THE PICKING TABLE

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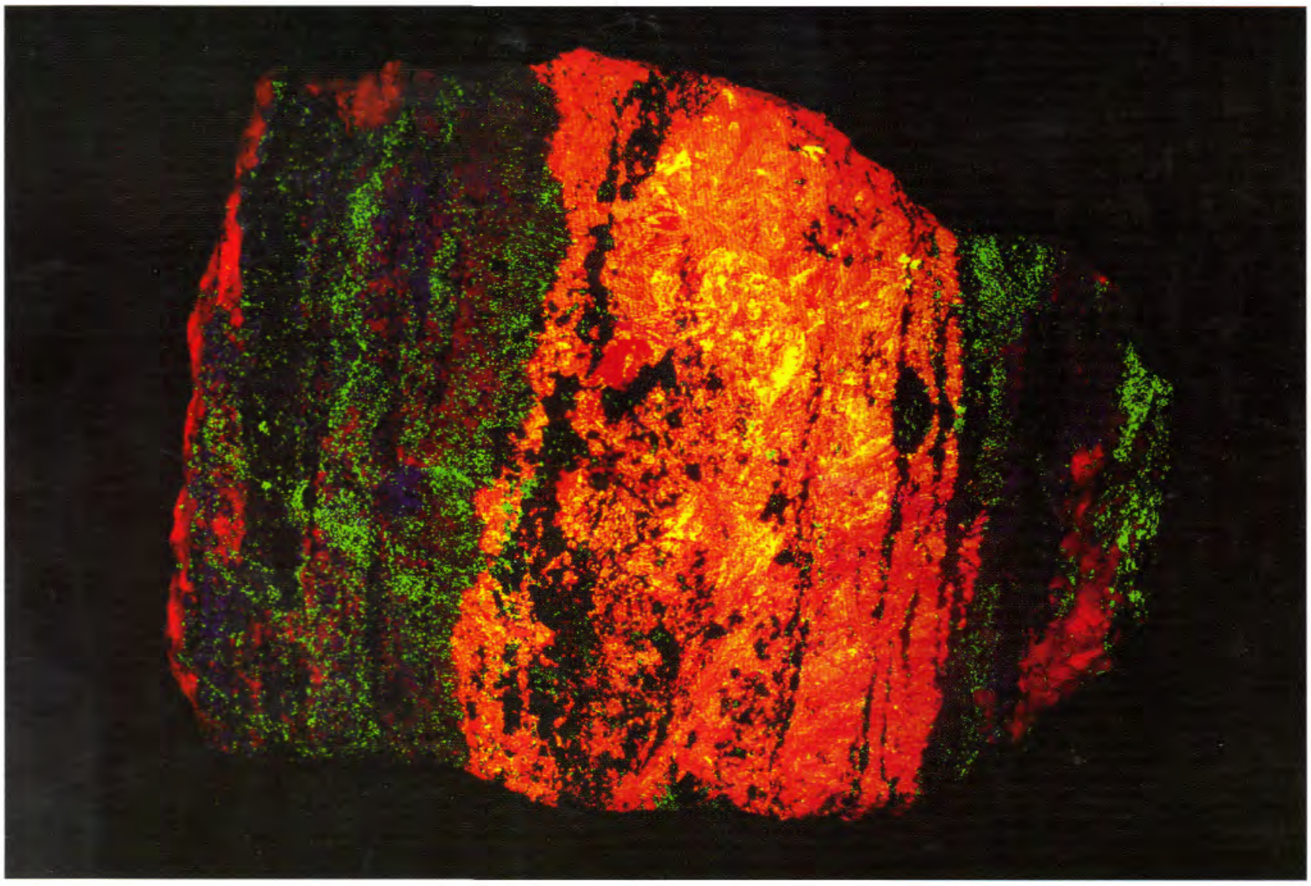

FRANKLIN WOLLASTONITE!

Also Inside This Issue:

- Fluorescent clinochrysotile from Franklin

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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.***

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THE PICKING TABLE

Vol. 45, No. 2—Fall 2004

About the Front Cover: The famous SPEX-Gerstmann First-Find wollastonite, reputedly the largest known example from this legendary Franklin, New Jersey, find. It resides at the Franklin Mineral Museum as the centerpiece of its 32-foot-wide fluorescent mineral display. Surrounding the massive orange-fluorescing wollastonite are willemite (green), hardystonite (blue), calcite (bright red), and bustamite (dull red). This specimen weighs more than 43 pounds and measures 16" x 10.5" x 5.5" thick (41 × 27 × 14 cm). The band of wollastonite measures 7" (18 cm) across. In 1996, the museum refused an offer of $40,000 for this specimen. Photo courtesy of the Franklin Mineral Museum.

Managing Editor
Mark Boyer

Editors
Richard C. Bostwick
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Tema J. Hecht
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Photo Editor
Gary Grenier

Production and Publishing
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
markaboyer@earthlink.net

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

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 2004 ACTIVITY SCHEDULE

Saturday, September 18, 2004
9:00 A.M. to Noon—FOMS Field Trip—Buckwheat Dump and Taylor Road Dump.
10:00 A.M. to Noon—FOMS Micro Group, Franklin Mineral Museum.
1:30 P.M. to 3:00 P.M.—FOMS Meeting and Lecture, Franklin Mineral Museum.
Dr. William Truran:
"Early Mining in the Wallkill Valley"

Saturday and Sunday, September 25 & 26, 2004
*48TH 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.

Swap and Sell, sponsored by FOMS, 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.

The FOMS Annual Banquet and Auction, 6:30 P.M. on Saturday at the Lyceum Hall of the Immaculate Conception Church, Main St., Franklin.

*The Sterling Hill Mining Museum "Garage Sale" on Saturday and Sunday from 1:00 P.M. to 3:00 P.M. Collecting on the Mine Run Dump and Passaic and Noble Pits from 9:00 A.M. to 3:00 P.M. on Sunday.

Saturday, October 16, 2004
9:00 A.M. to Noon—FOMS Field Trip—Collecting at Franklin Quarry, Cork Hill Road, Franklin, N.J.
1:30 to 3:00 P.M.—FOMS Meeting and Lecture, Franklin Mineral Museum
Derek Yoost:
"A History of Meteorites"

*6:00 P.M. to 9:00 P.M.—Night Dig, Mine Run Dump and Passaic and Noble Pits, Sterling Hill Mining Museum Foundation members only.

Sunday, October 17, 2004
9:00 A.M. to 3:00 P.M.—FOMS Field Trip—Collecting at Lime Crest Quarry, Sparta, N.J.

Saturday, October 30, 2004
*15th Annual ULTRAVIOLATION, a Show-Swap-Sell Session featuring fluorescent minerals only. "Keeping you in the dark for 15 years." Sponsored by the Rock and Mineral Club of Lower Bucks County.
First United Methodist Church,
840 Trenton Road, Fairless Hills, PA.
9:00 A.M. to 4:00 P.M.

Sunday, October 31, 2004
*9:00 A.M. to 3:00 P.M.—Mine Run Dump and Passaic and Noble Pits collecting and Outdoor Flea Market, Sterling Hill Mining Museum.

Saturday, November 6, 2004
*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 20, 2004
9:00 A.M. to Noon—FOMS Field Trip—Mine Run Dump and Passaic and Noble Pits, Sterling Hill Mining Museum.
1:30 to 3:00 P.M.—FOMS Meeting and Lecture, Franklin Mineral Museum
Carrie Papa:
"A Mile Deep and Black as Pitch: An Oral History of the Franklin and Sterling Hill Mines"

Saturday, November 20 through Saturday, November 27, 2004
*Holiday Sale of minerals at the Franklin Mineral Museum for FMM members.

Sunday, November 28, 2004
*9:00 A.M. to 3:00 P.M.—Mine Run Dump and Passaic and Noble Pits collecting 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 is 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, Inc.
P.O. Box 54, Franklin, N.J. 07416

Activities and Exhibits

The Franklin Mineral Museum has been quite busy on a number of fronts. Attendance is up, especially from weekend and holiday walk-ins. Our docents are doing a terrific job with their entertaining and informative tours and many visitors are coming back for more. This has a very positive effect on our staff and has inspired their ideas and creativity. Quiet time is put to good use polishing the brass (so to speak) and improving exhibits. Evidences of this are the frequently buffed lobby floors and the new mining theme exhibit in our mine replica "glass room." There visitors will now see a longwave ultraviolet exhibit of local fluorescent minerals and a mine scraper full of shortwave-fluorescent ore. Mannequins have been added and dressed like miners for realism. These improvements are the result of the inspiration of Bill Harpell and the hard work of our staff. I thank all of you for your show of pride in our museum and dedication to our many visitors.

Acquisitions and Sales

The museum has acquired a major mineral specimen for the exhibit. This specimen is a 5.5″ × 5″ × 4″ barysilite, and it is on display in the museum's Local Room with other barysilites. Two small collections were donated to the museum. One collection composed of Sterling Hill and worldwide minerals was donated by Mr. John Hoyer. John worked in the Sterling Mine in the mid to late 1960s. More recently Mr. Fred Shuster donated self-collected quarry minerals from the tri-state and New England areas. This collection has minerals from Oxford, Jenny Jump Mountain, Andover, Cranberry Lake, and other North Jersey sites.

By now most of us are aware that the old Lime Crest Quarry has changed ownership once again. The pumps have been shut off in the limestone operation, but the pegmatite is still being mined near the early Thomas A. Edison operation, and will be until the mining lease runs out in about 15 years. The new company is known as Crest Aggregates and is owned by Mr. Gene Mulvahill. The Franklin Mineral Museum was recently given permission by the owner to retrieve items of historic significance as well as other useful items, subject to his approval. Some very important photographs, letters, and paper items were recovered and will be important additions to our archives.

The Franklin Mineral Museum buys and sells minerals. Inquire at (973) 827-6671.

Museum Facilities and Grounds

We are proud to announce the lowering of "Jolly Green's" urinal in the museum men's room. It is hoped this will put an end to the graffiti! The museum's tired old heating system that has served us well for forty-plus years has been revamped. A new furnace was installed for the Local Room. The mine replica furnace was removed. The old in-ground gas tank was removed and an above-ground tank was installed at the edge of the museum parking lot. All-new gas lines were installed in and out of the building. Museum president Steven Phillips supervised the excavation and spent a good part of the day literally "in the trenches." The "Posse" (Paul Shizume, Mark Boyer, Claude Poli, and Greg Jacobus) re-landscaped and seeded the lawn under the supervision of Mr. Ed Henderson, our maintenance man. Earlier in the summer, a split-rail fence was installed around the ore car exhibit. Al Grazevich supervised the fence installation. His helpers were Greg Jacobus, Phillip Persson, and George Elling. ⚒

The museum's volunteer "Posse" at work. *Carol Cianciulli photo.*

News From Sterling Hill

Joseph Kaiser
40 Castlewood Trail
Sparta, NJ 07871

The Hesselbacher Room and the Oreck Family Mineral Gallery are two wonderful additions to the Sterling Hill Mining Museum tour. Their dedication is planned for this fall. It is hoped that the labeling of exhibits in the Oreck Gallery will be completed this winter.

John Kolic has been working in the pit getting good exposures of minerals, especially hydrozincite, which fluoresces brightly on a red-fluorescing calcite matrix. He has worked on the pillar opening by the "crazy calcite" and produced large crystals of willemite and franklinite as well as tons of "Christmas tree ore." This area will be a shining star for all those who come to the Sterling Hill Mining Museum fall night collecting event on October 16, 2004.

Dr. Earl Verbeek has been involved with the Sterling Hill Institute of Geoscience to provide instruction to earth science teachers. Word had spread so well that instead of the 15 teachers expected, there were 28 teachers accepted for the workshops. The mornings were spent in the Zobel Exhibit Hall explaining the relation between materials taken from the earth and end-products we use every day. Teachers spent all afternoon in the mine receiving instruction on the geology of the mine, safety features and practices that were in use when the mine was operative, and application of physics to the mining process.

Progress on the observatory has been painfully slow. Two years of applying for approvals had gone by and over $10,000 had been spent before the first work began late this summer. Hopefully by spring 2005 it will be ready to open. Bill and Denise Kroth will then be able to reclaim their living room after having the telescope stored there during the wait. Once the observatory is completed, students will have another avenue of science to explore and enjoy.

The Sterling Hill website, www.sterlinghill.org, posts updates on these and other events. ⚒

Field Trip Report: Lime Crest Quarry, Sparta, N.J.; 6-19-04

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

After a change in ownership, Lime Crest Quarry was graciously opened up to FOMS members. That is to say a part of the quarry was open; the rest was under many feet of blue water!

There was still a large contingent of members queued up in the parking lot waiting for the gate to be opened. Ed Wilk, our field trip coordinator, found a portion of the property that was not submerged, on the north end of the quarry. It was a separate excavation only two benches deep that had been started in the early 1980s, with minimal work done since that time. The current operations are only working the gneissic rock on top of the limestone; this is apparently what they have the mineral rights to mine. Therefore the cost to maintain the pumps for the lower marble zone was too high, and the main quarry is now the blue lagoon.

That being said, it was still fun to get in and collect, albeit in a very restricted portion of the quarry. The best way I can describe the area is as a rectangle with a ramp entry down to the floor and large gneissic boulders demarcating the outline of this area on the surface. Collecting was allowed from surface to floor. Several people focused on the large boulders, working on extracting the red almandine garnets present within the white feldspar bands. The largest plate removed was almost one half meter across with about 50 2- to 3-cm flattened garnets on its surface. Incidentally, there appear to be two species of feldspar present that in shortwave ultraviolet fluoresce blue and magenta. While we were checking this area out, several boulders of dark pegmatite were found to contain numerous crystals of allanite from 1 to 3 cm across. In a pile of dark gneissic rock were smaller rocks that had some euhedral almandine crystals with partially intact faces embedded in the feldspar and quartz. A specimen of gneiss with a fracture surface covered in what appears to be a zeolite-like mineral in white radial crystals to 2 cm was submitted for analysis by the author to the Franklin Mineral Museum.

In the marble proper, a few small patches (1 to 2 cm in diameter) of secondary copper mineralization were present. These appeared to be the remnant of sulfide oxidation, leaving behind malachite and chrysocolla. Some of the orange colored calcite in the southeast corner was collected for its striking color and also for a moderate pink response to shortwave ultraviolet light. Several pockets of small calcite crystals were brought out, the crystals being less than 1 cm long. A strange habit for uvite was found, in brown radiating masses up to 6 cm across, but with individual crystals only 1 mm thick. Two other uvites were found as the more common equant crystals, up to 4 by 5 cm. Many collectors went home with examples of the abundant phlogopite mica, of several colors but mainly tan, and in masses up to 15 cm across. Some norbergite bands up to 5 cm thick were discovered. A few collectors, including me and my son, started out their morning adventures in the northeast corner of the quarry on a productive pile of dirt and boulders. When I first walked onto this pile another collector had discovered some small corundum crystals (to 1 cm), that in cross section were described to me like a little watermelon with a green rind and red-purple core. These were on small rock fragments found loose in the dirt pile between much larger boulders of marble, so the search was on. As I went to the top of this pile what should greet me but the gruesome sight of a freshly disemboweled woodchuck. Apparently we had disturbed a hawk's breakfast meal which was left in haste for us to discover. Not wanting to leave this evidence out in plain sight, it was decided that I should move the woodchuck corpse out of the area so people could collect without tripping over it. It was still very fresh and fortunately odorless so it was placed several yards behind the pile. Then I looked down at the exact spot where the woodchuck lay and there was the most unusual specimen I saw that day, a 4 by 5 cm olive-colored uvite crystal. This was with a 1-cm purple corundum with a green serpentine rim, phlogopite plates, micro rutile, graphite, and pink zircon; one side of the specimen was part of a slip face that was very smooth. Later that day after many people had worked the area, and being told there was nothing left, my fellow collector kicked the dirt at his feet and found the other half of the specimen and it fit together perfectly. So that is the story of the woodchuck and the uvite.

As a whole there were only sporadic finds for those who looked carefully. Again I must remind all of us that it is a privilege to be able to collect in any commercial working property in our state, and we are grateful to those who worked hard to make this trip happen for FOMS. ⚒

Miners Day and Volunteer Appreciation Day
Sunday, May 2, 2004

Tema Hecht
600 W. 111th Street
New York, N.Y. 10025

This Miners Day the weather turned out to be cloudy and threatened rain, but none of us let that dampen our spirits. Once again the Franklin Mineral Museum did an outstanding job hosting the festivities for the day. It seems that the museum even ordered Mother Nature not to rain on our parade!

Our Master of Ceremonies, Richard Bostwick (or Dick, as most of us call him), said that he was "tickled to pieces" to see more of the Franklin community present than we have had here in a long time. Dick stated that there was a real community theme this day, since the curators of all three area museums were present: Mr. John Cianciulli of the Franklin Mineral Museum; Ms. Betty Allen of the Franklin Historical Society; and Dr. Earl Verbeek of the Sterling Hill Mining Museum. Distinguished guests present included the Mayor of Franklin, Doug Kissell, and Steve Oroho (township committee), and Gilbert "Socko" Schneider. Dick went on to say, "I have developed more of a sense of what America means by being here in Franklin."

We all stood for the Pledge of Allegiance and for the Star Spangled Banner, which was performed by the Franklin Band, conducted by Ron Bobiak. After the opening ceremonies, the Franklin Band performed a selection of pop standards and a medley of Disney themes.

Steve Phillips, the president of the Franklin Mineral Museum, thanked everyone for coming out and introduced the museum's staff. Franklin school superintendent Dr. Tom Turner announced the three winners of the Science Fair Awards. Two students were present: Donald Post, from the Franklin Elementary School, whose topic was "Smoke on the Water," and Kylie Repasy, from the Hardyston School, whose topic was "Modern Medicine Versus Herbal Treatments." The third winner, Hannah Katterman, from the Immaculate Conception Regional High School, received her award for excellence in science.

Dick Bostwick recognized many miners' wives and relations and said that there are almost no original Franklin miners left. Miners present today included Ron Mishkin, who worked at the Franklin Mine shortly before it closed, and his friend George Napuda with whom Ron had worked at the Richards and Scrub Oak mines; Jack Baum, who joined the New Jersey Zinc Co. in Franklin as a geologist in 1939; Bob Metsger, the head geologist at the Sterling Hill Mine; and Tom Sliker who came to work at Sterling Hill in 1940 and was the mine boss when it closed in 1986. Dick also introduced other Sterling Hill miners and their wives, including John Antal, John Falkenbach, Andy Gangarcik, Al Grazevich, Rich Gunderman, "Little Joe" and Sandy Mancik, Ron Riley and his wife, Paul Rizzo, Steve and Jane Rowan, and our Master of Ceremonies. Once again we owe Al Grazevich a very special thank-you for tracking these men down and inviting them to this annual event. Other former N.J. Zinc Co. employees present included Richard Ramage, in charge of mine safety; Elmer Ottens, head electrician; Richard Smith, shop boss; and Jan Hernandez from personnel.

John Bauer then gave an eloquent speech about Mildred Harding, after whom the new pavilion is named. Ms. Harding was a history teacher, and Mr. Bauer was once her student. He spoke about her vast contributions to her students and to the community as a whole. Dr. Tom Turner also spoke about Mildred Harding's contributions to Franklin and mentioned that there are "ripples" that can affect others and future generations.

Our Master of Ceremonies spoke about the Franklin Mineral Museum's Hall of Fame award. He explained that the Franklin community was and is a good collection of honorable people, which has included not only scientists, but also mine bosses who would let the miners take home specimens as long as they fit into their lunch buckets. Dick stated that the collector has been neglected in the community but he understood that, since collectors can be pretty scary. "Speaking of ripples," Dick said, "my benefactor was Ethel Packard Cook," who took the nickname "Sunny." Dick stated that he is one of the ripples that was made by Sunny, as she was his mentor. He continued, "Here we have the first out-and-out collector who has been elected to the Hall of Fame!" Dick went on to explain how after Sunny got divorced, she took her three children to California, where she met Tom Warren of Ultra-Violet Products, Inc. Sunny went back and forth between California and Franklin, eventually becoming an expert in the fluorescent minerals of Franklin and Sterling Hill. She gave her mineral collection to the Franklin-Ogdensburg Mineralogical Society, of which she was a founding member, in trust for a museum. Several years later that collection went to the Franklin Mineral Museum. "That's vision!" stated Dick. "This was a mineral heritage, rich and demanding, and deserved a sacrifice." Dick introduced the family and friends of Sunny Cook who were present: Ralph Southwick, Karen and Paul Rudnicki, Rebecca Southwick, Dot Lane, Alden Southwick, David Southwick and his friend Jalna, Art Frost and his wife Mary, and their daughters Emma and Mariah.

The Master of Ceremonies concluded Miners Day and Volunteer Appreciation Day by giving everyone his blessing and the Boy Scout salute. ⚒

Dr. Tom Turner presents a Science Fair award to Hardyston School's Kylie Repasy. *Tema Hecht photo.*

John Bauer, son of N.J. Zinc Co. chemist Lawson Bauer, speaks about Franklin school teacher Mildred Harding, for whom the museum's new pavilion is named. *Tema Hecht photo.*

Retired N.J. Zinc Co. geologists Bob Metsger and Jack Baum. *Mark Boyer photo.*

The family and friends of "Sunny" Cook, this year's museum Hall of Fame honoree. *Tema Hecht photo.*

Wollastonite From Franklin, New Jersey

Richard C. Bostwick
600 W. 111th St., Apt. 11B
New York, NY 10025

Introduction

Wollastonite is one of the most attractive fluorescent minerals of the Franklin–Sterling Hill district, where it exhibits a remarkable range of form, associations, and fluorescence. Other than the ubiquitous green-fluorescing willemite and red-fluorescing calcite for which the area is famous, wollastonite is one of the most widely distributed fluorescent minerals at both the Franklin and Sterling Hill mines. Its fluorescence ranges from pale greenish yellow through orange-yellow and yellow-orange to deep orange and is best seen under shortwave ultraviolet (UV) radiation. Throughout this article, observations of mineral fluorescence have been made under shortwave UV unless specified otherwise.

As Franklin and Sterling Hill wollastonite is almost always associated with calcite, and occasionally with willemite and other fluorescent minerals, specimens are usually quite attractive "under the lamp." At Franklin more than anywhere else, there are many visually distinctive types of wollastonite that are eagerly sought by collectors. Describing and illustrating these many "finds" is the purpose of this article. While not all of them are equally spectacular, the finest examples of Franklin wollastonite are among the best fluorescent specimens in the world: shockingly bright and vibrant with contrasting fluorescent colors of orange, red, green, and violet.

General Background

Wollastonite, $CaSiO_3$, is common in certain geological settings, where it is generally a nonfluorescent or weakly fluorescent industrial mineral whose most important property is that it breaks into elongated grains when crushed. This makes it useful as a binding material and as reinforcement in ceramics, plastics, and cement. In this connection, the New Jersey Zinc Company (NJZ) once imported industrial-grade wollastonite from Willsboro, New York, for trial processing in the Franklin mill. The attempt was unsuccessful, but examples of Willsboro wollastonite worked their way into many Franklin collections, where they lurk to confuse the unwary. Willsboro wollastonite may be differentiated from Franklin wollastonite by its weak pink fluorescence under shortwave UV, its pale orange-yellow fluorescence under longwave UV, and the lack of associated calcite, willemite, and other Franklin "markers."

Wollastonite is found worldwide as a rock-forming mineral and is generally formed where there is a local abundance of calcium and silicate ions that react at high temperature and pressure. This most often happens when a silicate-rich melt invades carbonate rock and creates skarn deposits, or when sedimentary rock such as siliceous limestones, or limestones containing silica-rich layers, are metamorphosed. The latter is the case for most wollastonite at Franklin and Sterling Hill. At both zinc orebodies wollastonite formed near the ore, generally within the "manganese halo" that surrounds the silica-rich zinc-iron-manganese orebodies and penetrates the Franklin Marble for a distance of several meters. An exception to this rule is the distinctive fibrous wollastonite from Franklin, which was found within the orebody in one of the hydrothermally affected areas often characterized as an altered calcium silicate or "Parker Shaft" assemblage.

There are differences of opinion about how the mineral's name should be spoken. Among Franklin and Sterling Hill collectors it is traditionally pronounced with the accent on the second syllable: "wuh LASS ton ite." William Hyde Wollaston (1766–1828) was a distinguished English mineralogist and chemist, and one would suspect he would have been horrified (though perhaps not surprised) at his name being thus mangled by the colonials. The true pronunciation is with the accent on the first syllable, the first two syllables together being pronounced like the name "Wallace."

Fluorescence of Wollastonite From Franklin and Sterling Hill

Pure wollastonite does not fluoresce. Manganese, omnipresent in the zinc orebodies at single-digit percentage levels, is the activator of fluorescence in Franklin wollastonite, as well as willemite, calcite, esperite, clinohedrite, various members of the apatite group, and several other brightly fluorescing minerals associated with these orebodies. As is the case with calcite, the amount of manganese in wollastonite affects fluorescent hue, saturation, and intensity, fluorescent qualities that are best seen under shortwave UV. In general, the more manganese, the brighter and more orange the fluorescence. With low percentages of manganese, the fluorescence of wollastonite is a weak, pale (i.e., unsaturated) greenish yellow. With gains in manganese the fluorescence becomes brighter and more intensely orange. Wollastonite from the first Franklin find, which has the most saturated orange hue of any Franklin-area wollastonite, has been analyzed as having 6.9% MnO (Baum, 1972), which translates to around 5.4% manganese by weight.

One curious aspect of the relative fluorescences of wollastonite and calcite is that when the two are found together and both fluoresce, at Franklin or elsewhere, wollastonite fluoresces brighter. The cause is not known but may represent partitioning of manganese into wollastonite during metamorphism, as the wollastonite formed and the surrounding calcite recrystallized. One such example was seen in place underground at Sterling Hill by the author (Robbins, 1983). There the calcite near the ore fluoresced brightly until wollastonite appeared. At the juncture of wollastonite-free and wollastonite-rich marble was a narrow zone of orange-fluorescing wollastonite in a matrix of red-fluorescing calcite, after which (moving away from the ore) the fluorescence of the calcite disappeared while fluorescence of the wollastonite went by degrees from a fairly bright yellow-orange to a moderate orange-yellow, then a weaker yellow. Another example is the large rounded grains of wollastonite enclosed in calcite, known from both mines. These grains usually fluoresce orange (manganese-enriched) around their rims and orange-yellow to greenish-yellow (with less manganese) at their cores.

Franklin wollastonite, whether it fluoresces orange, yellow-orange, orange-yellow, yellow, etc., has a bright and short-lived orange phosphorescence. This is referred to by collectors and in the amateur literature (e.g., Cook et al., 1958) as a "flash." More recently the term "BIP" for Brief Intense Phosphoresence has been used (Bostwick, 1999). This orange phosphorescence is similar in duration and initial brightness to the orange-red phosphorescence of the calcite with which wollastonite is frequently associated.

Franklin and Sterling Hill Wollastonite: Overview and Comparison

Most Franklin wollastonite fluoresces orange and is coarse-grained, while most Sterling Hill wollastonite fluoresces yellow-orange to yellow and is fine-grained. However, as mentioned above, both localities have produced specimens with larger wollastonite grains that fluoresce orange around the rim and orange-yellow to greenish-yellow at their centers. Sterling Hill is also noted for specimens in which the fluorescent hue of individual wollastonite grains shifts, grain to grain, from one side of the specimen to the other. Although Sterling Hill wollastonite is typically much more fine-grained then Franklin wollastonite, masses measuring in the tens of centimeters (eight inches or more) are known from both mines.

In daylight, wollastonite from Franklin and Sterling Hill is usually white to gray, much the same color as the calcite commonly associated with it. A sharp eye is needed to pick out wollastonite under natural light, and it is difficult to spot underground without a portable UV lamp. Wollastonite was found late at Franklin and Sterling Hill and is not listed in the 1935 Franklin "bible," Charles Palache's *The Minerals of Franklin and Sterling Hill, Sussex County, New Jersey*. Wollastonite was discovered in this area in 1939 or 1940, when it was noticed by NJZ geologist John L. Baum in older drill cores from Sterling Hill, during a study of insoluble residues in the Franklin Marble (June 11, 2003, letter from JLB). Baum subsequently found wollastonite in place at 1020 N. crosscut on 900 level at Sterling Hill, and he described its fluorescence as "a pink white of the same intensity as the blue white response of Franklin microcline" (Baum, 1972). In other words, the very first finds of wollastonite from the Franklin–Sterling Hill district were not particularly attractive under UV and were considered a curiosity rather than a bonanza for collectors.

This changed with the discovery of wollastonite at Franklin in mid-1944, which yielded large masses of bright orange-fluorescing wollastonite that are still considered among the world's finest fluorescent mineral specimens. After 1944 the miners knew what to look for, and from then until the closing of the Franklin mine 10 years later the search was intense and productive, yielding several assemblages of recognized wollastonite and others that were initially misidentified as pectolite. At Sterling Hill the recovery of fluorescent wollastonite didn't begin in earnest until the 1970s but continued until the mine closed in 1986, then started again in 1989 as part of the mineral recovery efforts of Richard and Robert Hauck of the Sterling Hill Mining Museum. Once the Sterling Mine filled with water, specimen prospecting continued on the surface, and fluorescent wollastonite can still be collected there in place on the saddle between the Noble and Passaic Pits.

Calcite is the matrix for most Franklin and Sterling Hill wollastonite. In Franklin wollastonite specimens, the associated calcite fluoresces red with a hint of orange under shortwave UV, a fluorescence typical for calcite from these mines. At Sterling Hill the fluorescence of the calcite matrix varies with the fluorescence and manganese content of the wollastonite. If the wollastonite fluoresces orange to yellow-orange, the calcite will usually fluoresce red similar to that of the calcite found with Franklin wollastonite. Where Sterling Hill wollastonite fluoresces orange-yellow to yellow, the calcite will generally be poorly fluorescent or nonfluorescent.

Associated fluorescent minerals give variety and interest to the various wollastonite assemblages from both mines. Green-fluorescing willemite is common in some of the Franklin wollastonite assemblages and rare in others, while in Sterling Hill wollastonite specimens, willemite is restricted to a few limited but memorable finds. At Franklin, depending on the assemblage, wollastonite can also be associated with some of the more unusual fluorescent minerals characteristic of the deposit: clinohedrite and hardystonite in the earlier finds, and brightly fluorescing barite in the most abundant find. The peculiar and distinctive fibrous form of Franklin wollastonite occurs in an altered calcium silicate assemblage with the rare fluorescent minerals margarosanite and minehillite. At Sterling Hill, though wollastonite typically is found with calcite and no other fluorescent minerals, it can be associated with fluorescent willemite, and rarely with other fluorescent minerals such as fluorapatite, chabazite, powellite, and monohydrocalcite.

Collecting Franklin and Sterling Hill wollastonite in all its forms and assemblages can be a dream project, or a nightmare, as while Sterling Hill wollastonite can still be field-collected today, some of the rarer Franklin and Sterling Hill varieties are nearly impossible to obtain. With Franklin's notoriety as a wollastonite locality, it is easy to overlook the fact that Sterling Hill has been a more prolific producer of wollastonite specimens. Sterling Hill wollastonite has its own history, merits, and legendary finds, and these will be dealt with in another article.

Wollastonite at Franklin

The first find of wollastonite at Franklin in 1944 was the most spectacular, yielding specimens which to this day set the standard for fluorescent wollastonite and are among the most beautiful fluorescent mineral specimens known. Over the next 10 years, many other finds followed. In the 50 years since the closing of the Franklin Mine in September 1954, collectors have informally sorted Franklin wollastonite specimens into six visually distinctive categories that carry weight among collectors and in the mineral marketplace. These categories, capitalized in this article, are time-based (Original Find, First Find, Second Find, and Third Find), descriptive (Fibrous), and locality-based (Dump Find). Some of these categories, notably First Find, are backed up by specimen labels and descriptions in the literature as having been found in a particular place at a certain time. In other cases little or nothing is known of the original occurrence or occurrences except through collectors' lore or miners' anecdotes, so the category is based more on resemblances among specimens. The purpose of this article is not only to describe the different Franklin wollastonite categories, but also to correlate specimens by appearance with what is known of their origins and relationships underground.

It has to be made clear at the outset that no one today knows how many actual wollastonite "finds" there were at Franklin, in the sense of a group of specimens found in a particular locality underground, such as a certain pillar slice a known number of feet from a specific level of the mine. In most cases we don't know the names of the miners who made these finds. Nor is it possible to say whether visually distinctive types of Franklin wollastonite were found once in one such workplace, or over time in a series of adjacent workplaces. Mine coordinates exist for some of the distinctive types, but only the Franklin First Find of 1944 was carefully recorded and described by a trained geologist and eyewitness, John L. (Jack) Baum. As nearly all the Franklin miners who brought out wollastonite are beyond being interviewed and kept no written records, it is now impossible to know as much as we would like about who found our prized wollastonite specimens, and where, and when. It's a shame that the collectors (the author included) who knew and patronized these miners should have devoted so much energy and money to acquiring specimens, while ignoring what the miners could have told us.

Most of what we do know about where wollastonite was found in the Franklin Mine comes from a few labeled specimens, and a short article in *The Picking Table* by John L. Baum (Baum, 1972). At Franklin, wollastonite was found in a limited number of places, most of them close to the ore or in it. In the case of the First Find, Franklin wollastonite seems to have been consistent in its relationship to the ore from cut to cut, and may have been found in the same pillar over a vertical distance of more than a hundred feet. While this hints that Franklin wollastonite could have been more consistently and widely distributed than is known, there are several reasons why Franklin wollastonite specimens are comparatively rare. One is that by 1944, the bulk of the Franklin orebody had been mined out. Another is that because the Franklin orebody had a simpler structure than the Sterling Hill orebody, mining strategy did not require drifts or other excavations into the adjacent Franklin Marble as often as at Sterling Hill, and it is in the adjacent marble that wollastonite was usually found. In his 1972 article Baum describes two finds of Franklin wollastonite "in the hanging wall at the contact of the ore with the marble to the East;" in other words, close to the ore but not in it. A third reason is that fluorescent wollastonite is difficult to find without a shortwave UV lamp. While the existence of luminescent minerals (e.g., phosphorescent diamonds) has been known for millenia, and some Franklin minerals (notably willemite) were reported as fluorescent before 1900, shortwave UV lamps that were both practical and portable were not available until the 1930s.

Lawson Bauer had an iron-arc unit in his NJZ lab in the 1920s, for research and occasionally for the entertainment of visitors. Although iron-arc units were used on the Franklin picking table and in the mill to find willemite and thus distinguish ore from waste rock, iron-arc units were bulky and line-operated and certainly not portable (Gaines and Bostwick, 1993). Ultra-Violet Products, Inc., located in greater Los Angeles, developed the M-12 Mineralight® lamp in the late 1930s, primarily for scheelite prospectors in the American West. The M-12 was powered by a 12-volt lantern battery, and would fit in a miner's lunchpail or an oversized pocket. In terms of a miner's wages the M-12 was expensive, and the New Jersey Zinc Company frowned on their use by anyone other than staff. However, Tom Warren of Ultra-Violet Products, Inc., developed an arrangement with John Obert, a New Jersey collector and part-time mineral dealer, to trade M-12s to the miners for minerals. Between the early 1940s and 1954 a lot of Ultra-Violet Products' lamps went east, and minerals west. There is no question that the M-12 was a significant force in driving mineral collecting underground during the last 15 or so years of mining at Franklin.

Franklin wollastonite is not colorful or conspicious except under shortwave UV, and while a discerning eye can detect the difference in cleavage and luster, wollastonite and calcite at Franklin and Sterling Hill looked much the same in the beam of a miner's cap-lamp. A Franklin miner without an M-12 Mineralight would have had little reason to pick up a piece of wollastonite, and of course the miners who had M-12s spent their spare time looking in the ore for known fluorescent minerals, in assemblages easier to spot with a cap-lamp. Between the iron-arc units used on the picking table and in the lab at Franklin, and the argon bulbs, NiCo lamps, and other sources of UV then commercially available to rockhounds, by the late 1920s many Franklin miners were becoming familiar with the appearance in daylight of fluorescent classics like hardystonite, calcium larsenite (now esperite), margarosanite, and others. However, if miners at Franklin before 1944 had drilled into solid wollastonite, all they might have noticed was that their drill bits were wearing out faster than usual. Needless to say, we should be grateful to the select number of observant NJZ workers who made it possible for us to cherish what specimens we have.

Franklin Wollastonite Finds: Background and General Discussion

Again, these are the terms here used for Franklin wollastonite occurrences: "First Find," "Second Find," "Third Find," "Original Find," "Dump Find," and "Fibrous" wollastonite. These terms are derived from collector usage, and (with the exception of the last) are based on what is known about where and when different groups of specimens were found. The actual groupings of specimens are based primarily on their appearance. If it were possible to assemble multiple examples of all the different types of Franklin wollastonite in one room, and then sort them into "affinity groups" by visible light and under UV, these are the groups that would emerge. This is not to say each group or category is precisely defined; specimens in the Second-Find category are quite variable in appearance, and the Dump-Find category consists at present of two visually distinctive finds and is subject to enlargement if more finds emerge. However, as a practical matter, First Find, Second Find, etc. will prove useful to the collector, and help reduce confusion rather than increase it. Please note that within local circles, the word "wollastonite" is commonly dropped when using these terms, as in, "Bill's got three Second Finds in his collection."

When this author began collecting in 1960, Franklin wollastonite specimens were divided into two groups: the legendary early or First-Find wollastonite, and the common or garden variety, blocky medium-sized grains of wollastonite in calcite, associated with fluorescent barite. Specimens from the first find were nearly as legendary as dragons among beginners because so many had never actually seen one. Few people owned them, and they rarely changed hands for any price. In contrast, wollastonite with barite (now called Third-Find wollastonite) was abundant and commonplace. Decent 2″ × 3″ specimens could be bought for less than $10, and display pieces for $25. There were miners living then who said that much of this material had been found in the last few years of the Franklin Mine.

After visiting more collectors to see what they had, it became apparent to the author that the "First-Find" designation, which originally meant any Franklin wollastonite other than the standard wollastonite with barite, covered at least two groups of specimens that were quite different in appearance from each other. Pieces that could be tied directly to the initial find shared certain features, notably having solid masses of wollastonite with uniform orange fluorescence, often associated with a selvage of weakly fluorescing bustamite. Other so-called "First-Find" pieces had wollastonite in irregular masses and grains, often rounded, which fluoresced orange around their rims and orange-yellow toward their centers. Generally there was a fair amount of hardystonite in these pieces, and many examples were rich in weakly fluorescing barite. This variably fluorescing wollastonite with hardystonite and barite has come to be known as Second-Find wollastonite. While no one knows exactly when Second-Find wollastonite appeared, many of these specimens were found in the collections of miners who had First-Find pieces. Hence Second-Find wollastonite is generally supposed to have been found near the initial find, and before what we now call Third-Find wollastonite. Some collectors still consider First-Find and Second-Find wollastonite to be part of the same assemblage, connected closely in time and space to the documented 1944 find. However, while it is not known whether Second-Find wollastonite is from one working-place or several, one example at least is labeled as having come from a locality hundreds of feet from the First-Find locality.

What we now call Third-Find wollastonite is by far the most abundant of the Franklin finds and is the type found in most collections: blocky, often rectangular grains of uniformly orange-fluorescing wollastonite in red-fluorescing calcite, with smaller grains of cream-fluorescing barite. We know this find to have been made in 1947. Its relative abundance suggests that this locality may have been exploited for some time after its discovery. Many miners considered this material to have been found later in time than the rare First-Find specimens.

First-, Second-, Third-, and Dump-Find wollastonite were the only types known to be wollastonite when the Franklin Mine closed in 1954. Years later, two types of orange-fluorescing Franklin "pectolite," from assemblages quite different in appearance from the established wollastonite finds, were re-examined and found to be wollastonite. One type actually looks like classic pectolite from other localities, being fibrous and of radiating habit. This is what we now call Fibrous wollastonite; it is part of the remarkable minehillite assemblage. Here the locality in the mine and the date (1951) were recorded, while the identification of the fibrous mineral as wollastonite was published over 20 years later (Parker & Fainberg, 1975). The other "pectolite," now called Original-Find wollastonite, is something of a mystery. Its locality underground and date of discovery apparently were not recorded, and the details of its re-identification have not been published. Collector lore places its emergence onto the market in the mid-1930s, and old-timers will recall seeing this material labeled "pectolite with clinozoisite," though apparently neither mineral is now believed to be present in this assemblage. While the orange fluorescence of this material was less bright than that of typical Franklin wollastonite, specimens were still valued for their rarity. Once this supposed pectolite became known as "wollastonite," and the date of its discovery was placed prior to 1944, specimens became more desirable to collectors. It was hailed by some collector/dealers as the only, true, original "*First*-Find" wollastonite, as if this diminished the glory of the 1944 find. Marketing pressure spawned "First First-Find" wollastonite, one of the odder terms in the long and tortuous history of Franklin–Sterling Hill mineral nomenclature. "Early Find" was also suggested, but collectors seem to have settled on Original Find.

The unlovely but accurate term Dump Find covers any wollastonite found on the surface in Franklin, in material removed from the Franklin Mine and discarded. There are two such confirmed finds, with a very limited number of specimens between them. Now we move on to a consideration of each find.

First-Find Wollastonite

Luckily this find was recorded in detail by John L. Baum, Franklin's equivalent of what Japan would call a National Living Treasure. Jack wrote up this find in 1972 for *The Picking Table*. In his account he begins by remarking that the first discoveries of wollastonite in the area were at Sterling Hill, first in a drill core and then in place in the 1020 North crosscut on the 900 level, 70 feet east of the West limb of the orebody. Then he goes on to Franklin:

> The first find here was made in mid 1944 and was the most spectacular. Art Watt, the Mine Captain, a position between the Mine Superintendent, C. M. Haight, and the ten shift bosses, observed the nearly vertical band of wollastonite on the wall of a working place called the 710 North top slice, 70 feet below the 600 ft. level, in disseminated lean ore 12 feet East of a pegmatite on the footwall. He gave it to the author for identification, and study of specimens obtained from the working place and again from the succeeding working places below, show a well defined band of wollastonite a few inches thick containing disseminated garnet and minor franklinite and willemite. The band was bordered locally by gray bustamite. The mineral is opaque white, and the grains have an irregular outline, tending less toward elongate than the Sterling material, from which they also differ in developing larger grains, some being half an inch long and a half inch wide. On the fracture surface they display the same semi fibrous appearance commonly observed in bustamite.

According to Baum (letter to the author dated June 11, 2003), the specimen that should qualify as the only true "*first* First Find" was the 3″ × 4″ piece of "strange calcite" Art Watt gave him for identification. Jack went to 710 North the next morning and secured two large pieces of wollastonite. The one Jack kept intact is the second-largest piece of wollastonite in the fluorescent display of the Franklin Mineral Museum.

In the George Elling collection is a specimen of wollastonite with bustamite that appears to match Baum's description. George calls this his "Franklin Rosetta Stone." It is from the collection of Allen W. Pinger, another NJZ geologist, and bears his label that is dated September 7, 1944. It locates the specimen at "680-N Pil, 650 Lev." The center line of 680 North stope slice pillar was 30 feet south of 710 North top slice, so if the specimen had been collected right at 650 level, Pinger's piece was found roughly 30 feet south of and 20 feet higher than the initial First-Find pieces, and collected several months later (Baum had mapped the initial wollastonite locality on June 19 [Fig. 1]). Since a pillar slice ran from footwall to hanging wall and these slices were 30 feet wide, it isn't possible to be precise about the distance between the two localities. However, coupled with Baum's observation (Baum, 1972) that wollastonite was found in "the succeeding working places below" the slice in 710 North where it was initially found, it appears that wollastonite was a consistent feature in this part of the orebody over a moderately large area.

First-Find pieces are distinguished by large, solid, medium-grained masses of wollastonite that fluoresce uniformly bright saturated orange under a shortwave UV lamp. That hue has also been called "deep orange" and "pumpkin orange." The associated minerals are calcite, andradite, willemite, bustamite, small amounts of hardystonite, and traces of clinohedrite. Where specimens show both sides of the wollastonite "band" mentioned by Baum, the wollastonite is flanked on one side by a mixture of andradite and calcite, and on the other by a border or band of pale gray bustamite which in turn is flanked by massive calcite. This bustamite border or band is generally 2 to 3 cm (0.75″ to 1.25″) thick and fluoresces moderately weak deep red under shortwave UV. The calcite fluoresces moderately bright red, less intense and orange-tinted than much Franklin calcite. Green-fluorescing willemite in small grains is scattered through the assemblage, though it is usually concentrated along the edges of the bustamite band. Where hardystonite is present, it is along the boundary between bustamite and calcite or within the bustamite. Cleavages in bustamite near hardystonite may show thin clinohedrite coatings. Not all specimens with solid, uniformly fluorescing wollastonite include that bustamite border, though many larger First-Find specimens do. Obviously a specimen from the middle of the wollastonite band or the side without bustamite would lack it. Also, as Baum says, that bustamite border was found locally while the band of wollastonite continued at least several cuts farther down in the same pillar.

We can probably assume that wollastonite of this description was collected for at least several slices below that where wollastonite was first found. According to Baum (letter of June 11, 2003), the "numerous earthshaking specimens" recovered by Harry "Bake" Hardy were from one slice below the original locality. There are no numbers attached to Hardy's haul, but it included the largest wollastonite in the Franklin Mineral Museum fluorescent display, and other specimens now in the collections of William Kroth and Elna Hauck.

There are not many First-Find wollastonite specimens of significant size, probably fewer than twenty that show up well in a public display. The two largest specimens known to the writer are those already mentioned as being in the Franklin Mineral Museum, where they agitate collectors and thrill thousands of visitors every year. One of these (Fig. 2) was donated to the museum in 2002 by Jack Baum and is 30 × 26.5 cm (12″ × 10.5″) on its display face. The other specimen (front cover), said to be the largest and most spectacular Franklin wollastonite in existence, is from the SPEX-Gerstmann collection and is described by Frank Edwards in an editor's gloss (*The Picking Table*, Vol. 13, No. 1, p. 6) on Jack's *Picking Table* notes:

> The most spectacular specimen I have seen is the centerpiece in Ewald Gerstmann's fluorescent display. The piece is about 12″ × 18″ × 10″ thick, of which an area 12″ × 12″ is almost solid wollastonite, the other 6″ × 12″ adjoining the wollastonite is a mixture of ore (calcite, willemite, franklinite) and garnet. This piece, and several others, were personally collected by Harry Hardy from the first locality described above.

Recent measurements by Mark Boyer and John Cianciulli give a slightly smaller size of 16″ × 10.5″ × 5.5″ thick (40.5 × 26.5 × 14 cm) for this piece, though it is so impressive one can't blame Frank Edwards for overestimating. Jack Baum brought out one other very large First-Find wollastonite, but it was broken up. One piece went to Lawson Bauer for the fluorescent display in the NJZ laboratory and can be tracked as far as the Sterling Mine offices prior to the closing of the mine in 1986. Jack has said that some smaller specimens from his broken piece were traded out West, but their whereabouts are not known. However, Jack kept one, a superb specimen, 16 × 8 cm (6.25″ × 3.25″) in size, that is still in his collection and was photographed by Henry Van Lenten (Fig. 3).

Two moderately sized examples of First-Find wollastonite can be seen in the Zobel Hall fluorescent display at the Sterling Hill Mining Museum. One is a rectangular, solid specimen 18 × 10 cm (7″ × 4″) in size, informally known as "The Brick" (Fig. 4). The specimen is

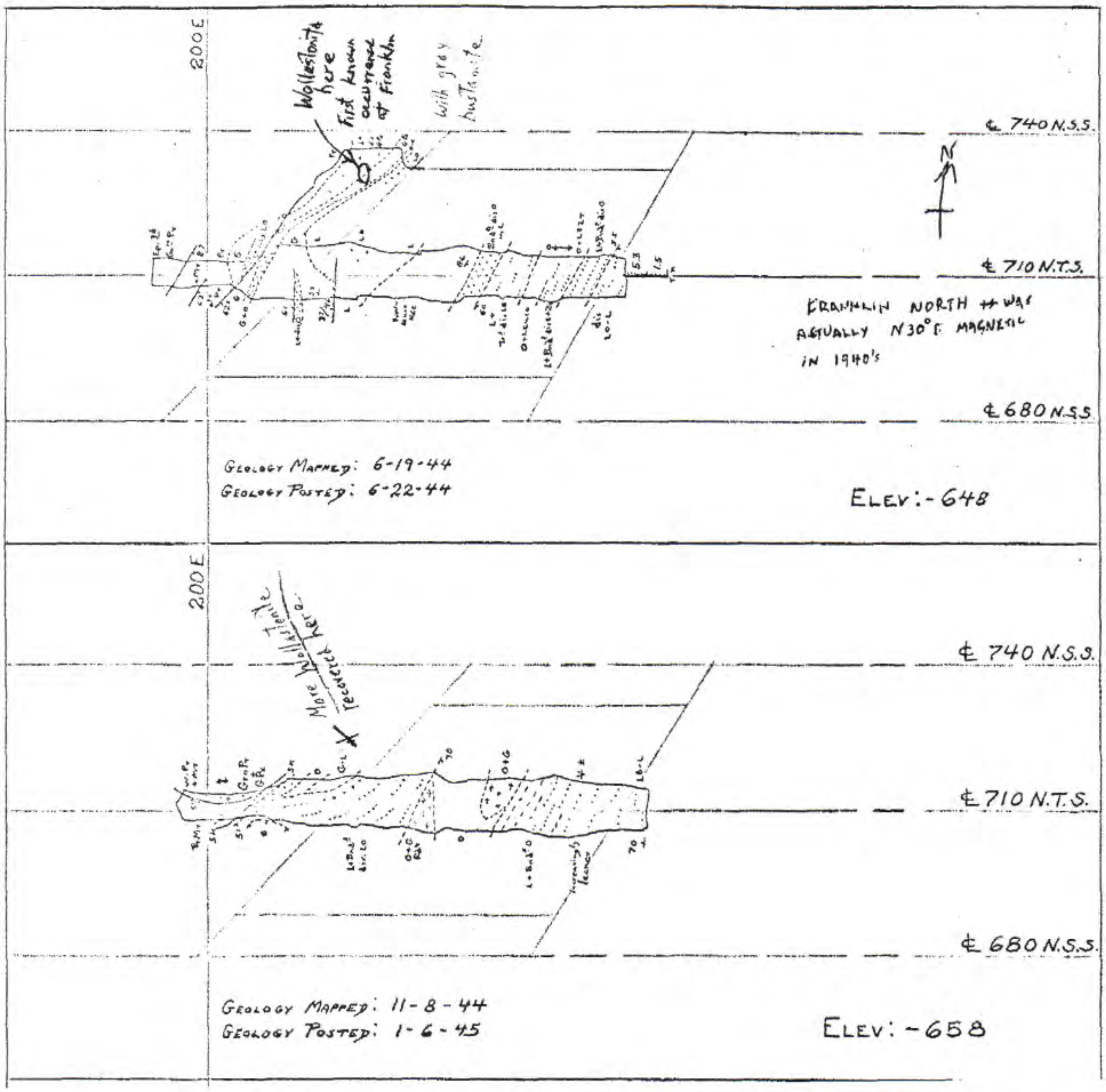

Figure 1. New Jersey Zinc Company (NJZ) maps of the Franklin Mine 710 North top slice, 648 and 658 elevations (i.e., feet below the collar of the Parker Shaft), surveyed and drawn by NJZ geologist John L. Baum. Wollastonite was found at Franklin in June 1944 at the 648 elevation. Baum surveyed the cut on June 19, 1944, and collected two large specimens at that time. When the next cut was mined five months later, wollastonite was encountered again. By that time, Baum had instructed the miners in that section on what to look for and where to look. The "numerous earth-shaking specimens" collected by miner Harry Hardy came from this location. Note Baum's notations (made at a later date), one at the 648 elevation, "Wollastonite here. First known occurrence at Franklin," and another at the 658 elevation, "More wollastonite recovered here." Map abbreviations include: NSS=North stope slice; NTS=North top slice; dis LO=disseminated lean ore; O=ore; G=garnet; L=limestone (i.e., calcite); F=franklinite. *Courtesy of John L. Baum.*

mostly solid wollastonite with small grains of willemite, and has bustamite in one corner. The other example is a slightly smaller, more esthetically pleasing piece of roughly triangular shape (Fig. 5), rather well known because of a Henry Van Lenten photo that was sold in quantity as a Franklin Mineral Museum postcard. This specimen, called "The Pyramid" or "The Postcard Wollastonite," is 16.5 × 11 cm (6.5″ × 4.25″) in size and includes the bustamite band and calcite across its base. Van Lenten's photo of "The Pyramid" also appeared in an issue of the *SPEX Speaker* with a Bob Jones article about Franklin, commissioned by Arthur and Harriet Mitteldorf (Jones, 1981), and is Figure 102 in the Franklin and Sterling Hill special issue of *Rivista Mineralogica Italiana* (Tealdi, 1983). This photo has a background of blue-fluorescing construction paper. An earlier photo of the same specimen with a black background was furnished by Tom Warren for plate 56 in Robbins' *The Collector's Book of Fluorescent Minerals* (Robbins, 1983). Prior to late 1974 "The Pyramid" was owned by Ultra-Violet Products, Inc., and was part of a portable display that Tom Warren used in conjunction with the frequent talks he gave to schools, civic groups, and mineral clubs. Tom liked to take his favorite specimens on the road, so he pressed them into a thick sheet of green Styrofoam that fit in a suitcase, and held them there with plaster of paris that was painted black after it hardened. All Tom had to do to set up his display was open the suitcase. "The Pyramid" was sawn on the back so it would fit in Tom's suitcase, and it retains traces of plaster.

Another image of a First-Find wollastonite is familiar to nearly every collector of fluorescent minerals, but the piece is too small (9 cm, 3.5″ across the display face) for effective public display, so few have seen it in person. This specimen is unusual in that the wollastonite band, which is much broader in most specimens, here is no thicker than the bustamite band that parallels it, about 2.5 cm (1″). Gary Grenier photographed the specimen for this article in white light (Fig. 6) and under shortwave UV (Fig. 7). Years ago, while in the possession of Tom Warren, it was photographed by David Grigsby. That photo appeared in *Ultraviolet Guide to Minerals* (Gleason, 1960, opposite page 180), *Nature's Hidden Rainbows* (Jones, 1964, Plate J10), and *Rainbow Minerals* (Jones, 1993), which is a recycling of the color plates from *Nature's Hidden Rainbows* with updated text. The caption for Plate J10 is, "Orange wollastonite, red calcite, and white barite along with a trace of green willemite provide another choice fluorescent mineral specimen from Franklin." Grigsby's photo captures the hardystonite and wollastonite but overexposes most of the willemite, which appears in the photo as blue and white grains. There is no barite in this specimen. This and other problems with photographs of First-Find wollastonite, such as the failure of this photo to capture the weak fluorescence of bustamite, can be attributed to the widely varying intensities of the fluorescences of different minerals and to the limited sensitivity of the film. While no camera can yet match the sensitivity of the human eye to a range of fluorescent hues and intensities seen simultaneously, newer films and digital (filmless) cameras have made it easier to take accurate photos of fluorescing minerals. Nevertheless, as seen in some of the photos accompanying this article, the fluorescence of hardystonite is often too weak to show up on film when the fluorescence of the much brighter wollastonite is correctly recorded.

Plate J27 of *Nature's Hidden Rainbows* and *Rainbow Minerals*, a photo taken by Ralph Walters of Franklin, N.J., portrays a significant First-Find wollastonite. The bustamite border and adjacent calcite can be clearly seen. This specimen was the one given to Lawson Bauer by Jack Baum in 1944, and was for many years in the fluorescent display of the NJZ laboratory. When the Franklin mine closed, this specimen went to Sterling Hill, where it was kept in the safe at the mine office. Bob Svecz was kind enough to show it to the author there in the late 1970s. When the Sterling Mine closed in 1986, this specimen disappeared, and its current whereabouts are unknown.

The private collection with the greatest concentration of displayable First-Find wollastonite specimens is that of Dr. Warren Miller of Neshanic Station, New Jersey. At present he has six such examples. One of many wonderful pieces in the Miller collection, WM1301, is nicknamed "The Hamburger" (Fig. 8), a nicely balanced piece here seen from the side, with willemite and calcite on either side of the bustamite band. Others (WM555, Fig. 9, and WM1050, Fig. 10) are similarly structured. All of Warren's pieces have a story: In 1971 when he was an impoverished graduate student, he drove from northern New York State over the Berkshires, in bad weather, to trade minerals with Harry Wain of Raytech in Somers, Connecticut. Warren's 1965 Chevy station wagon was loaded with 1,300 pounds of fluorescent minerals from Balmat, New York, and he traded them for a single First-Find wollastonite, now WM346 (Fig. 11). Much more recently he acquired a very clean, striking First-Find specimen (WM1465, Fig. 12), which came to him out of the Ron Koppel collection; Ron had bought it years before from Father Steve, the legendary pastor of St. John Vianney in Newfoundland, N.J., who had gotten many important pieces directly from the miners. One of the only First-Find pieces to leave Warren's collection is a striking example (Fig. 13) with calcite and wollastonite neatly bisected by a band of bustamite and hardystonite. This is now in the collection of Roman Gaufman. Warren remembers buying it for $75.00 at a garage sale. A photo by Henry Van Lenten

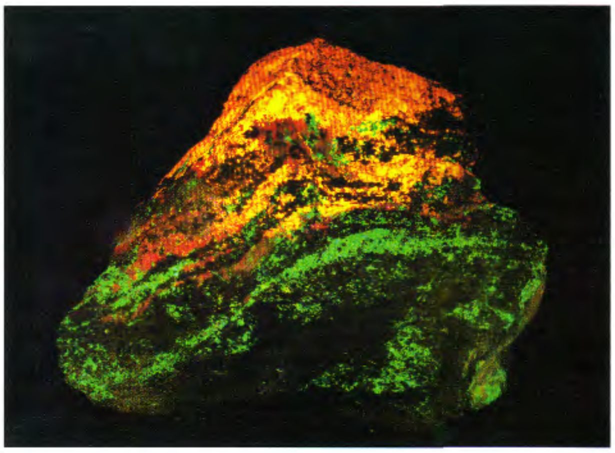

Figure 2. This First-Find wollastonite was recovered by Jack Baum from the Franklin Mine in June 1944. 12″ × 10.5″ (30 × 26.5 cm). *Franklin Mineral Museum photo.*

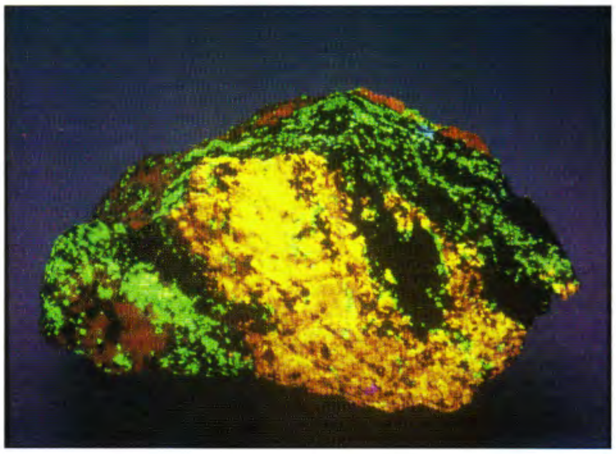

Figure 3. First-Find wollastonite specimen owned by Jack Baum. 6.25″ × 3.25″ (16 × 8 cm). *Henry Van Lenten photo.*

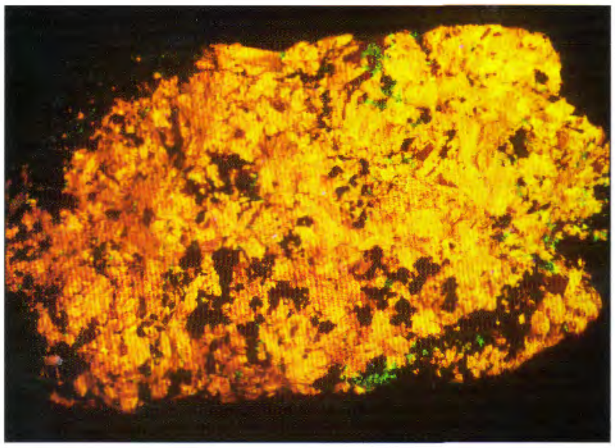

Figure 4. "The Brick," a solid mass of First-Find wollastonite measuring 7″ × 4″ (18 × 10 cm). The author purchased this from Dick Hauck in 1977. *Tema Hecht photo.*

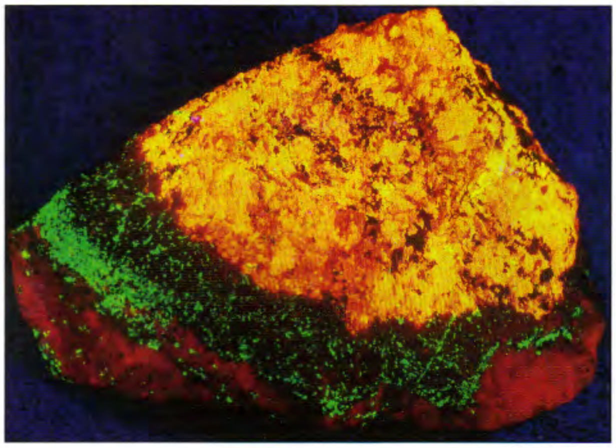

Figure 5. "The Pyramid." This First-Find wollastonite is perhaps Franklin's best-known fluorescent mineral specimen. 6.5″ × 4.25″ (16.5 × 11 cm). *Tema Hecht photo.*

Figure 6. Daylight photo of another well-known First-Find wollastonite. Author's specimen RCB-205, 3.5″ × 4″ (9 × 10 cm). *Gary Grenier photo.*

Figure 7. Same specimen as in Figure 6, here shown under shortwave UV light. The bustamite band is approximately 1″ (2.5 cm) thick. *Gary Grenier photo.*

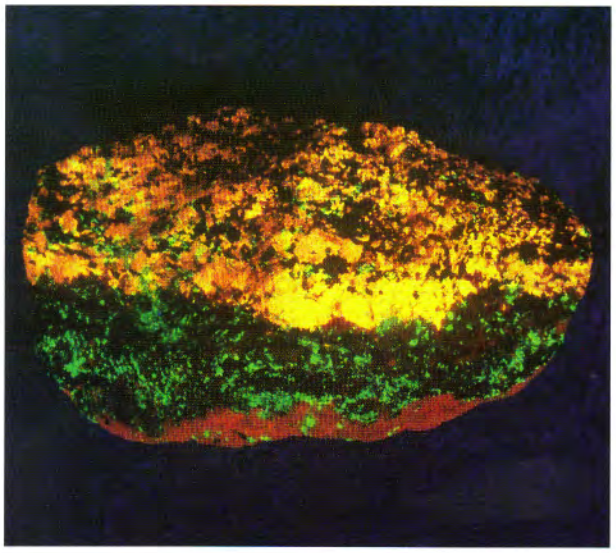

Figure 8. Nicknamed "The Hamburger," this remarkable First-Find wollastonite specimen measures 4.5″ × 4″ (11 × 10 cm). Warren Miller specimen WM1301. *Tema Hecht photo.*

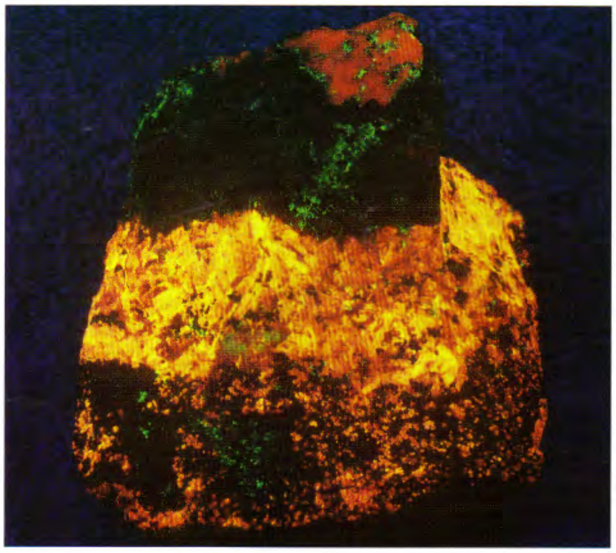

Figure 9. Another of Dr. Warren Miller's First-Find wollastonites. WM555, 4.25″ × 4.25″ × 3″ (11 × 11 × 8 cm). *Tema Hecht photo.*

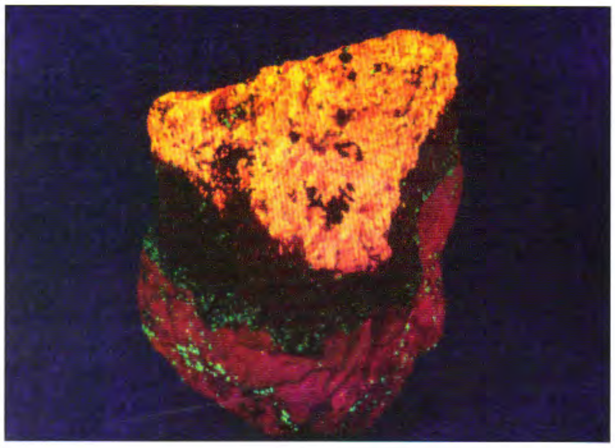

Figure 10. A striking example of the distinctive banding seen in the best First-Find wollastonites. Warren Miller specimen WM1050, 5″ × 4″ × 3″ (13 × 10 × 8 cm). *Tema Hecht photo.*

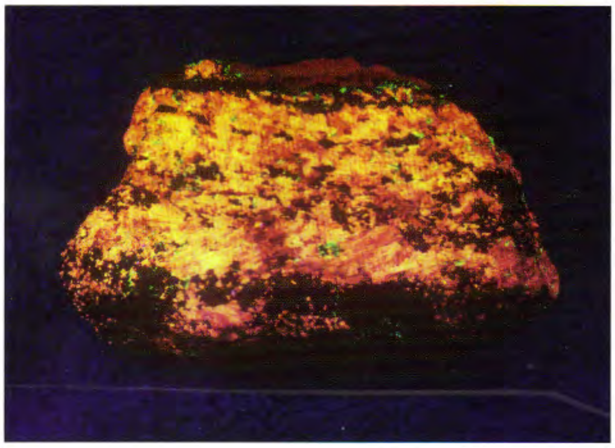

Figure 11. First-Find wollastonite showing a solid band of wollastonite with garnet and calcite. Warren Miller specimen WM346, 5″ × 2.75″ (13 × 7 cm). *Tema Hecht photo.*

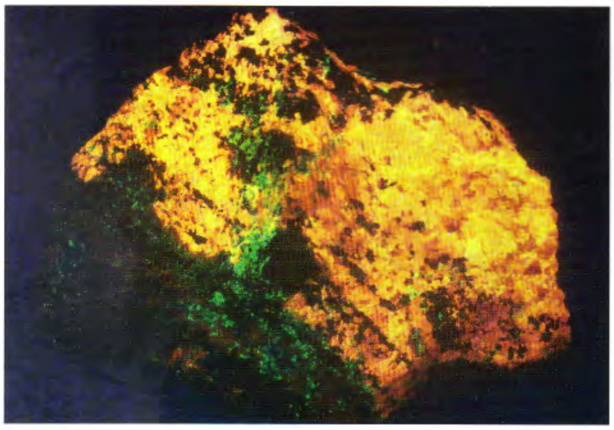

Figure 12. First-Find wollastonite. Warren Miller specimen WM1465, originally from the collection of Father Steve. 6″ × 4.5″ (15 × 11 cm). *Tema Hecht photo.*

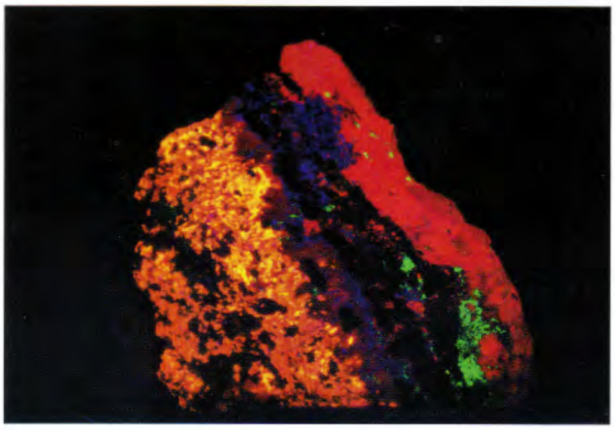

Figure 13. First-Find wollastonite with a band of bustamite and hardystonite. Roman Gaufman specimen R346, 5″ × 3.5″ × 4″ (13 × 9 × 10 cm). *Franklin Mineral Museum photo.*

of the opposite side of this specimen appears on page 1 of the Franklin issue of the *SPEX Speaker* (Jones, 1981).

The number of other significant First-Find wollastonite specimens is hard to pin down. There is a fine cabinet-sized piece (Fig. 14), 16 × 10 cm (6.25″ × 4″) in Elna Hauck's fluorescent display. Bill Kroth has a 16 × 11 × 8 cm (6.25″ × 4.25″ × 3.25″) example (Fig. 15) obtained from Dick Hauck. These two examples were Harry Hardy specimens, and both came from the collection of a "Dr. Shirley" in New York City (the spelling of the doctor's name is unclear). There is a smaller (8 × 6.5 cm, 3.25″ × 2.5″) but elegant "Mini-Pyramid" in the collection of George Elling; this is pictured on page 99 of Stuart Schneider's *Collecting Fluorescent Minerals*. A photograph of a striking 7.5 cm × 7.5 cm (3″ × 3″) specimen from Gary Grenier's collection appears on page 47 of *The Picking Table*, Vol. 40 (1999). Other examples of varying size are in the collections of Mark Boyer, Denis DeAngelis, Dr. Steven Kuitems, Dan McHugh Jr., Claude Poli, Dr. Marc Savett, and Nick Zipco.

There are tantalizing hints of other champion First-Find wollastonite specimens out there someplace. Steve Sanford remembers coming across one in an old-fashioned rock shop on a back road in Arizona. The owner could supply no details but was very fond of the piece and unwilling to negotiate. Dr. Al Standfast (Standfast, 1991) recalled a Manhattan dealer, an "older doctor, a retired Swiss physician who came to work at the American Museum of Natural History in New York City and later opened a shop in the nearby Endicott Hotel." (This is the same "Dr. Shirley" from whose widow Richard Hauck purchased a number of First- and Second-Find pieces originally collected by Harry Hardy.) "He had large stocks of Franklin fluorescents, including one huge piece of pure wollastonite from the depths of Franklin. It was about two feet across and fluoresced beautifully. How any miner got it out of the mine and into New York I'll never know. If I recall correctly it was sold to an Italian museum for $1,500.00." While there is a chance this is the Franklin Mineral Museum's showpiece (front cover photo), it is also possible that the "Mother of Franklin Wollastonites" may have gotten clean away and is no longer in the United States.

Second-Find Wollastonite

This is the most varied category of Franklin wollastonite. There are not many specimens, fewer than there are of First-Find wollastonite, and they are widely dispersed, so it is difficult to form a comprehensive impression of the group. There is also controversy over whether they are from one locality, two localities, or more. Only one specimen of this group is tied by a label to a locality in the mine, which is hundreds of feet from the First-Find locality, but there is evidence that the First-Find locality may have also yielded Second-Find specimens.

What we know for sure about Second-Find specimens is that they do not resemble either the First-Find specimens that can be tied to 710 North and 680 North pillars in 1944, or the Third-Find specimens described later in this article. Both First-Find and Third-Find wollastonites are consistent in their appearance and associations. Second-Find wollastonites are more variable, but they do share some distinctive characteristics. The most important is that Second-Find wollastonite generally occurs in moderately sized to large rounded grains in calcite, and in granular masses, and these grains fluoresce orange to yellow-orange along their rims and orange-yellow to yellow and greenish yellow toward their centers. (In contrast, First-Find wollastonite occurs in solid masses, Third-Find wollastonite occurs in angular grains in calcite, and the masses and grains of both First-Find and Third-Find wollastonite generally fluoresce uniformly orange.) The fluorescence of what we now call Second-Find wollastonite grains is thus described by Baum (1972): "The fluorescence of some large wollastonite grains varies from orange to yellow-orange or peach under the Mineralight SL 2537, unlike the uniform response of the original Franklin find." As observed earlier in this article, the hue of the phosphorescence of these variably fluorescing wollastonite grains is more uniformly orange than their fluorescence, and the length of phosphorescence is brief, on the same order as the "flash" or "BIP" of the associated calcite.

Hardystonite, fluorescing blue-violet, is found in nearly all Second-Find wollastonite specimens, often in significant quantity. (Hardystonite is found in small quantities in First-Find pieces and is absent in the Third Find.) Occasionally the hardystonite found with Second-Find wollastonite has a distinct pale bluish cast in daylight. In many Second-Find pieces, hardystonite forms a border on one side of the wollastonite mass as if there were a layered relationship between the two (Fig. 16). Colorless to pale gray barite is frequently associated with hardystonite in Second-Find specimens, but this barite is usually in coarse-grained masses rather than isolated grains; it fluoresces weak pale yellow, quite unlike the isolated, brightly fluorescent barite grains typical of Third-Find wollastonite specimens. The fluorescence of calcite in Second-Find wollastonite specimens ranges from moderately bright red, like that in First-Find specimens, to the moderate red of Third-Find specimens. Andradite, a nonfluorescent brown garnet, is found in all Second-Find wollastonites, generally in 1 to 2 mm grains.

Not all Second-Find specimens include all the associated minerals mentioned, any more than all First-Find wollastonites include the bustamite band, but one cannot expect every specimen broken from a larger-scale assemblage to include all its features. Wollastonite nodules and masses are apparently harder to break than their calcite matrix, which may account for the high proportion of Second-Find wollastonite specimens where the wollastonite masses are more or less centered in the matrix.

Only one Second-Find specimen is tied to a specific locality underground. In the National Museum of Natural History (Smithsonian Institution) is a remarkable piece with a sausage-shaped grain of wollastonite 8 or 9 cm (3.5″) long, nicely centered in a rectangular matrix, mostly calcite, which is approximately 11.5 × 15 cm (4.5″ × 6″) in size. The rim of the wollastonite grain fluoresces orange and the core fluoresces orange-yellow. Along one flank of the wollastonite sausage is a thin border of willemite, and on the other flank is a thicker border of hardystonite. Esthetically this is a remarkable specimen, and unfortunately it has not been photographed. It is from the Lawson Bauer collection and is labeled as having come from 290 pillar, 1000 level, Franklin. This closely matches the locality given by Jack Baum (Baum, 1972) for what is clearly Third-Find wollastonite, "in the hanging wall at the contact of the ore with the marble to the East, as in the 290 North top slice on the 1050 level, found in 1947. In these showings, the wollastonite was in relatively coarse, roughly elongated crystals, some an inch or more in length. Associated were barite and a peculiar variant of tremolite."

The other evidence of a locality for Second-Find wollastonite points toward proximity to the First Find of 1944. The author cannot explain this discrepancy, though it leaves several possibilties open. The Baum collection does in fact include an excellent Second-Find example (back cover, top photo) that resembles the Lawson Bauer piece now at the Smithsonian, but unfortunately was given to Jack without a locality underground. The wollastonite "sausage" in Jack's piece measures about 4 × 10 cm (1.5″ × 4″). As in the Bauer specimen, the wollastonite grain has smooth edges and hardystonite is concentrated on one side of the grain. Possibly related to these is a specimen in Warren Miller's collection with a nearly round mass of wollastonite 6 to 7 cm (2.75″) across (Fig. 17). This showy example was in the Gerstmann collection but was kept in his general collection, under visible light, so few visitors to his museum had seen it under UV. Here hardystonite is present in a thin layer, bordering the wollastonite mass on one side.

Whether the remaining few dozens of Second-Find pieces came from the area of 680 North and 710 North pillars in the vicinity of 650 level, or from 290 North pillar in the vicinity of 1000 and 1050 levels, or from additional localities in the mine, may remain an open question. To Jack Baum the distinction between First Find and Second Find is a false one, as he believes that both the solid masses and the bi-colored grains of wollastonite came from the same area of the mine over time as the pillars were mined downward (letter of June 11, 2003). There is support for this view in the now dispersed collections of two miners, Harry Hardy and Thomas Auche, who evidently had access to the area of 680 North and 710 North pillars, as their collections included multiple self-collected specimens of what we now call both First-Find and Second-Find wollastonite. Auche, during a visit the year of his death, told the author that once he and the other miners knew where to look for wollastonite, they'd check for it every cut, and find it perhaps every other cut. He wasn't sure exactly how many times wollastonite was found where he mined, but thought four or five times, at least. If found every other slice, each slice being 10 feet thick, wollastonite could have been recovered in this area to well below the 750 level. This suggests a consistent distribution of wollastonite of considerable extent in this part of the Franklin Mine. Depending on local conditions as the pillars were mined downwards, the continuous band of First-Find wollastonite seen and collected near the 650 level and "from the succeeding working places below" could have become boudinaged and broken up, yielding the "sausages," large irregular grains, and masses of smaller grains characteristic of Second-Find wollastonite.

In any case, what distinguishes most Second-Find wollastonites from each other is the shape and size of the variably fluorescing wollastonite grains and masses, which range in size from less than 1 cm to more than 20 cm (3/8″ to 8″) across. The larger grains can be singular, or consolidated masses of smaller grains. Most Second-Find wollastonite specimens share the features of the group—rounded, variably fluorescent grains of wollastonite in a calcite matrix with hardystonite and poorly fluorescent barite—but visually are distinguished by the grain size of the wollastonite. The Second-Find specimens already described (Fig. 17, back cover) are in the middle of the range, with isolated medium-sized boudins and rounded masses of wollastonite on the order of 6 to 10 cm (2.25″ × 4″) in diameter. Other, similar examples are in Figures 18, 19, and 20, which show specimens from the collections of William Kroth, Earl Verbeek, and the author, respectively. In specimens with smaller wollastonite grains, as illustrated by Figure 21, the grains are often massed in clusters. A similar Second-Find specimen with relatively small wollastonite grains, from the George Elling collection, is pictured on page 99 of Stuart Schneider's *Collecting Fluorescent Minerals*.

The largest example of Second-Find wollastonite known to the author is shown in Fig. 22. This is a specimen called "The Pod" by its owner, William Kroth.

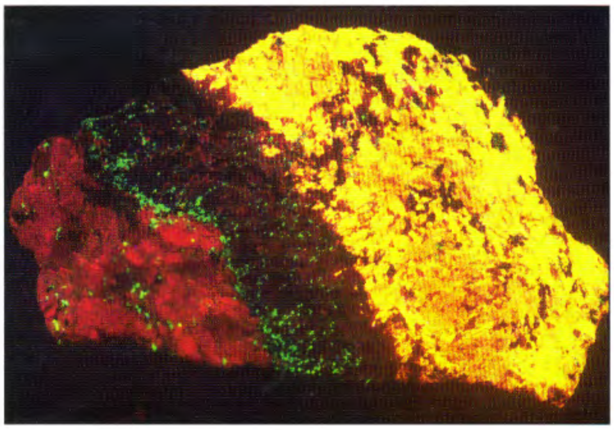

Figure 14. Elna Hauck's First-Find wollastonite, a specimen collected by miner Harry Hardy. 6.25″ × 4″ (16 × 10 cm). *Tema Hecht photo.*

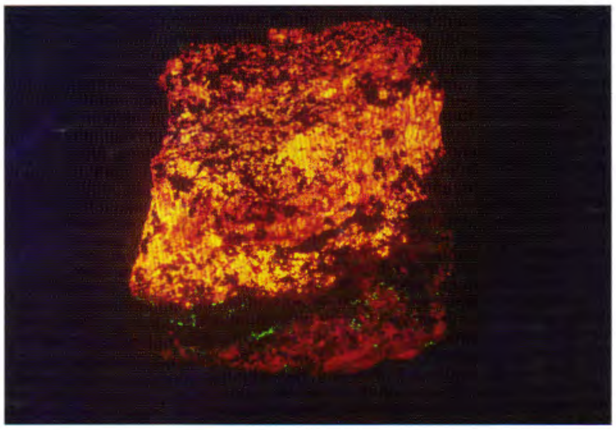

Figure 15. Another Harry Hardy–collected First-Find wollastonite. Bill Kroth specimen, 6.25″ × 4.25″ × 3.25″ (16 × 11 × 8 cm). *Tema Hecht photo.*

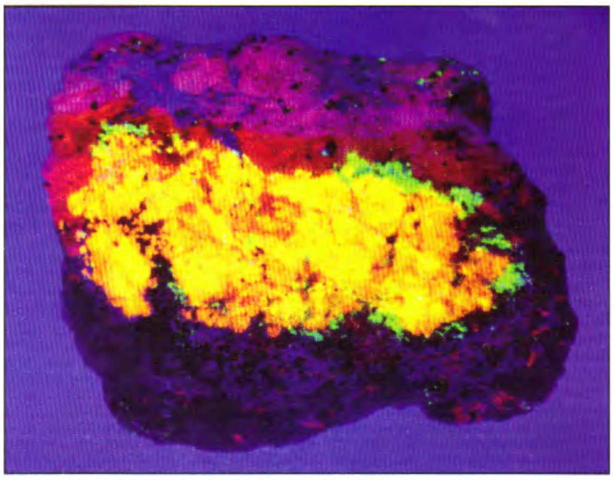

Figure 16. This magnificent Second-Find wollastonite specimen features layers of calcite and hardystonite. Ownership and size unknown. *Henry Van Lenten photo.*

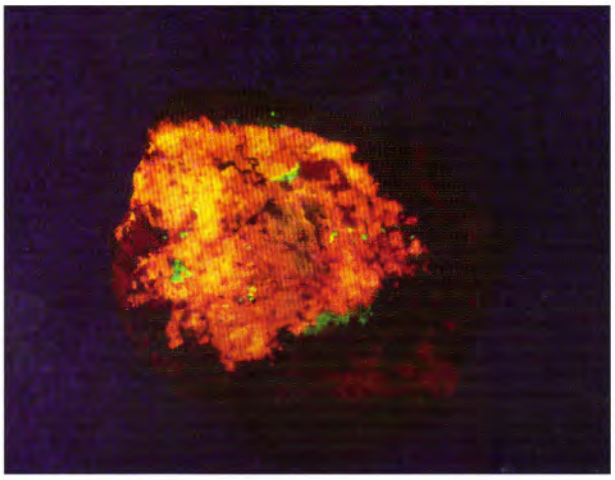

Figure 17. A nearly round mass of Second-Find wollastonite. Warren Miller specimen WM846, 5″ × 4″ × 2.5″ (13 × 10 × 6 cm). *Tema Hecht photo.*

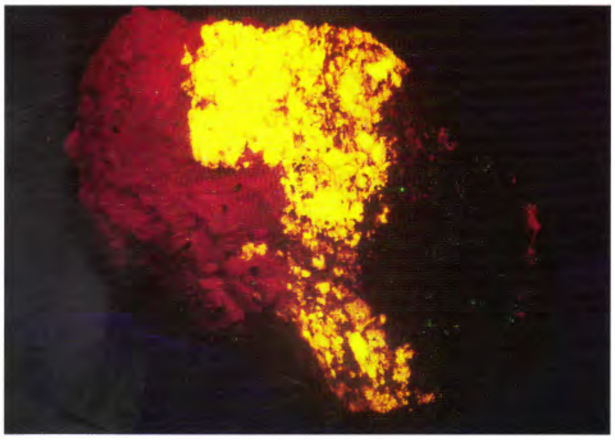

Figure 18. A rounded mass of Second-Find wollastonite between calcite and hardystonite. Bill Kroth specimen, 8.25″ × 4.75″ × 3″ (21 × 12 × 8 cm). *Tema Hecht photo.*

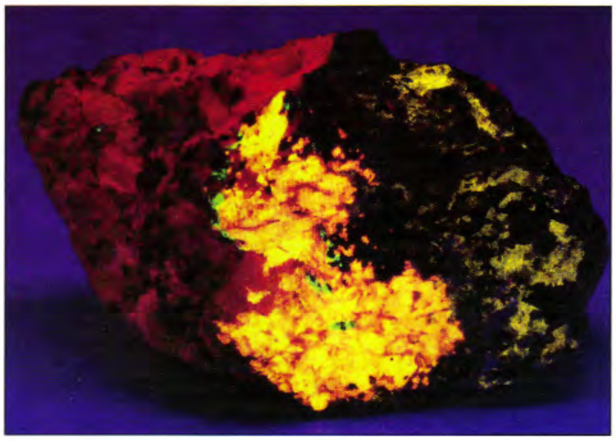

Figure 19. Second-Find wollastonite between calcite and clinohedrite on barite. Earl Verbeek specimen ERV-1290, 4.5″ × 3″ × 2.5″ (11 x 8 x 6 cm). *Gary Grenier photo.*

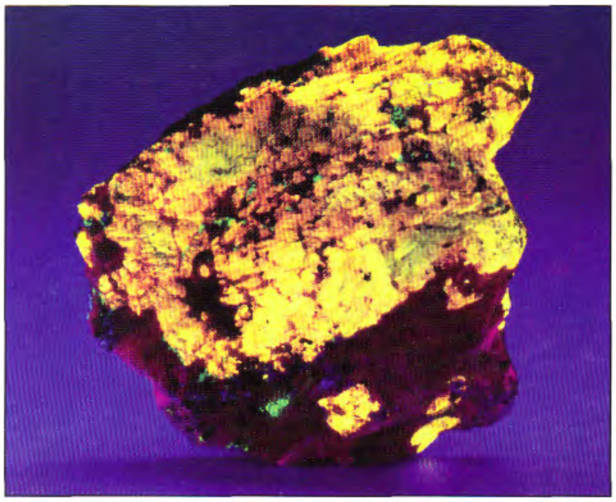

Figure 20. This Second-Find wollastonite specimen was sawn on the other side. Author's specimen RCB-202, 3.75″ × 3.5″ × .75″ (9.5 × 9 × 2 cm). *Gary Grenier photo.*

Figure 21. Second-Find wollastonite with small grains forming a massive cluster. Author's specimen RCB-206, 4″ × 3.25″ × 1.25″ (10 × 8 × 3 cm) *Gary Grenier photo.*

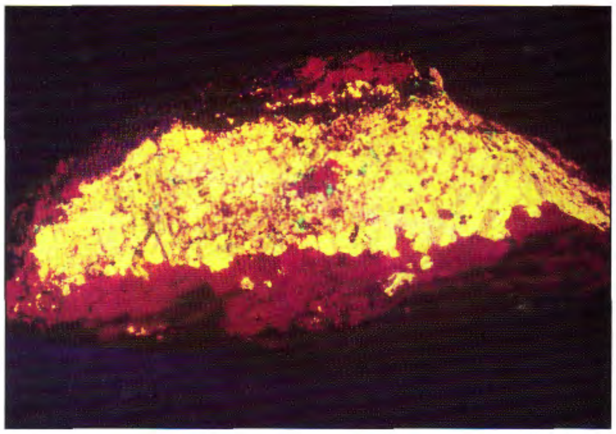

Figure 22. Nicknamed "The Pod," this whopper is the largest known Second-Find wollastonite. Bill Kroth specimen, 10.5″ × 4.75″ × 4.75″ (27 × 12 × 12 cm). *Tema Hecht photo.*

Figure 23. An exceptionally bright Second-Find wollastonite with hardystonite and calcite. Author's specimen RCB-200, 3.5″ × 2.5″ × 1.5″ (9 × 6 × 4 cm). *Gary Grenier photo.*

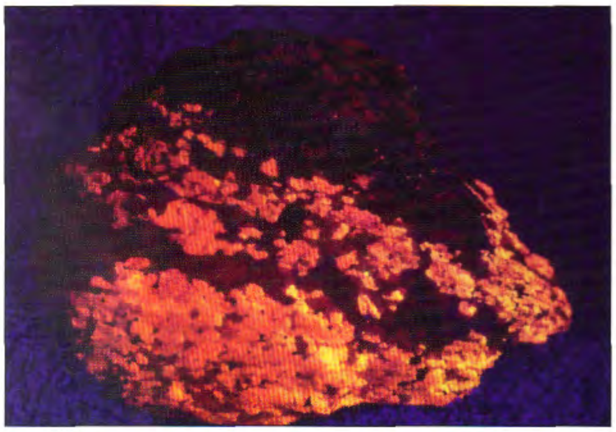

Figure 24. Second-Find wollastonite with grains fluorescing orange-yellow at their cores. Author's specimen, 4″ × 2.75″ × 1.75″ (10 × 7 × 4 cm). *Tema Hecht photo.*

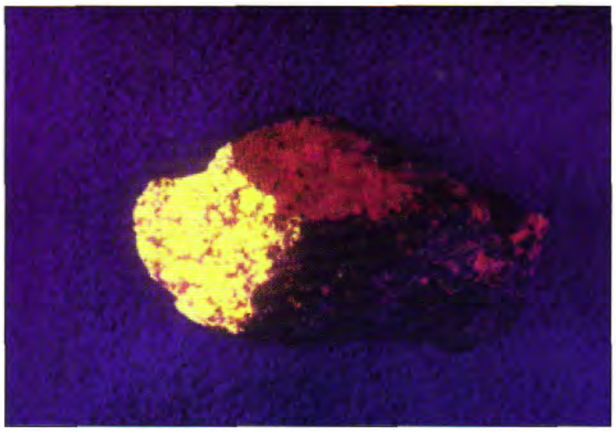

Figure 25. A striking example of what Dr. Warren Miller calls a "Triple-Point" type of Second-Find wollastonite. WM388, 5.5″ × 3″ (14 × 8 cm). *Tema Hecht photo.*

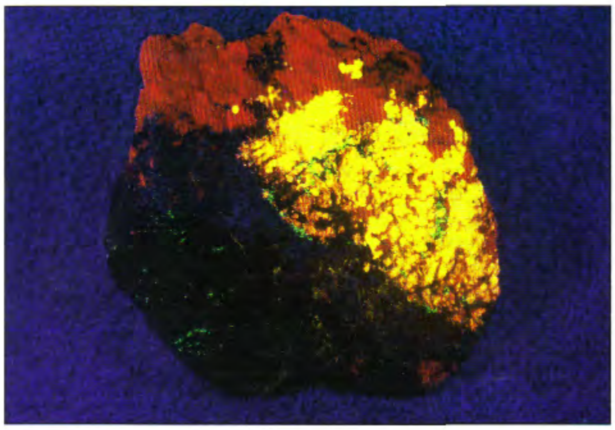

Figure 26. Another Miller "Triple Point" Second-Find wollastonite. Note the mutual contact of wollastonite, hardystonite, and calcite. WM269, 5″ × 4″ (13 × 10 cm). *Tema Hecht photo.*

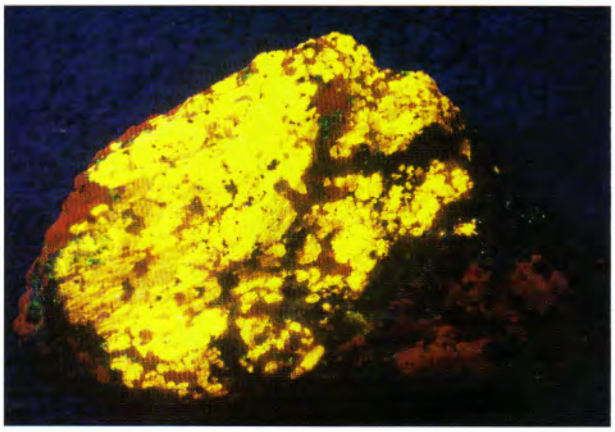

Figure 27. Second-Find wollastonite on display in Zobel Hall, Sterling Hill Mining Museum. Author's specimen, 5.75″ × 3.25″ (14.5 × 8 cm). *Tema Hecht photo.*

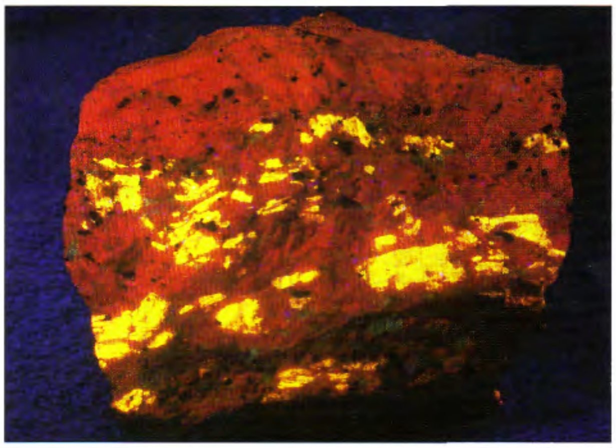

Figure 28. A good example of Third-Find wollastonite with barite. Author's specimen, 6″ × 5″ (15.5 × 13 cm). *Tema Hecht photo.*

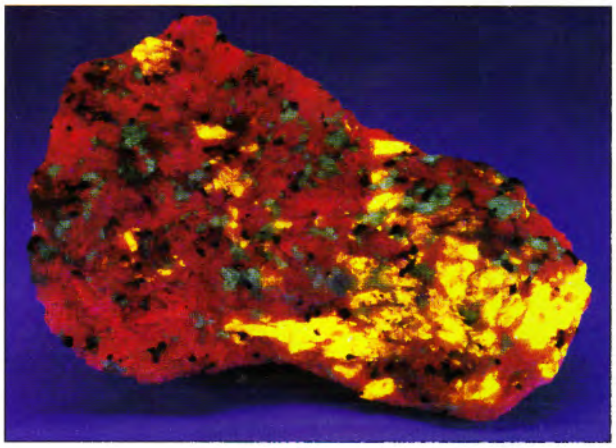

Figure 29. A Third-Find wollastonite specimen that is fairly rich in barite. Author's specimen RCB-201, 5″ × 3.25″ (13 × 8 cm). *Gary Grenier photo.*

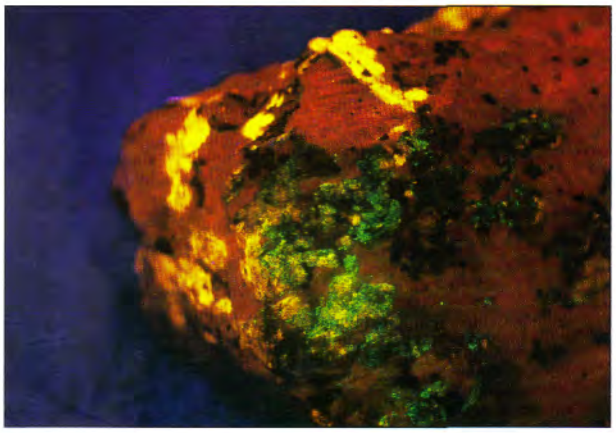

Figure 30. Third-Find wollastonite with willemite fragments adhered to the wollastonite grains. Field of view 3.25″ × 2.5″. Warren Miller specimen. *Tema Hecht photo.*

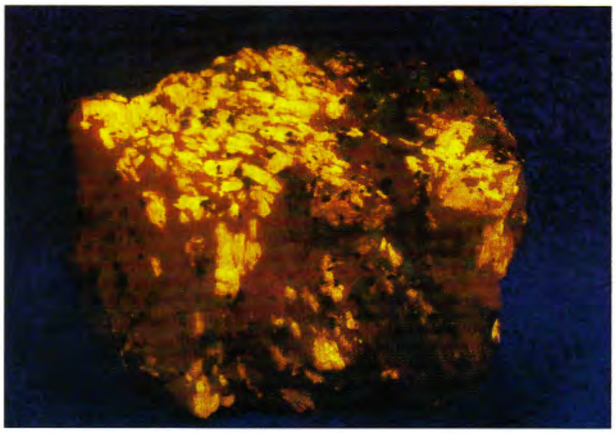

Figure 31. An exceptionally rich Third-Find wollastonite specimen. Warren Miller specimen WM355, 5″ × 4″ × 2.5″ (13 × 10 × 6 cm). *Tema Hecht photo.*

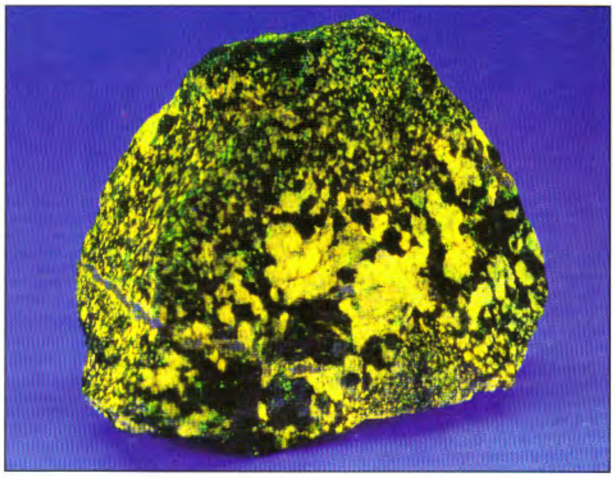

Figure 32. A typical example of an Original-Find wollastonite. Author's specimen RCB-203, 4.75″ × 3.5″ × 2″ (12 × 9 × 5 cm). *Gary Grenier photo.*

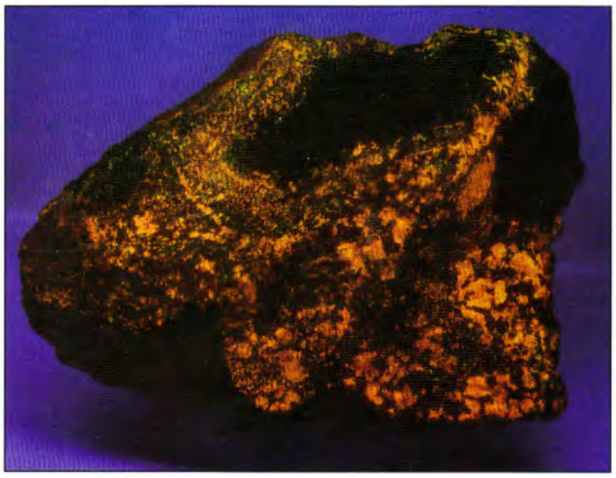

Figure 33. An Original-Find wollastonite that fluoresces more orange than most. FMM specimen no. 557, 6.5″ × 5.25″ × 2.25″ (16 × 13 × 6 cm). *Franklin Mineral Museum photo.*

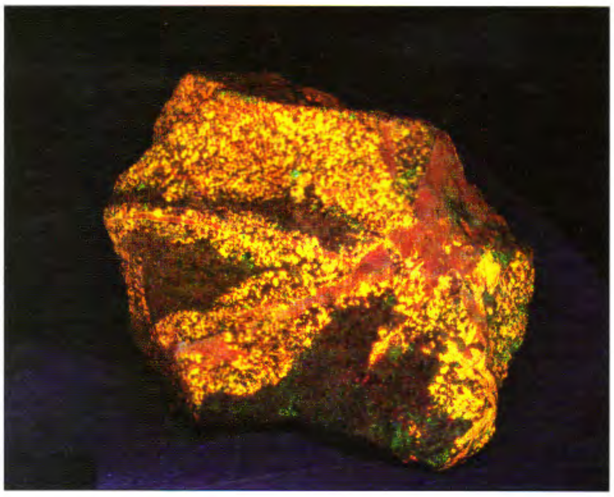

Figure 34. The largest known Original-Find wollastonite. Claude Poli specimen P115, 7″ × 5″ × 3″ (18 × 13 × 8 cm). *Franklin Mineral Museum photo.*

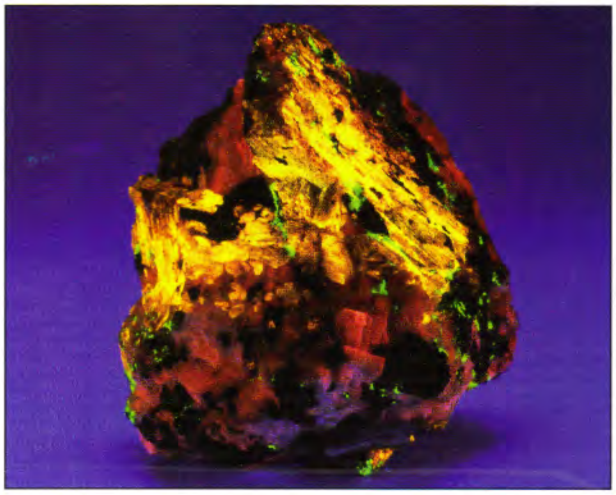

Figure 35. Dump-Find wollastonite, collected in 1948 on the Buckwheat Dump in Franklin. Author's specimen RCB-204, 3.75″ × 3.25″ (9 × 8 cm). *Gary Grenier photo.*

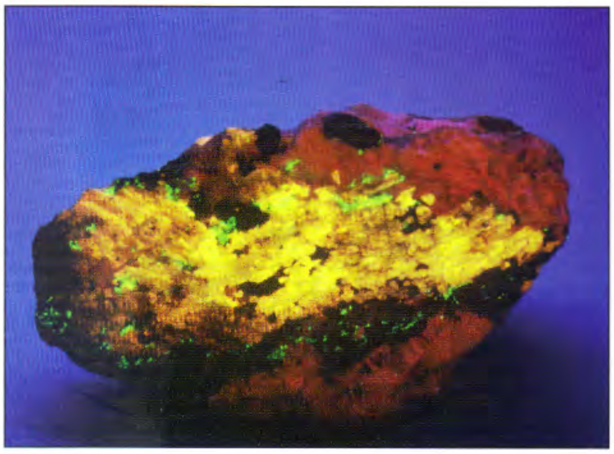

Figure 36. The largest piece of the rare Buckwheat Dump-Find wollastonite. Author's specimen, 6.75″ in length. *Henry Van Lenten photo.*

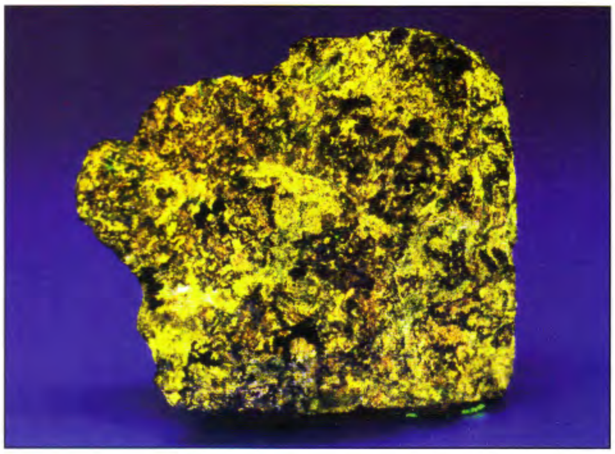

Figure 37. This Fibrous wollastonite bears NJZ geologist Allen Pinger's label with a mine location. Author's specimen RCB-129, 3.25″ × 2.75″ (8 × 7 cm). *Gary Grenier photo.*

Overall it measures 27 × 12 cm (10.5″ × 4.75″) and consists of a large, elongated, single grain of wollastonite, in calcite. This is an astonishing specimen, unique in its size and overpowering when seen close up; Bill is understandably proud of it. Like several other early Franklin wollastonites in the Kroth collection, this was collected by Harry Hardy, and it came to Bill via "Dr. Shirley" and Richard Hauck.

There are two variants of Second-Find wollastonite that don't quite fit the above mold. One consists of irregularly shaped grains and lath-like aggregates of bright orange-fluorescing wollastonite grains in calcite, in close proximity to mixtures of hardystonite and barite grains. This wollastonite is very bright under shortwave UV, as bright as First-Find specimens, and brighter than the wollastonite in most Second-Find examples. Figure 23 illustrates an example originally from the collection of miner Thomas Auche, obtained by the author from Warren Miller. The similar specimen in Figure 24 came from the E. Packard "Sunny" Cook collection. On close examination both specimens show orange-yellow fluorescence at the cores of the wollastonite grains, and hardystonite on one side of the layer or plane of wollastonite. The range of size of the wollastonite grains is unusual (1 mm to several cm) and the hardystonite has a pale blue color in daylight.

A second variant of Second-Find wollastonite is what Warren Miller, a professional chemist, calls "Triple-Point" specimens. These are examples where three different calcium minerals meet, in an orderly relationship that reflects diagrams of chemical equilibrium, with a 120° angle (or nearly) between the three. The minerals are wollastonite (calcium silicate), hardystonite (calcium zinc silicate), and calcite (calcium carbonate). Such specimens have substantial masses of wollastonite and hardystonite in contact, with calcite also touching the wollastonite-hardystonite junction. Hardystonite, wollastonite, and calcite are found together in most Second-Find specimens, but the relationship between them in a "Triple-Point" piece is often visually dramatic. Two examples from Dr. Miller's collection are shown in Figures 25 and 26.

Having seen about twenty Second-Find wollastonite specimens, the author is of the opinion that most or all of them are closely related enough in appearance to be from the same area of the mine. As is suggested by Jack Baum's comments, and the specimens in his collection and those of Harry Hardy and Thomas Auche, Second-Find wollastonite probably comes from subsequent pillar slices below the First-Find wollastonite locality but in the same part of the mine, from the area of 680 and 710 pillars between the 700 and 800 levels. There is enough variation in the appearance of these specimens so they were most likely from multiple individual finds, but they share too many features to be from widely scattered occurrences. The author cannot explain the discrepancy of Lawson Bauer's classic Second-Find piece in the Smithsonian, with its locality of 290 pillar on 1000 level, so close to the abundant Third Find of Franklin wollastonite. If this is another valid locality for Second-Find wollastonite, specimens of this type from 290 pillar must be extremely rare.

There are few examples of Second-Find wollastonite on display. One 14.5 × 8 cm (5.75″ × 3.25″) specimen (Fig. 27) can be seen in Zobel Hall at the Sterling Hill Mining Museum. This specimen was originally from the John Quick Stevens collection and was obtained from Richard Hauck. As detailed above, there are remarkable pieces in private hands, notably those in the collections of Bill Kroth, Warren Miller, and Earl Verbeek. Other Second-Find specimens are known to be in the collections of Mark Boyer, Denis DeAngelis, George Elling, Fred Lubbers, Jerry McLaughlin, Steven Phillips, Claude Poli, and Dr. Marc Savett.

Third-Find Wollastonite

When you do see Franklin wollastonite being sold, most of the time this is what's being offered. This is the typical Franklin wollastonite, with barite, that is in nearly every collection. There is probably at least half a ton in circulation, though as with other "rare but abundant" minerals like esperite, it is always a challenge to find exceptional and showy pieces. Once common and fairly inexpensive, Third-Find wollastonite is becoming scarcer and is now attaining the dignity that comes with high prices.

Third-Find wollastonite occurs in orange-fluorescing elongated grains, or in aggregates of grains, in a matrix of red-fluorescing calcite that also includes smaller grains of cream-fluorescing barite and, rarely, green-fluorescing willemite. Nonfluorescent dark brown garnet in small grains is always present. A locality and date for this occurrence, as well as a description, are given by Baum (1972). What we now call Third-Find wollastonite was found "in the hanging wall at the contact of the ore with the marble to the East, as in the 290 North top slice on the 1050 level, found in 1947. In these showings, the wollastonite was in relatively coarse, roughly elongated crystals, some an inch or more in length. Associated were barite and a peculiar variant of tremolite." Baum's "tremolite" occurs as thin, colorless, transparent blades that are nonfluorescent but conspicuous against their fluorescent calcite matrix under shortwave UV. In mid-2004, Joseph Orosz, at the suggestion of curator John Cianciulli of the Franklin Mineral Museum, performed X-ray diffraction analysis of this mineral; it is apparently ferroan wollastonite.

Typical Third-Find wollastonite grains range in size from several millimeters to several centimeters, though some are larger and some of the grain aggregates reach sizes of 10 cm (4″) or more. The grains are generally elongated in the direction of the striations on their cleavage and are usually angular rather than rounded. Many Third-Find wollastonite grains are rectangular in outline and could be described as bladed, subhedral to euhedral crystals, though collectors seem unwilling to test that supposition by carving them free from their matrix. In many such specimens the long dimensions of the wollastonite grains are parallel to the layering of the calcite. Figure 28 illustrates a good example from this find, with wollastonite grains ranging in size from 1 mm to 13 mm (1/16″ to 1/2″). The bottom photo on the back cover shows an exceptional Third-Find specimen from Earl Verbeek's collection, with a large single grain of wollastonite about 15 cm (6″) long. This piece was obtained from the collection of Mike Massey.

The fluorescence of Third-Find wollastonite is a consistent, fairly bright orange under shortwave UV. This orange is not as saturated as the orange of First-Find wollastonite, but more so than that of much Second-Find wollastonite. There is no fluorescent zoning in Third-Find wollastonite grains. Collectors tend to rank Third-Find specimens by the proportion of wollastonite to calcite, the more wollastonite the better, but points are given for the richness and brightness of barite grains and the presence of willemite.

The fluorescence of the calcite matrix is red of moderate intensity under shortwave UV. The barite grains are typically between 3 mm and 8 mm (1/8″ and 1/4″) in size, and the fluorescence, usually called "cream" in hue (really a very pale or unsaturated yellow, nearly white), is of moderate intensity, about on a par with the calcite matrix. Although neither the wollastonite, calcite, nor barite fluoresces intensely in Third-Find specimens, the three are fairly well balanced under UV and the combination is attractive. Commonly there is more wollastonite than barite in these specimens, but examples rich in barite can be desirable (Fig. 29). Note that the fluorescence of barite in these specimens is often described as blue, but this is a trick of the eye, due to our tendency to see complementary colors against a dominant background. If you isolate a grain of this barite against a neutral background, it will not appear to fluoresce blue.

Willemite is generally absent from the Third-Find wollastonite assemblage, with one curious exception where the willemite seems to have been introduced mechanically. Such specimens have surface coatings of small, green-fluorescing willemite fragments that have adhered to the surface of wollastonite grains, but often not the adjacent calcite or barite. Under a 10× hand lens, the coating can be seen to be a mixture of willemite and franklinite fragments, the franklinite grains obvious in visible light and the willemite grains more apparent under shortwave UV. The coating does not wash off, and the surface of the specimen where the coatings occur usually shows signs of weathering. In these specimens the fluorescence of the affected wollastonite grains is a patterned mixture of orange and green, which can be quite attractive close up (Fig. 30) and at a distance may have a striking and unique fluorescence, as the mixing of green and orange fluorescence appears as an odd shade of greenish-yellow. These specimens are most likely the result of drill cuttings being washed into a thin crack during mining and selectively accumulating on the wollastonite grains through the cementing action of calcium carbonate dissolved in water. This curious feature of wollastonite fracture surfaces acting as a growth site for a secondary carbonate has also been seen on the 800 level at Sterling Hill, where in cracks in wollastonite-bearing calcite, green-fluorescing monohydrocalcite has been selectively deposited on wollastonite grains.

In the early 1960s, ordinary Franklin wollastonite with barite was abundant and cheap. Charley Key at Crystal Gems in Great Notch, N.J., had powder boxes full for $2.50 a pound. Harry Wain of Raytech always seemed to have an excellent selection at the Franklin show. At that time a good 2″ × 3″ wollastonite cost less than $10.00, and what would now be described as fine cabinet specimens sold for $25.00 and up. At the 1964 show, the author made a trade with Harry for a $75.00 piece that Harry said was one of his best. It cost a fair volume of choice coarse-patterned Sterling Hill willemite and calcite, which the author had brought out from 1520 stope on 1200 level that summer. That wollastonite specimen (Fig. 28) is now on display in Zobel Hall at the Sterling Hill Mining Museum. A comparably rich Third-Find wollastonite in that display was later obtained from Harry Wain's stock when he retired to California and sold his material to Jim Kaufman of "Jim's Gems." There was a memorable "first come, first served" Saturday sale at Jim's second store, on Route 23 in Wayne, to mark the occasion.

Many excellent specimens of Third-Find wollastonite are on public display at the Franklin Mineral Museum, and there are three (including two mentioned above) in the fluorescent exhibit in Zobel Hall at Sterling Hill. Some of the better examples in private hands are in the collections of Warren Miller (Fig. 31), Steve Chuka, Steve Kuitems, and Earl Verbeek, but there are many more "out there."

Original-Find Wollastonite

This title is conferred on this find, somewhat arbitrarily, because it is presumed to have been brought out of the Franklin mine prior to 1944, the date of authentic

Figure 38. Daylight photo of a typical specimen of Fibrous wollastonite in pink grossular. FMM specimen no. 1631, 10″ × 8″ (26 × 20 cm). *Franklin Mineral Museum photo.*

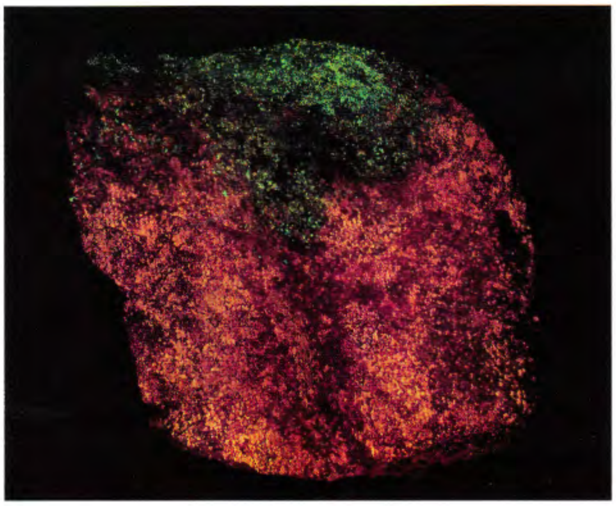

Figure 39. The same Fibrous wollastonite as Figure 38 under shortwave UV. This museum specimen came from the Ewald Gerstmann collection. *Franklin Mineral Museum photo.*

Figure 40. A Fibrous wollastonite exhibiting an uncommon orange-red fluorescence. Bill Kroth specimen. 6″ × 2.75″ × 1.5″ (15 × 7 × 4 cm). *Tema Hecht photo.*

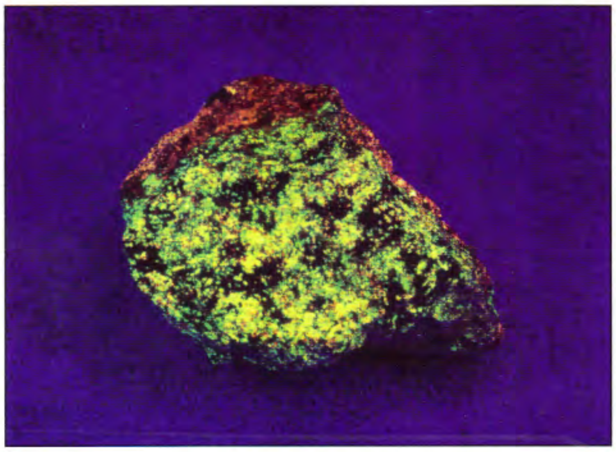

Figure 41. Intimate mixtures of Fibrous wollastonite and willemite appear to fluoresce yellow. SHMM specimen no. 355, 4.25″ × 3.25″ × 2.5″ (11 × 8 × 6 cm). *Tema Hecht photo.*

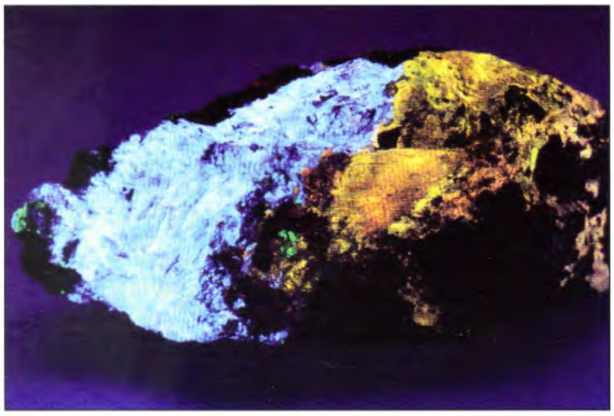

Figure 42. A magnificent "fish-scale" margarosanite/Fibrous wollastonite combination. Peter Chin specimen, 7″ × 3.5″ (18 × 9 cm). *Gary Grenier photo.*

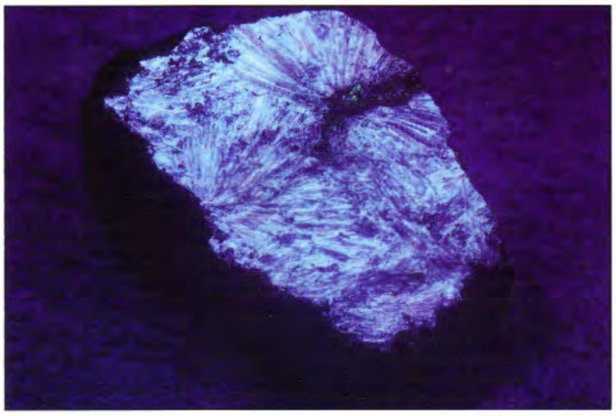

Figure 43. Extremely rare rosettes of margarosanite are associated with the minehillite/Fibrous wollastonite assemblage. Author's specimen. *Tema Hecht photo.*

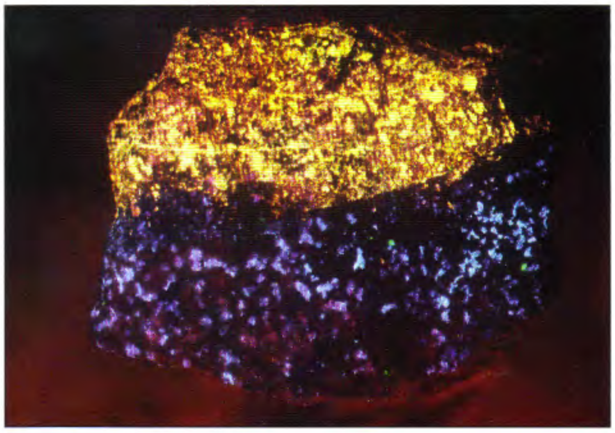

Figure 44. Fibrous wollastonite in contact with spotty margarosanite and minehillite in microcline. Author's specimen, 3.25″ × 2.75″ (8 × 7 cm). *Steve Sanford photo.*

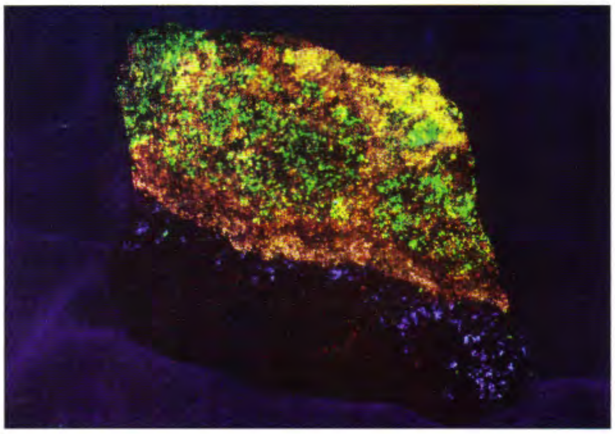

Figure 45. Fibrous wollastonite with willemite on microcline. Bill Kroth specimen, 5.5″ × 4.75″ × 4″ (14 × 12 × 10 cm). *Tema Hecht photo.*

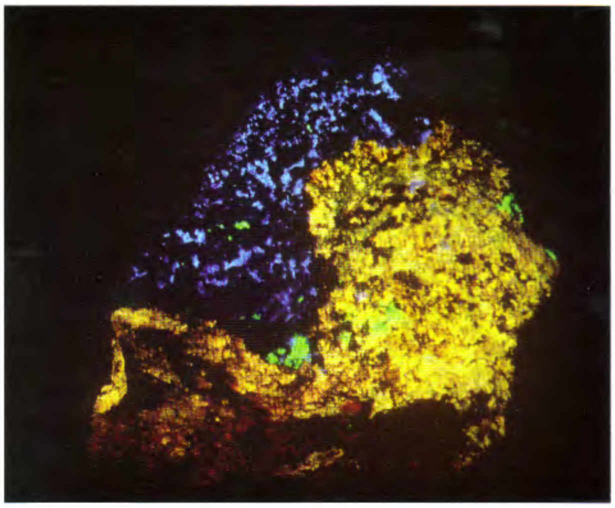

Figure 46. This Fibrous wollastonite/margarosanite combination is a fluorescent pattern collector's dream. Author's specimen, 6″ × 4.5″ (15 × 11 cm). *Henry Van Lenten photo.*

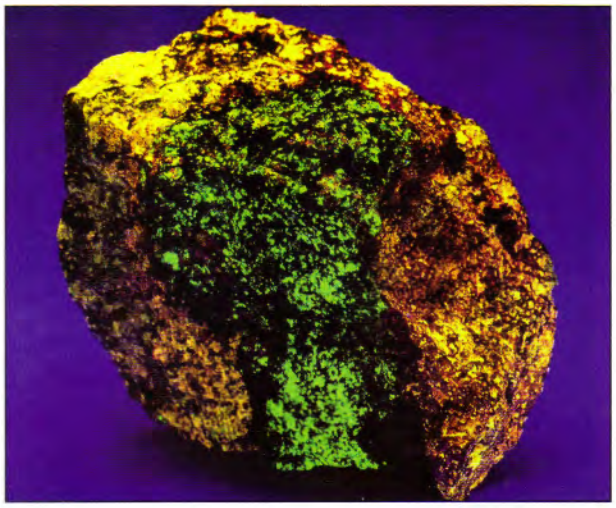

Figure 47. A well-balanced specimen of Fibrous wollastonite and willemite. Earl Verbeek specimen ERV-1215, 4.5″ × 3.5″ × 3″ (11 × 9 × 8 cm). *Gary Grenier photo.*

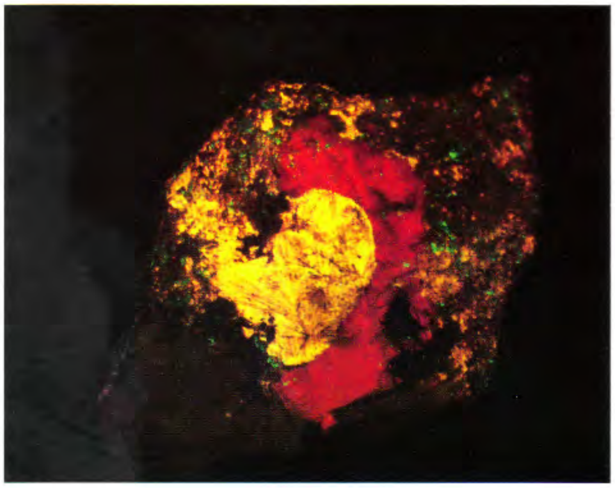

Figure 48. Franklin Mineral Museum's specimen no. 555, which features radiating Fibrous wollastonite with calcite. 5.5″ × 4″ (14 × 10 cm). *Franklin Mineral Museum photo.*

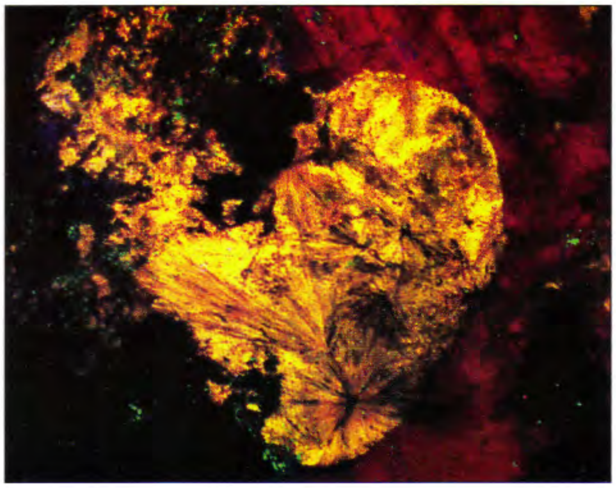

Figure 49. A close-up of Figure 48 showing the detail of the Fibrous wollastonite rosette. Wollastonite mass measures 1.375″ × 0.75″ (3.5 × 2 cm). *Franklin Mineral Museum photo.*

First-Find wollastonite. Original-Find wollastonite was believed to be pectolite until the 1970s or 1980s. The fact that it may have been found earlier than the world's best fluorescent wollastonite should not give it any imagined advantages, either esthetic, scientific, or commercial. To the average collector of fluorescent minerals, it is the least exciting type of Franklin wollastonite under shortwave UV (or any other wavelength), but it deserves respect as it is quite rare and unusual.

Original-Find wollastonite generally fluoresces moderately intense yellow-orange under shortwave UV. The phosphorescence is a brief orange "flash" or "BIP," followed by a prolonged orange-yellow afterglow. Of all the types of Franklin wollastonite, this is the one with the most obvious and persistent phosphorescence. The tiny willemite grains fluoresce a typical bright yellow-green under shortwave UV, and calcite (when present) fluoresces a pinkish red of moderate intensity.

Original-Find wollastonite was labeled "clinozoisite with pectolite" for several decades at least, and there are undoubtedly still specimens of it with similar labels. This type of Franklin wollastonite typically occurs in white grains, interspersed with similarly sized grains of a fine-grained, tan-colored mineral, that together make up veins between angular pieces of what has been called "pegmatite" but is a fine-grained rock composed of white feldspar, quartz, and a dark green mineral, probably a pyroxene. In two of three specimens examined, the wollastonite-containing "veins" range from 1 cm to 3 cm (3/8″ to 1.25″) in thickness and the wollastonite grains are small, from 1 to 3 mm across. The third specimen studied is almost entirely composed of the tan mineral and wollastonite, the latter in grains about 2 cm (0.75″) thick, with a fibrous aspect. Calcite is present in minor amounts in some specimens, and small (sub-mm) grains of willemite are usually present as well. The tan-colored mineral is often supposed to be clinozoisite, although when the author bought his first specimen, local folk wisdom was that the clinozoisite was actually the dark-reddish-brown grains found sparingly with pectolite and the tan mineral. This assemblage does not appear to have been formally studied. Clinozoisite is mentioned by Dunn (1995) and is included in the current Franklin-Sterling Hill species list (Cianciulli, 2004), but Dunn's clinozoisite is found only at Sterling Hill and bears no apparent resemblance to anything in Original-Find wollastonite specimens.

As mentioned earlier, this material was originally identified and sold as "pectolite with clinozoisite" until the 1970s or 1980s, when it was said to have been re-identified as wollastonite. However, the author has been unable to find a written record of this re-identification. Nor does there appear to be any record of who found this material, or when. At least whoever found it thought it odd enough to save a moderate amount, perhaps two peach baskets full, or two powder boxes' worth. By repute this material emerged in the mid-1930s. When the author began collecting in 1960, he became familiar with one piece in "Sunny" Cook's collection, labeled "clinozoisite in pectolite in pegmatite/Franklin, N.J." Several years later, Ewald Gerstmann had several pieces for sale at his museum, as pectolite, for $10.00 a pop. In the early 1980s, a powder box full turned up at Dick Hauck's. By then this "mystery mineral" was reputed to be wollastonite, but the price for a rich 9.5 × 12 cm (3.75″ × 4.75″) specimen (Fig. 32) was still fairly reasonable at $50.00. Since then Original-Find wollastonite has ridden the coat-tails of the more flamboyant wollastonite finds to price levels the author finds discouraging, but in fact this material is as rare as First-Find and Second-Find wollastonite.

In the fluorescent exhibit of the Franklin Mineral Museum is a substantial specimen (Fig. 33) of Original-Find wollastonite that fluoresces orange rather than the typical yellow-orange. Other Original Finds have been shown in recent years at the Franklin–Sterling Gem & Mineral Show in specialized displays of Franklin wollastonite. Typical examples reside in several private collections. The largest known Original-Find wollastonite (Fig. 34), an esthetically superior example with substantial amounts of calcite, is in the collection of Claude Poli. It measures 18 × 13 × 8 cm (7″ × 5″ × 3″) and came from the collection of Fred Howell.

Dump-Find Wollastonite

There are at present two confirmed finds of fluorescent wollastonite made by collectors combing the Franklin dumps. These two discrete finds are extremely limited, as in the experience of the author there are three specimens known from one occurrence, and one from the other. This is not surprising in view of the situation described in 1958 (Cook et al.): "Wollastonite has not been discovered by the editor in all dump specimens studied, the mineral having apparently been discovered only after dumping operations ceased at Franklin."

The better known of these two finds was reputedly made on the Buckwheat Dump in 1948. This at any rate was the locality and date that came with a specimen (Fig. 35) acquired by the author from Steve Sanford, who had purchased it from Warren Miller. Although the largest piece from this find (Fig. 36), a specimen now on display in Zobel Hall at the Sterling Hill Mining Museum, was eventually acquired from Mark Leger, further information was not forthcoming. According to the person from whom Mark obtained that largest piece, it had come out of the collection of his brother, an avid field collector who is now dead. If there was documentary evidence in the form of a label or journal entry, it has been lost. However, a third piece from this find is known from the collection of Doug and Gregory Wahl of Washingtonville, New York, and it was acquired from a rock shop in or near Port Jervis during a going-out-of-business sale (telephone conversation with Greg Wahl, July 2004).

The author's two pieces match but make up perhaps 75% of the original dump rock, so it is probable that these two, with the Wahl specimen, comprise the entire find. Clearly the material is from a surface dump as the wollastonite on the surface of the specimens is weathered reddish-brown to dark brown. In contrast, the calcite is not much weathered, but that is typical of Buckwheat Dump calcite found with lean ore. Willemite is present in small amounts, as grains and veinlets. Dark brown garnet is fairly abundant in grains and rough crystals as large as 1.5 cm (0.5″). The largest piece is about 17 cm (6.75″) long and the smaller one about 7 × 8 × 9 cm (2.75″ × 3.25″ × 3.5″), while the specimen in the Wahl collection measures 6 × 10 cm (2.25″ × 4″).

Most of the wollastonite in these two specimens fluoresces fairly bright orange, but there are yellow-orange areas in some of the grains. The orange is more saturated than that of Third-Find wollastonite but not as saturated as that of First-Find specimens. The orange fluorescence of the wollastonite and the red fluorescence of its calcite matrix are not quite as bright as that of classic First-, Second-, and Third-Find Franklin wollastonite specimens. However, the comparatively large size of the wollastonite masses makes up for any perceived lack of brightness. Green-fluorescing willemite is a minor but conspicuous feature of these pieces under UV, as grains and thin veins of willemite bordering wollastonite grains.

The second confirmed surface find of wollastonite consists, so far as is known, of one piece now in the collection of Dr. Steven Kuitems. (As it has one freshly broken surface, there may be two pieces.) It is not very large, about 5 × 7 cm (2″ × 2.75″), and most of the exterior shows signs of heavy chemical etching, rather than natural weathering, as if a weathered specimen had been cleaned up to make it presentable. Where it is freshly broken, the wollastonite, which is present in grains several centimeters across and comprises the bulk of the specimen, fluoresces a moderate orange, weaker than other Franklin finds. It is associated with red-fluorescing calcite and what appears to be microcline that fluoresces weak red. Dark brown garnet and "hornblende" are also present. Apparently there is no record of where and when this piece was found, or by whom. However, it can be tracked over the last several years from Richard Hauck to Herb Obodda to Warren Miller to Mark Leger to Steve Kuitems.

In his book *Collecting Fluorescent Minerals* (Schneider, 2004, p. 100), Stuart Schneider reported a self-collected find of wollastonite from the Franklin Mill Site (or as he describes it, the "Old Mill Site"). The specimen, photographed in visible light and short-wave UV, is of a white mineral with a striated surface in a matrix of brown garnet, and bears little resemblance to any other wollastonite from Franklin or Sterling Hill. Its fluorescence is described in Schneider's text as "violet (SW)" but in the photo (and to the author in person) appears deep red. According to Mr. Schneider (oral communication, 2004) the initial identification by a local authority was visual and based on the fibrous appearance of the mineral. A sample of the find acquired from Mr. Schneider was submitted for EDS analysis by Excalibur Mineral Corp., and has proven to be barite.

Fibrous Wollastonite

Fibrous wollastonite from Franklin was believed to be pectolite when it was found in 1951, and for more than 20 years thereafter. Pectolite from Paterson, New Jersey, and other classic localities had a radiating, fibrous habit, and so did this mineral. Furthermore, the fluorescence of Fibrous wollastonite was believed to be typical of Franklin pectolite, one of the 10 fluorescent minerals reported by Palache in the first checklist of Franklin fluorescent minerals (Palache, 1928). In his 1935 monograph, the "bible" for Franklin collectors from 1935 to 1995, he writes, "Under the iron-arc spark pectolite gives a pure-yellow fluorescence." Palache described pectolite from Franklin in two assemblages, as "transparent colorless crystals and grains implanted on and mixed with the prehnite," and "pinkish coarse-fibrous aggregates associated with brown garnet, willemite, and biotite." Palache's descriptions of Franklin pectolite's fluorescence, and its occurrence as "pinkish coarse-fibrous aggregates," reinforced the belief that the fibrous, orange-fluorescing mineral found in 1951 was pectolite.

Those with iron-arc units can satisfy their curiosity as to the accuracy of Palache's observations; he reported what he saw. Still, it is necessary to say that compared with the filtered mercury-arc UV lamps of today, the iron-arc spark device was primitive and awkward to work with. Among other things it did not have a filter to cut off visible light produced by the iron arc, so the visible light from the arc reflected from the specimen. In many cases this visible light masked any mineral fluorescence present; in others it blended with the fluorescence of the minerals to produce colors that in general are more unsaturated (pale or "washed out") than those we see with modern UV lamps. There is a more detailed discussion about observations made with the iron arc in Gaines and Bostwick (1993).

Classic Franklin pectolite, of the type Palache described as "transparent colorless crystals and grains," fluoresces orange of moderate saturation and intensity under a filtered, mercury-arc shortwave UV lamp, and has a brief, weak phosphorescence. Under the iron arc, the same material responds vividly but appears to be fluorescing yellow, though a chrome-yellow rather than a greenish-yellow like the fluorescence of esperite. This form of Franklin pectolite is neither opaque white nor found as glossy fibers, but looks like coarse grains of sugar, and is usually mixed with prehnite in curved white plates that often fluoresce a color described as "peach" or "hot pink." The term "pecto-prehnite" is used locally to describe mixtures of these minerals from Franklin, but is not, as some have supposed, the name of a mineral species.

Fred Parker and Dr. Arnold Fainberg made the discovery that the orange-fluorescing, radiating, fibrous mineral found at Franklin in 1951 was wollastonite (Parker and Fainberg, 1975). "One of the most sought after fluorescent minerals from Franklin, N.J. has been the cream white silky masses labeled Pectolite associated with a pink garnet . . . This brilliant peach-orange fluorescent is seen on dealers' tables commanding top prices and is purchased without hesitation. The authors of this article now have proof that this assumption is often in error. Quite routinely, Dr. Fainberg, using a modified Infrared Spectrometer, tested a sample of the material in question and found no Pectolite was present. The data did bear a close resemblence [sic] to that of Wollastonite plus a garnet, and later samples from various sources bore out this conclusion. Fred Parker, having access to an X-ray diffraction unit, tested the validity of the infrared data and came up with comparable results. X-ray data showed a good pattern for Wollastonite plus Grossular." A year later, Bernie Kozykowski wrote to *The Picking Table* that "the most recent analysis again confirms the initial findings by Dr. Arnold Fainberg, that the white fibrous specimens of what we have been calling pectolite are not. They are wollastonite . . . Subsequent analysis by Dr. Warren Miller and recent analysis by the Department of Geology at the University of Delaware support these initial findings" (Edwards, 1976).

Fibrous wollastonite is certainly the oddest of Franklin wollastonites and the only one with a link to the so-called Parker Shaft Suite of altered calcium silicate minerals. A member of that suite, the lead silicate margarosanite, is well-known for its bright pale blue fluorescence (and notorious for its property of inspiring madness in collectors). It is found in a fair number of distinctive assemblages at Franklin, but margarosanite has its best development in the same assemblage as Fibrous wollastonite, where the two are often associated. With these is found minehillite, a complex silicate found only at Franklin and only in this assemblage. The minehillite assemblage, unlike all other assemblages containing wollastonite at Franklin, appears to be the product of pervasive hydrothermal alteration. It is fascinating and complex and has been described in some detail by Dunn et al. (1984), Dunn (1995), and Cianciulli (2000).

Luckily the minehillite assemblage was discovered in the last few years of the Franklin mine, so its fluorescent qualities were noticed by the miners, and much material was recovered. As rare and expensive as the best specimens from the minehillite assemblage have become, particularly those rich in what is called "fish-scale" margarosanite, there are hundreds of specimens from this assemblage in collections, and they are well worth studying. The overall quantity of minehillite-assemblage specimens can be estimated at several hundred pounds, which makes it the second-most abundant find of wollastonite at Franklin after the Third Find. A specimen of Fibrous wollastonite (Fig. 37) in the author's collection is labeled as having come from "360N, 3 cuts below 950 level," or a few hundred feet north of the original Parker Shaft workings and a little deeper. This information is neatly inked on a piece of masking tape attached to the specimen; the label is dated "9-10-51," and the writing appears to be that of Allen Pinger, the NJZ geologist who also labeled George Elling's "Rosetta Stone" First-Find wollastonite.

The minehillite assemblage is not uniform in appearance or mineral distribution, and had been regarded as several different assemblages by past investigators, including this author and Pete Dunn (Dunn et al., 1984, and Dunn, 1995). This author did not at first connect examples of "fish-scale" margarosanite in orange calcite with the large masses of Fibrous wollastonite and grossular that also characterize the assemblage but with time realized that both could be associated with gray feldspar. In 1983 the author bought a specimen from Fred Parker that included all the major minerals in the assemblage, with grossular and wollastonite toward one end of the specimen, microcline in the middle, and margarosanite and an unknown mineral (the as-yet-undescribed minehillite) at the other end. In the Franklin Mineral Museum is a larger specimen, SPEX/Gerstmann no. 1657, with all the major minerals of the assemblage present, and many unusual accessory minerals (Cianciulli, 2000). In examining and describing this assemblage it is helpful to have a sense of these three divisions or phases: wollastonite/grossular dominant, microcline dominant, and orange calcite/margarosanite/augite dominant.

Fibrous wollastonite in the minehillite assemblage occurs as clumps of white, thin, silky fibers that typically display a radiating habit. Rarely it forms complete rosettes on the order of 1 to 2 cm (3/8″ to 3/4″) across, but more often it is in smaller clumps and divergent bundles of fibers, coarsely mixed with segregations of pink grossular: hence the mottled pink color, apparent on first sight, of most specimens (Fig. 38). Nearly pure masses of this wollastonite/grossular mixture 15 to 20 cm (6″ to 8″) or more in breadth are not uncommon (Fig. 39) and are prized by collectors.

The fluorescence of Fibrous wollastonite has been variously referred to as "chalky orange-yellow" (Cook et al., 1958), "more chalky orange than . . . the firmer appearing orange of clinohedrite" (Jones, 1964), "brilliant peach-orange" (Parker and Fainberg, 1975), "strong chalky pale orange" (Bostwick, 1977), etc. In fact, like much Second-Find wollastonite and wollastonite from Sterling Hill, Franklin's Fibrous wollastonite exhibits a range of hues under shortwave UV, from orange to yellow-orange and orange-yellow. Often these variations appear as patches of different fluorescent hues, over a scale of millimeters or centimeters, in the same specimen. In a few specimens, Fibrous wollastonite has an orange-red fluorescence similar to that of calcite (Fig. 40); the cause is not known. Where Fibrous wollastonite and willemite are fine-grained and mixed together, the combined fluorescence appears yellow (Fig. 41). Most likely the adjective "chalky" applies to the paler orange-yellow and yellow-orange fluorescent colors of Fibrous wollastonite, but the masses of wollastonite are unusually nonreflective, and this could also subtly influence a judgement of fluorescent color.

All these fluorescent hues of Fibrous wollastonite, however yellow-orange or orange-yellowish, have a distinctive short-lived orange phosphorescence that is much more consistent in hue than the fluorescence. This was noticed by "Sunny" Cook (Cook et al., 1958) when Fibrous wollastonite was still thought to be pectolite. "Cook . . . remarks that all the Franklin pectolite she has examined under short wave shows a fleeting flash of phosphorescence or afterglow comparable in duration to that of Franklin calcite, and similar to calcite in the distinct change in color response from the chalky orange-yellow of the fluorescence to the bright orange of the phosphorescent flash." This description does not match the phosphorescence of genuine Franklin pectolite, as described earlier, so it applies to Fibrous wollastonite.

Margarosanite and calcite are the other conspicuous fluorescent minerals in the minehillite assemblage under shortwave UV. Here calcite, which is typically pale orange in daylight, fluoresces moderately strong red. Margarosanite fluoresces bright pale blue, with zones and highlights of moderately bright red. Generally speaking, margarosanite from the minehillite assemblage fluoresces as bright as, or brighter than, other margarosanite from Franklin. As margarosanite and calcite frequently occur together in this assemblage, the results are often quite dramatic. Unlike most margarosanite found at Franklin, which typically occurs as thin plates disseminated in feldspar, and occasionally as solid masses of plates, margarosanite in the minehillite assemblage is found in seam fillings and solid, foliated masses that can be many centimeters thick. "Fish-scale" margarosanite is the dominant form, and the term ideally applies to masses with parallel plates, which resemble rows of fish scales. Remarkable examples are found in the collections of the Franklin Mineral Museum, Bill Kroth, Peter Chin, Warren Miller, George Elling, Marc Savett, Earl Verbeek, and others. Peter Chin's extraordinary piece (Fig. 42), which combines fish-scale margarosanite with Fibrous wollastonite, can also be seen in a Gary Grenier photograph on page 20 of the Fall 2003 issue of *The Picking Table*. A smaller but rich and flamboyant piece in the Elling collection is pictured on page 72 of *Collecting Fluorescent Minerals* (Schneider, 2004). The minehillite assemblage is also noted for rosettes of margarosanite, which are extremely rare and highly sought after. In the Warren Miller collection is a superb example, which was photographed by Henry Van Lenten; that image can be seen on page 5 of the June 1981 *SPEX Speaker* (Jones, 1981). A corresponding piece (Fig. 43), perhaps the other half, is on display in Zobel Hall at Sterling Hill.

One of the less conspicuous fluorescent species in the minehillite assemblage is that of its namesake mineral. Minehillite's fluorescence has been discussed in detail by Cianciulli (2000), but to summarize, it fluoresces weak violet in shortwave UV and moderately strong violet in midwave UV (a.k.a. "midrange" or "medium-wave" UV, circa 300 nm). In fact, in midwave UV, minehillite is the brightest fluorescent mineral in the assemblage, and using a midwave UV lamp is by far the easiest way to find and identify it. Much minehillite occurs as small (1–2 mm) plates in microcline, near its contact with Fibrous wollastonite, and these plates are often dark gray because of thin layers of native lead between the plates. Small plates of margarosanite occur in the same matrix, and if the red and blue fluorescences of margarosanite are mixed together, the effect under shortwave is that of a bright violet-fluorescing mineral, but these plates are not minehillite. Since minehillite plates are small, dark gray in daylight, and weakly fluorescent in shortwave UV, they are often overlooked: hence the belief that minehillite is an extremely rare mineral, although within its assemblage it is relatively abundant. It certainly is true that larger (in the range of 1 cm and up) masses of lead-free minehillite, which are nearly colorless or faintly yellow and have a luster like that of brucite, are quite rare. The best of these were in a collection purchased and resold by the late Andy Massey.

Other fluorescent minerals in the minehillite assemblage include green-fluorescing willemite in colorless grains (easily seen only under UV), blue-green fluorapatite that fluoresces orange-yellow, colorless grains of barite with strong pale blue fluorescence, and pale gray microcline that fluoresces weak red. The fluorescence of the barite grains has been described as "navy blue" but is the same as that of margarosanite, and it is an open question whether the fluorescence is that of barite or included margarosanite. Barite and willemite are found as grains in Fibrous wollastonite. The fluorapatite, reported by John Cianciulli (Cianciulli, 2000) is in the associated microcline.

Nonfluorescent minerals in this assemblage include pink grossular, greenish-brown andradite, dark red vesuvianite, dark green augite, and black allanite. The tabular crystals of allanite are typically surrounded by reddish radiation halos; in one specimen seen, the mineral inside the radiation halo is not black like allanite but transparent and orange, which suggests thorite. On some specimens of mixed wollastonite and grossular are tiny amounts of blue, red, and green secondary copper minerals, which appear to be derived from weathered native copper and grains of blue-black chalcocite. John Cianciulli (Cianciulli, 2000) reports copper, chalcocite, and cuprite. Fred Parker identified colorless, sparkling apophyllite crystals in this assemblage (mineral label with oral confirmation, 1983) by X-ray diffraction; they have been seen by the author in shallow vugs on minehillite plates and on Fibrous wollastonite. Massive, pale gray quartz has been noticed in this assemblage as a 2-cm (0.75″) mass in orange calcite. Lead is fairly abundant, as exsolution films in minehillite and disseminated in microcline, where it is seen as a dark-gray discoloration. Lead is usually concentrated near the contact of microcline with both the wollastonite-grossular masses, and the calcite-margarosanite pods.

Most display specimens from the minehillite assemblage fall into three groups, as mentioned earlier, rather as if the assemblage consisted of three related but distinct "mini-assemblages": 1) masses of Fibrous wollastonite mixed with grossular, and sometimes willemite grains (Figs. 37, 38, and 39); 2) wollastonite-grossular masses in contact with microcline that incorporates small grains of minehillite and margarosanite (Figs. 44, 45, and 46); and 3) coarsely crystallized margarosanite and minehillite, associated with orange calcite and dark green augite (Fig. 42). The latter type can be associated with masses of pure microcline and more rarely with patches of Fibrous wollastonite.

As at least several hundred pounds of the minehillite assemblage were saved, praiseworthy specimens of fluorescent Fibrous wollastonite, fish-scale margarosanite, and combinations thereof exist in many collections. Excellent examples can be seen at the Franklin Mineral Museum, and Warren Miller has extremely fine examples of nearly all the varieties described in this article. Several of the best specimens of Fibrous wollastonite in contact with margarosanite-bearing microcline are in the collection of Steve Chuka, and Bill Kroth's collection includes a piece of this type (Fig. 45) that includes an unusual amount of willemite. Another example (Fig. 46), with a distinctive S-curve boundary between microcline and wollastonite, is displayed at Sterling Hill in Zobel Hall. Earl Verbeek's collection includes a vivid and well-balanced example (Fig. 47) of Fibrous wollastonite with willemite, acquired from Dave Wellbrock; these are rare. Complete rosettes of Fibrous wollastonite are surprisingly scarce. The Franklin Mineral Museum has a fine piece (Figs. 48 and 49) that has often been exhibited at the Franklin–Sterling Gem & Mineral Show, and Dr. Steven Kuitems owns an extraordinary larger piece with many wollastonite rosettes. Outstanding examples of Fibrous wollastonite in its various displayable forms are in many other collections, including those of Joseph Daley (his large specimen from the Lee Areson collection weighs 23 pounds!), Denis DeAngelis, Jerry McLaughlin, Steven Phillips, Claude Poli, Marc Savett, and Nick Zipco.

Conclusion

Franklin has without a doubt produced the most varied and spectacular fluorescent wollastonite of any locality on Earth. It also has to be said that the best examples of First-Find wollastonite from Franklin rank with the best fluorescent mineral specimens ever found anywhere. The best Second-Find and Third-Find specimens rank close behind, as do the better examples of Fibrous wollastonite, particularly when they are associated with margarosanite.

From time to time it has been said that collectors of Franklin minerals are blind to the merits of competing localities and that the title "Fluorescent Mineral Capital of the World" is just New Jersey political chauvinism and chest-thumping. Perhaps this is true, but what ought to be scrutinized is not the political motivations of this title but whether the title is accurate. This article is an attempt to convey through images and descriptions the complexity, variety, and magnificence of one of the most famous fluorescent minerals from one of the world's most legendary and remarkable mining districts. Admittedly this is an incomplete report, as it is restricted to representative specimens in a few collections; a biased report in that it reflects the views of someone who has specialized in collecting "Franklin rock" for 44 years; and a partisan report as the author has no doubt that Franklin is legitimately "The Fluorescent Mineral Capital of the World." If the present article succeeds in demonstrating this claim, it will be because through the photos the specimens speak for themselves.

Acknowledgements

This project was originally envisioned as a Grand Tour through all the great collections of Franklin minerals. My wife, Tema Hecht, and I were to visit one after the other, while she took photos and I took notes. We were going to share collector stories, learn new ones, enjoy knowing our hosts better, see a lot of "great Franklin rocks," and generally have a good time. It's a lovely fantasy but alas, it was not to be. We both work for a living, and the deadline for writing this article, though originally quite generous, kept shrinking. Consequently I know I have missed much. There are still major collections I have not seen, and dozens of worthy collectors I have not been able to interview. To those of you I did not have time for, I apologize. I hope that this article serves as a magnet to draw out additional information about the complex and fascinating subject of wollastonite at Franklin.

Tema and I are particularly grateful to Gary Grenier, who took so many excellent photographs of wollastonite for this project. He spent Lord knows how many hours doing it, showed us how he did it, and continued to give us invaluable instruction and advice, not only about mineral photography. We are thankful for his friendship. His death on Sept. 28, 2004, was a cruel blow to us, *The Picking Table*, and all who support the continuing effort to educate the public about the greatest of mineral localities.

The Picking Table managing editor Mark Boyer has been helpful in encouraging this project and nudging me ahead when I faltered. Earl Verbeek continues to be, as he has been for at least 20 years, a valued advisor, editor, proofreader, friend, and a source of truth and authority in matters of rocks and minerals and almost everything else. Both have contributed to this project and have allowed repeated access to their collections.

My particular thanks to Dr. Warren Miller, who not only hired me in 1980 for the job I still have, but has over the decades allowed me frequent viewings and photo-ops of his unparalleled collection, which contains literally dozens of top-notch Franklin and Sterling Hill wollastonites. Thanks also to Richard and Elna Hauck, and Bill and Denise Kroth, who recently granted access to their Inner Sancta so we could browse through their wollastonites and take photos of many outstanding pieces. Many thanks as well to John Cianciulli for a critical review of the text and for new information about the "tremolite" associated with Third-Find wollastonite.

I am also grateful to the collectors and friends I interviewed in connection with this project, all of whom were cooperative in imparting the mysteries of the "wheeler and dealer" trade. In particular, I would like to thank Dave Wellbrock, Mark Leger, and Claude Poli, all vigorous collectors who are familiar with the collector scuttlebutt of the last few decades.

John Leach ("Jack") Baum has to be singled out for special attention, as he has with grace and tolerance not only answered my repeated questions about Franklin wollastonite, but also was willing to write down for me what he knew. Unlike most of us, he wrote things down to start with; it is refreshing to report that he is still capable and willing, if asked politely.

Throughout this arduous process my wife, Tema, has given support, appropriate criticism, and advice whenever and wherever it was needed. Since her support has included photography, proofreading, pep talks, and numerous other services without which this project could not have been completed, I must justly acknowledge her as a full partner and accomplice in this work and in my life.

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Editor's Note:

After much arduous consideration, the following editorial styles were established for Richard Bostwick's article on Franklin wollastonite:

1. Collectors' terms commonly used to describe the various types of Franklin wollastonite specimens are treated as proper nouns (i.e., they are capitalized), with and without the generic descriptor "wollastonite," which is not capitalized.
2. These ad hoc proper names are hyphenated for clarity when used adjectivally.
3. Unless otherwise expressed, measurements given are rounded to the nearest quarter inch or whole centimeter. Every effort was made to obtain precise measurements in three dimensions, but in some cases measurements were copied from other sources. Please also keep in mind that measurements of mineral specimens are prone to subjectivity and the dimensions given are approximations.

—MB

Clinochrysotile: A Fluorescent Serpentine From Franklin, New Jersey

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

Figure 1. Daylight photo of clinochrysotile from Franklin, N.J. The waxy brown, chert-like clinochrysotile is surrounded by white calcite and a matrix of gray carbonate resembling dolomite with 1 to 2 mm grains of franklinite. *Franklin Mineral Museum photo.*

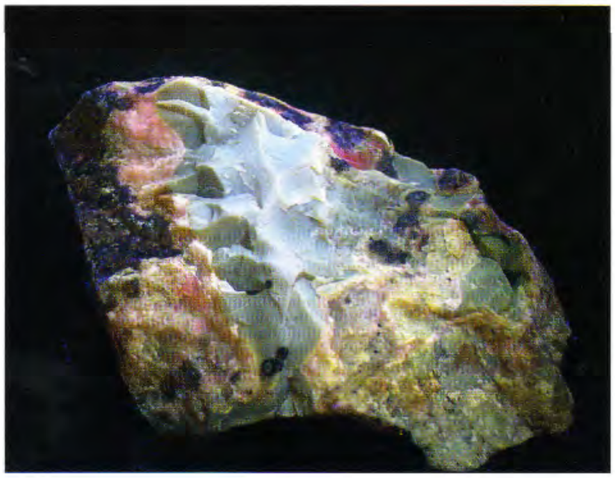

Figure 2. Under longwave ultraviolet light, clinochrysotile fluoresces a pale blue-gray and the calcite fluoresces pink to medium red. Specimen measures 4 × 3 inches (10 × 7.5 cm). Specimen owned by Lou Cherepy, Jr. *Franklin Mineral Museum photo.*

In June 2002, Mr. Lou Cherepy, Jr., brought to my attention a specimen with a mineral that he thought might be chert or serpentine. We quickly determined this material was too soft to be quartz (chert). The matrix is similar to that of the radiating willemite finds from the Buckwheat Mine. A good example of this radiating willemite is on display in the Franklin Mineral Museum's field collecting exhibit in Kraissl Hall. John Kolic collected this fine specimen on the Buckwheat Dump in the early 1980s. The radiating willemite occurs in a matrix of gray carbonate (possibly dolomite) with white calcite and serpentine stringers and pods usually rimming secondary willemite crystal aggregates that form rosettes.

When examined with shortwave ultraviolet (UV) light, Mr. Cherepy's specimen has no hint of secondary willemite, although the calcite fluoresces red. The brown mineral has an almost indiscernible brown fluorescence, which I first thought was influenced by the daylight color of the mineral. Under midwave UV light, the fluorescence of the brown mineral is distinctive orange-brown and the calcite a weaker orange-yellow. Under longwave UV light, the brown mineral fluoresces best; color responses range from pale blue-gray with a green hue to strong yellow-brown resembling a mustard color. The calcite fluoresces a pale red of variable intensity. When this specimen is compared with similar specimens in the

Figure 3. The reverse side of Lou Cherepy, Jr.'s specimen. While the cherty texture of clinochrysotile is interesting in daylight, the colors are somewhat drab. *Franklin Mineral Museum photo.*

Figure 4. Under longwave UV, the specimen takes on a subtle beauty of pastel shades of pink and blue. *Franklin Mineral Museum photo.*

Franklin Mineral Museum collection, a variation of fluorescing color responses may be observed. A curious characteristic of these specimens is that the serpentine exhibits a notable fluorescent color change from yellow-brown to blue-gray during sustained exposure (about 1 minute) to longwave UV light.

Suspecting that this mineral was an uncommon serpentine, I was able to confirm this through optical determination. A sample was then forwarded to Mr. Tony Nikischer of the Excalibur Mineral Company for scanning electron microscope (SEM) analysis. The following table shows the result of his analysis:

Element	Wt%	Z	A	F
MgO	47.89	0.9840	0.5802	1.0038
Al_2O_3	1.21	0.9551	0.4614	1.0061
SiO_2	47.47	0.9829	0.5889	1.0000
Fe_2O_3	0.99	0.8663	1.0031	1.0059
ZnO	2.45	0.8359	1.0078	1.0000
Total	100.01			

The energy dispersive spectral (EDS) analysis results confirmed a serpentine-group mineral with a low Fe (iron) content. The sample was then sent to the Geological Survey of Canada (GSC) for X-ray diffraction (XRD) analysis by Mr. Andrew Roberts. The XRD confirmed the true identity of this serpentine: clinochrysotile, the most common member of the serpentine group found at Franklin and Sterling Hill. The GSC film reference number is X-79027.

The fluorescence of serpentine from Franklin has been observed for years but was thought to be caused by admixed sphalerite or calcite (Bostwick, personal communication). Optical study for the most part proved to be a lesson in futility, but the exercise raised questions about the "mixture theory." SEM and XRD analyses indicate that this fluorescing serpentine is not a mixture.

I believe that fluorescent clinochrysotile from Franklin reposes in many old collections and may still be found on the Buckwheat and Trotter Dumps. Collectors searching for this mineral should bear in mind that its best fluorescent response is observed under longwave UV.

Acknowledgements

The author would like to thank Mr. Lou Cherepy, Jr., for bringing this specimen to his attention. Special thanks also go to Mr. Anthony Nikischer from Excalibur Minerals Company, Peekskill, N.Y., for his SEM analysis; and Mr. Andrew Roberts, X-ray Mineralogist from the Geological Survey of Canada, for the XRD analysis. I would also like to thank Mr. Richard C. Bostwick and Dr. Earl R. Verbeek for their fluorescent-response observations and recollections. Photographs are courtesy of the Franklin Mineral Museum archives.

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Scenes From the 32nd Annual NJESA Gem and Mineral Show, April 24 & 25, 2004

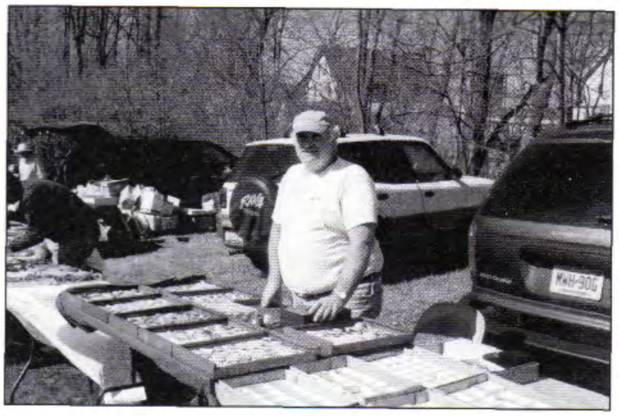
Swap & Sell dealers as far as the eye can see. *Mark Boyer photo.*

Saturday's weather was perfect for wheeling and dealing. *Mark Boyer photo.*

Mr. and Mrs. Rich Eisenman are set up and open for business. *Mark Boyer photo.*

The dons of the Franklin Mafia: Kurt Hennig, Denis DeAngelis, Claude Poli, Greg Lesinski, and Fred Lubbers. *Mark Boyer photo.*

Dru Wilbur: "And this specimen was owned by a little old lady from Ogdensburg who only fluoresced it on Saturdays. . . ." *Mark Boyer photo.*



The cabochon king Ralph Kovach displays his handiwork. *Mark Boyer photo.*

Scenes From the 32nd Annual NJESA Gem and Mineral Show, April 24 & 25, 2004

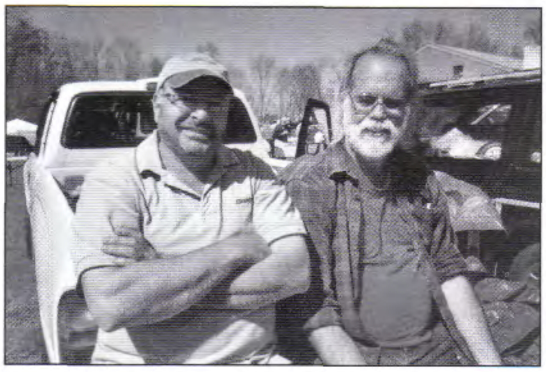
Show chairman Fred Stohl and show treasurer Russ Brarens. *Tema Hecht photo.*

Paul Shizume disguised as a mild-mannered fluorescent mineral collector. *Richard Bostwick photo.*

Charlie Ward does the "hootchie-kootchie." *Tema Hecht photo.*

Two curators to go: John Cianciulli hitches a ride from Earl Verbeek. *Richard Bostwick photo.*

Peter "Lucky Pierre" Chin. *Tema Hecht photo.*

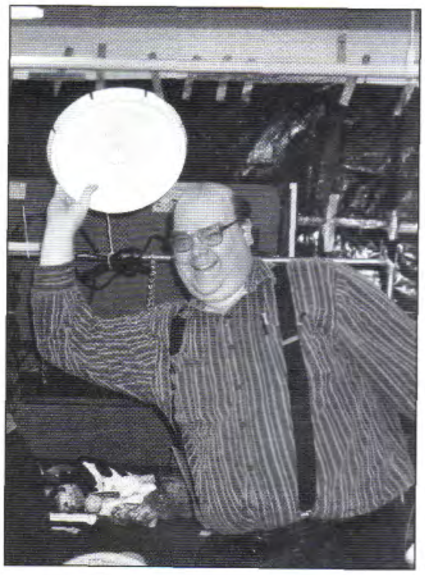


Hardened veterans of the rock wars, Mark Leger and Dave Wellbrock. *Richard Bostwick photo.*

Scenes From the 32nd Annual NJESA Gem and Mineral Show, April 24 & 25, 2004

In the trenches at the Trotter Dump dig. *Jeff Winkler photo.*

Ewald Gerstmann and Tema Hecht as viewed from the waist up. *Richard Bostwick photo.*



Charlie Ward's assistant Mark Thompson flips his lid. *Tema Hecht photo.*

Display chairman John Sanfaçon and show chairman Fred Stohl. *Tema Hecht photo.*

Longtime NJESA stalwarts Franklyn and Lavina Ellis. *Tema Hecht photo.*

Mary Kuitems sweeps up the crumbs husband Steve left behind. *Tema Hecht photo.*

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- 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.

Sterling Hill Mining Museum Foundation

30 Plant Street
Ogdensburg, NJ 07439-1126
Phone: 973-209-7212
Fax: 973-209-8505
Web: www.sterlinghill.org

Memberships include:

- Wallet-size membership card
- The *Sterling Hill Newsletter*, 2 issues per year
- 10% discount on gift shop purchases (excludes consignment items)
- Special days to collect at the Mine Run Dump and special night collecting events (all to be announced)

Calcite Membership, Individual (one year): $15.00, includes 1 admission to the mining museum

Calcite Membership, Family (one year): $25.00, includes 2 admissions to the mining museum

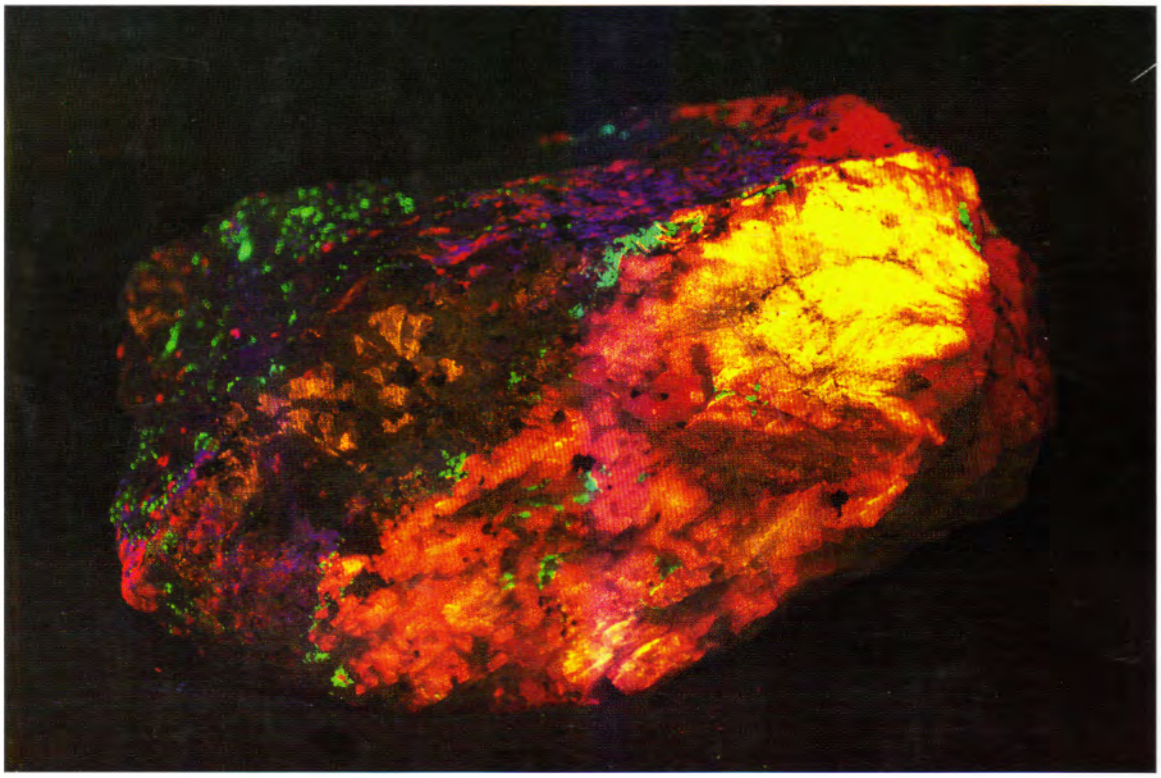
Willemite Membership (one year): $50.00, includes 4 admissions to the mining museum and 10 pounds from the Mine Run Dump (when open) or select from special specimen collection

Zincite Membership (one year): $100.00, includes 6 admissions to the mining museum and 20 pounds from the Mine Run Dump (when open) or select from special specimen collection

Lifetime Membership: $500.00, includes unlimited personal museum admissions, 20 guest admissions per year, and 100 pounds from the Mine Run Dump (when open) or select from special specimen collection

Club Membership: $500.00 This 10-year membership program enables a club to have a special day each year at the Mine Run Dump and mine tours to any member who comes that day.

PLEASE NOTE: For foreign memberships other than Canada, add $5.00 to each category.



A spectacular Second-Find wollastonite from Franklin, N.J. This specimen, here viewed on edge, measures 5.5″ × 5″ × 2.5″ (14 × 13 × 6 cm). It features a large single grain of wollastonite that fluoresces vibrant orange with an orange-yellow core. Also present are nonfluorescent barite, orange-fluorescing clinohedrite, red-fluorescing calcite, blue-fluorescing hardystonite, and green-fluorescing willemite. John L. Baum specimen. *Franklin Mineral Museum photo.*

A Third-Find wollastonite from Franklin, N.J. This is the most commonly seen type of Franklin wollastonite in mineral collections. Third-Find wollastonite specimens typically have grains of dull white-fluorescing barite. This specimen has an unusually large (6″ long) grain of wollastonite that is neatly bisected by a thin plane of an unidentified nonfluorescent mineral. Earl Verbeek specimen ERV-472, 6.5″ × 4″ × 3″ (16 × 10 × 8 cm). *Gary Grenier photo.*