priority Bracket (APB) feature. APB is an automatic setting that will bracket three shots at intervals from 0.5 to 2.5 f-stops, with the same exposure time. Bracketing exposures to automatically shoot at 1-, 2-, and 3-second intervals is not a feature found in most automatic cameras and is not discussed further here.

If you do not want to program an APB setting, or set the camera shutter to manual and shoot a manually counted spread of mixed shutter durations, modern automatic cameras can provide another shooting variable through the aperture control. This can be set to f/8, and the camera then set to overexpose or underexpose at that f-stop by using the (+) or (−) settings to change the aperture by 0.5 or 1 f-stop increments. Whichever type of control you select to create a spread or bracketed result, you will need to record your settings so that when you compare the resulting photos or slides, you will have some idea of what worked well and what did not.

You will likely find that the bracketing technique will allow you to photograph more quickly a larger volume of specimens. After you have processed your film, you will have the opportunity to select the best resulting image. If you have kept careful records of your shooting data, you will be able to duplicate your shots without using bracketing. However, you may find that bracketing your exposures is an essential step in photographing fluorescent minerals from Franklin and Sterling Hill.

There are many combinations of minerals with varying fluorescent colors and intensities, and it is impossible to "eyeball" the correct exposure every time. The nearly limitless variety of color and intensity combinations make this locality's fluorescent minerals extremely challenging for even an expert photographer. It is these colorful combinations of strong and weak fluorescent responses that further complicate estimating exposure times. Brightly fluorescing minerals such as willemite will quickly saturate the film, while many others, including some calcites, require longer exposures. When both bright and dim fluorescent responses are present in the same specimen, it is nearly impossible to correctly balance the exposure time to capture both responses. Therefore, you must train your eye to recognize fluorescent intensity and attempt to find specimens that have species with minerals whose intensities match. This is a significant challenge for the photographer, one at which you may become a specialist in recognizing the multicolor, multispecies specimens that will yield good photos.

5: What You Can Realistically Expect

Your expectations with a camera should be tempered by a realistic understanding of your equipment and film. Rarely will your naked-eye appreciation of the wonderfully fluorescent mineral in your hand be perfectly matched on film. Often your expectations will not be realized due to many subtle factors and the personal choices you make as a photographer. Other reasons for not achieving the expected results will be based totally on the film. The film, as previously discussed, will operate as expected within certain conditions but not outside them. Ultraviolet light-source photography will often push the film to its design limits and beyond. Specimens often present fluorescent colors that do not lend themselves to being photographed as we see them.

After you have taken a few rolls of film, you will begin to recognize how certain minerals respond to UV, and how film responds to fluorescence. As with most photographers who are trying a new technique, you will learn from the analysis of your photographic results.

One of the most common mistakes that a novice photographer makes during specimen selection is to take the most brightly fluorescent specimen and consider it an easy one to try. Most Franklin and Sterling Hill specimens have more than one fluorescent mineral present, and looking for the brightly fluorescent ones may cause you to lose sight of the other fluorescing species. This in turn will cause a habitual loss of recognition for well-balanced fluorescing specimens that are actually easier to photograph than the brightly fluorescing ones.

Another common mistake is photographing brightly fluorescing green willemite in a matrix of poorly fluorescing calcite. Results will range from slightly to severely overexposed willemite, with willemite's characteristic yellow-green fluorescence being represented on film as greenish yellow to yellow and finally white, while the underexposed calcite may appear dull red to dark red to black. Such images are all but unusable.

The rule of thumb in these situations is to begin your exposure bracketing with the brightest-fluorescing mineral, regardless of what companion species are also fluorescing in the specimen. The photo will not be worth keeping if the major part of the photo or slide is grossly overexposed or underexposed.

Sometimes the fluorescent response of the specimen may be very well balanced and completely suitable for a well-timed bracketed shoot, and still not appear on film as you saw it fluorescing on the stand. In these cases the failure may be the result of the film. As previously described, reciprocity failure occurs during low-light, long-duration exposures. With experience you will learn to predict when this is likely to occur. The loss of film emulsion sensitivity to light during long exposures often causes film not to record accurately the many pastel hues that can be seen with the naked eye.

For example, imagine a red-fluorescing roeblingite nodule in a matrix of peach-fluorescing prehnite, orange-fluorescing pectolite, and green-fluorescing willemite. However, when you attempt to photograph it under shortwave UV light, the most likely result is reddish roeblingite in gray prehnite with pale-orange pectolite and yellow willemite. It is extraordinarily difficult for film to record the fluorescence of prehnite as the pastel peach-pink that your eyes see. Due to the film's reciprocity color shift, prehnite will appear gray, and this can be expected virtually every time you go beyond the design limit of the film. You may have more or less success with other films. I have successfully caught on film the peach-pink of prehnite, but it was with an exceptionally bright fluorescent prehnite that had no other brightly competing species present.

In some cases, the film emulsion will accurately record fluorescent colors that the eye ignores. For instance, a very rich platy margarosanite will fluoresce bright pale blue to the eye, yet when viewed on film, reddish-fluorescing areas you never noticed will be obvious. While it is true that margarosanite fluoresces both pale blue and reddish-pink, your eye may not be able differentiate the small areas of red fluorescence within the blue-fluorescing mass. In such cases the film will record the red areas equally with the blue, not ignore the red as the human eye will do. Typically this is the result of a film emulsion that the manufacturer has designed to be more sensitive to warm flesh tones.

As a further example, imagine a handsome prehnite specimen in which round roeblingite "eyes" and minor amounts of xonotlite are accompanied by willemite, pectolite, and margarosanite. This multicolor specimen with its green, pale blue, orange, peach-pink, violet, and red fluorescent colors would be a major challenge to photograph. If done well, five out of the six species will be portrayed on film as you see them. If not, you will only see green, red, pale blue, and dull orange. This is due to the insensitivity of the film in recording the pastel shades of prehnite's peach-pink and xonotlite's blue-violet, as well as the film's sensitivity to red-fluorescing margarosanite. In fact, on film both prehnite and xonotlite may mimic margarosanite, giving the impression that margarosanite is far more abundant in the specimen than is the case. Your specimen may be thought of as a major margarosanite by a casual observer who is not familiar with the specimen and is viewing only the photograph.

This ends Part I. Part II will be presented in the Spring 2004 issue of *The Picking Table*. The following sections and shooting bracket data will be presented in Part II.

6: Photographing the More Popular Franklin and Sterling Hill Fluorescent Minerals
7: Multiple Ultraviolet Lamp Setup for Photography
8: Fluorescence as a Diagnostic Tool
9: Frequently Asked Questions
10: Photography Data by Species

References

1. Bostwick, R.C. (1977) The fluorescent minerals of Franklin and Sterling Hill, New Jersey—a progress report for 1977. *The Picking Table*, 18 (1):15–24, and 18 (2): 11–24.
2. Brooks, D. (1989) *How to Control and Use Photographic Lighting*. HP Books, Price Stern Sloan, Inc., Los Angeles, California.
3. Curasi, F.J. (1989) Glowing in the darkroom. *Lapidary Journal*, 42 (12): 49–52.
4. Murphy, J.A., and Hurlbut, J.F., editors (1989) *Photography of Mineralogical, Paleontological and Archaeological Specimens*. 1989. Short papers presented at the 7th Friends of Mineralogy, Colorado Chapter, Symposium. Friends of Mineralogy, Denver, Colorado.
5. Scovil, J.A. (1984) Mineral photography: basics and a different approach. *Rocks and Minerals*, 59 (6): 272–277.
6. Scovil, J.A. (1987) Mineral photography: lights and metering. *Rocks and Minerals*, 63 (6): 473–477.
7. Standfast, A.L. (1980) The photography of miniature mineral crystals. *The Picking Table*, 20 (1): 13–14.
8. Standfast, A.L. (1980) The photography of minerals—ultraviolet fluorescence. *The Picking Table*, 20 (2): 4–5.
9. Standfast, A.L. (1990) Improved photomicrography. *The Picking Table*, 30 (1): 11–21.
10. White, W. (1987) *Photomacrography: An Introduction*. Focal Press, Butterworth Publishers, Massachusetts.
11. Wilson, W. (1974) Photographic record. *Mineralogical Record*, 5:167–170.
12. Warren, T., Gleason, S., Bostwick, R., and Verbeek, E. (1995) *Ultraviolet Light and Fluorescent Minerals: Understanding, Collecting, and Displaying Fluorescent Minerals.* Privately published by Thomas S. Warren.
13. Robbins, M. (1994) *Fluorescence: Gems and Minerals Under Ultraviolet Light*. Geoscience Press, Phoenix, Arizona.
14. Scovil, J. A. (1996) *Photographing Minerals, Fossils and Lapidary Materials*. Geoscience Press, Phoenix, Arizona.
15. Grenier, G. (1996) Mineral photography: table-top tripod methods in photomacrography. *The Picking Table*, 37 (1): 9–16.

Photographers' Guide to Fluorescent Images of Franklin and Sterling Hill, New Jersey, Minerals

PART I

Gary Grenier
P.O. Box 1184
Laurel, MD 20725

The following collection of images are provided to assist you in interpreting the article presentation of expected results when photographing Franklin and Sterling Hill fluorescing minerals. The specimens were at one time or another owned by a number of Franklin mineral collectors, the Franklin Mineral Museum, or the Sterling Hill Mining Museum. Unfortunately, the majority of the specimens' current homes are unknown to the author. Specimen information is provided where known.

All photographs were shot by the author using a Pentax Spotmatic 35mm camera with a 50mm macro lens, haze 2A interference filter, and Kodak Ektachrome or Fuji Provia ISO 100 slide film. The UV light source is identified in each photo caption. Apertures and shutter speeds were manually set.

Please note that since this is a presentation of various types of responses that you can expect when you take your own UV light source photos or images, some less-than-perfect shots with explanations are shown. Also shown are subtle differences in color representation, fluorescent intensity balance in multicolor specimens, different angles of UV light, multiple UV light sources, and different fluorescent background selections.

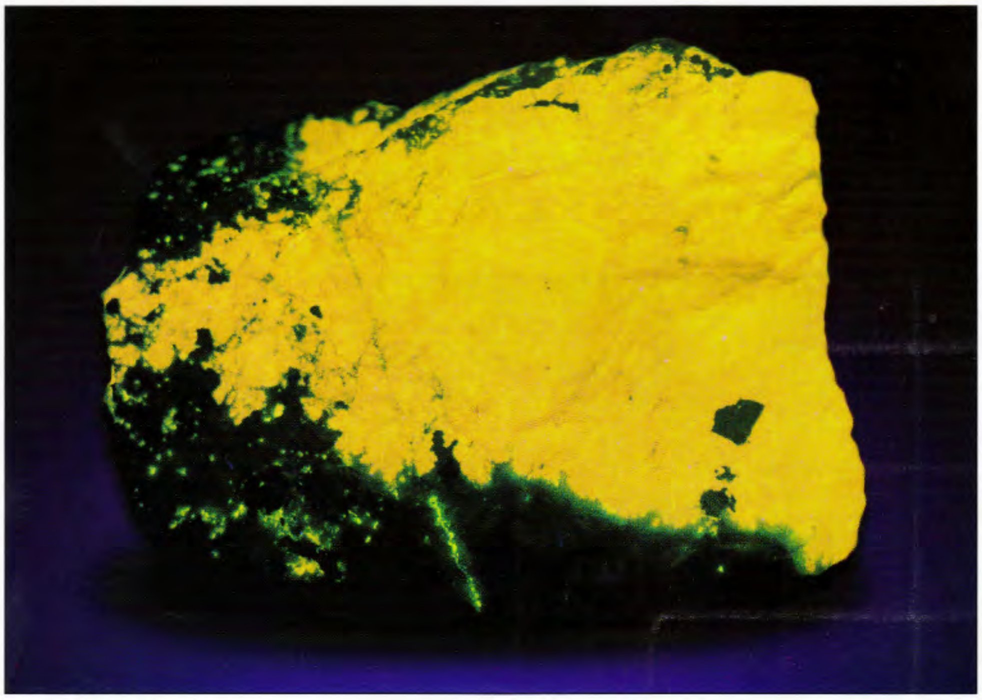


Figure 1. Esperite with willemite
Shot using one SuperBright SW lamp held directly over the specimen on a moderately fluorescent blue poster board. The intensely bright yellow esperite and small amount of willemite produced a very well balanced shot. Camera lens set to f/11 and exposure bracket of 0.5, 1, and 2 seconds used. Franklin Mineral Museum specimen, 3″ × 3.5″. Photo by Gary Grenier.

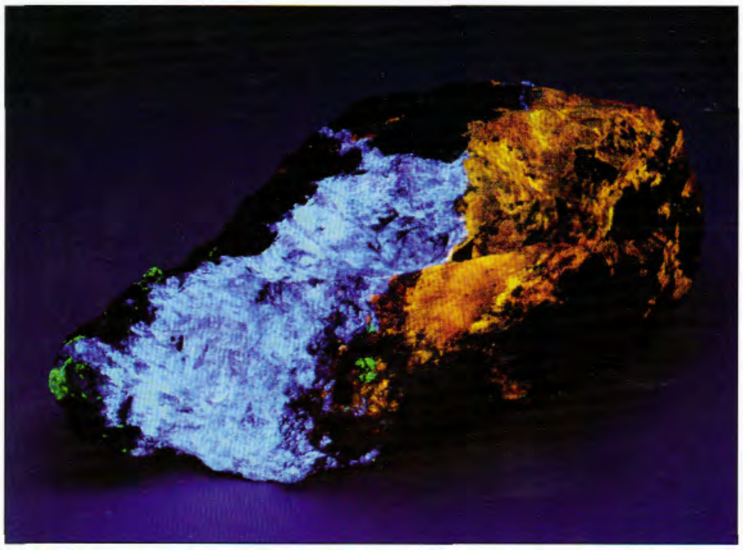
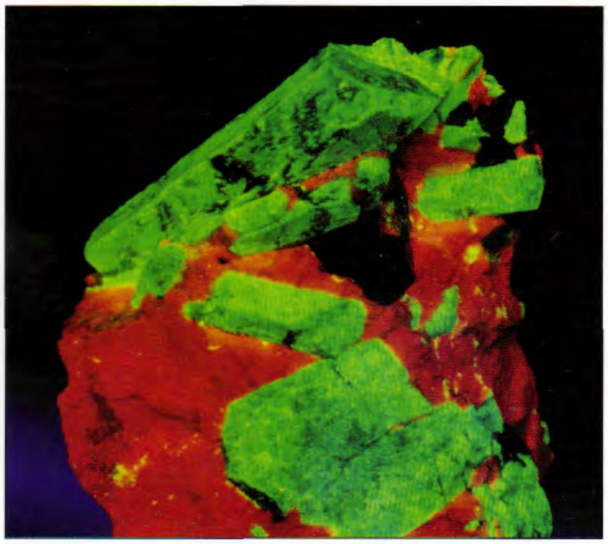


Figure 2. Margarosanite with wollastonite from Franklin
Shot using two SuperBright SW lamps and one 50-watt UVP Model 225D held directly over and in front of the specimen on a moderately fluorescent blue poster board. The margarosanite is very bright and can be seen reflecting off the fluorescing blue poster board. Reflection off the background should be avoided; however, this example helps reinforce the brightness of the margarosanite. Camera lens set to f/11 and exposure bracket of 0.5, 1, and 2 seconds used. Peter Chin specimen, 3.5″ × 7″. Photo by Gary Grenier.

Figure 3. Willemite and calcite from Sterling Hill
Shot using one Raytech Model 18, 15-watt display lamp held directly over the specimen on a weakly fluorescent blue fabric. The willemite and calcite are close being in fluorescent intensity balance. The willemite demonstrates reciprocity failure by shifting to yellow at the contact with the red-fluorescing calcite. A shorter exposure may avoid this. Camera lens set to f/6 and exposure bracket of 2, 3, and 4 seconds used. Photo by Gary Grenier.



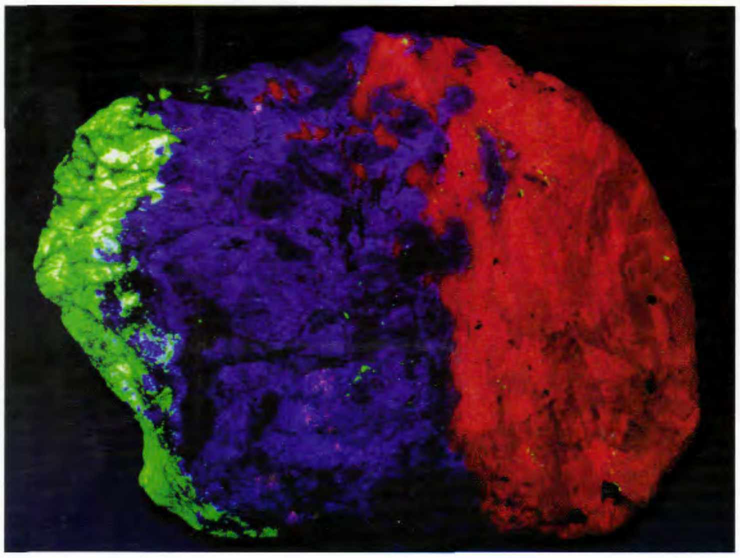


Figure 4. Willemite, hardystonite, and calcite from Franklin
Shot using one SuperBright SW lamp held directly over the specimen on a weakly fluorescent blue fabric. To be able to pull the weaker fluorescing blue hardystonite and red-fluorescing calcite, the willemite was slightly overexposed, as seen by the near white spots in the willemite. A shorter, more underexposed photo may avoid this, but the hardystonite and calcite responses will be dimmer. Camera lens set to f/6 and exposure bracket of 2, 3, and 4 seconds used. Photo by Gary Grenier.

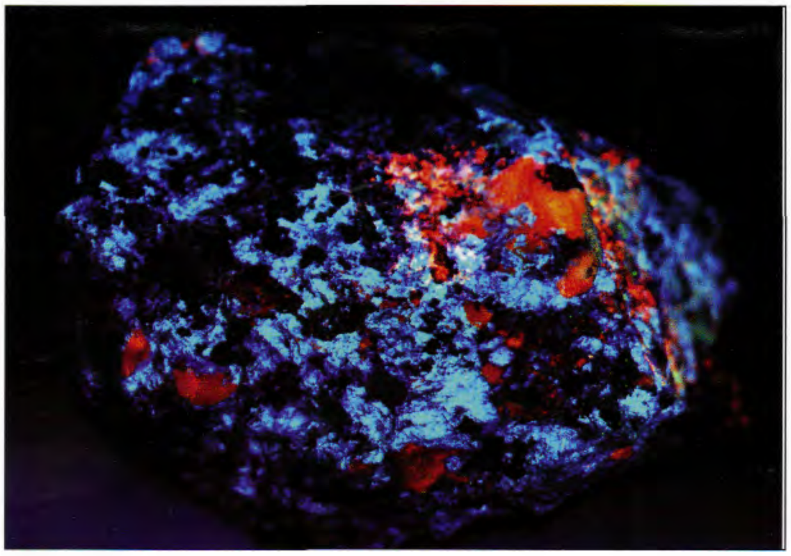


Figure 5. Roeblingite in prehnite and margarosanite from Franklin
Shot using one SuperBright SW lamp held directly over the specimen on a weakly fluorescent blue fabric. The pink- and red-fluorescing roeblingite and the blue fluorescing margarosanite were overexposed to capture the weaker fluorescing pink prehnite on film. However, reciprocity failure caused the pink-fluorescing prehnite to shift to blue-gray and mimic the response of the margarosanite. Camera lens set to f/5.6 and exposure bracket of 3, 4, and 5 seconds used. Photo by Gary Grenier.

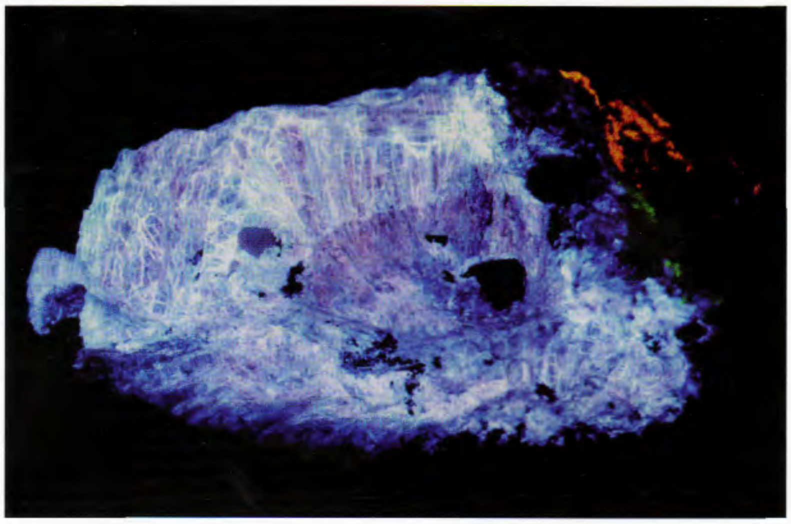


Figure 6. Margarosanite, clinohedrite, and willemite from Franklin
Shot using one SuperBright SW lamp held directly over the specimen on a very weakly fluorescent blue fabric. Notice the red-fluorescing margarosanite mixed with the blue-white fluorescing margarosanite. Both are normal responses for margarosanite. Minor orange-fluorescing clinohedrite and green-fluorescing willemite can be seen on the upper right of the specimen. Camera lens set to f/8 and exposure bracket of 2, 3, and 4 seconds used. Photo by Gary Grenier.

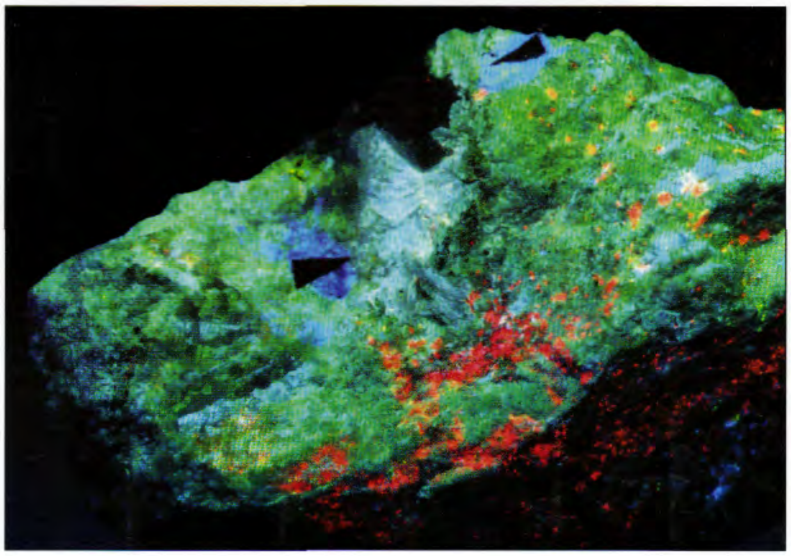


Figure 7. Nasonite with roeblingite and prehnite from Franklin
Shot using one SuperBright SW lamp held directly over the specimen on a weakly fluorescent blue fabric. The yellow-fluorescing nasonite and red-fluorescing roeblingite show well in absence of brighter competing fluorescent species. Notice the dark arrows pointing to platy prehnite, which normally fluoresces pink, color shifted to gray-white due to reciprocity failure. Camera lens set to f/5.6 and exposure bracket of 4, 5, and 6 seconds used. Peter Chin specimen, 2.5″ × 3.5″. Photo by Gary Grenier.

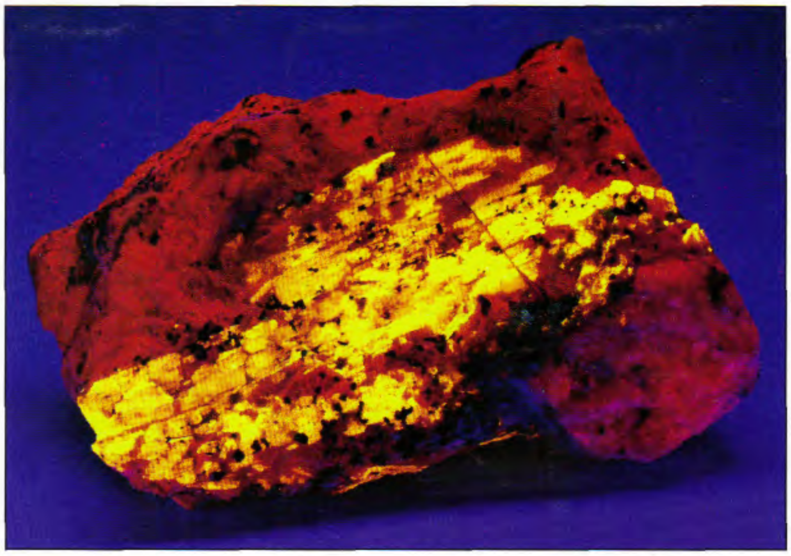
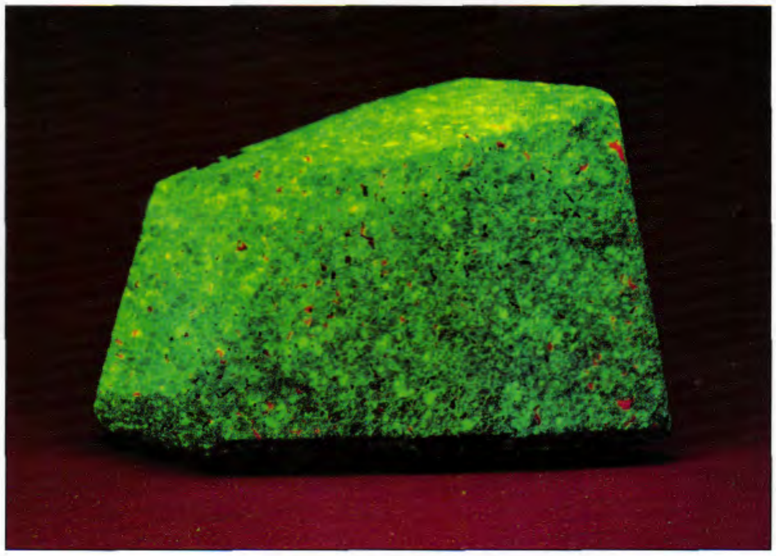


Figure 8. Wollastonite and calcite from Franklin
Shot using two SuperBright SW lamps and one 50-watt UVP Model 225D held directly over and in front of the specimen on a moderately fluorescent blue poster board. The wollastonite is very bright. The calcite provides contrast by fluorescing more weakly than the wollastonite. The blue-fluorescing poster board also offers a lively contrast, however the blue is reflecting back onto the specimen. This can be avoided by using a dimmer fluorescing background or repositioning the UV lamps. Camera lens set to f/11 exposure bracket of 1, 2, and 3 seconds used. Earl Verbeek specimen, 3.5″ × 5″. Photo by Gary Grenier.

Figure 9. Sawn block of willemite ore from Franklin
Shot using one UVP 6-watt lamp held directly over the specimen on a red-fluorescing background for contrast. The willemite is the dominant fluorescing species, which is perhaps the easiest way to shoot willemite, with minor red fluorescing calcite. Sawn stones are often the easiest to photograph, as there are fewer depth of field issues to resolve. Camera lens set to f/8 and exposure bracket of 2, 3, and 4 seconds used. Gary Grenier specimen, 3″ × 4.5″. Photo by Gary Grenier.



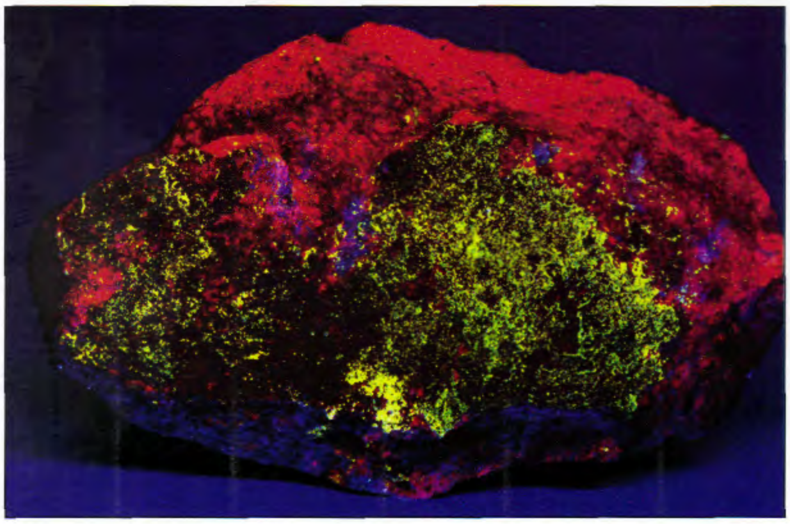


Figure 10. "Beta" willemite on calcite from Sterling Hill
Shot using one SuperBright SW lamp held directly over the specimen on a moderately fluorescent blue poster board background. The willemite fluoresces yellow against the red fluorescing calcite. The intensity of the two responses are relatively close in balance. However, the brightly fluorescing blue background is reflecting onto the specimen and distorting the red and yellow fluorescences with blue. A dimmer-fluorescing background should be used and the shot re-tried. Camera lens set to f/8 and exposure bracket of 3, 4, and 5 seconds used. Gary Grenier specimen, 3.5″ × 5″. Photo by Gary Grenier.

Genthelvite From Ogdensburg, New Jersey

John Cianciulli
Franklin Mineral Museum
5 Evans Street
Franklin, NJ 07416

and

Earl R. Verbeek
Sterling Hill Mining Museum
30 Plant Street
Ogdensburg, NJ 07439

Introduction

Genthelvite, $Zn_4Be_3(SiO_4)_3S$, the zinc member of the helvite group (Table 1), was found near the northeastern margin of the Passaic pit at Sterling Hill, Ogdensburg, New Jersey, during the summer of 2002 in material mined by John Kolic. Genthelvite had previously been found at Franklin, as microscopic grains in petedunnite, with gahnite, sphalerite, titanite, and numerous other minerals (Essene and Peacor, 1987), but until 2002 had remained unknown from Sterling Hill.

Table 1. Mineral species of the helvite group

Helvite	$Mn_4Be_3(SiO_4)_3S$
Danalite	$Fe_4Be_3(SiO_4)_3S$
Genthelvite	$Zn_4Be_3(SiO_4)_3S$

Occurrence

During the summer of 2002 John Kolic mined a shallow trench into rock 2 to 3 m stratigraphically beneath the footwall of the East limb at Sterling Hill, in an area just north of the passage between the fill quarry and the Passaic pit. The locality is at 41°04′55.9″ North, 74°36′19.7″ West; approximate mine coordinates are 740N, 1410W. Geologically this area corresponds to a part of the pyroxene zone of the Sterling Hill deposit as described by Metsger et al. (1958). The rock mined from this pit is coarse-grained and mineralogically complex, facts that quickly led to local collector interest even before the presence of genthelvite was known or suspected. Adding to this interest was the presence of phases rich in zinc (willemite, gahnite) and manganese (bustamite, rhodonite) in association with abundant greenish brown pyroxene, a dark green amphibole, and quartz. The rock is polygenetic: some of the original high-grade metamorphic phases had altered to other minerals, and the presence of abundant galena and quartz suggested a later period of mineralization. Minerals visually identified from this area so far include, in addition to those mentioned above, apatite, calcite, sphalerite, barite, titanite, zircon, feldspar, scapolite, secondary copper minerals, and traces of silver and gold. The secondary copper minerals apparently were derived from chalcocite (Steven Kuitems, oral communication, June 2003).

Description

In daylight, genthelvite from Sterling Hill superficially resembles several other minerals, notably scapolite and feldspar, and at first was not recognized as a mineral new to the locality. Attention to genthelvite first arose when some collectors examined their specimens under shortwave ultraviolet lamps and noticed a green-fluorescent mineral that superficially resembled willemite. This "odd willemite," however, fluoresced dull green rather than bright yellowish-green, and the response under longwave ultraviolet light was much brighter than that under shortwave ultraviolet light. The occurrence of some of this material as equant crystals was another early indication that it was not willemite, but its identity as genthelvite was not established until months later.

Genthelvite in most of the specimens so far recovered from Sterling Hill occurs either as tiny (1–3 mm) grains along the borders of other minerals, or as somewhat larger grains in thin veins transecting the rock. In some specimens, however, genthelvite forms large, pale green masses as much as 5 cm across. The straight borders of some of these masses arise from contact with large crystals of other minerals, particularly rhodonite, rather than being crystal faces of the genthelvite itself. True crystals of genthelvite, however, have also been recovered from this locality; most are either embedded in galena or partially project into open vugs in that mineral. These

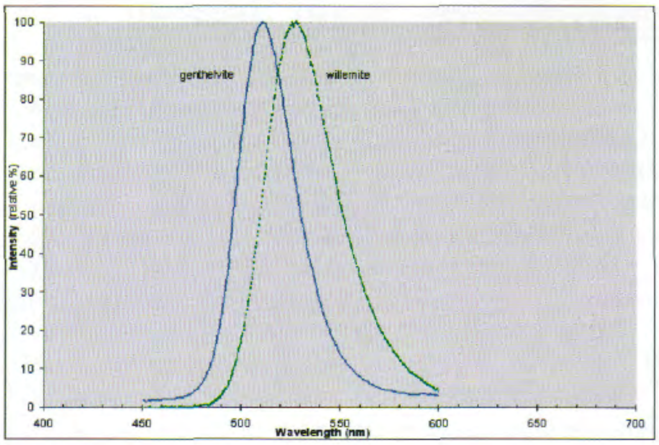


Figure 1. A comparison of the fluorescence emission spectra for genthelvite (peak 511 nm) and willemite (peak 528 nm). Although the 17-nm difference between the peaks is substantial, in practice genthelvite from Sterling Hill is often mistaken for willemite. The difference in fluorescent response is readily discernable, however, when both minerals are present on the same specimen.

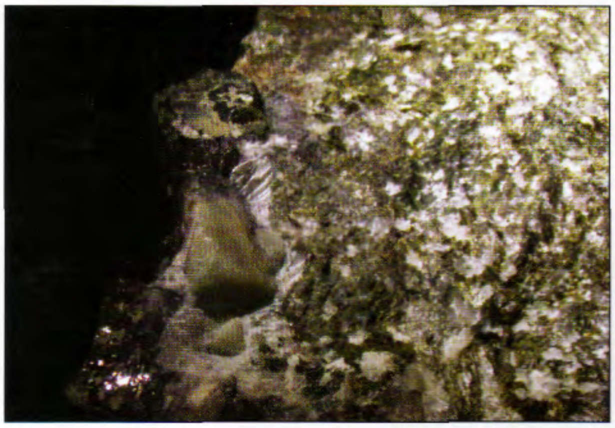


Figure 2. A 1.5-cm crystal of genthelvite in calcite from Sterling Hill. Mark Boyer specimen; John Cianciulli photo. Courtesy of the Franklin Mineral Museum archives.

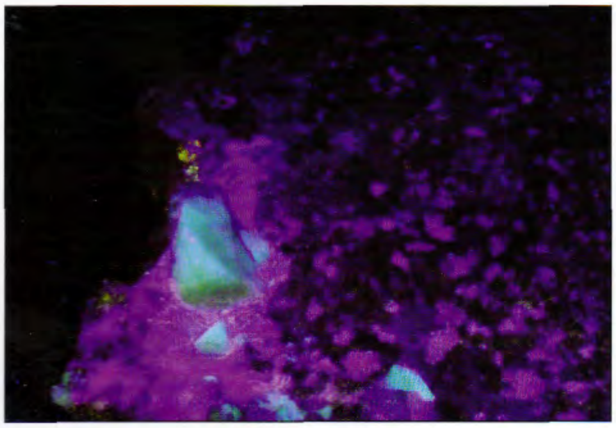


Figure 3. Same genthelvite crystal as in Figure 2 fluorescing aqua under longwave ultraviolet light. John Cianciulli photo. Courtesy of the Franklin Mineral Museum archives.

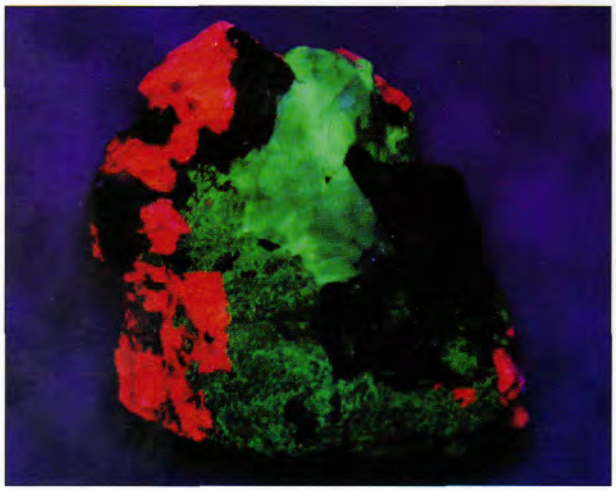


Figure 4. A 4-cm mass of genthelvite (bright aqua-green) with willemite (yellowish-green) and calcite (orange-red) from Sterling Hill, as viewed under combined longwave and shortwave ultraviolet light. Photo by Maureen Verbeek, with background *PhotoShop* adjustments by Gary Grenier.

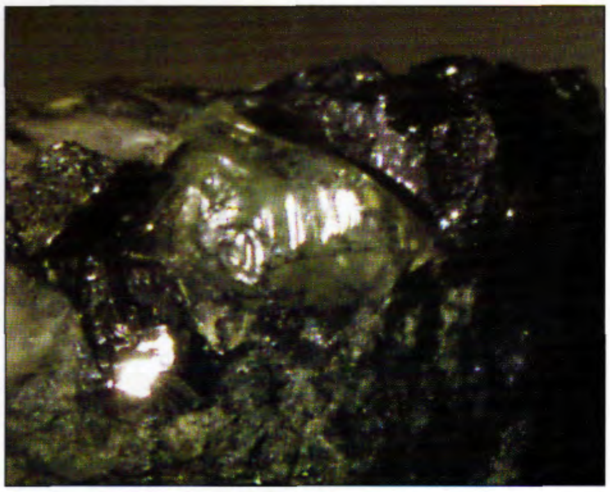


Figure 5. An 11-mm transparent crystal of genthelvite in galena. Only a few such transparent crystals are reported to have been collected from Sterling Hill. Mark Boyer specimen; John Cianciulli photo. Courtesy of the Franklin Mineral Museum archives.

crystals, also of pale green color, are as much as 1.5 cm across, rather large for the species.

Representative specimens from this occurrence have been preserved in local institutional collections under catalogue numbers FMM6316 (Franklin Mineral Museum) and SHMM-195, 196, and 199 (Sterling Hill Mining Museum).

Physical and Optical Properties

Specimen FMM6316 from the Franklin Mineral Museum was subjected to optical examination and chemical analysis to establish its identity as genthelvite. The material studied is optically isotropic with $n = 1.740$, in agreement with the known refractive index range for the species (1.738–1.745) and its crystallization in the cubic system. Sterling Hill genthelvite has a pale green color, vitreous luster, a measured hardness of 6 on the Mohs scale, and no cleavage; these properties too are consistent with genthelvite from other localities. As reported in the literature, genthelvite has a specific gravity of 3.66.

Chemistry

Sample FMM6316 was sent to Tony Nikischer of Excalibur Mineral Company for Energy Dispersive Spectral analysis (EDS), with the following results:

ZnO	60.75
SiO_2	28.94
SO_3	9.73
MnO	0.59
Total:	100.01

It is important to realize that EDS analyses, by their very nature, are *semi*quantitative. Though the data are reported to two decimal places, as customary, this does not imply a corresponding level of accuracy, which actually is closer to ±10% of the amount reported. Moreover, elements of low atomic weight, such as beryllium, cannot be measured with this technique, and the averaging software adjusts the contents of all measured elements to "force" a total of 100%. These limitations aside, EDS analyses are inexpensive and, properly interpreted, of great use in identifying minerals. In this case the data are conclusive: the only zinc silicate that also contains sulfur is genthelvite.

About the same time as these results were being obtained, Mark Boyer submitted another sample for x-ray powder diffraction (XRD) analysis. The XRD analysis, performed by Joe Orosz, agrees with the optical and EDS results. Copies of the chemical analysis and X-ray scan are on file at both the Franklin Mineral Museum and the Sterling Hill Mining Museum.

Chemical analyses of genthelvite specimens from worldwide localities, as reported by Dunn (1976), show considerable iron as a substituent for zinc, in amounts (expressed as FeO) of 6.14 to 22.60%. The sole exceptions up to that time were three analyzed samples from Mont Saint-Hilaire, Quebec, Canada, which have FeO contents of 0.03% or less. The Sterling Hill material is similarly impoverished in iron and, like Mont Saint-Hilaire genthelvite, appears to be of nearly end-member composition, with only minor amounts of manganese in substitution for zinc. The absence of FeO in both the Mont Saint-Hilaire and Sterling Hill genthelvite is noteworthy because Fe^{2+} is a notorious "poisoner" of fluorescence, but genthelvite from both of these localities fluoresces brightly. The presence of manganese is likewise noteworthy, for we believe the green fluorescence of genthelvite at both localities is activated by that metal, as further explained in Verbeek and Yeates (this volume).

Luminescence

Sterling Hill genthelvite fluoresces moderately bright green to aqua-green under longwave ultraviolet light. No phosphorescence is noted when the lamp is extinguished. Under shortwave and midwave ultraviolet light, the fluorescence is less bright, but is followed by brief phosphorescence. The brightness of fluorescence is not uniform from specimen to specimen, nor even within single masses of genthelvite, some of which show a distinctly mottled response. Aqua-green triboluminescence is noted when crystals are shattered with a hammer (Mark A. Boyer, written communication, July 2003).

Early Confusion With Chabazite

During the same time period that collectors were first taking specimens from the genthelvite locality, other collectors were focusing their attention on the saddle area between the Passaic and Noble pits, where much fluorescent wollastonite and scapolite, sparse barite, and other fluorescent minerals had been collected before. As collecting proceeded in both areas, word soon spread of an oddly fluorescing willemite that was being found at Sterling Hill. This was the genthelvite, but events quickly transpired to confuse the true locality.

The first sample of the supposed "odd willemite" brought to the Franklin Mineral Museum for inspection was said to have come from the saddle area and showed a fluorescence resembling that of hyalite opal under shortwave ultraviolet light. The fluorescent mineral resembled massive gray quartz in grains as much as 3 cm across in a matrix of dark green, nearly black amphibole associated with quartz, galena, and titanite—some of the same minerals, fortuitously, that are present at the genthelvite locality. Upon examination by one of us (JC), the fluorescent mineral was identified as chabazite. This soon led to some local collectors regarding *all* the newly recovered, green-fluorescent material as chabazite and attributing its locality to the saddle area between the Passaic and Noble pits. However, all other samples examined by JC since then are genthelvite and came from the trench near the west entrance to the fill quarry, more than 400 ft distant from the saddle area.

The matrix of the chabazite specimen that led to early confusion between the new genthelvite and chabazite localities is visually identical to rock from the 1990 chabazite find on the 900 level at Sterling Hill. Although the chabazite specimen was said to have been collected from the saddle area it may, in fact, be 900-level material. Regardless of its origin, much confusion initially arose over the fortuitous circumstance that a specimen of chabazite rather than genthelvite was first submitted for examination as a piece of the newly found "odd willemite."

Sterling Hill genthelvite and chabazite can most readily be distinguished by their different fluorescent responses. Chabazite fluoresces "uranium green"—that is, yellowish green, similar to that of willemite, and quite unlike the green fluorescence of genthelvite, which some describe as verging on aqua-green. More importantly, however, genthelvite fluoresces most strongly under longwave ultraviolet light and only weakly under shortwave, whereas chabazite shows the opposite effect and in many specimens appears not to fluoresce under a longwave lamp at all. The bright longwave but weak shortwave response of Sterling Hill genthelvite likewise serves to distinguish it from willemite, which, like chabazite, fluoresces far more brightly under a shortwave lamp.

Genthelvite Elsewhere

Genthelvite was first found in 1872 in West Cheyenne Canyon, near St. Peter's Dome, El Paso County, Colorado, and was described in 1892 by Frederick A. Genth. The mineral was later named in his honor. Since then genthelvite, the rarest member of the helvite group, has been described from nearly a dozen other localities.

Genthelvite is usually found in granitic and syenitic pegmatites and at most localities was among the last minerals to form; the same is true of the other two helvite-group species. Late crystallization is indicated by the common association of helvite-group minerals with fluorite, and by the frequency with which members of the group occur as discrete euhedra in vugs and as vein fillings in quartz. Crystals of genthelvite generally are small, but several localities have yielded tetrahedra as much as 1 cm across. Crystals 5 cm across, the largest known for the species, have been found at Mont Saint-Hilaire. The Sterling Hill crystals, though smaller than some from Mont Saint-Hilaire, nevertheless are impressively large for the species.

Genthelvite belongs to the cubic crystal system and commonly crystallizes as simple tetrahedra—that is, four-sided crystals resembling a pyramid. The crystal faces are triangular, as are sections cut at any angle through such a crystal. The three-sided outlines of broken genthelvite crystals are a clue to their identity and are apparent on numerous specimens recovered from Sterling Hill.

References

Dunn, P.J. (1976) Genthelvite and the helvine group: *Mineralogical Magazine*, 40:627–636.

Dunn, P.J. (1995) *Franklin and Sterling Hill, New Jersey—the world's most magnificent mineral deposits*: Privately published, 755 pp. [discussion of genthelvite in Part Three, p. 369]

Essene, E.J. and Peacor, D.R. (1987) Petedunnite ($CaZnSi_2O_6$), a new zinc clinopyroxene from Franklin, New Jersey, and phase equilibria for zinc clinopyroxenes: *American Mineralogist*, 72:157–166.

Genth, F.A. (1892) *Contributions to Mineralogy*, No. 54, with crystallographic notes by S.L. Penfield: (5) danalite: *American Journal of Science*, 44:385.

Metsger, R.W., Tennant, C.B., and Rodda, J.L. (1958) Geochemistry of the Sterling Hill zinc deposit, Sussex County, New Jersey: *Geological Society of America Bulletin*, 69:775–788.

Acknowledgements

The authors would like to thank the following people for their assistance: John Kolic for mining this material; Rick Koval for providing a sample for analysis; Robert Hauck for donating samples from the footwall of the East limb to the Franklin Mineral Museum; Dru Wilbur, Mark Boyer, and Steve Kuitems for their loan of specimens for study; Joe Orosz for the XRD analysis; Mark Boyer for arranging for the X-ray work; Tony Nikischer of Excalibur Mineral Company for providing the EDS analysis; and Carol Cianciulli for manuscript typing. ⚒

Fluorescence Emission Spectrum of Genthelvite From Sterling Hill, New Jersey

Earl R. Verbeek
Sterling Hill Mining Museum
30 Plant Street
Ogdensburg, NJ 07439

Herb Yeates
1707 Vestal Drive
Coral Springs, FL 33071

Introduction

Genthelvite, $Zn_4Be_3(SiO_4)_3S$, was found in moderate abundance during the summer of 2002 in a small trench about 2 to 3 m below the footwall of the East limb at Sterling Hill, just north of the passage between the fill quarry and the Passaic pit. Locally, the mineral had been known before only from Franklin, where it had been reported as microscopic grains in a petedunnite assemblage (Essene and Peacor, 1987). Its occurrence at Sterling Hill as masses several centimeters across, as well as sharply formed crystals readily visible to the naked eye, understandably caused quite a stir among local collectors, and specimens were soon offered on the market at immodest prices.

The appearance, physical and optical properties, and chemistry of Sterling Hill genthelvite are described in a companion paper (Cianciulli and Verbeek, 2003) in this volume. Possibly the most appealing property of this mineral among local collectors, other than its rarity, is its fluorescence, which is bright medium green under longwave ultraviolet (UV) light. Until recently nothing was known of the activator of this fluorescence, but emission spectra obtained in May 2003 suggest that the green fluorescence is activated by divalent manganese.

Experimental Procedure

Emission spectra for Sterling Hill genthelvite, and a specimen of Franklin willemite for comparison, were obtained with an Ocean Optics USB2000 spectrophotometer with a VIS/NIR (visible/near infrared) grating and P600-025 VIS/NIR probe. A filtered UV Systems SuperBright shortwave lamp, with maximum output at 254 nm, was the excitation source. The Ocean Optics spectrophotometer was first checked for wavelength positional accuracy by obtaining spectra from several noble gas discharge tubes (Ne, Ar, Kr), which emit sharp line spectra, and comparing the measured wavelengths of several of these lines to the known wavelengths tabulated in the *Handbook of Chemistry and Physics* (1993, 73rd edition). The wavelengths measured proved accurate to within 0.5 nm.

The spectra were measured using integration times of 10 msec for the willemite and 1000 msec for the genthelvite. The longer integration time for the genthelvite was required due to the dimness of its fluorescence, relative to that of willemite, under shortwave UV light. The emission spectra shown in this paper represent the average of 10 iterations for genthelvite and 100 for willemite.

A spectrum of the filtered UV light source was also obtained to check that it had essentially zero output in the wavelength region of the genthelvite and willemite emissions. Measurements were conducted in a light-tight, darkened enclosure. The visible light measured from the specimens, then, is due to the minerals themselves, with no contribution from the excitation source or ambient room lighting.

The spectra discussed here, as noted above, were obtained by using a shortwave UV lamp as the excitation source. Spectra were also obtained using longwave UV, and emission peaks are present in identical positions. The only difference, for the genthelvite, is that the emissions are considerably more intense under longwave UV light, and for the willemite the opposite is true, but for both minerals the position and shape of the emission peaks remain the same. This is not surprising, inasmuch as emission peaks are characteristic of electronic transitions determined by crystal structure, not excitation wavelength.

Results

The averaged emission spectra for the genthelvite and willemite specimens are shown in Figure 1 (page 24 of this volume). Note that the Y-axis on this plot represents *relative*, not absolute, intensity—that is, the maximum of both peaks is given a value of 100%, even though under shortwave UV light the willemite emission is considerably stronger than that of the genthelvite. This is a standard convenience, for we are here concerned with wavelength distribution, not differences in the strength of fluorescence. Plotting both spectra with equal peak heights facilitates comparison of peak shape.

The two spectra (Fig. 1) are closely similar, with that of genthelvite lying on the short-wavelength side relative to that of willemite. The emission peaks are about 511 nm and 528 nm, respectively. The spectra thus confirm the visual impression that genthelvite fluoresces green, as opposed to the longer-wavelength, yellowish-green of willemite. The difference of 17 nm in peak position is actually quite substantial, easily discernible to the human eye. In practice, however, though the two minerals clearly fluoresce different colors when seen together in the same specimen, one may easily be mistaken for the other when seen separately, as numerous local collectors can now attest. The same effect has often led the unwary to mistake Franklin esperite for willemite, or vice versa.

Activator of Green Fluorescence in Genthelvite

The absence of multiple narrow peaks in the genthelvite emission spectrum virtually eliminates uranyl ion as the cause of the green fluorescence. To further test this conclusion, specimen SHMM-196 was placed in a commercial freezer and the emission spectrum remeasured when the specimen was chilled to about 0°C. Chilling a specimen reduces thermal vibrations and thereby "sharpens" its emission spectrum, increasing the chances of measuring minor peaks, but still no hint of a polymodal peak was obtained.

The emission spectrum instead suggests that divalent manganese, substituting for zinc in the genthelvite structure, is the cause of the observed green fluorescence. As supporting evidence we note the following:

- Manganese as a substituent for zinc in the genthelvite structure occupies a distorted tetrahedral site in which the manganese is bonded to three oxygens and one sulfur (Hassan and Grundy, 1985). Divalent manganese, where it substitutes for another metal in a tetrahedral site, is a known cause of yellowish-green to green fluorescence in minerals (Marfunin, 1979). Notable among these are willemite, esperite, and some green-fluorescent fluorite.
- Chemical analysis of Sterling Hill genthelvite (specimen FMM 6316, Franklin Mineral Museum) revealed the presence of 0.59% MnO. Genthelvite from Mont Saint-Hilaire, which fluoresces similarly to the Sterling Hill material, likewise contains manganese in amounts of 0.95–2.11% MnO (Dunn, 1976).
- Emission peaks of green-fluorescent Sterling Hill genthelvite and Franklin willemite (Fig. 1) are closely similar in shape and width. The standard measure of peak width, the full width at half maximum (FWHM), is 36 nm for the genthelvite and 42 nm for the willemite.

Together these lines of evidence strongly suggest that divalent manganese is the activator of the green fluorescence in Sterling Hill genthelvite. A complete proof, however, would involve synthesizing manganese-doped but otherwise pure genthelvite in the laboratory and obtaining an emission spectrum identical to that of the natural material.

References

Cianciulli, J.C. and Verbeek, E.R. (2003) Genthelvite from Ogdensburg, New Jersey: *The Picking Table*, 44(2):23–26.

Dunn, P.J. (1976) Genthelvite and the helvine group: *Mineralogical Magazine*, 40:627–636.

Essene, E.J. and Peacor, D.R. (1987) Petedunnite ($CaZnSi_2O_6$), a new zinc clinopyroxene from Franklin, New Jersey, and phase equilibria for zinc clinopyroxenes: *American Mineralogist*, 72:157–166.

Handbook of Chemistry and Physics (1993) 73rd edition: CRC Press, Boca Raton, Florida.

Hassan, Ishmael, and Grundy, H.D. (1985) The crystal structures of helvite group minerals, $(Mn,Fe,Zn)_8(Be_6Si_6O_{24})S_2$: *American Mineralogist*, 70(1 and 2):186–192.

Marfunin, A.S. (1979) *Spectroscopy, Luminescence, and Radiation Centers in Minerals*: Springer-Verlag, Berlin.

Acknowledgements

The authors would like to thank Mr. Leeward Bean of Ocean Optics, Inc., for loan of an Ocean Optics USB2000 spectrophotometry package. ⚒

An Interview With Dr. Pete J. Dunn Regarding His Historical Treatise on Franklin and Sterling Hill

PART I

Maureen Verbeek
82 Struble Road
Branchville, NJ 07826

In late July of 2002, the first volume of Dr. Pete J. Dunn's historical treatise, *Mine Hill in Franklin and Sterling Hill in Ogdensburg, Sussex County, New Jersey: 1765–1900*, was distributed to the public. In September of 2002 and April of 2003, the second and third volumes, respectively, were published. These monumental works detail at great length the history of iron and zinc mining in the Franklin-Sterling Hill area. This is done in part through recounting the numerous deed transfers of these now-famous mineral deposits, the legal battles, and how the various owners throughout time left their marks on history.

In Volume One, Dr. Dunn states on page 7: *"The records of legal cases are voluminous; the writer has examined approximately 24,000 pages of legal records, deeds, and documents."* This was an enormous undertaking. In this interview, I would like to bring to the reader a sense of the dedication that went into this work.

Maureen: *First off, Pete, I would like to thank you for taking time away from your research to participate in this interview. Also I would like to congratulate you on bringing this story to the Franklin-Sterling Hill community. You are an accomplished mineralogist, so why choose to write about history?*

Dr. Dunn: As to why, as a mineralogist, I chose to write about history, part of the answer lies in the limited but inspiring and stimulating writings done by others. Part lies in an increasing awareness that the history of mining at Franklin and Sterling Hill was possibly the most complex mining story ever to exist, and perhaps the greatest as well. By 1995 I had a much clearer grasp on the matter than those who came before me, and, although slightly intimidated by the scope of the task, I began to think a mining history could be done if one invested many years of effort. In retrospect, I then knew very little about the immense effort that would be required. The deeper I got into this intricate tale, the more I was caught up by it and became determined to see it through.

The publication of my monograph in 1995 and 1996 was the visible end to a turning point that took place in December of 1992, when I had decided not to describe any more new minerals from anywhere. Also, by 1992 I had put aside my interests in Långban, Sweden; Laurium, Greece; pegmatite phosphates; and other research areas. I also put aside my work in systematic mineralogy (discreditations, redefinitions, revalidations, etc.). The description of samfowlerite was finished in December of 1992, and it was the last new mineral discovered by me.

In the preceding 15 years (1978 to 1992 inclusive), I had shared much time and put enormous efforts, mostly fruitless, into serving the Franklin-Sterling Hill mineral collectors' agenda. By early 1993 it was time to follow only my intensive research program on Franklin and Sterling Hill. Lastly, I wanted to take a very long look at the zinc ores, the calcium silicates, the ways they did and did not interact, and a host of other problems. To make much time available for these efforts, I had to put aside the work on the weird and unusual minerals at Franklin and Sterling Hill.

I took up the possibility of writing a mining history in part to meet the steep intellectual challenge of understanding it, in part to enrich the world's knowledge of these deposits (one of my life goals), and in part to provide me with a stimulating nonscience research interest, so as to exercise other parts of my mind and provide a respite from my work on the ores, country rocks, and silicates.

Maureen: *I understand that your study of the documented record of Franklin and Sterling Hill mining commenced in 1978. Approximately when did the concept of writing this treatise begin?*

Dr. Dunn: I was stimulated by the historical sections of Palache's 1935 monograph, Shuster's 1927 booklet, Frondel's 1972 checklist, and other writings. These publications painted an intriguing but sketchy outline of a possibly complex chain of ownership of these mineral deposits. After studying Franklin-Sterling Hill minerals here at the Smithsonian for over four years and characterizing uvite, I was ready to go to Franklin in 1977 and meet the geologists and mineral collectors. After visiting Dr. Frondel at Harvard in October, I visited Jack Baum in Franklin later the same day. I think it was during my second visit, in the spring of 1978, that I began looking at a few interesting deeds in the "courthouse" (actually the Sussex County Hall of Records in Newton).

I began by looking at Colonel Fowler's deeds, and saw that the matter of Franklin and Sterling Hill mineral rights was exceedingly complex. My primary, secondary, and tertiary focuses were on the minerals, but I returned to the deed rooms again and again when I had a bit of spare time. My numerous, then-monthly visits were usually on a Thursday or Friday because I met with collectors at Ewald Gerstmann's on Saturday mornings. Frankly, I found the mineral rights story very confusing and was frustrated many times in my quest to get a firm handle on even one of the historical matters. This sideline historical activity went on for many years, and the problem continued to seem more and more complex.

In the mid-1980s, the New Jersey Zinc Company records, which had been at Sterling Hill, were transferred to Rutgers University's Alexander Library and were housed in the Special Collections and Archives section. I was excited that they were preserved, and I went there to examine some of them. After a number of visits, I found some chain-of-title documents that appeared to open windows on the confusing deeds I had read in Newton. This find was exciting after more than 7 years of struggling with scant guidance, but these company documents were to provide additional frustrations.

By 1986 I had strong confidence that my contemplated mineral monograph was really a reasonable objective, and it began to absorb all my spare time and energy. By the early 1990s, the structure of my monograph was all in place and much of the mineralogy was ready to publish. Creating some time and space in my researches, I then began to examine in detail many mineral rights documents I had copied at Rutgers and tried to piece together the mining history. Sketching out certain aspects of the mineral rights in my lab and then taking my notes to the Hall of Records in Newton for cross-checking led to immense frustrations, and I almost shirked the great challenge I saw in front of me. This went on for years; the deeds were so complex I found it difficult to even discuss them with others.

I included a historical summary in my 1995–1996 monograph, but this was drawn mostly from prior studies by others. I could not then address the more complex aspects of local mineral rights, and I saw that the subject was much too complicated to be just a part of my mineral monograph.

By 1994–1995 I was at an impasse and mighty frustrated with my poor understanding of the mineral-rights situation in spite of my considerable efforts over many years on the hated highways and the investment of great amounts of time, money, and effort. I was convinced that my approach was flawed, and that there was no reliable window or key into these matters. I wrote a sentence in the preface to my 1995 monograph which stated: "Much of the local history has not yet been distilled from the record of the 40-year period of litigation, and this presents a fine opportunity for very persistent, careful historians and scholars who wish to punish themselves." I decided to accept this challenge.

I saw that I had to undertake three principal actions. First, I had to ignore many of the error-laden New Jersey Zinc Company mineral-rights records I had invested much time in. Many of the deed citations were in error; the records were very incomplete in terms of the mining leases; and significant references were wholly lacking. I had been led astray too often to follow those paths again. Second, I had to personally examine every deed to and from every mining company in the Franklin-Sterling Hill area, and examine every deed to and from every person connected with the relevant properties and mineral rights in this area, and I had to do so with a truly dauntless approach. Third, I had to really step up the scope and intensity of my long and fruitless search for records of litigation between 1857 and 1896.

Maureen: *You partially dedicated your book to Dr. Samuel Fowler, who you stated was the Renaissance Man of Franklin and Sterling Hill. Would you like to explain that further?*

Dr. Dunn: For the nonce, I would refer the reader to pages 121 to 128 of Volume One of my treatise; pages 121 to 122 address Dr. Fowler specifically.

I readily admit my biases of admiration in connection with Dr. Fowler. They are as follows: Although he was an astute businessman and investor, as a mineralogist he reached well beyond these pedestrian endeavors and strove *to increase scientific knowledge of the deposits.* He also was the only person in our story to do so. One example is his letter to Dr. Berzelius (page 228). Franklin and Sterling Hill's mineral wealth attracted some grubby folks with base motives; it still does. Dr. Fowler stood tall and proud by any comparison.

Concerning the exploitation aspects, Dr. Fowler was the first man to suggest separating franklinite by magnets; he was the first to make zinc paint, with George Ballou; and he was the first to suggest smelting franklinite with anthracite. He was ahead of his time in many ways, very industrious, mighty intelligent, hard-working, perspicacious, capable, and highly respected. I cannot name anyone who did more for Franklin and Sterling Hill in the 19th century, and I wish I could have met him then.

Maureen: *Part of your dedication read as follows: "This study is dedicated to the vast number of wonderful librarians, archivists, and registrars who preserve knowledge, protect it, organize it, and provide it to all who seek their assistance. Without their efforts and assistance, this study could not have been sustained or completed. The writer is thankful for the splendid services provided by dedicated librarians." Would you like to elaborate on* *this? Any specific libraries, archives, or repositories that you found particularly useful?*

Dr. Dunn: I was aware, all through this long effort, that my study was barely possible only because librarians, archivists, and registrars had preserved this material. The contemporary guardians of these documents are often of invaluable assistance to the researcher. They know the character of the records, the pathways to using and interpreting them, what limitations exist, and where the intellectual pitfalls are. These folks made my study possible. The staff at most research facilities was wonderful and extremely helpful.

The deeds to Sussex County mineral rights are in the Office of the County Clerk in the Hall of Records in Newton; they are an invaluable resource and available to visitors upon request. Other deeds are in the appropriate repositories in Essex and Hudson Counties in New Jersey, and Northampton, Carbon, and Lehigh Counties in Pennsylvania, and are available to visitors upon request.

Many of the New Jersey Zinc Company records are in about 140 boxes in the Alexander Library at Rutgers University in New Brunswick. The records of the New Jersey Court of Errors and Appeals are in the Law Section of the New Jersey State Library in Trenton. The records of the New Jersey Chancery Court and New Jersey Supreme Court are available through the New Jersey State Archives in Trenton. For these three named institutions, advance requests *must* be made; most records are not on their sites and must be retrieved from storage prior to a visit.

Other useful repositories are the Hagley Library and Museum in Wilmington, Delaware; the Sussex County Library's New Jersey section at Frankford, New Jersey; the Stonehill Industrial History Center in Easton, Massachusetts; the New York Public Library in New York City; the Library of Congress in Washington, D.C.; and numerous historical societies.

Maureen: *What did it feel like to be reading all these hundreds of old deeds and the testimonies in the legal cases?*

Dr. Dunn: While reading these documents I felt like an invisible guest, peeking over the shoulders of folks in the 1800s. These clerks and scribes knew that real-estate and legal folks would eventually use their work, but they never knew that I would come one to two centuries later to learn the mining history of Franklin and Sterling Hill from their handwriting.

The most exciting parts were in all the personal testimonies of the principal actors. I had wondered about Colonel Fowler's activities for a long time, and in these testimonies I found some of his behaviors, observations, and activities described in his own words. Similarly, the words of James L. Curtis, Charles W. Trotter, William I. J. Kemble, and many other men were not only enlightening, but downright exciting to one trying to understand an intricate story. These fragments of their own speech were, in some instances, the very best evidence I would obtain.

Maureen: *In your text there are numerous excerpts from legal cases, which are plainly and clearly written. One imagines that wasn't exactly how you came across this information. Did you have a problem deciphering the writing style? Noted throughout the text are statements indicating gaps in the legal documents. How frustrating was this?*

Dr. Dunn: There are two principal and general classes of information for this discussion: legal cases and deeds.

The legal cases were prepared and presented to the courts in cursive script (handwriting) until well into the late 1880s. Many of these were difficult to read, in some instances very much so. However, if the decree in the initial case, in New Jersey Chancery Court for example, was appealed to the New Jersey Court of Errors and Appeals, the lower court case was then, but only then, *printed, not just typed* (for the first time) by a printing company, and the appeals case was also printed, and they were both bound together. This greatly facilitated the reading of the complaints, responses, documents, testimonies, and the like for a few of the legal cases. On the upside, many of our most important Franklin-Sterling Hill Chancery Court lawsuits were appealed and thus were printed, and this facilitated my access to the story.

Considering a negative aspect, I found only one set of such printed casebooks, in Trenton. My diligent search for another set at a nearer library, or even a set which I would have very willingly purchased at a steep price to save myself much punishing time on the road, and which would have permitted a more leisurely consideration of the documents, was wholly unsuccessful.

Another particularly vexatious problem was that these bound composite volumes containing both cases, some being 4 to 6 inches thick and containing over a thousand pages, were not "published" in the sense of being prepared for a reader to follow in an orderly manner. Instead, many of them consisted of a messy aggregate of small pamphlets (3 to 20 pages) or large ones (hundreds of pages), each paginated separately or not at all. Many of these pamphlets were undated, and often they were not bound in the order in which they were introduced in either the chancery or appeals cases. Interpretation of these composite "casebooks" was fraught with the possibility of me introducing an error, and this is one reason why some legal cases are discussed in a very brief manner. I consider it better to be incomplete than to take chances on erroneous interpretations.

Additionally, many documents are missing from these composite casebooks. This was particularly vexing to me because many injunctions were missing, and these had real-time, on-the-ground effects at Franklin or Sterling Hill, where they stopped a company or person from mining or removing ore. These were important events in the local mining history. In some extremely frustrating casebooks I found up to a hundred pages of argument concerning certain injunctions, but I never saw the injunction itself, the very subject of the argument.

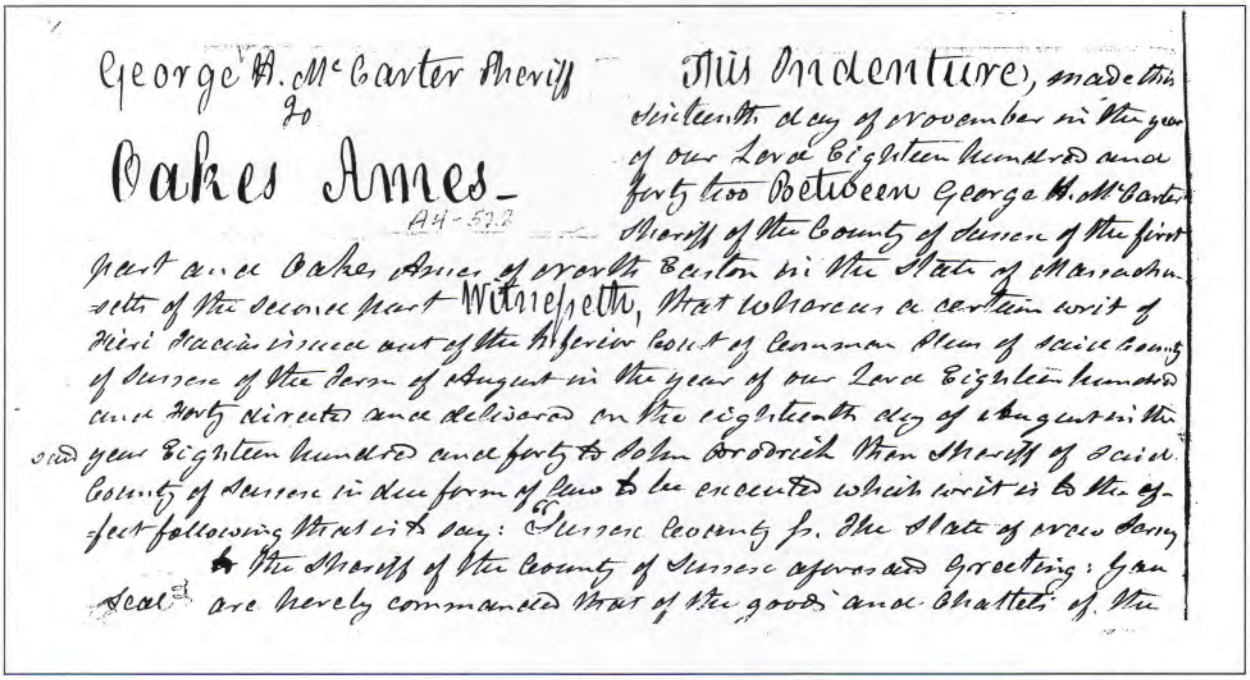
The lack of dates on a great many diverse documents, even including a number of opinions and decrees, was likewise frustrating because their absence precluded a responsible interpretation of the sequence of events, their relationship to the legal case itself, within local deeds, and especially, actions down on-the-ground in the "Holey Land."

The deeds and mortgages, unlike the legal papers, were not original documents. They were copied from originals in cursive script until near the end of the 19th century. The custom in the 1800s was that the original deeds were submitted to the County Clerk, at the courthouse in Sussex County for example, to be recorded as public records, and were then returned to the document owner. Such original deeds bore a certification by a commissioner that they were indeed signed by the individuals so named as grantors or grantees.

These deeds were then carefully copied by hand into deed-books by a court employee, a scribe well-trained in the formalities and traditions of this important task and the need for great accuracy. The scrivener's work was then compared with the original copy, presumably by a senior staffer, and was then amended by marginalia if necessary (not too often). Finally, the County Clerk added his declaration and signature as an attester that the deed was an accurate copy of the original.

The lack of a certification of signatures or the lack of the County Clerk's signature and declaration were significant flaws which could render a deed invalid. Such problems cropped up from time to time, commonly resulting in a corrected deed being filed, with the new version bearing all the needed information and signatures. This system worked well and provided good records of transactions and leasing activities at Franklin and Sterling Hill. The reader may wish to read the section on leases on pages 8 through 12 in Volume One.

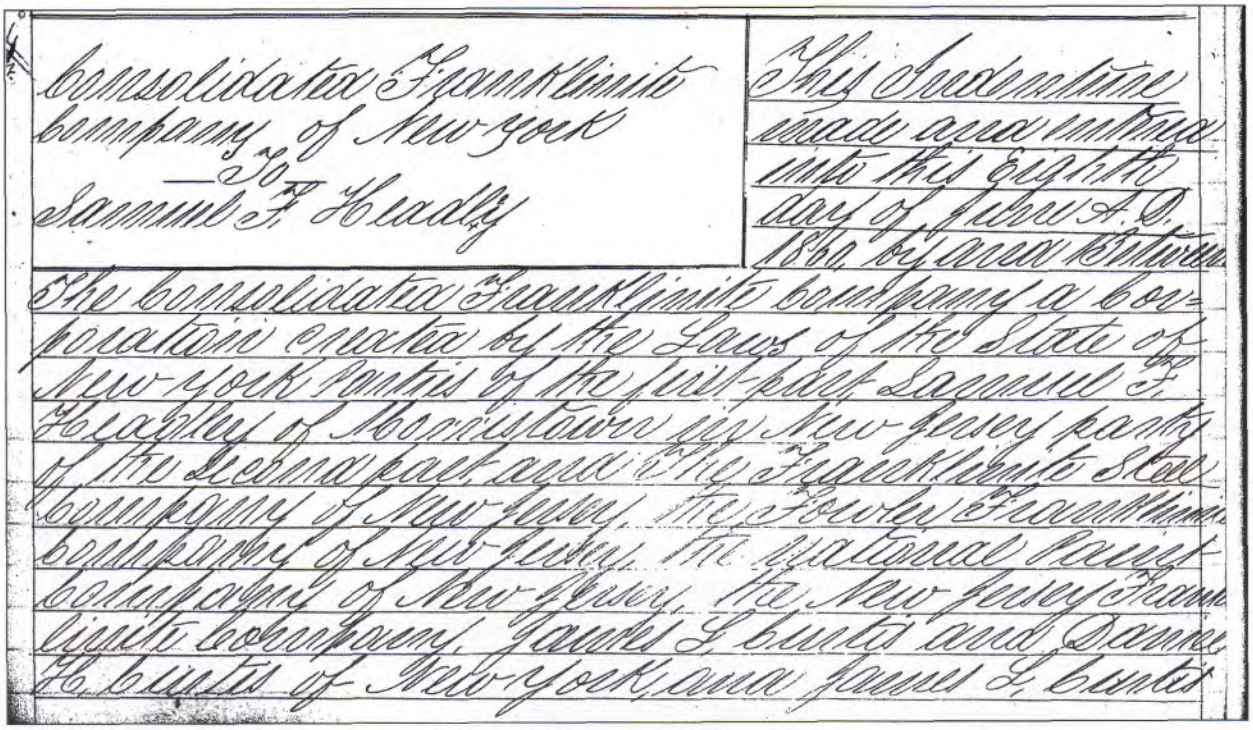
A problem in this system, in my opinion, was that the scribe, once carefully trained and found to be very meticulous, was retained in that position for a period of time, sometimes for many years. If that particular scribe had good handwriting, the researcher can have easy reading. On the other hand, if the scribe had difficult-to-read handwriting, such as florid, excessively ornate, or tiny writing, the researcher is condemned to struggle with this



George H. McCarter Sheriff
To
Oakes Ames
A4-528

This Indenture, made this sixteenth day of November in the year of our Lord Eighteen hundred and forty two Between George H. McCarter Sheriff of the County of Sussex of the first part and Oakes Ames of North Easton in the State of Massachusetts of the second part Witnesseth, That whereas a certain writ of Fieri Facias issued out of the Inferior Court of Common Pleas of said County of Sussex of the Term of August in the year of our Lord Eighteen hundred and forty directed and delivered on the eighteenth day of August in the said year Eighteen hundred and forty to John Broderick then Sheriff of said County of Sussex in due form of law to be executed which writ is to the effect following that is to say: Sussex County ss. The State of New Jersey to the Sheriff of the County of Sussex aforesaid Greeting: You Seal are hereby commanded that of the goods and chattels of the

Figure 1. Deed from George H. McCarter to Oakes Ames on November 16, 1842, selling him the Franklin furnace, related properties, and all the mineral rights owned by Dr. Samuel Fowler in 1836 (Sussex County Deed A4-528). The action is described on page 85 of Dr. Dunn's historical treatise.

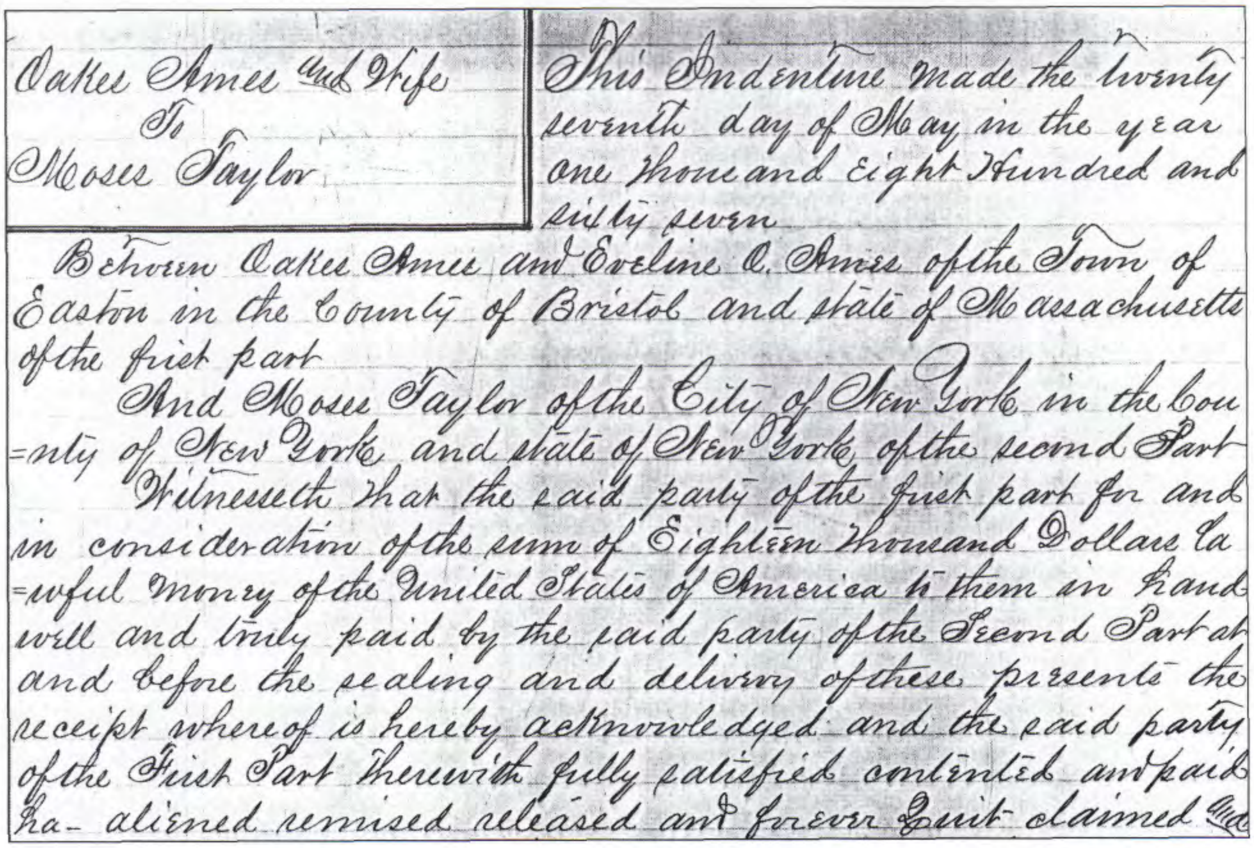


Consolidated Franklinite
Company of New York
—To—
Samuel F. Headly

This Indenture
made and entered
into this Eighth
day of June A.D.
1860 by and Between

The Consolidated Franklinite Company a Cor-
poration created by the Laws of the State of
New York Parties of the first part Samuel F.
Headley of Morristown in New Jersey party
of the Second part and The Franklinite Steel
Company of New Jersey, the Fowler Franklinite
Company of New Jersey, the National Paint
Company of New Jersey, the New Jersey Frank-
linite Company, James L. Curtis and Daniel
H. Curtis of New York and James L. Curtis

Figure 2. Deed from the Consolidated Franklinite Company (of New York) to Samuel F. Headley on June 8, 1860, selling him the company's numerous mineral-rights leases (Sussex County Deed Z4-80). This action is described on page 489 of Dr. Dunn's historical treatise.



Oakes Ames and Wife
To
Moses Taylor

This Indenture made the twenty
seventh day of May in the year
one thousand Eight Hundred and
sixty seven

Between Oakes Ames and Eveline O. Ames of the Town of
Easton in the County of Bristol and state of Massachusetts
of the first part
And Moses Taylor of the City of New York in the Cou
=nty of New York and state of New York of the second Part
Witnesseth that the said party of the first part for and
in consideration of the sum of Eighteen thousand Dollars la
=wful money of the United States of America to them in hand
well and truly paid by the said party of the Second Part at
and before the sealing and delivery of these presents the
receipt whereof is hereby acknowledged and the said party
of the First Part therewith fully satisfied contented and paid
ha- aliened remised released and forever Quit claimed and

Figure 3. Deed from Oakes Ames and wife to Moses Taylor on May 27, 1867, selling him all of Ames's mineral rights on Mine Hill in Franklin and several other properties (Sussex County Deed Z5-453). This action is described on page 444 in Dr. Dunn's historical treatise.

writing until that point in the deed-book where the scribe was replaced by another. The worst-case scenario was in instances in which a scribe with difficult-to-read writing was replaced by another with even more difficult writing!

Maureen: *We are all aware of the nationally famous mineral collectors of long ago, but were there many local mineral collectors of note in the 1800s?*

Dr. Dunn: Yes, and a number of them played roles in the grand story of Franklin and Sterling Hill. These include Dr. Samuel Fowler, a very serious long-term mineral collector mostly bereft of the motivations of those living now. Other collectors were William I. J. Kemble, Francis Alger, Garret Kemble, and Charles W. Trotter. Others at a distance were Charles P. Williams, a chemist, and William Roepper, a mineralogist. I have included collector-related quotations from or about all these collectors in my treatise.

The collection of William I. J. Kemble must have been great. Dr. Charles Palache described visiting with Kemble and his mineral collection on page 2 of his 1935 monograph. William Kemble began collecting minerals as a boy, spent most of the summer of 1839 collecting minerals at the almost unopened zinc deposits with Thomas Nuttall, and learned much mineralogy from him.

William Kemble was a long-term mining supervisor at Franklin and Sterling Hill during the last half of the 1800s. He worked for almost all the mining companies and individual operators from 1848 on, and his testimony concerning his experiences crops up often in this long story. I wish I could have met him then; his biography probably would have been the very best document obtainable from ground-level. He is one of only two principal characters who saw the whole 1848 to 1897 story unfold; the other was our principal scoundrel, James L. Curtis. Kemble's collection was dispersed in 1915 according to Palache (1935), and it is highly probable that parts of it are today in the hands of many F.O.M.S. members, and possibly on the trading tables as well.

Maureen: *Were any women involved in the history of Franklin and Sterling Hill in the 19th century?*

Dr. Dunn: In a nutshell, and unfairly from our contemporaneous perspectives, it was a man's world. Rebecca Fowler Ross personally owned a lifetime interest in much of the land on lots #8 and #9, where most of the present, composite Sterling Mine is located, having inherited it in her father's will. However, Dr. Fowler had sold off all the mineral rights on this land in 1836, eight years before his death, and therefore his daughter was not a major player on the mineral scene.

Charlotte Rutherfurd, a widow, owned the Rutherfurd Farm along present-day Buckwheat Road and Rutherford Road in Franklin [name spellings are correct as given]. Part of the north end of the east limb of the Franklin orebody was under the Rutherfurd Farm, and Charlotte Rutherfurd entered into leases with Richard Wayne Parker ("Judge Parker"). These leases were transferred to the Lehigh Zinc and Iron Company, then from it to Samuel P. Wetherill, and from him to the Sterling Iron and Zinc Company. Richard W. Parker, Charlotte Rutherfurd, and her descendants benefited from these leases for a long time.

Maureen: *Your treatise and monograph have a marvelous assortment of old photographs and etchings. Will you please elaborate on the ferreting out of these pictures that add so much to the telling of your story?*

Dr. Dunn: Yes, there is a lot of imagery never seen locally, and it is a delight to share it with the folks in the local mineralculture. Indeed, acquiring it has been a significant aspect of my overall efforts. In my previous books on Franklin and Sterling Hill, I had published over 1,000 different images, and a number of those are replicated in this history treatise where appropriate. I have to keep in mind that this treatise is written for a much wider and more general audience, some of which will not have seen my monograph. However, it is the newer, fresher material that catches the mind and eye most enticingly.

Your term, "ferreting out," is wholly appropriate in some instances. I was particularly pleased to find the etching of a library that I used on the dedication page, in part because I have worked long and hard in places like that. There are a lot of delightful etchings and woodcuts of library scenes, and I considered using a different one in each volume, but that would have been a deflecting distraction. This is not a work about libraries, but about mineral rights and mining.

I particularly favor line drawings and was very pleased when I found good ones. Most of my cover illustrations came from an 1860 volume of *Harper's New Monthly Magazine*, and they are superb! A few others, especially in Volumes One and Two, came from other volumes of the same journal.

Some acquisitions were more delightful than others, of course. I was especially pleased to obtain several photographs of Colonel Fowler from the U.S. Army Military History Institute. Drawings of many of the most famous and infamous men who drove our great epic were similar delights to acquire. The only major one I did not find an image of was Charles W. Trotter, and it would have been wonderful to see what he looked like and share that knowledge with everyone for posterity.

In Volume Two I was thrilled to be able to show photographs of the rock and mineral exhibits at the Great Exhibition in London. It would have been special to have found one of the 16,400-pound zinc-ore specimen. The early structures of the New Jersey Zinc Company at Ogdensburg and Newark, the drawing of the Newark smelter, the maps showing the smelter sites and neighborhoods, several maps showing the region and proposed and extant railroads, and the painting of Sterling Hill were all fun additions. In Volume Three I was delighted to be able to show Moses Taylor's flag.

Some folks were very helpful in providing images, and others were markedly less enthusiastic; I understand both positions quite well and fully support both approaches. A few folks, thankfully very few, took a perverse delight in telling me about photographs they would not share. They *owned* these images, possessed *full control*, and folks could come to them on bended knee to see them. Such few images were, regrettably, not available for general sharing.

I obtained a lot of satisfaction from the drafting and publishing of my own maps; there are many throughout the work, and they are really targeted at the contexts and places of the grand story. They were drafted and redrafted over two decades. There are more to come. I hope the readers find them as useful as I have intended in assisting their understanding of our Franklin-Sterling Hill geography and history.

Maureen: *As stated above, in Volume One you mentioned that you had examined approximately 24,000 pages of legal records, deeds, and documents. Do you have any idea what that number stands at today? And approximately how many hours have you spent doing research?*

Dr. Dunn: For many years I kept among my travel notes an approximate tally of how much material I had examined, but it was not complete and was not of great importance to me, and I gradually lost the discipline of maintaining this trivial list. I simply gave the last number I had, 24,000, so as to convey to the reader that there really was a humongous amount of knowledge preserved, and to provide the reader with some sense that I had indeed greatly condensed it. The given number, 24,000, is now obsolete, and it might be 35% to 45% larger now.

I have no idea how many hours were spent on this treatise, but my total, full-bore, deep commitment to the combined mineralogy and history of Franklin and Sterling Hill was 30 years in April of 2003, and I have researched nothing other than Franklin and Sterling Hill since December of 1992. Although the research effort was spread out, much of the actual *writing* of this historical treatise took place in the last six years and continues to this day.

Maureen: *To date you have published three volumes; any idea as to how many additional volumes may be necessary to complete this treatise to your satisfaction? Any timetable on the completion of this project?*

Dr. Dunn: The number of volumes in this case is dictated by the length of the whole story, which is still growing as we write, so it is too early to make an estimate. An additional factor in the overall size of the study is the layout work, a process in which all the illustrations are inserted and in which I try to concentrate on the readability of the study. I use "white space" wherever needed to enhance readability or elegance, and all this adds additional pages. All these factors expand the treatise far beyond the simple number of pages in my still-growing text.

Completing the treatise to my satisfaction, as you say, is almost impossible; it would have to be of an inordinate and wholly unreasonable length to satisfy me. Rather, I have to try to achieve a carefully crafted measure of balance, telling the whole magnificent story, but not permitting one part to overwhelm the others or overload a reader. Attaining this balance and keeping a clear perspective on the overall story is difficult. A case in point involves the colossal, detailed, and long arguments concerning the naming of the ores, a discussion of which appears in Volume Three, and which, if discussed and presented comprehensively, would entail a whole volume or more, instead of the very limited but not diluted discussion I present. This "naming of ores" was an issue from 1857 all the way to 1896; its importance was derived in good part from the wording in the original deeds.

I do not have a timetable for the publication of this historical treatise. This story will reach a natural endpoint, and there will be "no wine before its time," which is to say it will take as long as necessary. I have already limited Part One of my Final Report to the 1700s and 1800s, as the title states.

Maureen: *I've heard you refer to this study as your "treatise," but the volumes are entitled "Final Report." How would you like your work to be referred to?*

Dr. Dunn: Either term is correct and agreeable. Because my 1995–1996 effort was called a monograph, using the term "treatise" for this historical study provides a useful and clear distinction.

Maureen: *For those who might not read every section right away, but will read some parts first, might you indicate some of the more interesting or important parts of the story, with references?*

Dr. Dunn: For now I'll refer only to Volume One. My preferences may not closely overlap those of *The Picking Table*'s readers. The sections described below, however, reflect not necessarily my opinion of the most interesting, but instead my ideas on what the readers of *The Picking Table* might find most interesting.

- The introduction and perspective on the iron industry (Volume 1, pages 21–22).
- The ironmaster and his challenges (Volume 1, pages 27–28).

- Lord Stirling and mining (Volume 1, pages 53–54, 114–116).
- The great Edison project (Volume 1, pages 63–66).
- Transportation in early times (Volume 1, page 76).
- The demise of charcoal furnaces (Volume 1, page 88).
- The wonderful ad for the store in Franklin (Volume 1, page 90).
- Dr. Samuel Fowler (Volume 1, pages 121–122).
- The standards of weights and measures (Volume 1, pages 134–136).
- All of Chapter 8 (Volume 1, pages 139–144).

References

Dunn, P.J. (1995) *Franklin and Sterling Hill, New Jersey: The World's Most Magnificent Mineral Deposits.* Privately published in 5 parts, 755 pages. Available from: Franklin-Ogdensburg Mineralogical Society, P.O. Box 146, Franklin, NJ 07416.

Dunn, P.J. (1996a) *Franklin and Sterling Hill, New Jersey: The World's Most Magnificent Mineral Deposits. First Supplement.* Pages 757–854 & i–xii. Privately published. Available from: Franklin-Ogdensburg Mineralogical Society, P.O. Box 146, Franklin, NJ 07416.

Dunn, P.J. (1996b) *Franklin and Sterling Hill, New Jersey: The World's Most Magnificent Mineral Deposits. Second Supplement.* Pages 855–978 & i–xiv. Privately published. Available from: Franklin-Ogdensburg Mineralogical Society, P.O. Box 146, Franklin, NJ 07416.

Frondel, C. (1972) *The Minerals of Franklin and Sterling Hill—A Check List.* Wiley Interscience, New York, 94 pp.

Palache, C. (1935) *The Minerals of Franklin and Sterling Hill, Sussex County, New Jersey.* U. S. Geological Survey Professional Paper 180, 135 pp. with map (reprinted in 1937, 1961, and 1974).

Shuster, E.D. (1927) *Historical Notes of the Iron and Zinc Mining Industry in Sussex County, New Jersey.* Privately published, 48 pp. Reprinted (no date given) by the Franklin Kiwanis Club. Reprinted again in 1988 by the Franklin Mineral Museum. ⚒

The Franklin-
Ogdensburg
Mineralogical
Society, Inc.

Available Publications

Complete Set of *The Picking Table*-$300.00 (+$6.00 UPS) (Vol. 1, No. 1 - current issue)

Individual Back Issues of *The Picking Table*

Vol. 1, No.1 - Vol. 23, No.2: each issue	$ 2.50
Vol. 24, No.1 - Vol. 29, No. 2: each issue	$ 3.50
Vol. 30, No.1 - Vol. 34, No. 1: each issue	$ 5.00
Vol. 34, No. 2 - Vol. 37, No. 2: each Issue	$ 7.50
Vol. 38 (combined issue)	$15.00
Vol. 39, No. 1	$15.00
Vol. 39, No. 2 (1st color issue: roeblingite)	$15.00
Vol. 40, (combined color issue)	$20.00
Vol. 41, No. 1 & No. 2 each	$10.00
Vol. 42	$20.00
Vol. 43 No.1 & No. 2 each	$15.00
Vol. 44 No.1 & No. 2 each	$15.00

Add $0.75 postage for each issue through Vol. 23, No. 2, and $1.00 postage for each issue beginning with Vol. 24, No. 1.

Note: All issues of *The Picking Table* prior to Vol. 23 are available only as photocopies.

Books and Other Publications

Dunn, P. J. (2002) *Mine Hill in Franklin and Sterling Hill in Ogdensburg, Sussex County, New Jersey: Mining History, 1765-1900. Final Report: Part One, Volumes 1, 2, 3, & 4.* $20.00 each (+ $3.00 postage)

Cooper, Susan B., and Dunn, Pete J. (1997) *Magnificent Rocks: The Story of Mining, Men, and Minerals at Franklin and Sterling Hill, New Jersey.* Privately printed. $15.00 (+ $3.00 postage)

Dunn, Pete J. (1997) The Story of Franklin and Sterling Hill. Privately printed. $15.00 (+ $3.00 postage)

Dunn, Pete J. (1995) *Franklin and Sterling Hill, New Jersey: the world's most magnificent mineral deposits.* Privately printed. Part One, bibliography and chapters 1-3; Part Two, chapter 4-12; Part Three, chapters 13-17; Part Four, chapters 18-23; Part Five, chapters 24-26, appendices, and indices; First Supplement, chapters S1-S5; and Second Supplement, chapters S6-S10. $30 each (+ $5.00 postage) for Parts One through Five, $25.00 each (+ $5.00 postage) for First and Second Supplements, or $200.00 (+ $15.00 postage) for the complete set of seven.

Frondel, Clifford and Baum, John L. (1974) Structure and Mineralogy of the Franklin Zinc-Iron-Manganese Deposit, Franklin, New Jersey. Economic Geology, Vol. 69, No. 2, pp. 157-180. Only photocopies are available. $2.50 (+ $1.25 postage)

Horuzy, Paul (editor) (1990) The Odyssey of Ogdensburg and the Sterling Zinc Mine. Privately printed, Sterling Hill Mining Company. $6.50 (+ $1.75 postage)

Shuster, Elwood D. (1927) Historical Notes on the Iron and Zinc Mining Industry in Sussex County, New Jersey. Privately printed. Franklin Mineral Museum reprint. $3.00 (+$0.75 postage)

Send your order with check or money order, payable to FOMS, to:

Denise Kroth, Treasurer, FOMS
240 Union Avenue
Wood-Ridge, NJ 07075

MINERALS & SUPPLIES

THE PHOTOGRAPHIC GUIDE TO MINERAL SPECIES

Tired of seeing photos of just the same common minerals? Try our CD! The most comprehensive product of its kind, displaying over 5400 original photographs of nearly 3100 different species, far more than any other CD! Mineral photos are accessible by mineral name or by locality, and all associations and localities are fully hyperlinked. Worldwide in scope, localities are indexed and searchable as well. Also includes complete chemical formula and crystal system, and the CD runs under Windows or MAC operating systems. For a sample, see our website ***just 69.95.***

DIAMONDS of the WORLD COLLECTION

A valuable collection of 12 different natural diamond crystals! These will include several different colors, a variety of different forms such as cubes, octahedrons, macles etc., and all from twelve different countries! Total weight in these collections will average about three carats, and crystal sizes will range from about 2.5mm to 5mm. Every specimen is individually labeled with complete locality data, and each collection is offered at an exceptionally low, competitive per carat price.

Diamond Collection: 12 different @ only $99- per lot!

STEREO MICROSCOPES

5x to 100x magnification

Unit includes binocular microscope, two sets of oculars, armrests, two stage plates, 200v incandescent light source and power supply (110v transformer optional), extra bulbs and English instruction package. German designed and Russian manufactured, these are new, sturdy units:

only $549- plus shipping

Photographic Modules & Fiber Optic Units are always available and in-stock. Full two year warranty with US servicing!

MINERAL IDENTIFICATION SERVICE

***Name your unknowns! X-Ray microanalysis using our in-house* Energy Dispersive Spectroscopy and SEM equipment!**

Semi-quantitative chemical analysis using the most sophisticated detectors and imaging software available. A typical analysis includes a full written report, X-ray spectra and specimen SEM image @ $55.00!! Tiny sample size, non-destructive analyses at low prices! *See our technical article in the July-Aug. 1999 issue of Mineralogical Record.*

RARE SPECIES CATALOGS: $3.00

Receive a year's worth of our monthly catalogs, featuring detailed descriptions of some of the 200,000 specimens in our inventory, covering more than 3000 different species! Just $3.00 starts your subscription. Receive special offers and learn about new discoveries!

A Great Book: LANGBAN!

A masterpiece of descriptive mineralogy from one of the most prolific localities in the world. The sister locality to Franklin-Sterling, this Swedish locale has produced over 270 different species, many similar to those found at Franklin! This large-format, fully illustrated volume is filled with the history, geology and, of course, the mineralogy of LANGBAN, with many superb color photographs throughout! This excellent, 215 page masterpiece is ***only $75- plus shipping.*** See the review in the May-June, 2000 issue of *Rocks & Minerals* magazine.

RAYTECH UV LAMPS

We stock the full Raytech line of ultraviolet lamps, from the small, hand-held 4 watt SW/LW - Portable- battery/AC Versalume unit, the 12 watt SW/LW - Portable- rechargeable battery /AC Raytector V, the12 watt SW/LW Model 88 Superstar AC only unit and its Custom View Box, all the way up to the 30 watt SW/LW Super Display LS218 unit All Raytech units have lifetime filters. *Free book* with each lamp; inquire!

The Fersman Mineral Database

This excellent software product is a comprehensive database of all known mineral species through early 1998. Information for each mineral includes chemistry, mineral group, X-ray data and space group, optical data, other physical properties as well as type locality and literature references! ***Every field is searchable, and two user fields are included!*** It functions well under any Windows environment with an IBM-compatible system. We have prepared a full installation package and instruction guide for our clients, and this excellent software package is ***just $99-.***

New! Gemstones of the World Collection

A handsome boxed set of nine different faceted gems, including rarities like tanzanite, apatite, cordierite, emerald etc.. A variety of cuts, eye clean with total set weight over 5 carats @ ***just $99-***

SUPPLY CATALOG: $2.00

All the items needed for your collecting pleasure: plastic & cotton filled boxes, the full line of Estwing hammers and chisels, Riker Mounts, Geiger counters, loupes, microscopes, assorted mineral collections and special lots, a full line of fluorescent lamps and supplies, lapidary equipment, tumblers, mining models, and much more! Let us be your sole source supplier!

Please add 8% shipping and handling ($5.00 minimum) to all orders except Catalogs; prepay by check or money order, no COD's, please. We gladly accept Visa, MasterCard or American Express. Send card number, expiration date and daytime telephone number. New York residents, add sales tax. Satisfaction guaranteed!

EXCALIBUR MINERAL COMPANY

Rare Minerals, Meteorites & Analytical Services

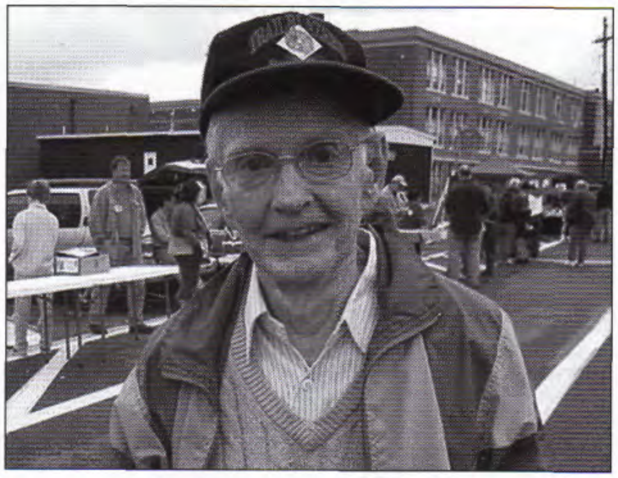
1000 North Division Street - Peekskill, NY 10566

Tel: (914)739-1134 www.bestweb.net/~excalmin Fax: (914)739-1257

The contents of The Picking Table are licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Scenes from the 31st Annual NJESA Gem & Mineral Show, April 26-27, 2003

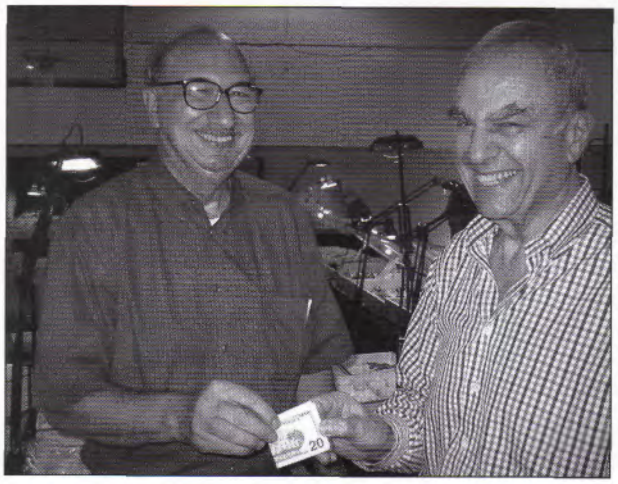
Mineral gurus Charles Key and Vandall King.
Dick Bostwick photo.



The "Godfather of Glow," Ralph Thomas.
Tema Hecht photo.

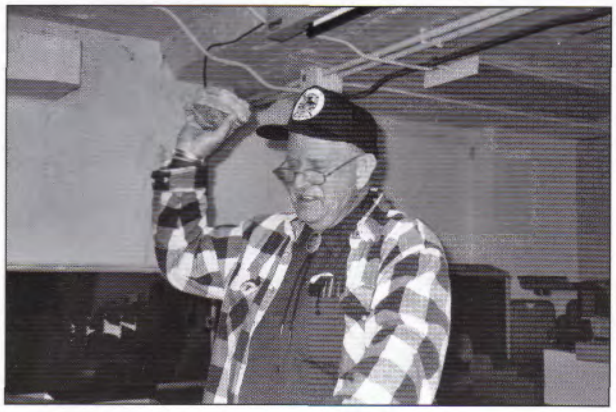
Fred Lubbers and Denis DeAngelis looking for trouble.
Tema Hecht photo.

Jerry Day (on right) displays his marvelous Franklin spheres.
Dick Bostwick photo.



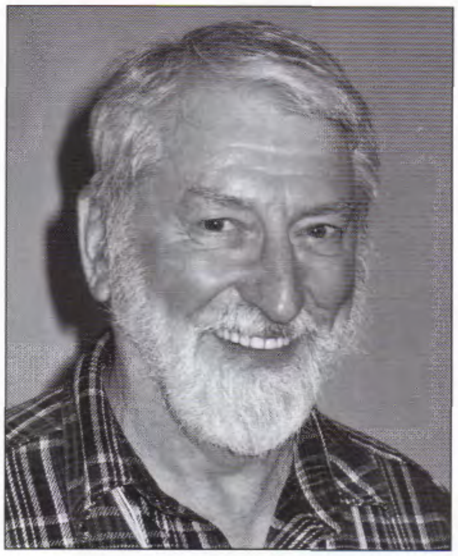
Phil Betancourt's money is good with Larry Conklin.
Dick Bostwick photo.

Maureen Verbeek and Bernie Kozykowski pose with veteran Franklin miner Nick Zipco.
Dick Bostwick photo.



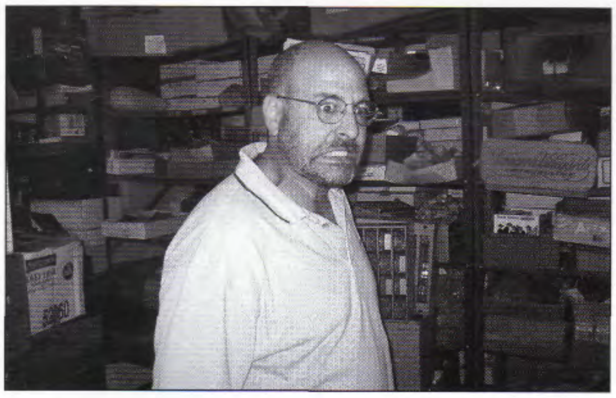
Dick Hauck throws out the first pitch at the auction.
Tema Hecht photo.

Wheelers and dealers Gary Grenier, Steve Phillips, Jim Chenard, and Casey Phillips.
Dick Bostwick photo.

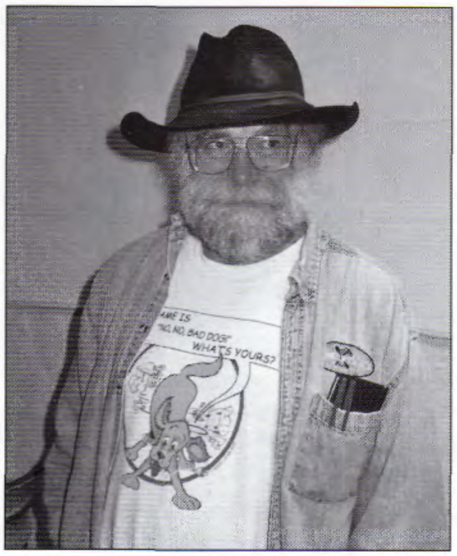


What puts the twinkle in John Ebner's eyes?
Tema Hecht photo.

Mary Bridget and Chet Lemanski.
OK, so how do the rest of us rate?
Tema Hecht photo.



Mark Leger grimaces at the current prices of Franklin classics.
Dick Bostwick photo.



Bob "Bad Dog" Jenkins on the prowl.
Dick Bostwick photo.

Pararealgar Added to the Franklin-Sterling Hill Species List

James E. Rumrill
7 Redding Place
Towaco, NJ 07082

Tony Nikischer
Excalibur Mineral Company
1000 North Division Street
Peekskill, NY 10566

During an April 2002 collecting trip at Sterling Hill, one of us (JER) visited a small exposure of Franklin Marble along the northeastern margin of the Passaic pit, where realgar had been found two years previous by Bob Hauck of the Sterling Hill Mining Museum. Mr. Hauck had been clearing the area with a bulldozer, and the initial discovery was made when the bucket knocked off a small chunk of marble, revealing the red realgar within. The discovery was not made public until early 2002, when John Kolic began excavating two trenches beneath the east limb of the orebody a short distance to the south. During these operations Mr. Kolic also mined into the realgar exposure to better expose the rock for collectors. Within the newly mined material, JER noticed minute patches of a yellowish-orange mineral, sparingly present in the calcite matrix, and it was hoped that the first find of orpiment from the Franklin-Sterling Hill area had just been made! Three samples of the yellowish-orange mineral, together with associated unidentified species, were then submitted to Excalibur Mineral Company for examination by Energy Dispersive Spectroscopy (EDS).

Orpiment, a yellow mineral with composition As_2S_3, and realgar, a red mineral of similar composition (AsS), often occur together in colorful specimens. Orpiment had long been sought at Sterling Hill, and several claims of its presence had been made in the past, but each time the material, when analyzed, turned out not to be that mineral. For example, under the general heading of "The Post Palache Minerals," Edwards (1976) expressed his belief that although orpiment as such did not come directly from the mine, specimens of realgar had become altered to orpiment through exposure to light. As one example he cited the Chorney specimen at the Franklin Mineral Museum, suggesting that in three years of public display "at least half of the surface realgar had already altered to orpiment." This was a reasonable inference, for many texts warn that prolonged exposure of realgar to light can cause that mineral to alter to powdery, yellow to orange orpiment. When John Kolic started finding realgar again underground at Sterling Hill in the 1970s, yellowish areas were not uncommon in these specimens, and were popularly supposed to be orpiment. However, specimens examined by Dr. Pete J. Dunn all proved to be finely powdered realgar. Thus, orpiment was neither discussed in his extensive 1995 monograph nor added to the Franklin-Sterling Hill species list.

Minute fragments of the yellowish-orange mineral were chemically analyzed utilizing a Phillips 525-M Scanning Electron Microscope equipped with an EDAX Super Ultra-Thin Window Energy Dispersive Spectroscopy CDU detector. Several analyses were conducted at 20 kV operating voltage across a tungsten filament with a nominal spot size of 100 microns. The EDS results showed only arsenic and sulfur as major constituents in an approximate As:S ratio of 2:1 by weight. Pararealgar was immediately suspected, as it is found as a yellowish alteration product of realgar at a number of other localities. Pararealgar, a dimorph of realgar, cannot be distinguished from orpiment by semiquantitative EDS analyses alone. However, initial attempts at structural determination by X-ray diffraction were unsatisfactory due to the paucity of material.

Additional material was then harvested from the samples, confirmed as an arsenic sulfide by EDS, and then submitted to Andy Roberts at the Geological Survey of Canada for X-ray diffraction (XRD) study with a Debye-Scherrer camera. The results confirmed pararealgar. Interestingly, in 1980 Roberts was the senior author of the first published description of pararealgar. Hence, we confidently recommend the addition of this species to the Franklin-Sterling Hill species list.

A brief description of the exposure that supplied this material follows: The exposure is along the edge of the Passaic pit, roughly 20 feet west of the footwall contact of the east limb of the Sterling Hill orebody. It can be found by entering the Passaic pit from the Fill quarry, turning right immediately past the east limb of ore, then walking northward, parallel to the east limb, for about 130 feet. At that point the pararealgar-bearing marble is 20 feet to one's left. The exposure is easily recognized by its white color, in contrast to the dark color of much of the ore nearby. The pararealgar, realgar, and associated minerals are at the south end of a fairly narrow rib of marble that rises 3 to 6 feet above the present ground level and can be traced northward for about 160 feet, where it is transected in whole or in part by a mass of mica, andradite, gahnite, and calcite.

The identification of pararealgar adds a new species to the Franklin-Sterling Hill mineral species list. The most obvious feature of the pararealgar is its orange-yellow color. It occurs sparingly as tiny grains and thin, filmy coatings on calcite. About five flats of material were collected from this locality, but pararealgar is present in only about five percent of the specimens, suggesting it has very limited distribution. X-ray techniques are strongly recommended for confirming any additional samples that may be uncovered.

Also found in this assemblage and confirmed by EDS are arsenopyrite, baumhauerite, calcite, conichalcite, diopside, duftite, galena, goethite, graphite, phlogopite, pyrite, quartz, and sphalerite. Several other minerals remain unidentified.

We extend our special thanks to Andy Roberts at the Geological Survey of Canada who graciously performed the XRD studies on the material. One of us (JER) has maintained the studied material in his private collection, and additional material has been donated to the Franklin Mineral Museum and the Sterling Hill Mining Museum for their reference collections.

Reference

Edwards, Frank (1960) The Post-Palache Minerals. *The Picking Table*, 17(2):6–8. ⚒

The Fluorescent Mineral Society is devoted to increasing the knowledge of its members in the luminescence of minerals, with an emphasis on fluorescence and phosphorescence. It promotes increased knowledge with emphasis on collecting, displaying, studying and understanding. It publishes a bi-monthly newsletter, the UV Waves, and an annual or biennial periodical, The Journal of the Fluorescent Mineral Society.

Membership information may be obtained by writing to:
The Fluorescent Mineral Society
P.O. Box 572694
Tarzana, CA 91357-2694
http://www.uvminerals.org/

Franklin Mineral Museum Memberships
32 Evans Street
Franklin, NJ 07416
Phone: 973-827-3481 • Fax: 973-827-0149
Web: www.franklinmineralmuseum.com
E-mail: rockman@tellurian.com

Yearly memberships, renewed every March, include:
- Personalized membership card
- Museum newsletter, 2 issues per year
- 10% discount in the gift shop (excludes monographs and consignment items)
- Special week of members-only holiday discount shopping, last week of November
- Discounts on children's birthday parties

Individual: $15.00, includes 1 guest pass for museum exhibits
Family: $25.00, includes 2 guest passes for museum exhibits
Patron: $50.00, includes 4 guest passes for museum exhibits
Supporting: $100.00, includes 6 guest passes for museum exhibits

"FMM Society" one-time payment memberships include:
- Personalized membership card
- Museum newsletter, 2 issues per year
- 10% discount in the gift shop (excludes monographs and consignment items)
- Invitations to special or planned events
- Option to display your collection of minerals or mining items in the museum lobby for one season
- Special week of members-only holiday discount shopping, last week of November
- Discounts on children's birthday parties

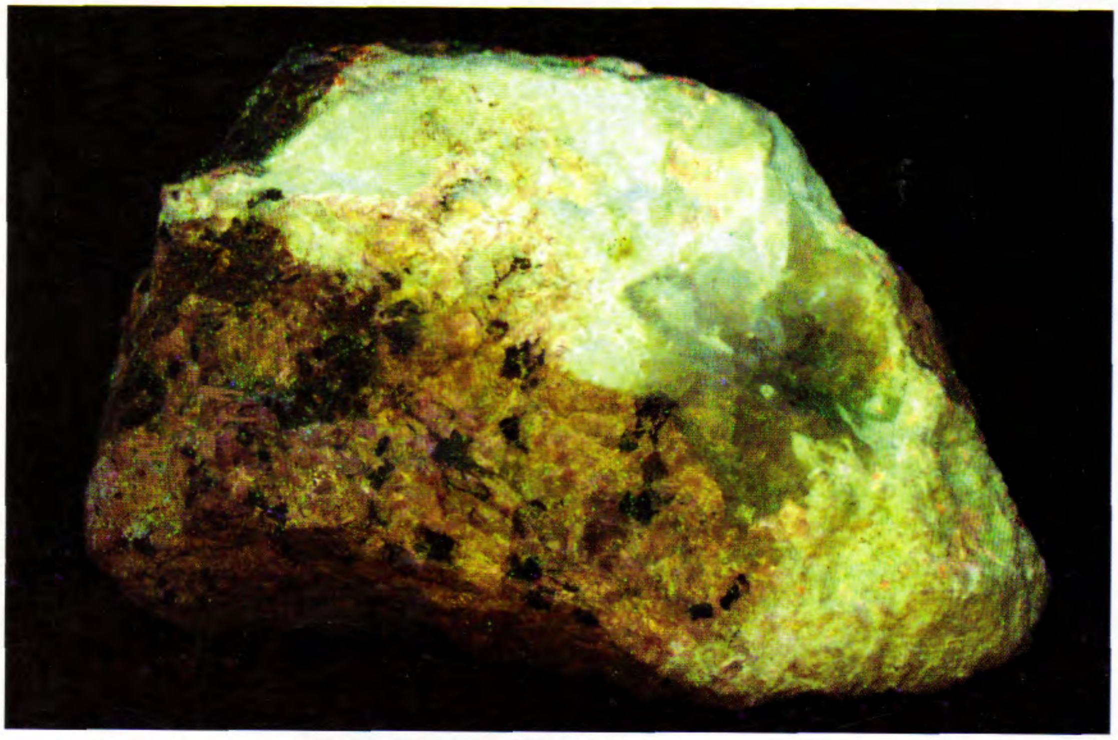
Life
$500.00, includes:
- Unlimited personal museum exhibit visits
- 25 guest passes for museum exhibits
- 10 collecting passes that include entrance into the Buckwheat dump and a maximum of 3 pounds each. All passes will be issued once only with your membership.
- Name engraved on membership plaque

Benefactor
$1000.00, includes:
- Unlimited personal museum exhibit visits
- 50 guest passes for museum exhibits
- 20 collecting passes that include entrance into the Buckwheat dump and a maximum of 3 pounds each. All passes will be issued once only with your membership.
- Name engraved on membership plaque

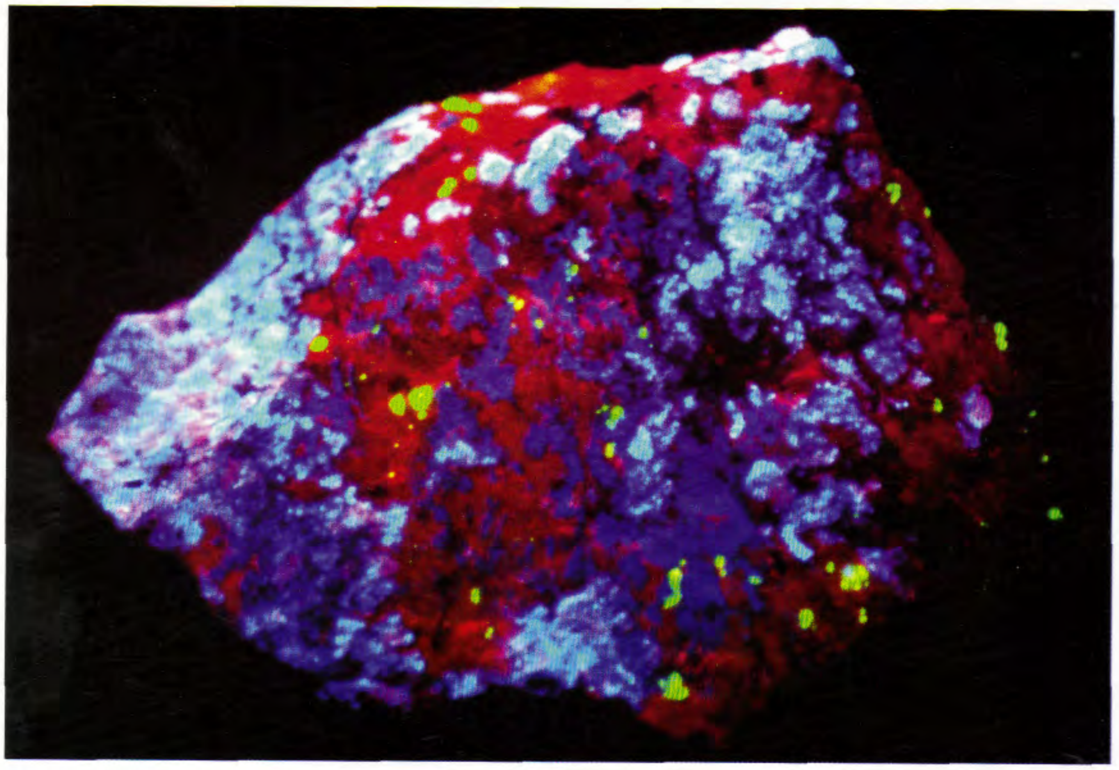
Sustaining
$5000.00, paid in U.S. currency or materials, includes:
- All entitlements of Benefactor membership
- Copy of Dr. Pete Dunn's "The Story of Franklin and Sterling Hill"

Collecting passes are not valid for special collecting events. Membership cards or benefits will not be reissued if lost or misplaced. Benefits and events subject to change.

www.FOMSNJ.org
The contents of The Picking Table are licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.



Nasonite, prehnite, and datolite from Franklin, N.J., photographed under shortwave UV. This is one of the best known specimens of Franklin nasonite. Approx. 4.25″ × 2.75″ × 1.75″ (11 × 7 × 4.5 cm). Privately owned. John Cianciulli photo. Courtesy of the Franklin Mineral Museum archives.



Margarosanite and manganaxinite with minor willemite, photographed under shortwave UV. This Franklin classic is a former Sunny Cook specimen, now Franklin Mineral Museum specimen no. 5224. Approx. 5.25″ × 4.75″ × 2.75″ (13 × 12 × 7 cm). John Cianciulli photo. Courtesy of the Franklin Mineral Museum archives.