NATURE'S HIDDEN RAINBOWS

FLUORESCENT MINERALS OF FRANKLIN, NEW JERSEY

ROBERT JONES, JR.

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The
Fluorescent Minerals of
Franklin, New Jersey

by the writer of
"Collecting Fluorescent Minerals"
a regular column in *Rocks and Minerals*
magazine

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Preface

The author wishes to express his appreciation and thanks to the many wonderful people who worked with him, encouraged him, and contributed time, energy, materials, and specimens to make this book possible. What is said in these pages is the responsibility of the author but it is possible only through the fine assistance of many people. Special thanks are extended to the following people: Richard Hauck, Howard Pate, Tom Warren, and Scott Williams. Each of these men contributed much to make this all possible.

The author also wishes to give credit to those who contributed photographs for color reproduction as follows:

David B. Grigsby of Ultra-Violet Products, Inc., Numbers 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 and 32.

Ralph Walters of Franklin, New Jersey, Numbers 4, 23, 24, 25, 26, 27, 28 and 29.

Carl Smith of Covina, California, Numbers 21 and 22.
Wes Mowery of Los Angeles, California, Numbers 30 and 31.

Since publication of this book a number of significant events have occurred at Franklin. Among them are, declaration by the State of New Jersey that Franklin is the "Fluorescent Mineral Capital of the World," expansion of the Franklin Mineral Museum, opening of the "dump" around the Trotter Shaft to amateur collectors, expansion of the Gerstmann Museum, reduction in the number of collecting areas previously mentioned, challenge of the theory on the origin of the ore deposits. In revising this book the author has attempted to correct errors, revise and up-date collecting information, add notes on the minerals, and add a special new section which treats the above mentioned recent events so the reader can be as fully informed as possible.

Robert W. Jones, Jr.

Phoenix, Arizona 1970

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Chapter I

INTRODUCTION

Sometime in the early 1600's a white man first saw the outcrops of ore minerals in the area which is referred to now as Franklin, New Jersey. To a mineral collector whether he is interested in micromounts, ore minerals, spectacular cabinet specimens, or fluorescent minerals, the name Franklin means variety, complexity, beauty, and many other things. To that early, unknown settler the thought never occurred that he was seeing evidences of an ore body that would eventually challenge the ingenuity of man, provide him with a valuable source of zinc and provide him with a complex variety of minerals found nowhere else in the world. If our early white man had but seen those same minerals under the influence of a modern ultraviolet lamp, he would have invoked the Heavens to protect him from magical doings. No early settler could see the fluorescent minerals of Franklin since science hadn't yet learned to produce the equipment necessary to excite minerals. It is our good fortune to have an inexpensive source of ultraviolet radiation today.

The beauty of the Franklin minerals may be surpassed in some respects by minerals from other localities but under the ultraviolet lamp Franklin reigns supreme. The equipment manufactured by Ultra-Violet Products, Inc. causes the variety of colors that belong to Franklin to be seen in all their glory.

That Franklin produced a variety of colorful minerals is unquestioned. The list is not yet complete and will certainly reach over two hundred before studies are complete. Of this truly amazing number of minerals from one area, we are particularly interested in those minerals which present the fascinating aspect of fluorescence.

As of this writing, over two dozen minerals have been identified as fluorescent. Again, this is by no means the end. As old collections are restudied and new and more practical equipment becomes available, as the old ore dumps are weathered causing minor alterations and as fluorescent mineral collecting becomes more popular and more accurately studied, as more collectors increase their knowledge and searching; then other fluorescent varieties and perhaps new species will be detected or uncovered. This can be one of the great contributions of the amateur collector. Working with the ultraviolet lamp, not as a novelty but as a research tool, the collector can and has discovered heretofore unreported fluorescent minerals from Franklin. Later on in this report the colector will read of such findings that are still going on. At the same time, some of the previously reported observations can be confirmed or corrected. This work is also in progress and many people are adding to the wealth of knowledge constantly. The purpose of this report is many-fold. The knowledge contained within is only to form a basis for activities of collectors and a place from which one may catapult into the fascinating world of fluorescence.

The property of fluorescence in some of the Franklin minerals has been used in the past to sort the ores. Under ultraviolet lamps the yield was enriched by removing the calcite and other gangue materials. It is not the intention here to give a detailed discussion of the past history of Franklin. This has been done a number of times already and would serve no immediate use to the reader. References will be made, however, to certain important dates in the accompanying Historical Timeline to give the reader a reference to certain historical facts. The intention of this paper is to provide the reader with an up-to-date, reliable guide to the collecting and identification of the fluorescent minerals of the Franklin area.

Without question the best single paper written on the Franklin area was Geological Survey Paper #180 by Charles Palache entitled, "The Minerals of Franklin and Sterling Hill, Sussex Co., New Jersey". This paper was written in 1935 and in 1960 was reprinted to the joy of many collectors.

Anyone reading Palache's paper will certainly appreciate the efforts of that author. The reader must bear in mind, however, that the study was done some years ago when fluorescent minerals were not as popular, nor equipment as advanced as it is today, Palache and his associates were hindered by a heavy, clumsy, noisy monster called the "Iron Spark Gap" which was the source of ultraviolet radiation for them. This machine can best be described as being similar to an arc welding machine where an electric spark gives off heat, fumes, noise, huge quantities of undesirable bright light, and the radiation required to cause fluorescence. One can imagine the difficulty in concentrating on the studies at hand with such a device operating. Compare this to economical, silent, cool, controlled sources of ultraviolet today and it is easy to understand how interest in fluorescent minerals has skyrocketed.

Operating with rather crude equipment, Palache was able to report a number of fluorescent minerals from Franklin. They are listed below as they appeared in the original text. The collector must bear in mind the listed responses were obtained with the "Iron Spark monster" and will not, in some cases, compare with responses seen under present day equipment.

Page 54 manganocalcite (calcite)—red to pink to violet
Page 65 pectolite—yellow
Page 68 bustamite—red
Page 70 margarosanite—pale violet
Page 81 calcium larsenite—yellow
Page 83 willemite—green, phosphoresces green
Page 92 barylite—blue
Page 94 hardystonite—dull violet to none
Page 100 manganoaxinite (axinite)—pinkish red
Page 106 clinohedrite—orange yellow
Page 113 roeblingite—pale pink to none
Page 121 hedyphane—poor bluish gray

On page 68 Palache lists the mineral bustamite as fluorescent red. This is an example of a mineral that is under observation now. In some cases it has been shown that calcite or some other fluorescent mineral will admix with a species or variety causing a fluorescent response. The mineral may then be reported as fluorescent when in reality it is not. This writer has often tried to find a piece of fluorescent bustamite but in every piece it was possible to check, calcite was present. A simple test will be given later in the case of admixed calcite to help avovid such mistakes. It may be said here that this does not disprove bustamite as a fluorescent mineral under Iron Spark. It merely provides an explanation of how one might see red fluorescent bustamite and be fooled because of a mixture.

The origin of the Franklin-Sterling Hill deposits has been the subject of much study and speculation. The latest, and most authoratative decision is that the ore bodies are related and have comparable origins. Undoubtedly, they were formed simultaneously, probably as one body. Albanese, in his "Notes" suggested the ore bodies are the legs of an "N" whose crown or hump has been eroded away, leaving the disconnected legs. This would account for the fact that the ore bodies are closely associated but not connected.

One theory on the origin of the material suggests that the ore body is exclusively sedimentary, having been later metamorphosed such that a number of recognized minerals were formed by this process. The latest proponent of this theory, John Albanese, suggested there was evidence that the ore bodies were completely enclosed in metamorphosed limestone and could not, therefore, have an igneous source. Many authorities disagree with this proposition.

In the February, 1966, issue of "The Picking Table," official publication of the Franklin-Ogdensburg Mineralogical Society, the reporting of the discovery of uraninite in the ore body at Sterling Hill was made. From Page 9 of that issue, "Considerable excitement was recently caused by the finding of a single specimen of uraninite in Sterling Hill ore at the 700 foot level. The uraninite is in the form of a lonely cubic crystal, about ½ inch per face, in calcite, associated with Franklinite and Willemite."

Uraninite has always been considered primary in origin and the discovery of a well-crystallized specimen in the ore at Sterling Hill suggests strongly that igneous activity has played a role in the formation of the minerals. This little specimen would seem to have sounded the death knell of the "exclusively sedimentary origin theory."

Terminology

Some explanation is necessary for terms used here. Most terms are common geological or mineralogical terms and should be familiar to the reader. However, clarification of some terms is necessary so that the reader may fully understand the author's meaning. Below are a few such terms and their meanings.

Fluorescence — This is the visible, colored light emitted by a mineral when it is excited by an ultraviolet lamp.

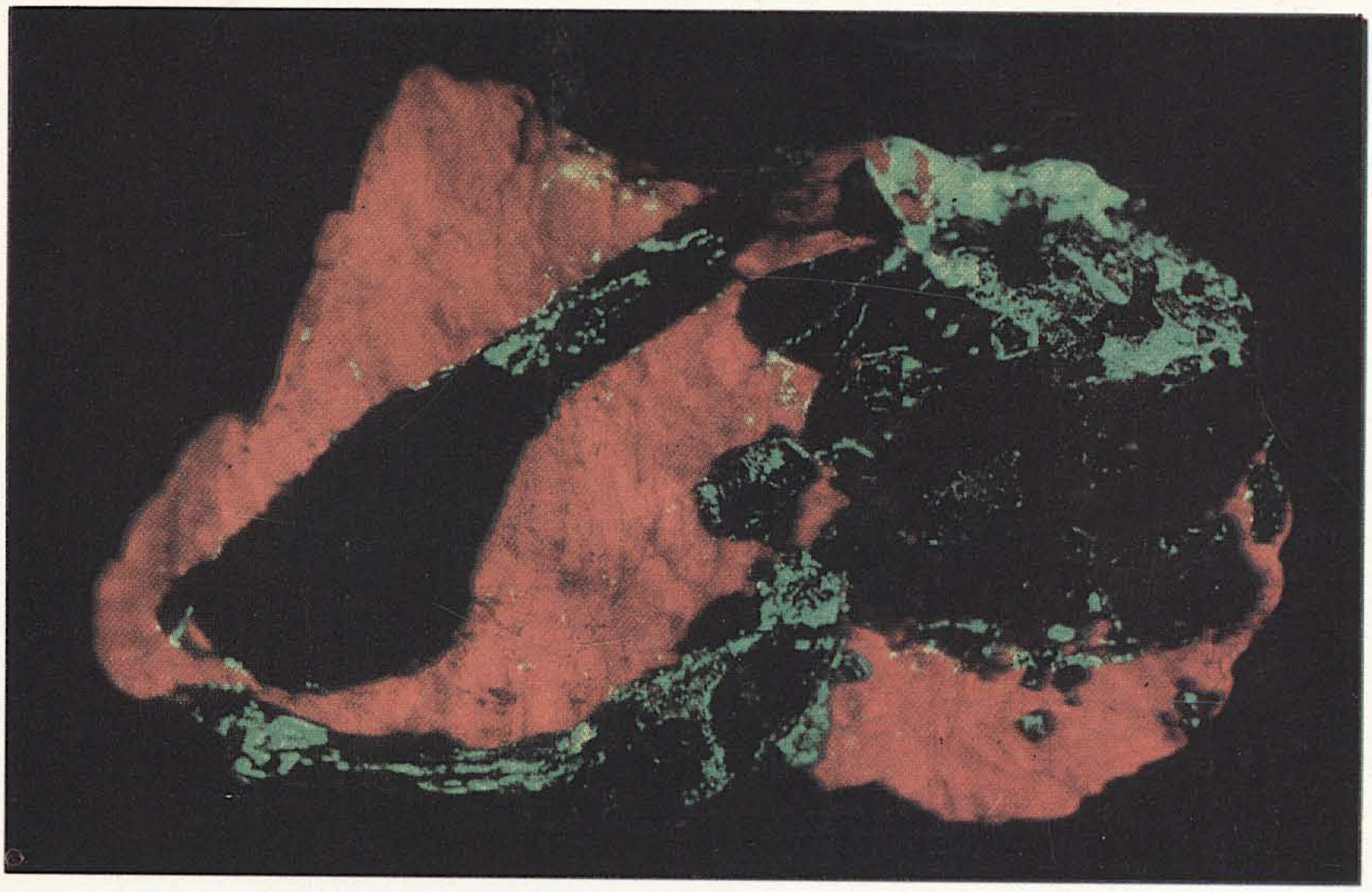


PLATE J19. Willemite, calcite and franklinite occur in myriads of patterns which captivate the imagination.

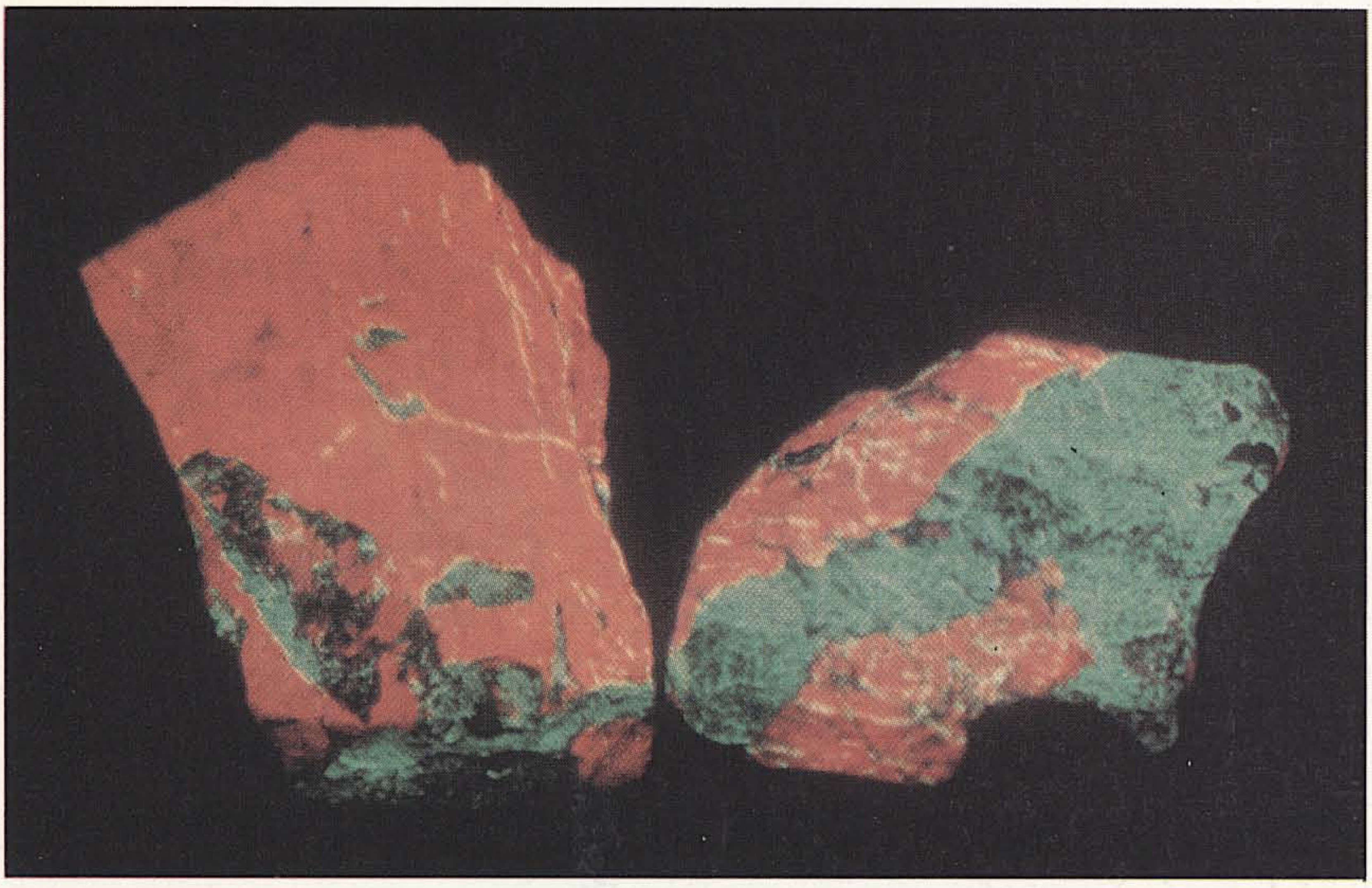
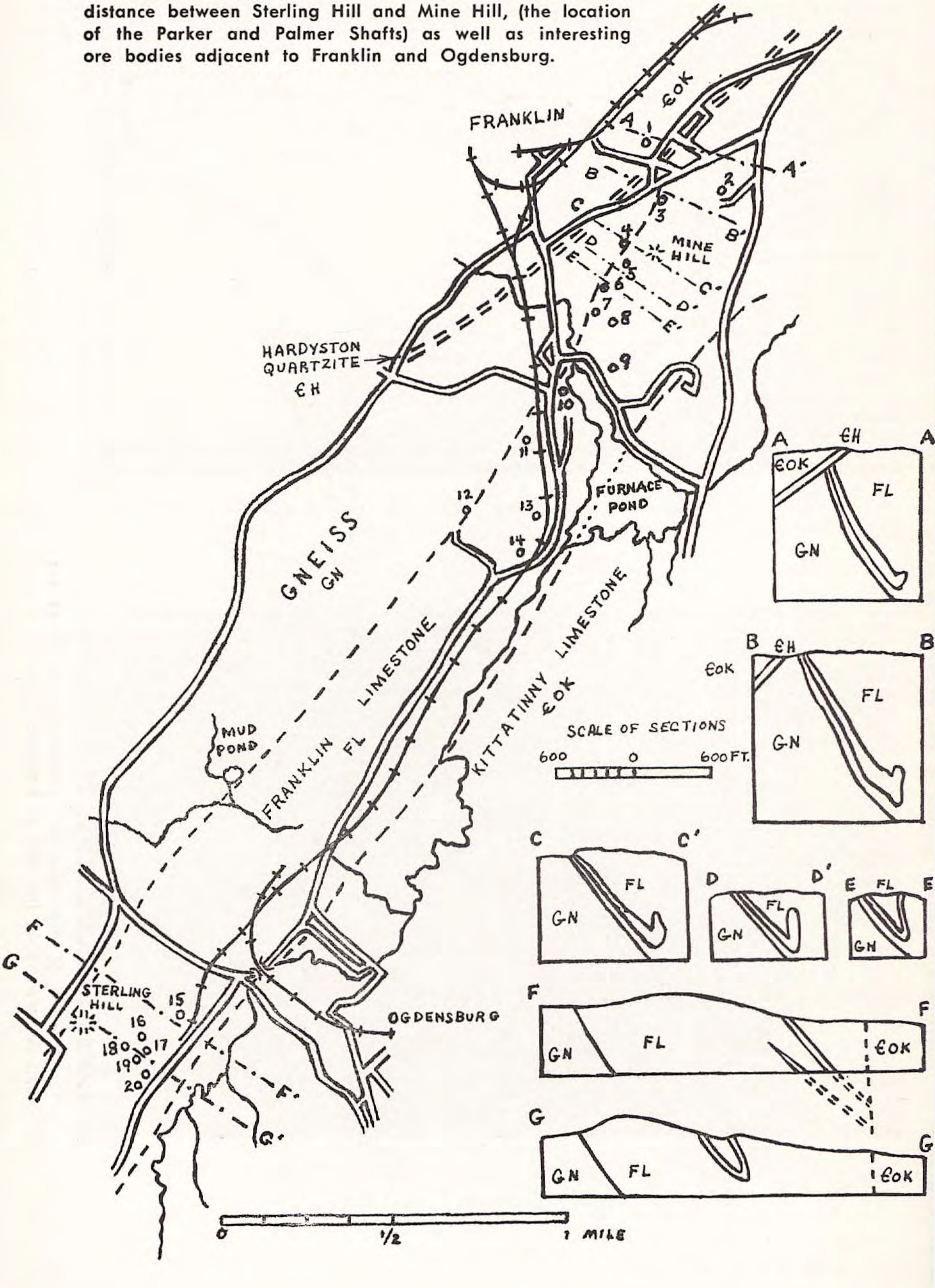


PLATE J20. No fluorescent mineral anywhere in the world offers the collector such deep and rich colors as found in specimens from Franklin.

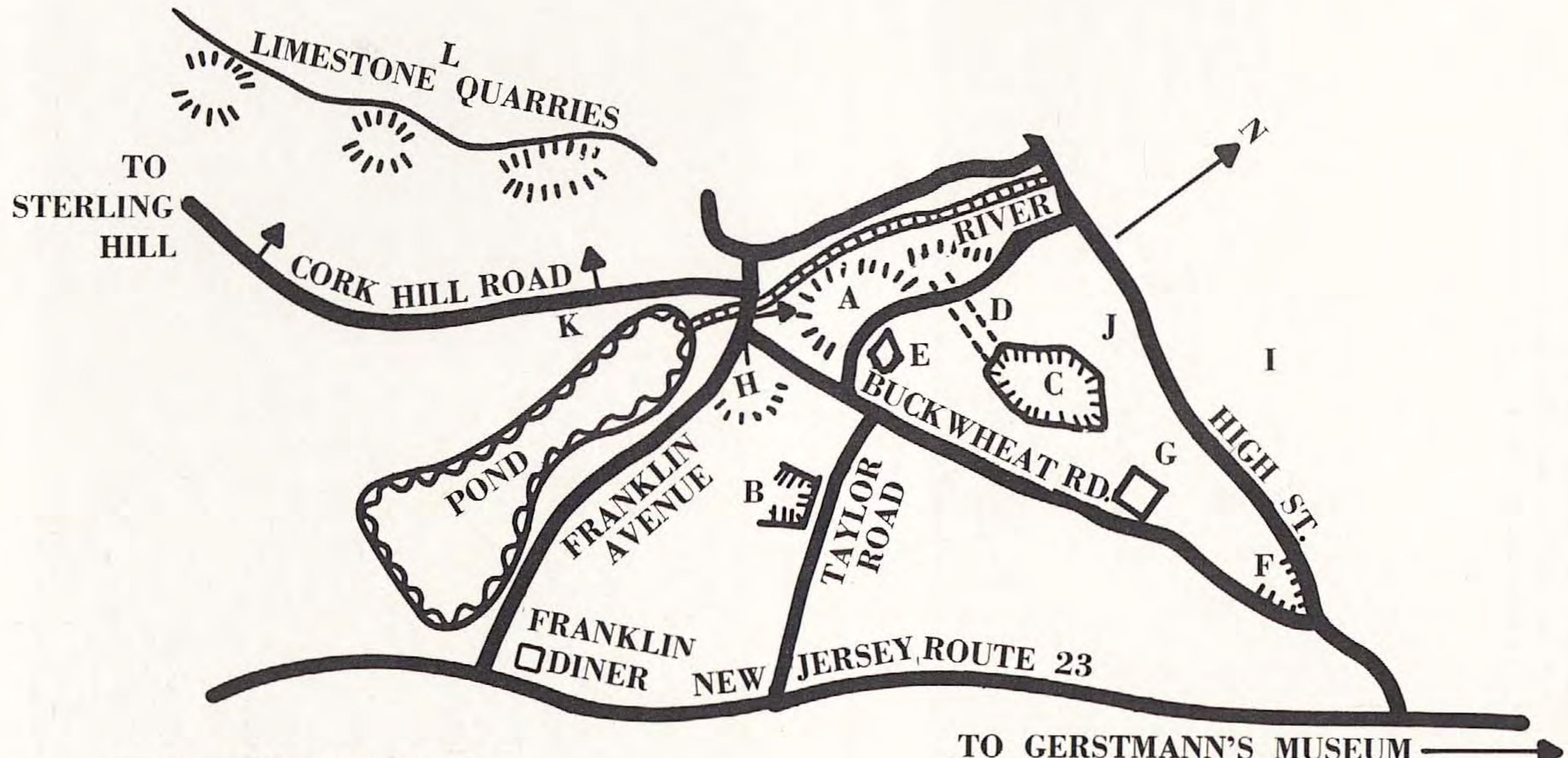
MAP A — FRANKLIN MINING AREA

Geologic map of the Franklin mining district showing the distance between Sterling Hill and Mine Hill, (the location of the Parker and Palmer Shafts) as well as interesting ore bodies adjacent to Franklin and Ogdensburg.



FRANKLIN, NEW JERSEY

A — BUCKWHEAT DUMP
B — TAYLOR ROAD DUMP
C — BUCKWHEAT PIT
D — TUNNEL FROM PIT TO DUMP (CLOSED)
E — KIWANIS CLUB (TAYLOR) MINERAL MUSEUM
F — PARKER DUMP
G — PARKER SHAFT (SEALED)
H — FRANKLIN IRON CO. QUARRY (CLOSED)
I — PALMER SHAFT
J — TROTTER SHAFT
K — OLD FURNACE LOCALITY
L — LIMESTONE QUARRIES



MAP B — FRANKLIN MINES

The location of the important points referred to in the text. All are within the city of Franklin.

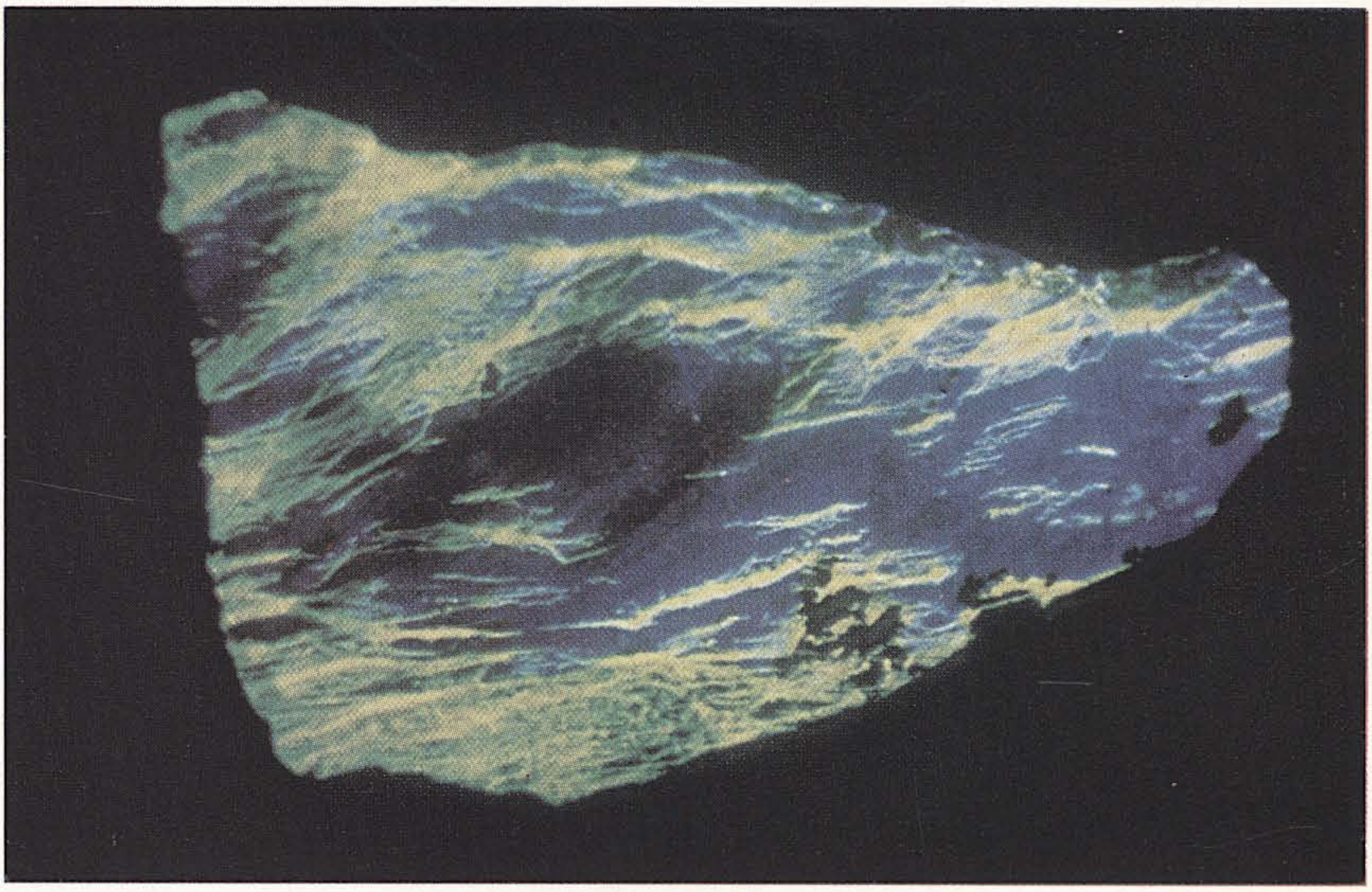


PLATE J9. Streaks of bright yellow calcium larsenite blend with green fluorescent willemite.

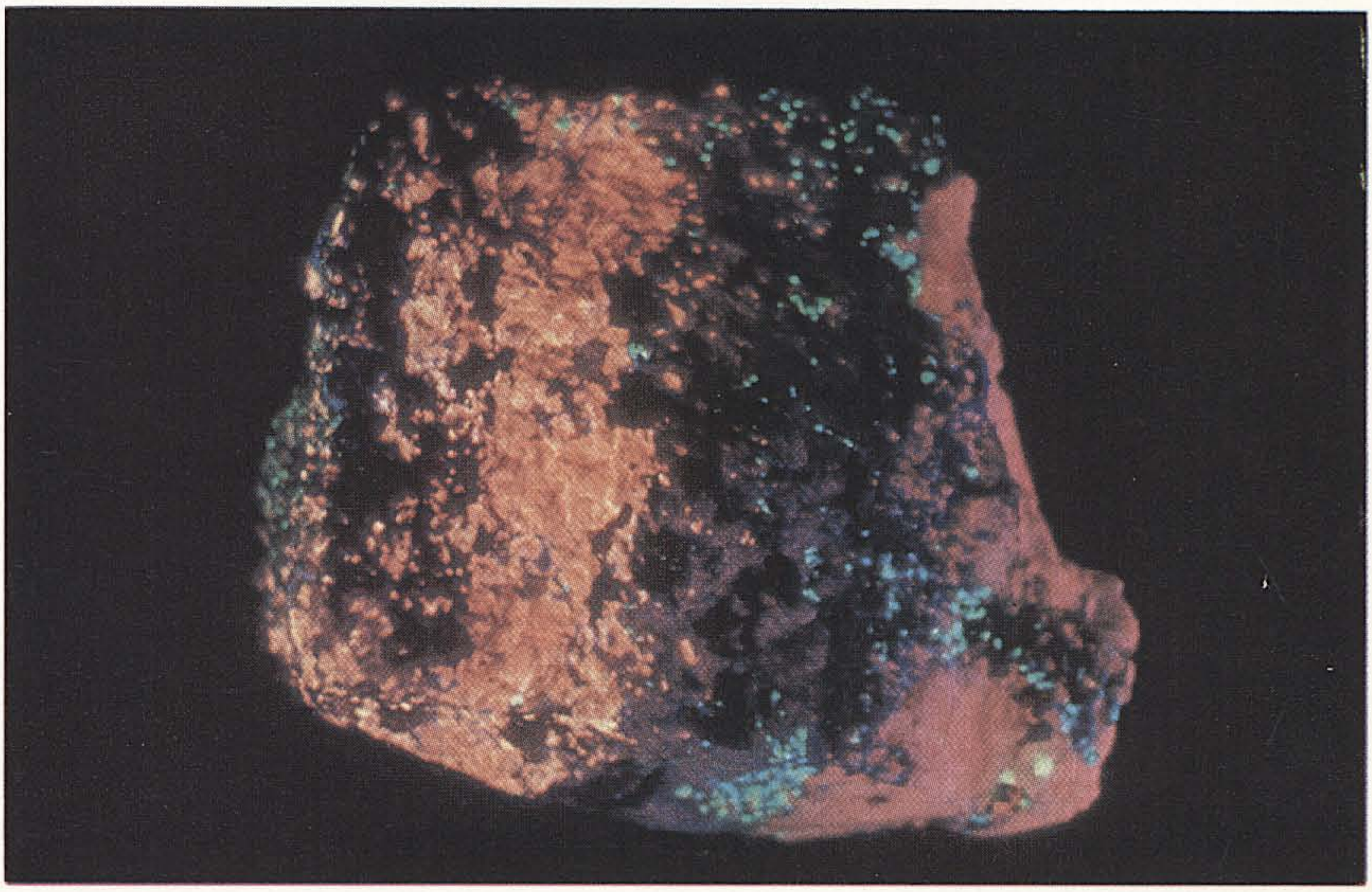


PLATE J10. Orange wollastonite, red calcite and white barite along with a trace of green willemite provide another choice fluorescent mineral specimen from Franklin.

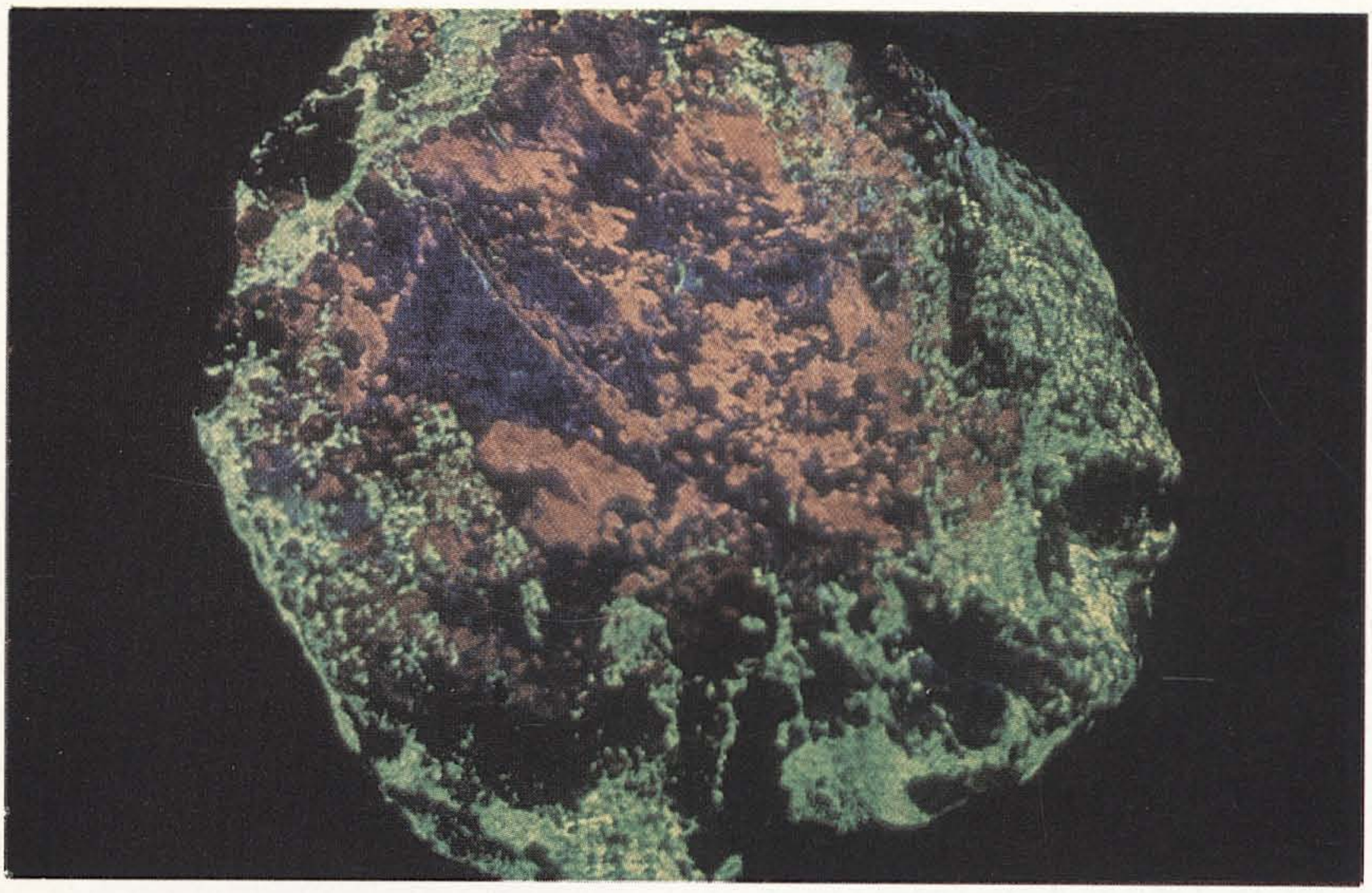
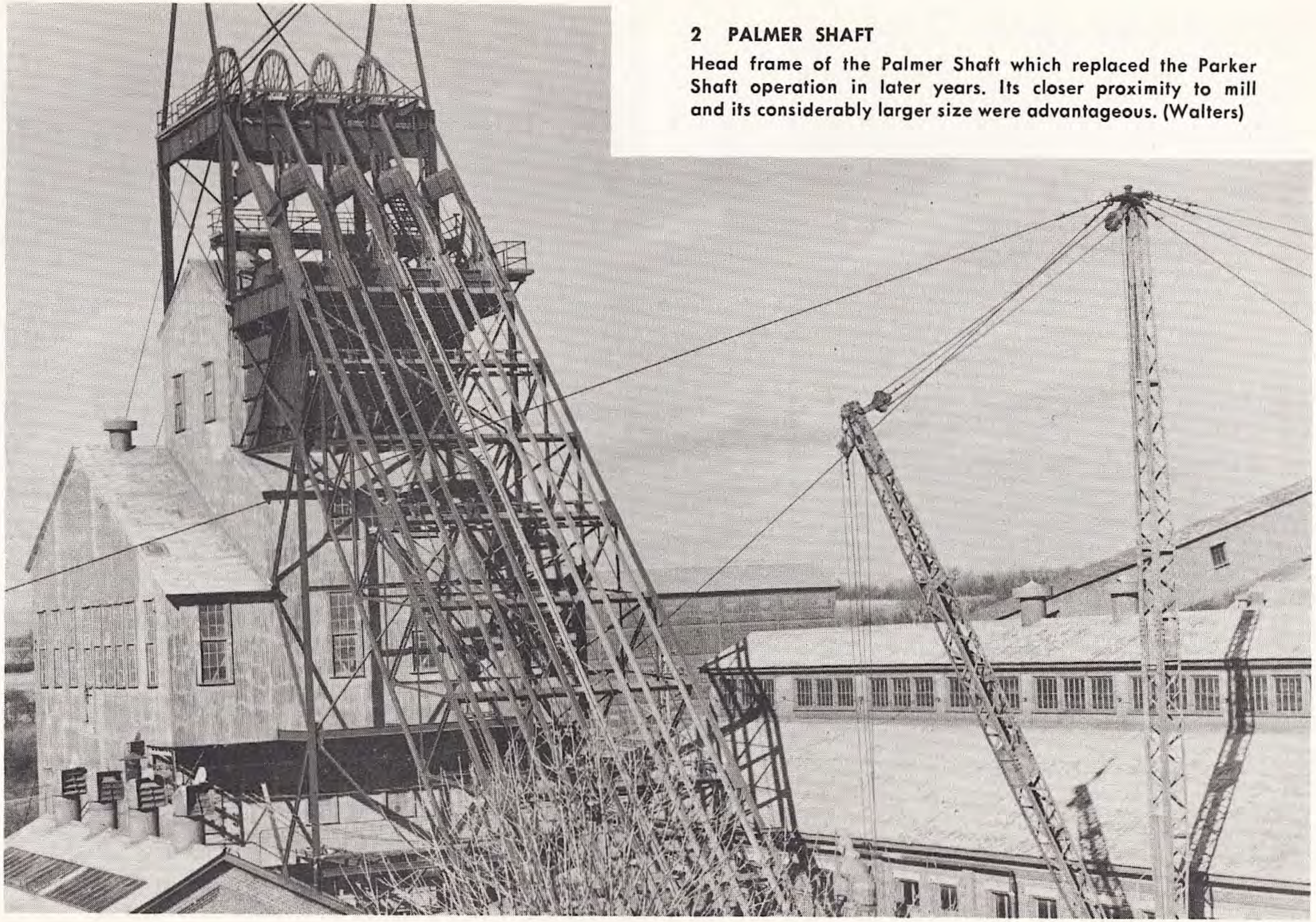


PLATE J11. Clinohedrite surrounded by willemite is a pleasing combination of colors.

PLATE J12. Pectolite adds to the variety of fluorescent Franklin specimens.

1 PARKER SHAFT

The shaft that is near and dear to the hearts of all rare lead-silicate collectors is the Parker Shaft. Here we see the head frame in the days when the Parker was in operation. There is practically no evidence of this head frame today. (Walters)



2 PALMER SHAFT

Head frame of the Palmer Shaft which replaced the Parker Shaft operation in later years. Its closer proximity to mill and its considerably larger size were advantageous. (Walters)

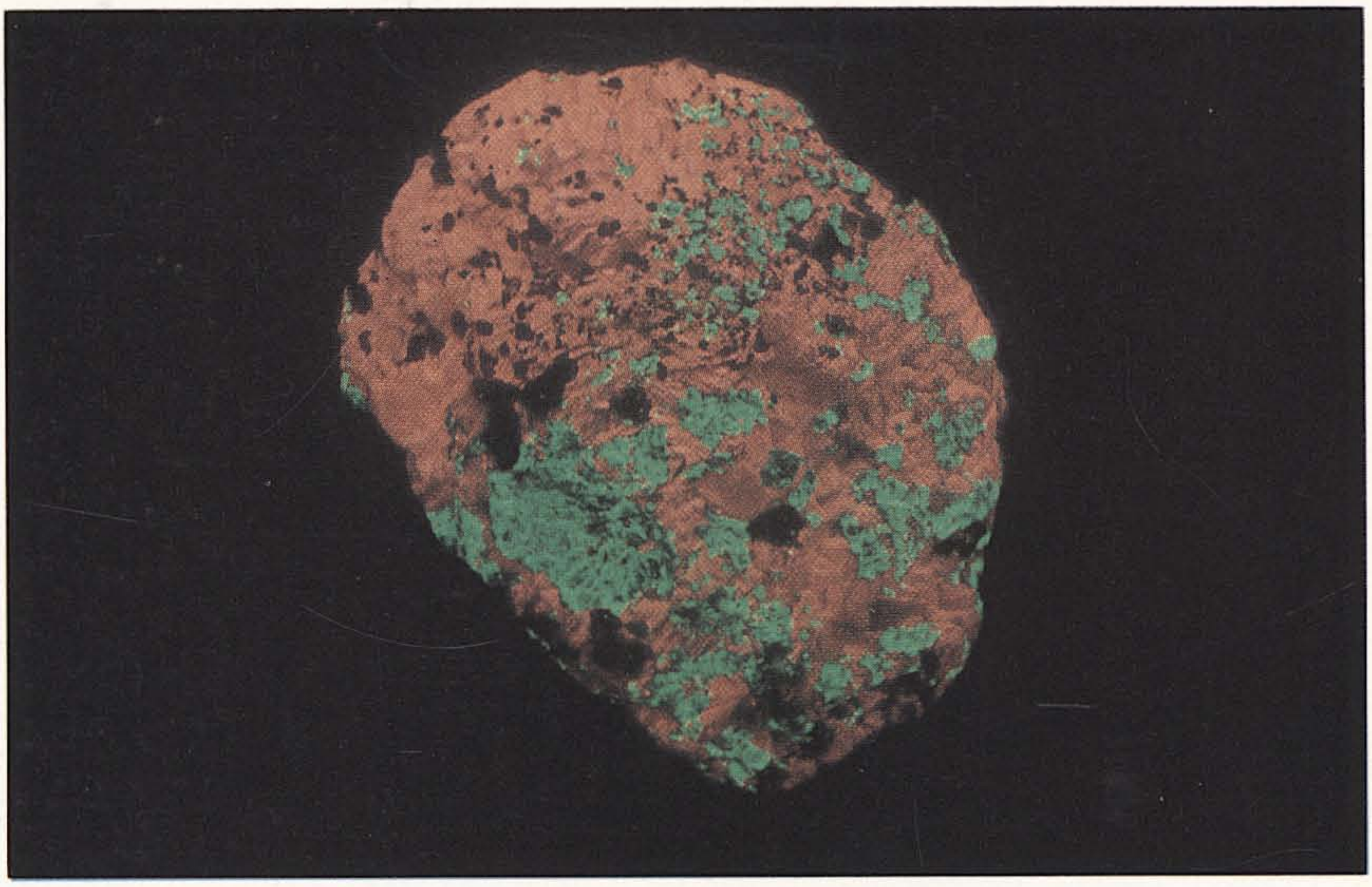


PLATE J17. Typical fluorescent calcite interspersed with bright green fluorescent willemite and a few spots of black franklinite.

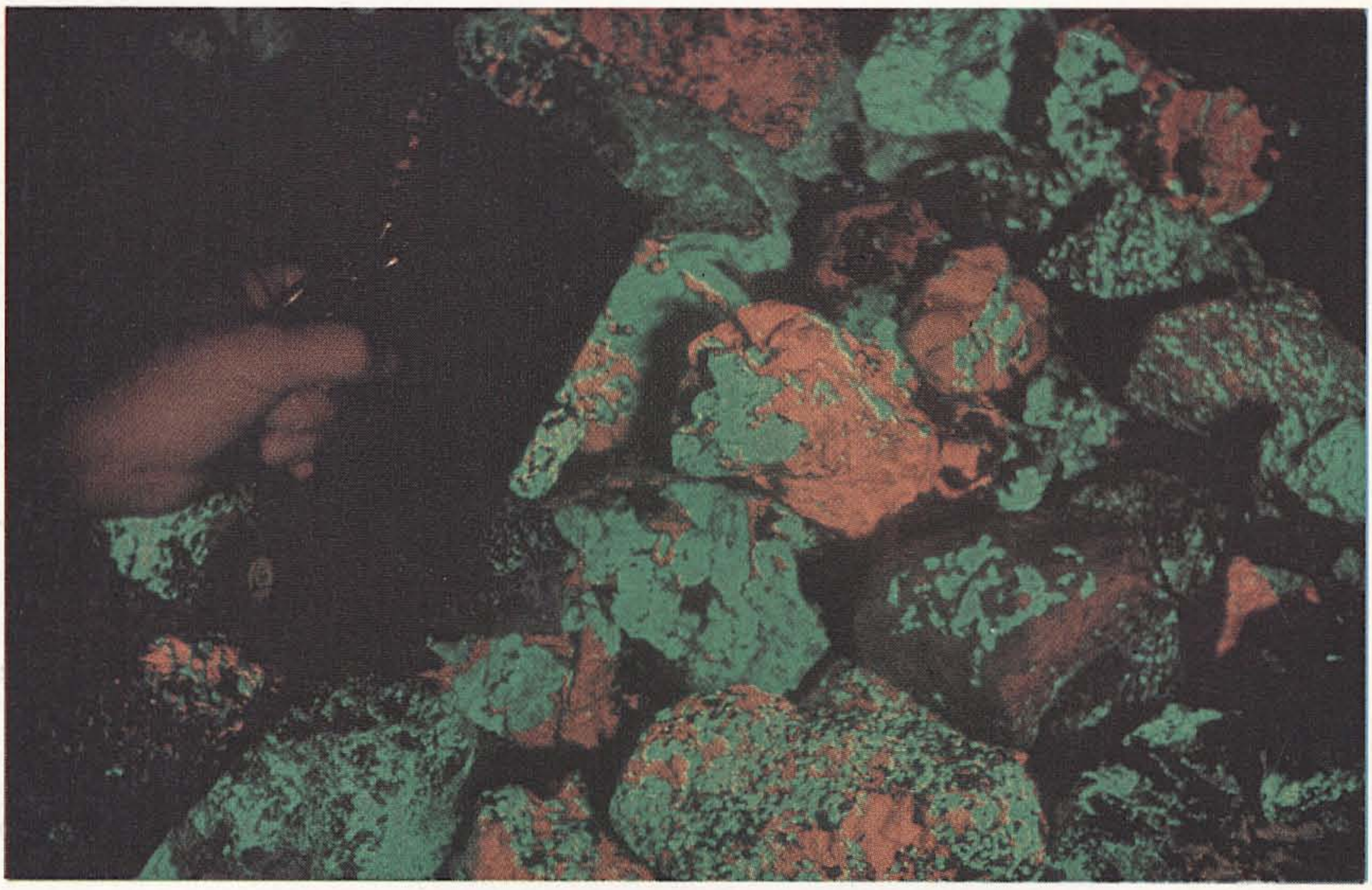


PLATE J18. An assortment of willemite and calcite specimens fluorescing bright green and red from the ultraviolet rays of a MINERALIGHT Lamp.

Phosphorescence — Visible, colored light given off by a mineral after it has been exposed to an ultraviolet lamp and the lamp is then turned off. This property is considered to be the same as fluorescence, except for the time of occurrence.

Short wave — Energy given off by an ultraviolet lamp is measured by the length of the energy wave. Energy waves of about 2537 angstrom units in length are called short waves. Lamps that give off energy at about this wave length are called short wave lamps.

Long wave — A term used to denote energy with waves that are longer than short waves, about 3600 angstrom units in length. Lamps that give off energy of this wave length are called long wave lamps.

Ultraviolet lamp—A mercury vapor type lamp which gives off energy capable of making minerals respond by either fluorescing or phosphorescing.

Luminescent properties — Any visible response made by a mineral when excited, either by rubbing (triboluminescence), heating (thermoluminescence), or by exposure to an ultraviolet lamp (fluorescence or phosphorescence).

Occurrences—Whenever possible some indication of the occurrences of a mineral is made. The purpose of this is to provide the reader with some help when going into the field. Some minerals are found only at certain dumps or may never have been found on the dumps. Knowledge of this is helpful and timesaving.

Tests — In some cases reliable fluorescent tests can be made to identify specimens. Since these tests are simple to perform and are reliable they are most helpful to the reader. When found to be of value, simple chemical tests will be suggested to help verify observations and conclusions of fluorescent tests.

Associations—This author is of the opinion that a most reliable and important means of identifying minerals is found in the associations of a mineral. When an unknown mineral is noted and its associations observed, these associtions can, in many cases, indicate a course of action to follow for the identification of the unknown. In some cases associtaions are so true to form that further checking is not necessary.

Pronunciation Guide

The mineral names used in this text are generally common names. There has been noted, however, some confusion as to the pronunciation of some of these names. Based on M. H. Hey's book, "Chemical Index of Minerals," an attempt is made here to provide the reader with an easy guide to these mineral names. Familiarity with the names will encourage the collector to become more fluent and conversational with other collectors and, hence, learn and grow. No intention is made here to act as a final authority.

The consonants in the pronunciations which will follow each mineral name will always use their most common sound. As an example, the letter "t" will always sound like the "t" in "top." The vowels are of two common sounds, long and short. Vowels which are short in sound are unmarked and long vowels are marked with a long line above the letter. Silent vowels are omitted from the Pronunciations. Other unusual pronunciations are provided for below:

Short vowels sound like:

a as in at
e as in end
i as in it
o as in on
u as in up

Long vowels sound like:

ā as in make
ē as in he
ī as in ice
ō as in note
ū as in cute

"u" also represents an unaccented vowel and sounds like the short "u."

ar as in army
er as in father
or as in or
oo as in moon
ou as in out or cow
th as in thin

Each mineral name will also be accented (′) to help in the correct pronunciation.

The Franklin and Sterling Hill Mines Mining Methods

There are many descriptions available on how these two ore bodies were and are mined. The best brief descriptions have appeared in the trade magazine "Mining Engineering", put out by the American Institute of Mining and Metallurgical Engineers, Inc. Both descriptions appeared in the December, 1953 issue which was devoted to the New Jersey Zinc Company. Rather than attempt to improve on an already fine job of describing these mines, excerpts will be given here. Acknowledgment for their use is here given.

Franklin — by C. M. Haight

"First mining was by shrinkage stopes: where the width of the ore was narrow the stopes were carried along the strike, where too wide for this they were carried at right angles to the strike. Both types were started at a level and carried to the one next above, then emptied of the broken ore, and the space was filled with rock quarried at the surface, and mill tailings."

"Pillars between the stopes, 30 to 45 feet wide, are mined by top slice methods, with entrances from main drifts in the footwall rock." (The writer continues with a description of the four compartment Palmer Shaft.)

Sterling Hill — by Warren Hastings

"Early mining activities were limited to quarrying of the outcrop and minor stoping of upper portions of the east leg. Current operations were initiated in 1912 and sinking of the present 57° operating shaft was commenced the following year."

"Ore removal is by transverse and longitudinal shrinkage stoping, the former being laid out on 40 foot centers, with stope widths of 19 feet separated by temporary line pillars 21 feet in thickness. Following removal of broken ore and tight filling of the stopes, pillars are recovered by undercut inclined slicing, accompanied by breasting back of the adjacent stope fill. "

Hastings goes on to describe ore loading as well as fairly recent hoisting development work which is intended to make possible continued mining operations at Sterling Hill.

The Millson Study

In July, 1950, Henry E. Millson and his son reported their findings concerning "Observations of Exceptional Duration of Mineral Phosphorescence." Simply stated, this means they exposed minerals to ultraviolet light and timed the phosphorescence of the minerals. Specifically, the Millson's exposed minerals for a period of one minute at a distance of 2.5 cm. from an unfiltered short wave lamp. The short wave lamp peaked at 2537 angstrom units as do the great majority of lamps available today. The resultant phosphorescence of each specimen was observed by the dark adapted eye and the color and duration of phosphorescence were recorded. Even more fascinating results were obtained by using photographic plates to check and record phosphorescence of minerals that was too weak to be detected by the naked eye in spite of being dark adapted.

The Millson's first slabbed each specimen to be photographed and polished the flat surface so as to insure sharp images on the photographic plates. Each specimen was then excited as above and placed flat side facing a photographic plate, wrapped, and allowed to record itself. Kodachrome film, type B, was used to observe color reproductions. The resultant color images of the phosphorescence of the minerals are referred to as phosphorographs by the authors. Brief reference to their findings concerning Franklin area material will be made throughout the text. For the interested reader reference should be made to the bibliography where details of the Millson report are given in order that it may be obtained and studied by those interested.

Chapter II

LOCATIONS

The Open Pits, Noble and Passaic

These large open pits were first mined in the 1870s. The Passaic was referred to as Lot #9 or the Marshall Mine and the Noble was Lot #10 or the Mud Mine in the old days. These pits are what is left of two large bodies of calamine (Hemimorphite) which rested between two legs of the ore body at Sterling Hill. The calamine was, at that time, the major source of zinc ore and was mined for a period of about thirty years. The calamine is frequently referred to as worm ore since it has a surface much like a tangled mass of worms.

Since calamine from these areas has not been shown to fluoresce, it would seem to be of little importance to mention these areas. Such is not the case. A number of fluorescent minerals are available in the Noble and Passaic Pits.

Due to the danger of the pits, as well as for other reasons, it is not possible for the collector to get into the pits under normal circumstances. However, the Zinc Co. has allowed infrequent visits into the pits by organized groups for short periods of time. It was on one such trip that the author gathered specimens and the information included here. It is hoped these trips will continue to be available in the future. Such an organization as the Franklin-Ogdensburg Mineralogical Society, Franklin, New Jersey, has made trips possible and is one good reason for belonging to an organized club.

In 1962, and again in 1963, the Franklin-Ogdensburg Mineral Society was allowed to enter these pits for a short-time collecting trip. This has been most generous on the part of the company since there is some risk and bother involved. Areas are carefully roped off by club officials and an excellent tour conducted.

The area can be thought of in two general parts (see map). The pits are separated to some degree by a mud zone wall and, southward of it, an area of barren limestone partly encircled by Pegmatite.

The mud zone has in the past yielded specimens of corundum, usually single crystals weathered from the surrounding limestone in which they primarily occur. To the author's knowledge no corundum crystals were found on the 1962 trip but some were reported on the more recent trip. In the past, the corundum was found in the washing operations. If the reader is ever able to enter the pits, take a quarter inch mesh screen along. It should work well to help screen material from the mud zone.

Since the original pits were excavated between legs of the ore body there is considerable fluorescent ore material available such as calcite (most of which fluoresces), and willemite, fluorescent green, plus non-fluorescent franklinite. The franklinite can be found in masses and even in rounded and nearly perfect crystals. These crystals are usually about one-fourth inch across but a few are twice that size. Rarely a larger but more distorted crystal will be unearthed.

Most of the willemite seen in the pits was the familiar grayish material with good fluorescence under short wave. However, in the northeast portion of the Passaic was found black willemite. This type is not as common nor as strongly fluorescent as the lighter colored material. The fluorescence is a softer green, short wave, not too much different from the Buckwheat fluorite, variety chlorophane. No crystals of willemite have been reported recently.

Another fluorescent mineral frequently noted on specimens from these pits, usually in small coatings, is hydrozincite. It appears as bright blue fluorescent material, short wave only, disseminated throughout or coating the ore. It was most commonly noted with the calcite, willemite, franklinite, zincite ore. Since this area has been completely exposed for 50 years and is a surface deposit anyway it can be assumed the hydrozincite is a result of weathering. It would be interesting to conjecture what the material would have been like had the area been flooded those 50 years. If the reader has seen any of the rich hydrozincite coatings on ore found buried at the bottom of Lake Hopatcong for many years he can visualize the same thing happening to the ore when still in place.

Several other non-fluorescent minerals were located. In the Noble Pit, along the southern wall, occur jeffersonite, feldspar, apatite in very nice green non-fluorescent crystals, biotite mica, and galena. The author had hoped to find fluorescent cerussite in association with the galena but the search was unproductive. However, another collector did give the author a specimen with a small cavity in which could be seen several fine clear cerussite crystals. These were checked and found to fluoresce a very weak yellow under long wave. There was no galena evident though it may have been weathered out of the cavity, or altered.

The apatite crystals mentioned were not fluorescent but provided some of the better material collected since they occurred up to 3 inches in length. Exposing them in the matrix was very difficult due to fracturing of the crystals.

Since the trip into the open pits at Sterling Hill was of such short duration it would be safe to say this area has hardly been touched. There are a number of specimens waiting for some energetic person to come rescue them from the walls and floors of the pits. Many people were able to gather study specimens of malachite, azurite, graphite, magnetite, and others so it is suggested that collectors join a qualified group, such as the Franklin-Ogdensburg Society, to visit the Nobel and Passaic Pits behind the Sterling Hill mine buildings on their next authorized field trip.

Parker Dump

Probably the most challenging area to collect was the Parker Dump. It was a very small area, about the size of a street corner, but it presented a tremendous variety of rare, unusual, fluorescent minerals. As of this writing we must bid farewell to the Parker Dump. A town fire station is being completed on the site this year. It had been hoped some organization could purchase the land and preserve it but such was not possible.

Several references will be made in the text to the minerals of the Parker Shaft. It might be well to review briefly the set-up used in the shaft and give some idea of the minerals reported fluorescent from there. Keep in mind that it was possible for a mineral to be mined somewhere else in the mine and be hoisted out of the Parker and credited to it.

The ore, as it was worked out, left large dangerous openings which had to be supported. These large openings also provided an economical dump area.

To prevent the collapse of the ceilings in these large openings, or stopes, some means of support had to be provided. In Franklin columns or pillars of ore were left in place to provide support. When the ore was completely removed, except for the pillars, that section of the mine was closed. As it was closed the pillars were removed and in them some very interesting material was found, such as axinite, clinohedrite, calcium-larsenite, hardystonite and margarosanite. So out of the Parker Shaft came some of the rare Franklin fluorescent minerals. Varying amounts of some of these minerals were available to the collector until the Parker Dump closed (see map).

The Parker was located at the corner of Buckwheat Road and High Street. Reference to the accompanying map will help the collector locate it. It is on the opposite end of the Buckwheat Pit from the Buckwheat Dump. I spent many hours digging in poison ivy, piling the minerals, and then, crawling under a blanket to view my finds. Incidentally, that blanket business is not very efficient. Some light always get in, and chances of exposure to short wave radiation are increased. Parker is gone and with it a truly great fluorescent mineral collecting area.

What could have been found there? Well, certainly red fluorescent calcite and green fluorescent willemite. If lucky, a collector might have found a trace or small mass of calcium larsenite. This was certainly cause for shouting. On rare occasions, a collector could also find a specimen of the violet fluorescent hardystonite and, associated with it, some orange fluorescent material usually called clinohedrite. The high point at Parker would come when someone unearthed a scrap of svabite, the rare arsenic apatite. This was probably the rarest of the fluorescent minerals found there including magarosanite, a very rare item in itself. The author experienced the great pleasure of cracking open a specimen and finding svabite in both pieces. In one specimen the svabite comprised 10% of the fluorescent surface. To think some other collector will never again have that thrill, is indeed a sad thought. Some collectors will remember the large limestone boulder that rested in one corner of the Parker Dump. It contained yellow fluorescent norbergite and bluish fluorescent diopside. Year after year people pecked away at that huge mass, gathering many fine samples of fluorescent minerals from the limestone. It finally disappeared as if to portend what was soon to befall Parker Dump.

The Parker Shaft was sunk in 1896 and was followed in the early 1900s by the Palmer Shaft. This provided another means of hoisting ore out of the ground and eventually led to the closing and sealing of the Parker Shaft.

Buckwheat Dump and Others

Buckwheat Dump — This is the largest and most accessible collecting area in Franklin. There is a nominal fee of $1.00 collected by the deputy sheriff to help defray the cost of maintaining the collecting site. Part of the maintenance consists of a wired dark room right on the dump somewhat resembling an old Chic Sale. Other money is used to help pay the cost of a heavy piece of equipment brought periodically to turn the dump and refresh the surface. The Pied Piper has nothing on that machine as it uncovers what following collectors feel will be the best find on the dump.

If one has not seen the Buckwheat Dump, its size will be surprising. If it is familiar, one will be surprised at the way it has shrunk. The dump gets smaller each year as ton upon ton of material leaves in the trunks of cars and on trucks. Several years ago it was a vast pleasure just to walk along the dump at night with a black light and admire the brilliant colors. Now it is getting increasingly hard to find just a few pieces of that same brilliant, fluorescent material. There is still plenty there but the amount gets smaller each year. Looking at it from the bright side, as the dump pile gets smaller something new may be discovered. An example of that is the scheelite-powellite find of recent years.

About the only thing needed for collecting on this dump is a good pair of shoes. One will spend most of the time scrambling around on rocks; heavy footwear is recommended. A pair of gloves will help, too. As for equipment, such items as a heavy hammer, chisels, collecting bag, etc. are standard.

The most important single item, a must at Franklin, is the ultraviolet lamp. If possible, have both a long and short wave lamp since there are minerals that respond to each or have a different response under each and can be identified by this difference. The best item on the market is the combination lamp such as the one manufactured by Ultra-Violet Products, Inc. Their UVSL-13 lamp gives off both long wave and short wave at the same time allowing you to check specimens once for both responses. It is also designed to eliminate one wave for separate checking. If the collector is not able to use a lamp having both wave lengths, the short wave lamp is recommended. Most Franklin minerals respond best under short wave and practically all will respond to some degree under short wave. This is best seen by referring to the chart on fluorescent responses at the back.

To find the Buckwheat Dump is relatively easy (see map). It is located along the Walkill River which flows out of Franklin Pond. When driving into Franklin on Route 23, turn at the Franklin Diner and travel along the pond. Just before coming to a bridge over the river a narrow dirt road is seen which enters the dump area. There is a sign which announces the Buckwheat, or Franklin, Dump. Also in the immediate area is the Franklin Iron Co. Quarry which is across Buckwheat Road from the Buckwheat Dump. This quarry is closed to collectors. It is a private shooting range.

Upon entering the Buckwheat Dump the collector will have an opportunity to obtain many fluorescent minerals. Whether it is best to collect at night or in daylight is hard to decide. Since collecting at night affords the beginner the added support of identifying by fluorescent colors, perhaps this is best when learning. As the collector becomes more familiar with the minerals in their natural state and with their associations he will do well to collect during the day, using the lamp as an additional tool of identification.

The most common minerals found on the Buckwheat are calcite and willemite. This familiar red-green fluorescent association is best known from Franklin. Various shades and patterns are collected with relative ease. Another fluorescent mineral frequently seen is the strong blue fluorescent hydrozincite, an alteration product of the zinc ores. Careful collecting will yield fair amounts of the following: microcline, fluorescent blue, best found at the end of the dump farthest from the entrance; troostite, the flesh colored willemite found near the entrance; pale green fluorescent fluorite near the tin can dump; orange fluorescent sphalerite is associated with the fluorite. On dolomite may be found smithsonite which appears as whitish coatings, sometimes fairly thick. Two of the most exciting finds you can make, and both of recent discovery, are yellow fluorescent powellite and scheelite. Only a few specimens have been uncovered but this should only serve to spur the collector on to greater finds. Another recent find is a mixture of pectolite and clinohedrite. Available to the reader are location maps showing where likely spots for certain minerals are located. One such map is put out by Mr. Gerald Navratil, Middleburgh, New York. Such maps are personal observations and give the beginner help in becoming familiar with an area. Minerals are, of course, where you find them so search the nooks and crannies, too.

Of the long list of fluorescent minerals which are found in the surrounding Franklin and Kittatiny limestones, none are found in quantity at the Buckwheat Dump. The material on the dump is composed of overburden dumped there when the nearby Buckwheat Pit was opened. This overburden may be either ore material, the enclosing gneiss, or limestone in very small amounts. The best source of limestone minerals is the many limestone quarries of the region.

Along Cork Hill Road, across the bridge from Buckwheat off to the right are several limestone quarries. This road runs over to the Sterling Hill Works. These limestone quarries are accessible, although most are closed and abandoned. There is a variety of fluorescent material to be found in these quarries. The familiar calcite and willemite of the ore body are absent. Such minerals as may be collected are not in great abundance but are scattered rather evenly throughout the quarries. There is a wealth of fine study material to be collected with relative ease. A list of the fluorescent materials would include: norbergite, chondrodite, apatite, tremolite, diopside, scapolite, phlogopite, corundum, tourmaline, barite. Not all these minerals are easily found and the reader should check the discussion of each mineral separately. To find a crystal of corundum would indeed be unusual while such minerals as norbergite and phlogopite are quite common.

Another possible collecting area is a small dump of Buckwheat material just a block or so from Buckwheat on

Taylor Road. Turn off Buckwheat Road on Taylor and go up the hill. At the crest of the hill park and walk into the open area at your right. This is all fill from the Buckwheat. It is not too well known and still yields much bright material. How long it will be accessible is not known.

There are a few fluorescent minerals from Franklin for which a source has not been given here. One reason is the author's inability to pinpoint a reliable location. More importantly, the occurrence of these minerals in the ore complex or their association with it may not be known. Under each mineral its occurrence is discussed and in some cases fluorescent specimens can be found only in the cellars of Franklin residents or on dealers' shelves waiting for the highest bidder. This material occurred in that part of the mine where surface dumping was not used. Instead, the material too lean for processing was dumped in old abandoned stopes or tunnels underground. It could find the light of day only in the pocket or lunch bucket of some enterprising miner. For this reason it is impossible to physically collect a complete suite of Franklin fluorescent minerals. Either by trading or using the "silver pick" one can usually pry loose the specimens.

Chapter III

THE FLUORESCENT MINERALS

The following minerals are placed in alphabetical order since they are too few to list in classes. Each mineral is followed by its pronunciation, properties, occurrences, associations and tests.

All minerals listed here have been shown to fluoresce under short or long wave or both. The fluorescent responses given are reliable though subject to individual observation. Since these responses are observed by individuals it is well to keep in mind individual observations may vary just a little.

Some of the material given below appeared previously in the magazine, "Rocks and Minerals" in my column, "Collecting Fluorescent Minerals." Acknowledgment is made here to the magazine for the use of that material.

As the following pages are read and fluorescent minerals from Franklin are studied, keep in mind this one thought. No mineral which occurs at Franklin will always fluoresce. Even the common calcite and willemite do not always fluoresce. The information given here is applicable only to those minerals that do fluoresce and is reliable for them.

APATITE—(ap′ u tite) See svabite. This phosphate has a formula $(CaF)Ca_4(PO_4)_3$ and as Mn replaces Ca up to $10\frac{1}{2}\%$ MnO the mineral is referred to as manganapatite.

Physical properties — Crystal—hexagonal, cleavage—imperfect, fracture-conchoidal to uneven, H—5, SG—3.17 to 3.23, color—gray to bluish green to green, luster—vitreous to opaque.

Luminescent properties — The single bluish crystals found in the surrounding limestone may fluoresce a pale greenish, short wave. The material from the ore body has been reported to fluoresce two different colors — orange or dull red, short wave. The material from the "pegmatites" which fluoresces orange, short wave, may be manganapatite. Apatite is easily confused with svabite but a general rule has been developed to help identify these similar minerals.

If the specimen occurred within the ore body it is assumed to contain sufficient arsenic to be called svabite. If the specimen occurred outside the ore body, it is assumed to have no arsenic and is, therefore, apatite. Tests have, thus far, supported this guide.

Occurrences — As noted above, the greenish material is found only in the host limestone. It is found in the southern wall of the Noble Pit and should be expected in any limestone locality of the region. The material suspected to be manganapatite was found in the so-called pegmatite which cut the ore body so actually was not found in ore. If found in the ore material it is svabite. The only locality where this mineral could be collected was the Parker Dump.

Associations — Apatite may be found associated with metamorphic minerals of the limestone. Among this group may be spinel, phlogopite, diopside, corundum, magnetite, etc. Also galena, jeffersonite, cerussite. In the "pegmatite" it will be found with garnet, quartz, feldspar, mica, etc. In the ore body material previously reported as apatite was found associated with fowlerite, franklinite and feldspar from the old Trotter Mine. At the Buckwheat Dump with calcite and at the Parker Shaft with hardystonite. At Sterling Hill in the Noble Pit, it is found with galena, jeffersonite, franklinite, calcite and possibly, cerussite.

Tests — To differentiate between apatite and svabite with a lamp is not possible. The common fluorescent association of svabite in red fluorescent calcite may be of some help but is not definitive. Reliance on association with ore minerals, or without them, is best to distinguish between apatite and svabite.

ARAGONITE — (ar′ u gu nite) This calcium carbonate is relatively rare at Franklin. It is the same chemical formula as calcite, $CaCO_3$, but there is a difference in the occurrence and in some of the properties.

Physical properties — crystal—orthorhombic, cleavage—distinct, fracture—subconchoidal, H—3.5 to 4, SG—2.947, color—usually colorless to white but may be tinted. Luster—vitreous to resinous, transparent to translucent.

Luminescent properties — reported as a yellow-cream fluorescence under long wave. The mineral also phosphoresces but the color was not reported. The response under short wave is also yellow-cream but, as is usual with aragonite, less intense. Some of the calcite from the area may fluoresce the same color and has been bought by unsuspecting collectors as aragonite. Aragonite has also been reported to fluoresce blue. One specimen this author observed fluoresced yellow-cream and phosphoresed a very weak cream, best long wave.

Occurrence — Found rarely as crystals, needlelike, or as coatings or incrustations, still rarely. It is a secondary mineral believed to be deposited by warmer solutions than is calcite. For that reason it should not be expected on the dumps. In the ore body it most likely formed in close proximity to later injection areas subjected to secondary heating.

Associations — Reported as found in the ore, rarely, rather than in the host limestone. It can be anticipated in specimens from the ore body only, in one instance in ore high in zincite.

Tests — No fluorescent test is reliable since the response exhibited by some calcites is very similar. If, however, a specimen is suspected to be aragonite there are several tests that may help. Gently heat a piece of material after first observing the fluorescence. The best procedure here is to break the specimen in two and heat only one piece. If the fluorescence is stronger after heating, the specimen is most likely calcite. If, however, the fluorescence is diminished or eliminated, the specimen is aragonite. An acid test is also possible. Boil a sample of the material in a tube with a solution of cobalt nitrate. It will become a pink-violet color if it is aragonite. The more complex and reliable Meigen test may also be used and is recommended for those equipped to do it. All the above tests would more accurately be termed indicators since there can be variations.

AXINITE — (aks′ in it) The variety found at Franklin that has luminescent properties is frequently referred to as maganaxinite because there is always manganese present and may be the cause of the fluorescence. Axinite has a chemical formula $HCa_2(Mn,Fe)Al_2B(SiO_4)_4$ and it is a hydrous aluminum borosilicate with calcium, manganese and ferrous iron.

Physical properties — crystal—triclinic, cleavage—distinct, fracture—conchoidal, luster—vitreous, H—6.5 to 7, SG—3.27 to 3.35, color—yellow to yellowish tan, transparent to translucent.

Luminescent properties — Under the "Iron Spark," Palache reported this mineral to fluoresce pinkish-red in a few specimens. Under the mercury vapor lamp it fluoresces a strong red and usually stronger red under long wave. It may also phosphoresce briefly red, short wave.

Occurrences — This mineral was found in Franklin in several places. The largest amount reported came up through the Parker Shaft. For that reason it was possible to collect small amounts of axinite on the Parker Dump. It was best collected during the daylight hours since the fluorescence of axinite is quite similar to calcite and the collector eventually tends to ignore the red fluorescence he sees since it is so common. The material has also been reported rarely at the Buckwheat Dump, the only likely source today.

Associations — Garnet, manganophyllite, and hancockite are the common associates with the Parker material. Barite and rhondonite were also reported with this material. Rarely, it may be found associated with margarosanite. This association may be responsible for some of the reported fluorescence of barylite since the axinite-margarosanite mixture gives a weaker blue response than does margarosanite alone. The Buckwheat material is always associated with ore minerals.

Tests — Lack of a red phosphorescence in some specimens may be reliable since calcite seems to be quite consistent in its response. With experience the collector may acquire a "feel" for the red axinite as opposed to the calcite red and this might lead him to hold a specimen at night that he might otherwise discard as calcite. The association with the Parker Shaft minerals is of some aid. If it is very pure, the lack of effervescence in hydrochloric acid will distinguish it from calcite. A hardness test is also reliable. The texture and color are quite different from most calcites, too.

BARITE — (bar′ ite) A barium sulfate with the formula $BaSO_4$.

Physical properties — crystal—orthorhombic, cleavage—perfect, fracture—uneven, H—3 to 3.5, SG—4.5, color—

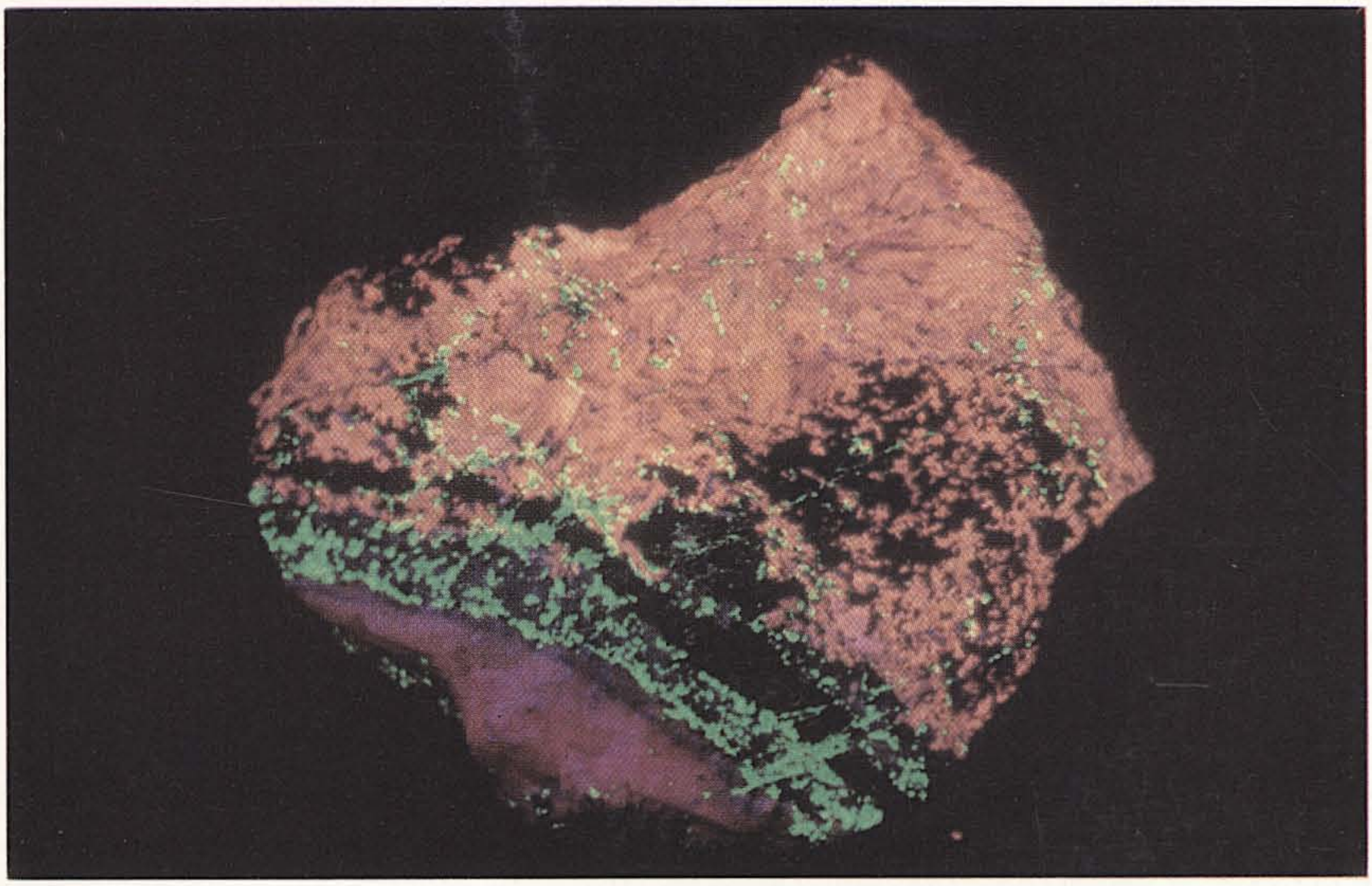


PLATE J27. A beautiful rare specimen of wollastonite with franklinite, willemite and calcite.

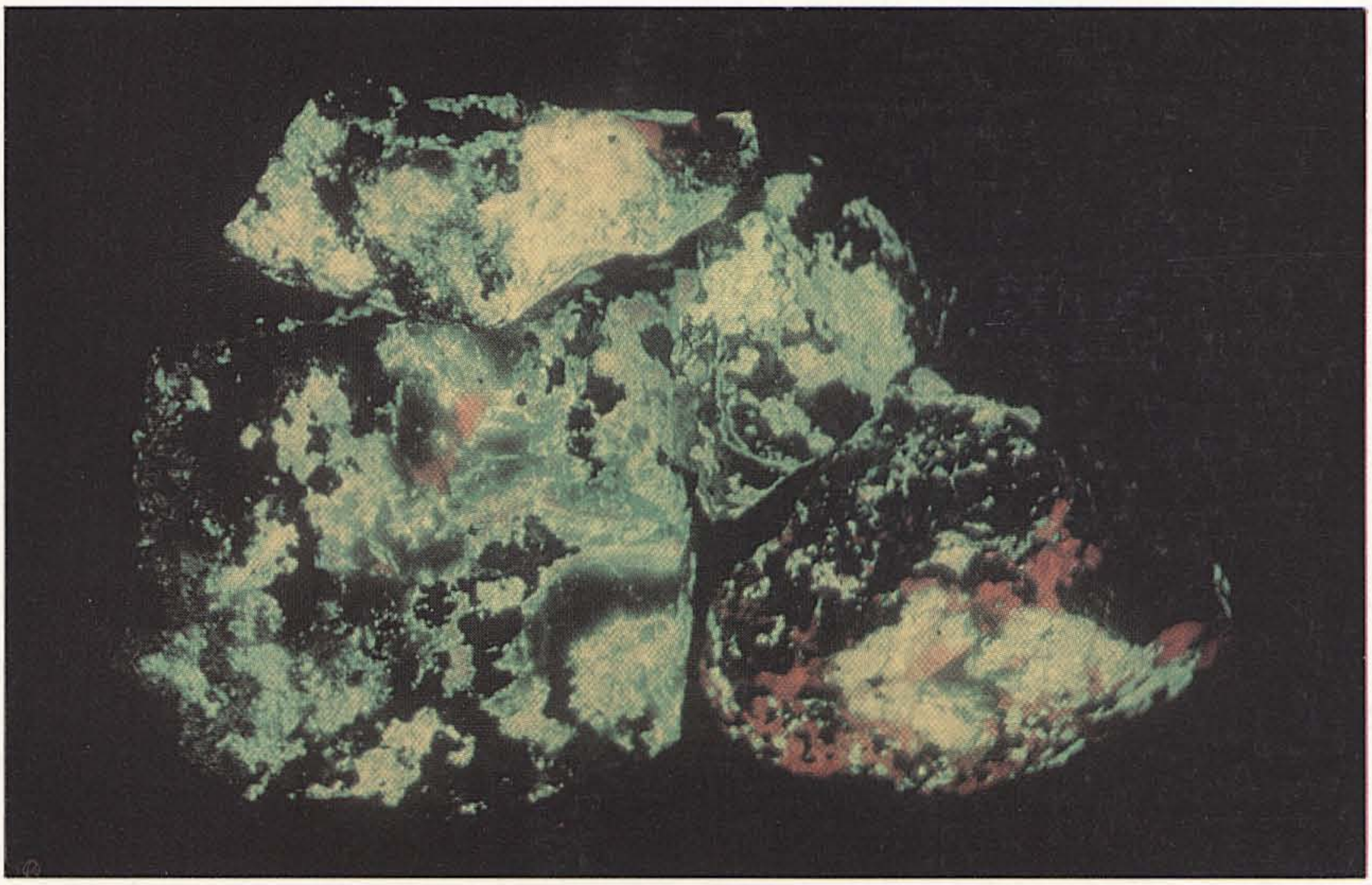
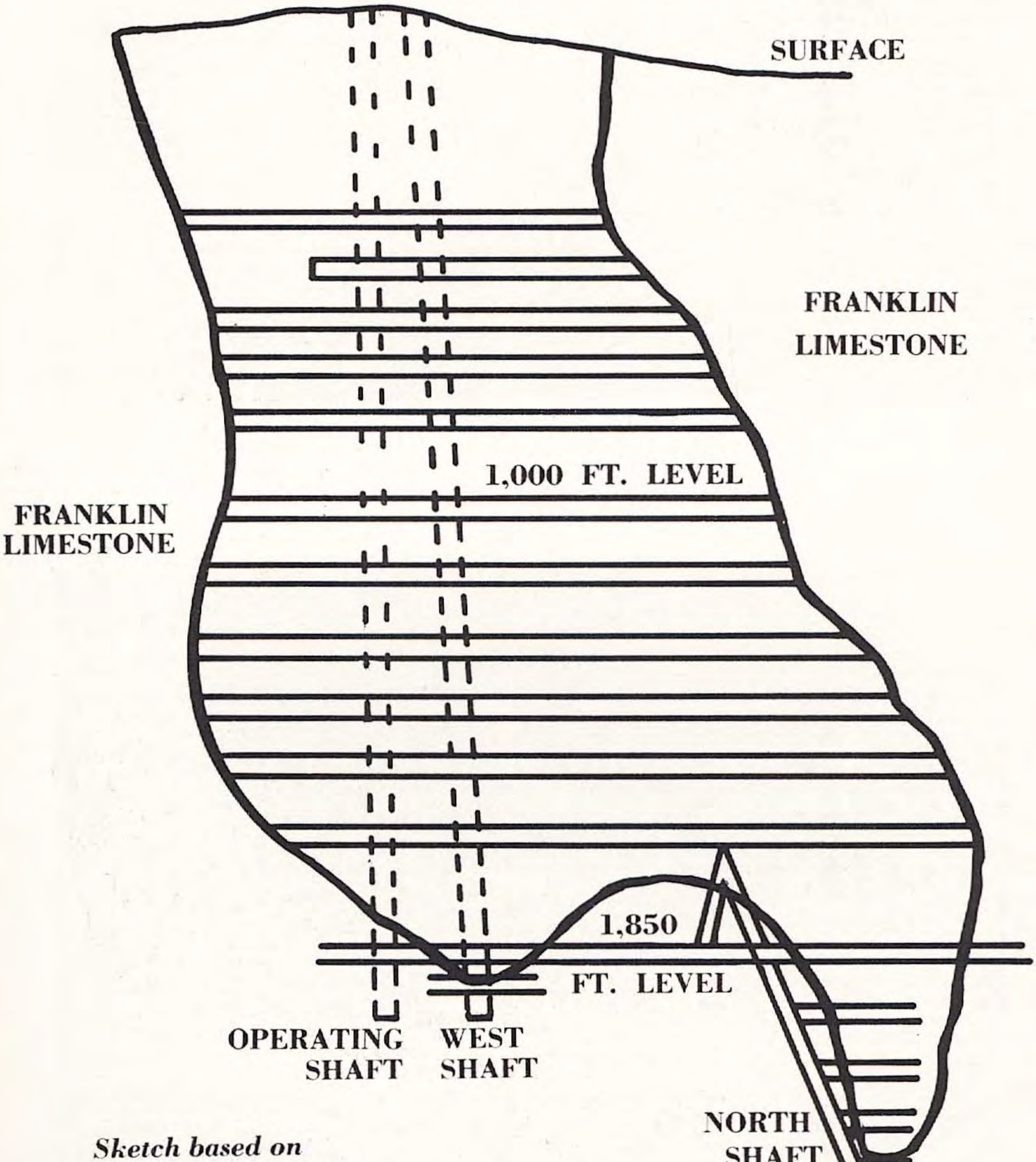


PLATE J28. The golden yellow fluorescence of calcium larsenite is a prized specimen in any collection.

LONGITUDINAL PROJECTION SKETCH OF STERLING HILL

(Only approximate levels shown)



Sketch based on projection presented in, Mining Engineering, *December, 1953*

MAP C — STERLING HILL MINES

A. PALE-YELLOW PRISMS OF WILLEMITE.
Trotter mine.

B. LARGE CRYSTALS OF WILLEMITE (TROOSTITE) WITH FRANKLINITE.
Sterling Hill.

3 WILLEMITE CRYSTALS

Reproduced from "The Minerals of Franklin and Sterling Hill Sussex County, New Jersey" by Charles Palache. Printed by U.S. Dept. of the Interior, Professional Paper 180.

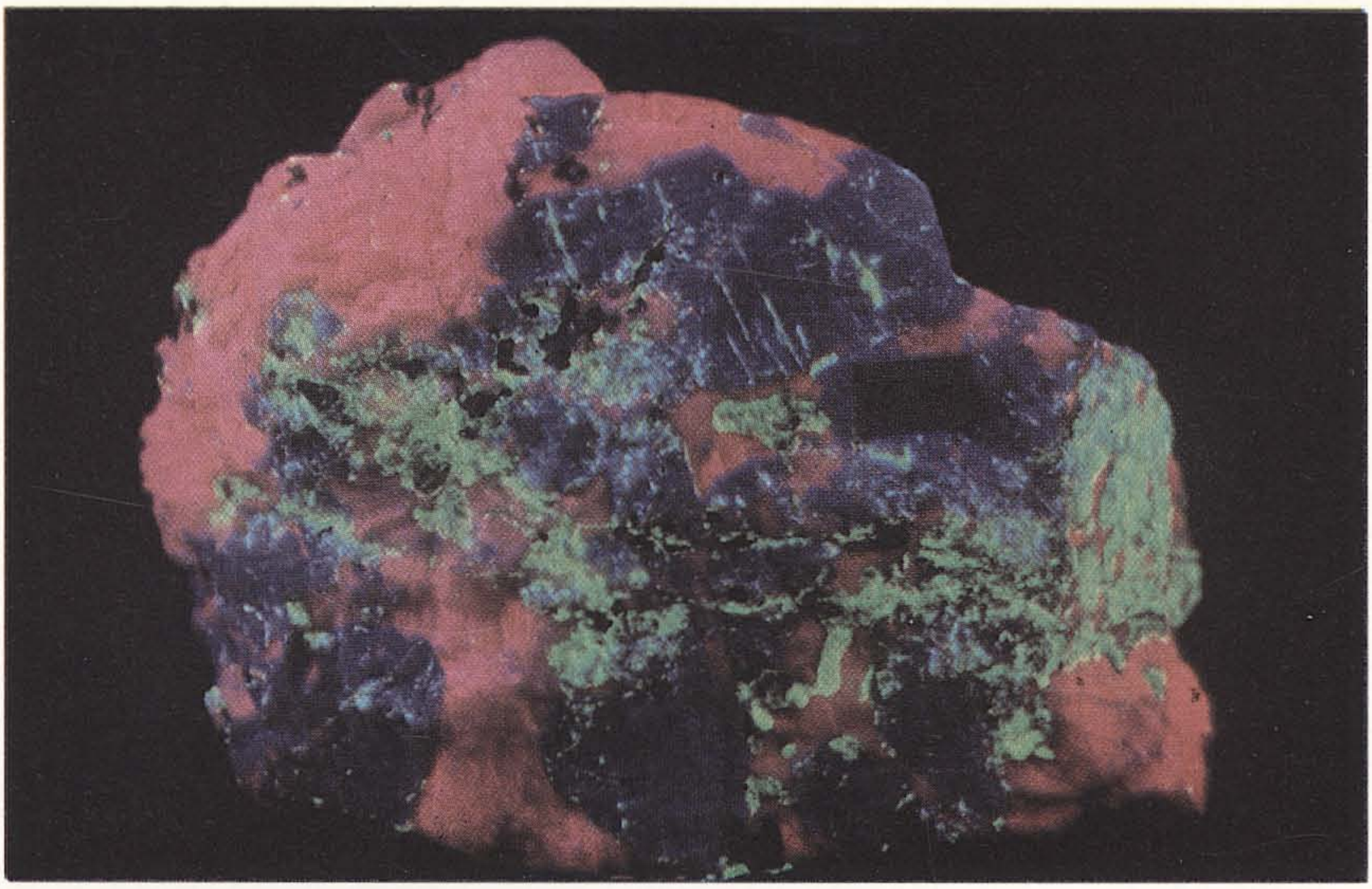


PLATE J21. Willemite, calcite and hardystonite make another of the many beautiful color combinations from Franklin.

PLATE J22. The black non-fluorescent areas always add sharp contrast to the brilliant fluorescence of the willemite and calcite.

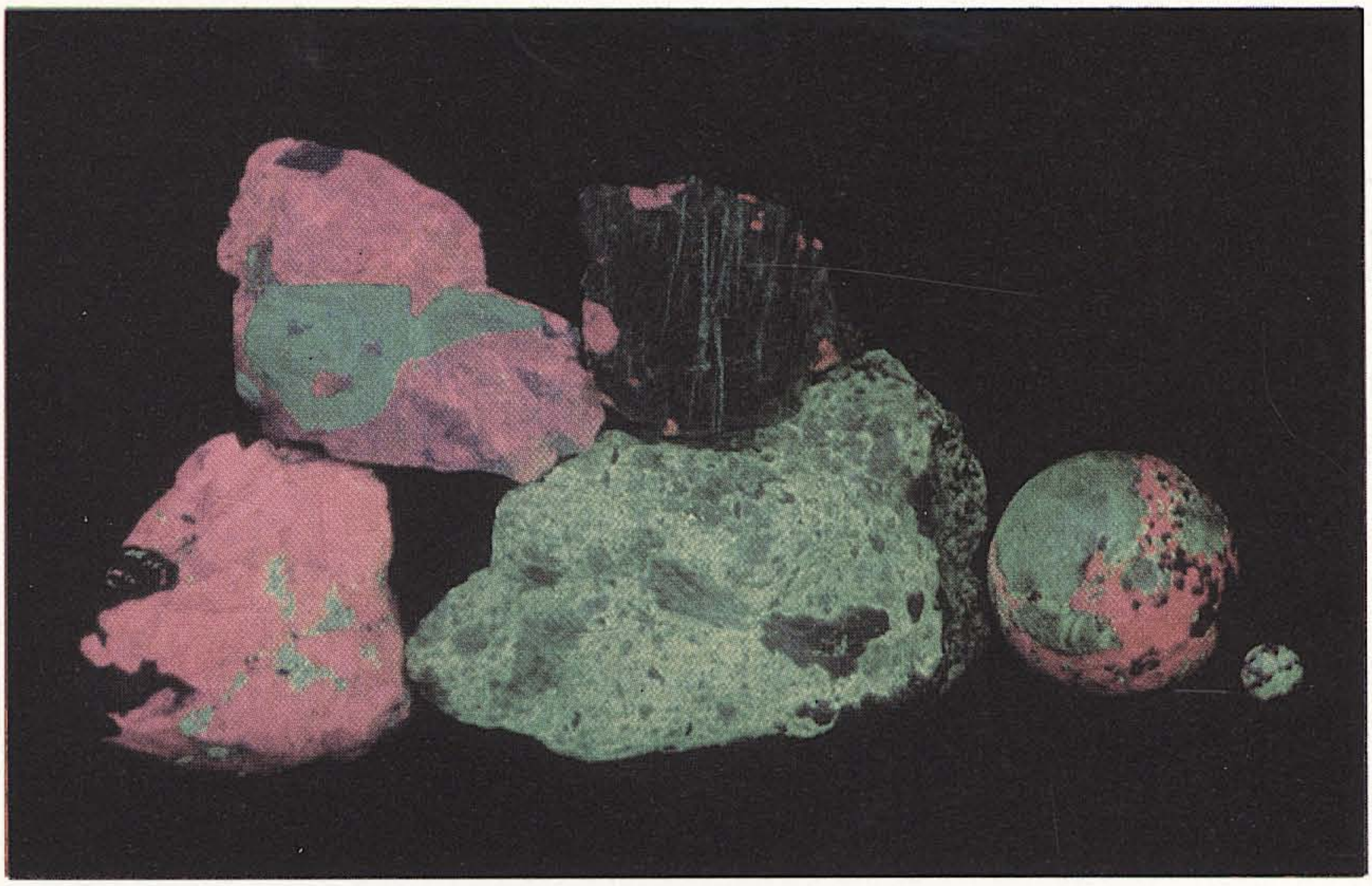


PLATE J23. An interesting combination of colors of willemite and calcite.

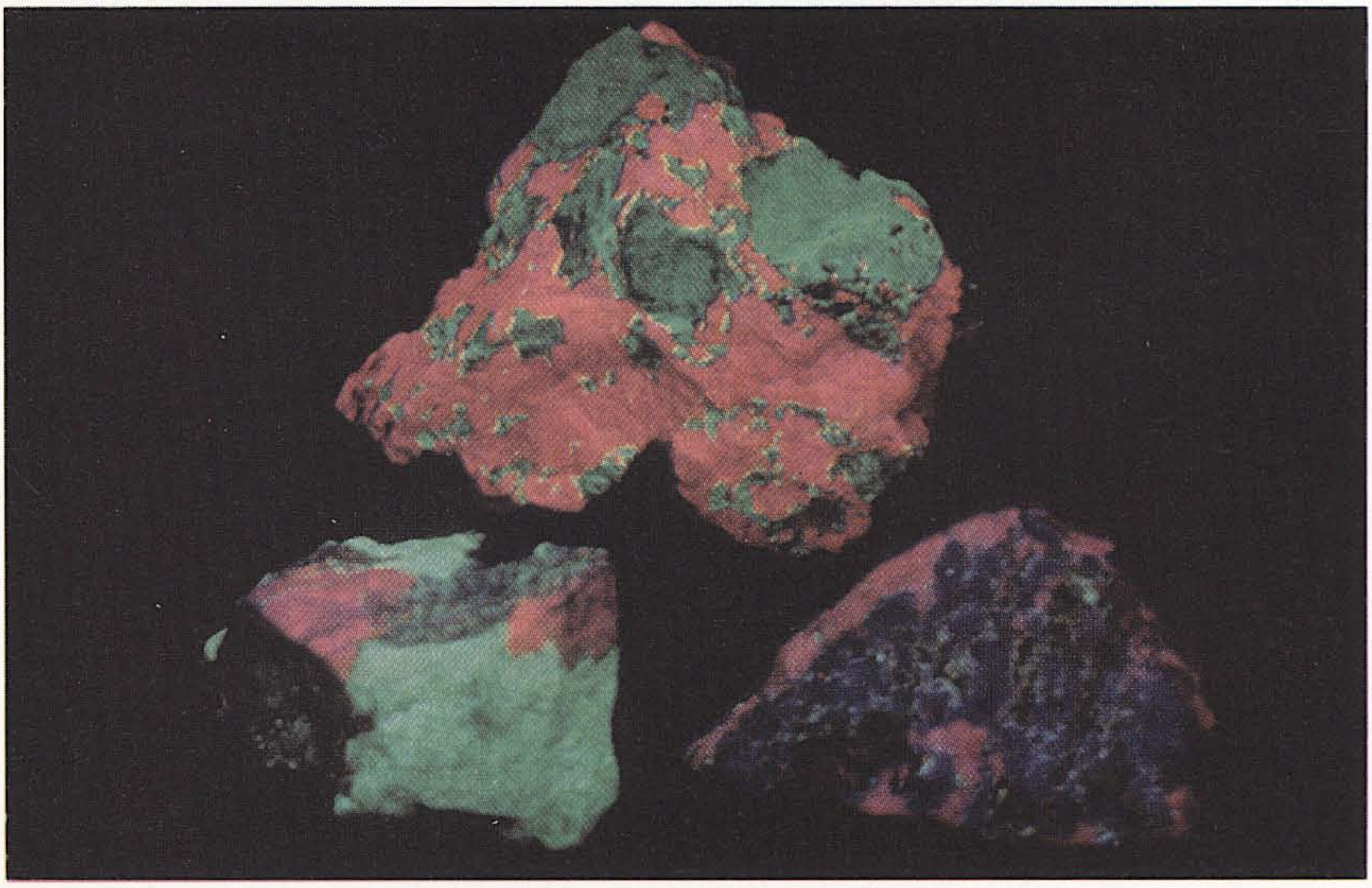
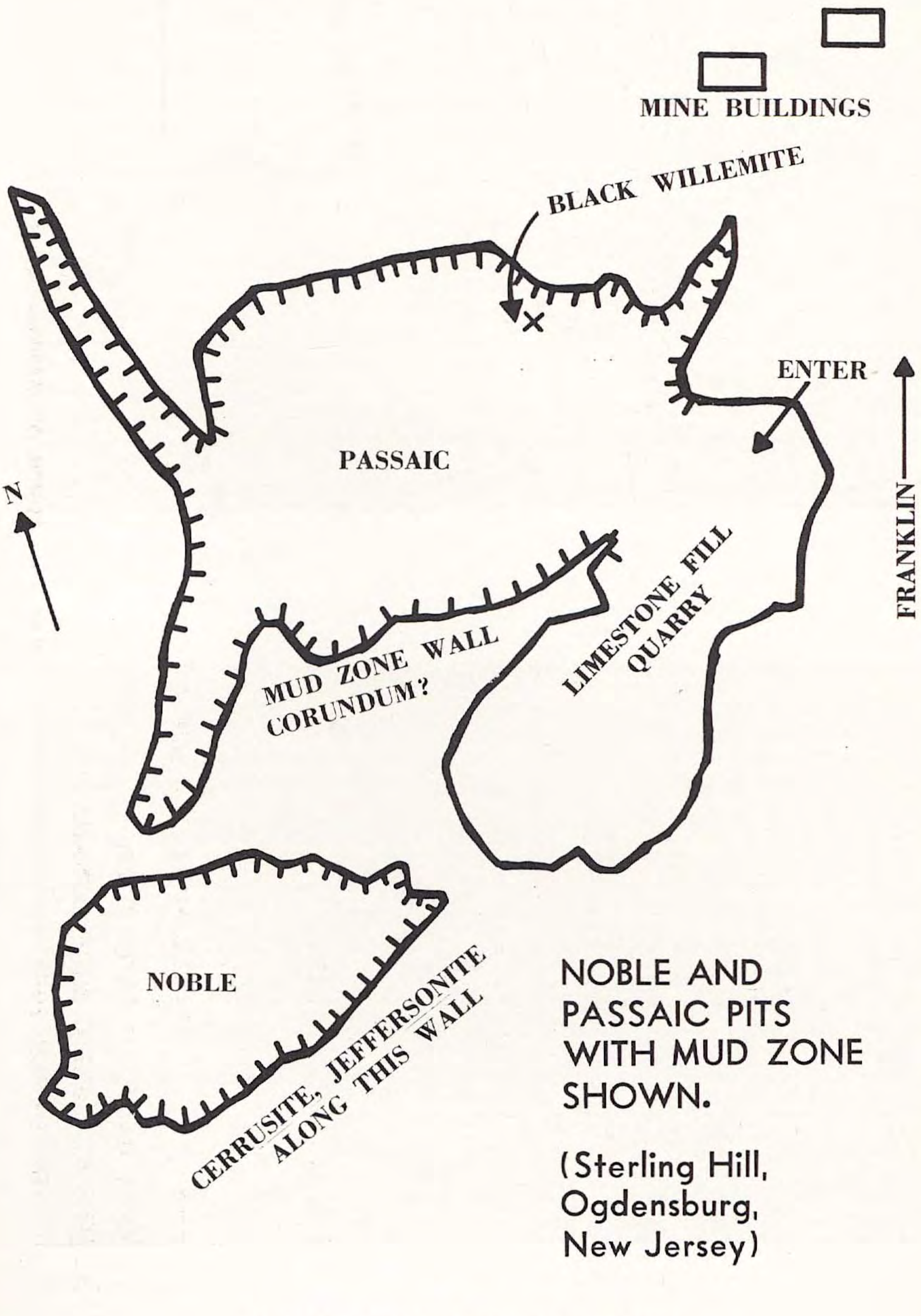


PLATE J24. Three specimens with an eye-catching combination of colors from hardystonite, willemite and calcite.

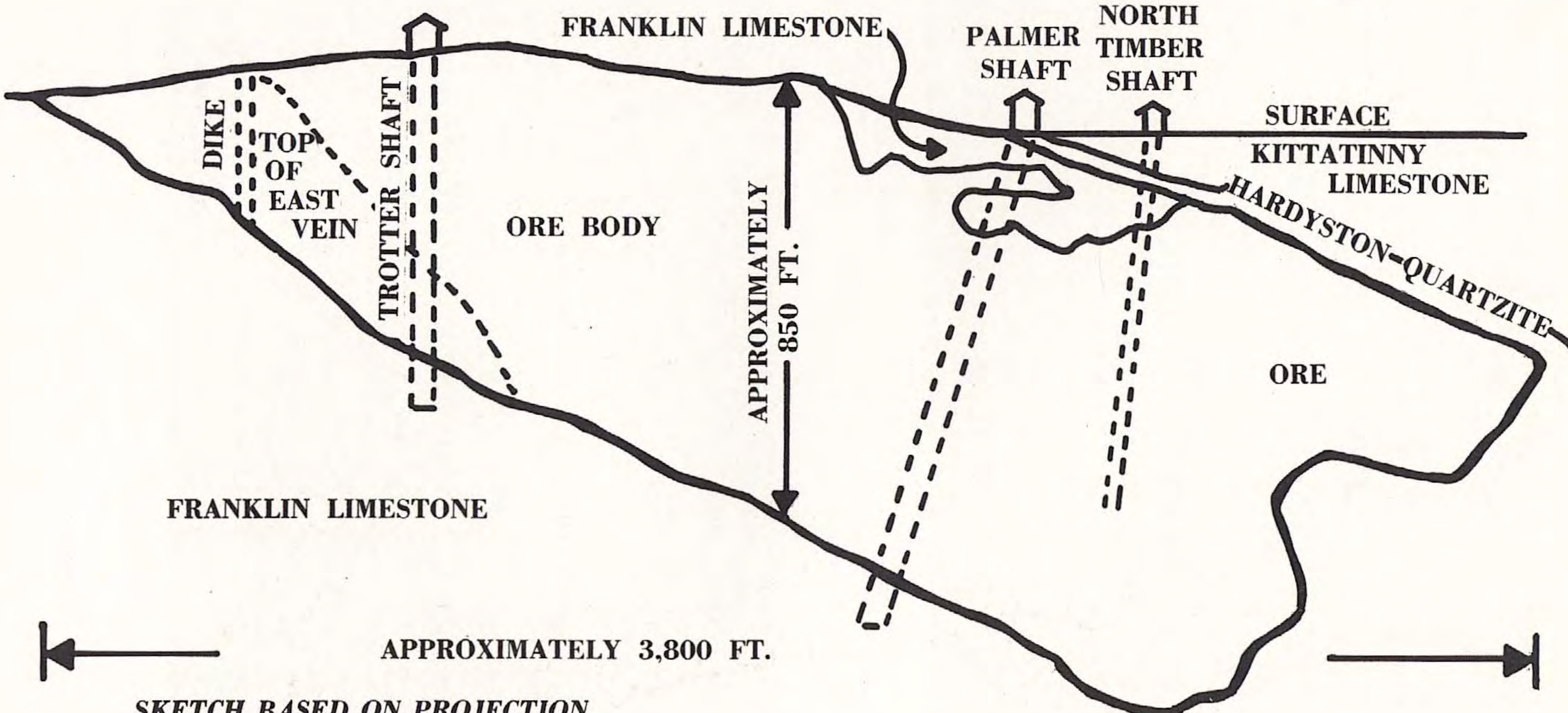


NOBLE AND PASSAIC PITS WITH MUD ZONE SHOWN.

(Sterling Hill, Ogdensburg, New Jersey)

MAP E — STERLING HILL MINE AREAS

LONGITUDINAL PROJECTION SKETCH OF FRANKLIN MINE



SKETCH BASED ON PROJECTION PRESENTED IN "MINING ENGINEERING," *DECEMBER, 1953*

MAP D — SKETCH OF FRANKLIN MINES

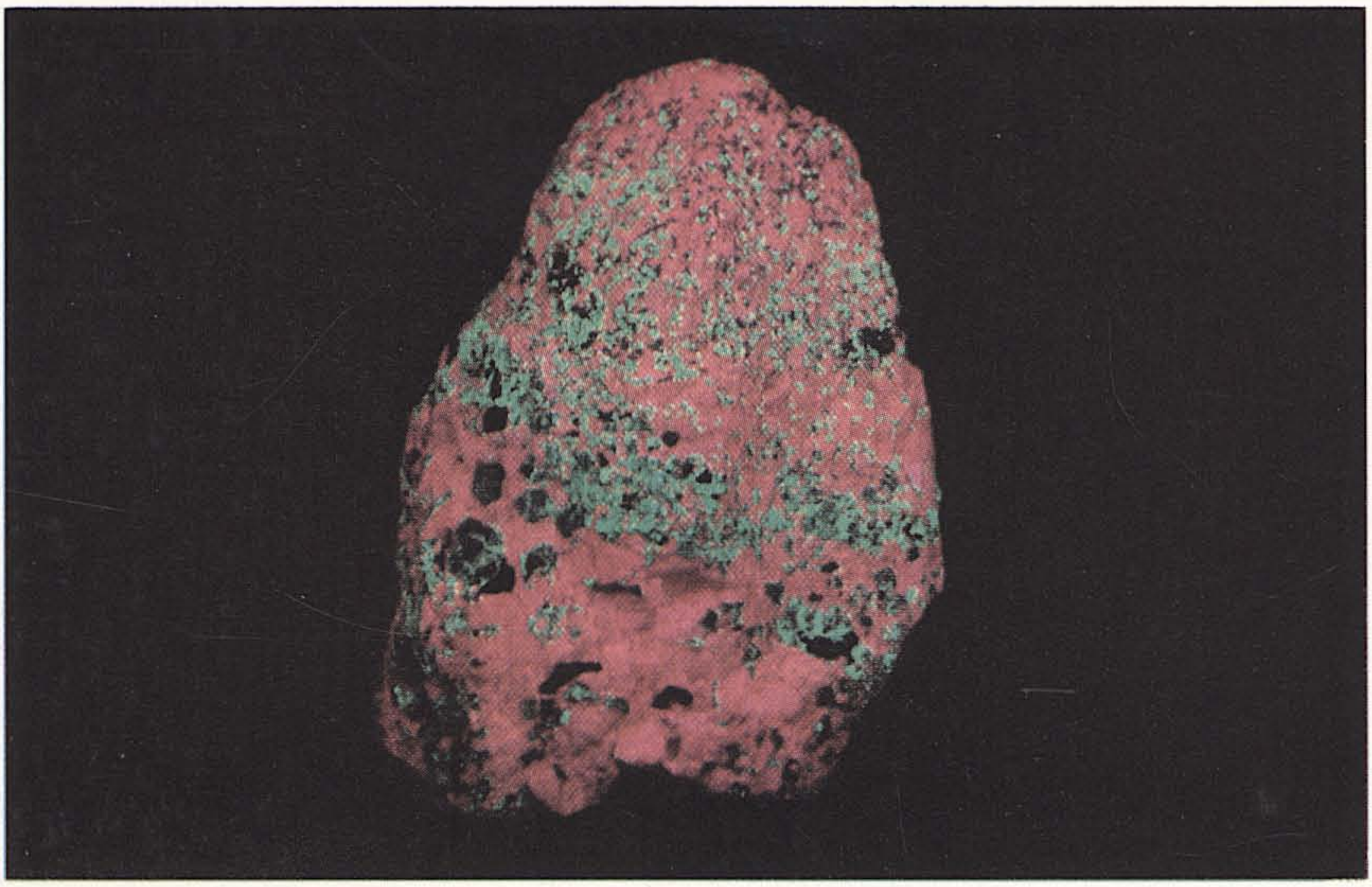


PLATE J25. A specimen of willemite and calcite weighing 62 pounds.

PLATE J26. An assortment of small but typical willemite and calcite specimens.

colorless, bluish, white, pale yellow, gray, luster—vitreous to resinous, translucent to transparent.

Luminescent properties — The reaction varies with the occurrence of the material. When found in calcite it has a pale blue to grayish cream fluorescence, short wave, only if the natural color is pale blue. When associated with franklinite and colorless to white, it may fluoresce creamish, short wave. The fluorescence of any barite may range from blue through bluish to cream, short wave only. The most common material is seen as spots and small masses in red fluorescent calcite. The fluorescence of this barite is creamy and varies in brightness from fair to very good.

Occurrences — Barite is widely distributed throughout the Fanklin region. It is a late forming gangue in the ore veins and well developed crystals are rare due to the time of formation. It is generally seen as one of two types: as spots well scattered in the calcite or as rather good sized masses, also in calcite. It has been reported found on the Parker Dump and is rarely found elsewhere.

Associations — One common association is calcite from the ore body sometimes with willemite and hodgkinsonite. Palache suggests barite is usually found in the hodgkinsonite-carrying veins. It may also be found with pectolite or franklinite and in a few cases has been noted with diopside in the host limestone.

Tests — There is a very reliable test for this material. Heat very intensely and check the whitened assay under short wave lamp. It will fluoresce a bright orange, in most cases. Also, the common test for a sulfate can be made. Fuse the mineral with sodium carbonate on platinum wire in an oxidizing flame. Crush the bead and moisten with water. Place on a silver coin and no reaction is seen. Do the same test in a reducing flame and the coin will be blackened.

CALCIOTHOMSONITE — (kal′ si o tom′ sun it) A variety of thomsonite. All the evidence is not yet in on this mineral. The crystal is orthorhombic, SG—2.45, and the chemical formula is $2(Na_2.Ca)Al_4Si_4O_{16}:5H_2O$.

Luminescent properties. — This mineral has been reported to fluoresce a good blue under long wave only.

Associations — These are reported to be garnet, axinite, barite, and datolite from the Parker Shaft, very rarely.

Tests — None with the ultraviolet lamp. The material is very scarce. Blue fluorescing material associated with Parker Shaft material should be carefully checked out. It has never been reported from the dumps.

CALCITE — (kal′ sit) As the major gangue mineral of the ore deposit this mineral is found in great abundance. The formula is $CaCO_3$.

Physical properties — crystal—hexagonal, cleavage—perfect rhombohedral, fracture—conchoidal, H—3 but varies slightly on different planes, SG—2.71 to 2.96 according to impurities, color—white when pure but usually tinted sometimes to black. Weathered outcrops at Franklin are never white. They usually show a very beautiful bronze sometimes to the depth of three-eighths of an inch. Much is also seen as very dark, almost black, material, the result of the manganese content. Luster—vitreous, transparent to translucent.

Luminescent properties — Several pages of notes could be written on the fluorescence of the Franklin calcites. It is generally some shade of red, usually quite bright, even brilliant. Best under short wave, but can be equally strong under long wave. The variations in the fluorescent response are due to the variations in the manganese content.

Research done in 1934 showed that manganese is the activator in Franklin calcites. Maximum brilliance of the red fluorescent material is reached with a content of 3.5% Mn. The fluorescence of the calcite will decrease from that point as the amount of manganese goes up or down. When it reaches 17%, the fluorescence is nil. Later work has shown the need for a second activator, or co-activator, lead. An avid collector could, if he wished, start with a very pale pink calcite and gather a fine collection of colors and brilliances all the way to violet. It is possible to use the weathered color as a guide since the darker the specimen the higher the manganese content, or longer the exposure time.

Another important property of the calcite is its brief red phosphorescence under short wave. The red "flash" can be seen if the specimen is exposed then abruptly pulled from under the lamp. It is also possible to build a revolving container in which the red phosphorescence can be seen. If a sphere of the Franklin material is spun rapidly the red phosphorescence can be seen on the side away from the short wave lamp. Millson reports obtaining phosphorographs showing orange-scarlet to yellow-orange phosphorescence for calcite.

Calcite found outside the ore body has been reported to flouresce bright blue, short wave and phosphoresce blue. Calcite from the nearby magnetite ores has a delicate blue-green fluorescence and phosphorescence under short wave. Other sepciemns of calcite have been reported a dull yellowish under long wave.

Occurrences — Red fluorescent calcite formed the gangue material in the ore body and will be found at all ore body dumps. Since the ore formed in limestone there was an abundant supply of calcium carbonate. Very little of the calcite outside the ore body is fluorescent. Calcite crystals are relatively rare.

To be specific about where to collect calcite would be unnecessary since it is so common at all dump areas. It might be said that for those who prefer small mountains to hand specimens the largest pieces of calcite are probably found at the Taylor Road site.

Associations — As the major gangue it may be found with almost any other mineral of the ore body. This is not exactly true but generally is so. It is most well known in the typical ore mixture with franklinite, willemite and zincite. The beautiful red and green (willemite) fluorescence has made Franklin known all across the land.

The associations of the calcite from without the ore body, and so not red fluorescent would be with one or more of the metamorphic minerals such as: magnetite, phlogopite, diopside, barite, etc.

Tests — The regular checks for calcite may be used here such as the Meigen reaction. The brief red to orange-red phosphorescence has usually been accepted as indicative. However, recent reports on the phosphorescence of axinite may limit the usefulness of this test.

CALCIUM LARSENITE — (kal′ si um lar′ sun it) A very popular Franklin fluorescent mineral with the formula $(Pb,Ca)ZnSiO_4$ an orthosilicate of lead, calcium, and zinc.

Physical properties — crystal—orthorhombic, cleavage—indistinct, H—about 7, SG—4.421, color—white and frequently noted to be red rimmed in matrix, the darkening of some specimens is suggested to be due to the release of lead within the specimen, luster—greasy, opaque.

Luminescent properties — Under the short wave lamp this mineral is a bright yellow. Under the long wave lamp the mineral is seen to fluoresce a weak to fair yellow-white. The material has also been reported to be thermoluminescent, meaning it will glow when gently heated below incandescence. Some calcium larsenite is difficult to see when it is intermixed with willemite having a yellow-green fluorescence. This association tends to cause the two colors to blend and make viewing difficult. Unfortunately, some of the yellow-green fluorescent willemite has been assumed to be calcium larsenite and collected or bought as such. Under a strong lamp it is almost impossible to pass off willemite as calcium larsenite especially when a specimen of each is available. Millson reports a yellow phosphorescence for calcium larsenite obtained with unfiltered short wave lamp. The phosphorescence lasted 33 hours.

Occurrences — This mineral was found sparingly in the Franklin Mine. It was first noted under the ultraviolet lamps of the picking table where the ore was upgraded. It was traced to the north end of the mine 20 feet above the 400 foot level according to Palache. It was later found at the 1200 foot level. During the operation of the Parker Shaft considerable calcium larsenite was removed and some of this was left on the dump. Unfortunately, the cost of hoisting unprofitable material out of the mine forced the operators to use old stopes and tunnels for dumping waste. Just think of all the calcium larsenite, and other even rarer minerals, that are buried forever in that old shaft area.

No calcium larsenite has been reported from the Buckwheat so with the closing of the Parker Dump it is now not possible to collect this material. Much is still available in shops and locally, but buy wisely.

Recent studies have indicated calcium larsenite as due for a new name. It has been shown to be in a different grouping than larsenite. In two local collections I have seen the mineral renamed though the official announcement has not been made. The new name will probably be esperite after Esper Larsen. This will avoid confusion for you if you should happen to chance upon a specimen of esperite. In the future that name will probably be used but to the collectors of Franklin the name calcium larsenite will be a hard one to forget.

Associations — Originally found with larsenite and later with hardystonite, willemite, calcite, franklinite, garnet, zircon, clinohedrite, and others of the rare Parker minerals. It is probably best represented by the "Christmas Tree Ore" which is the red and green fluorescent calcite-willemite and the yellow fluorescent calcium larsenite scattered throughout giving a spotted appearance to all the colors. The red and green calcite-willemite is sometimes called by the same name but the true "Christmas Tree Ore" must have calcium larsenite and perhaps some other fluorescent material with it.

Tests — The bright yellow fluorescence under short wave should distinguish this mineral from anything else at Franklin. Yellow fluorescent willemite has an orange phosphorescence. Yellow fluorescent chondrodite-norbergite is found in limestone, not ore. The weak long wave response of calcium larsenite will also help.

CERUSSITE — (sir′ u site) Recently found in material from Sterling Hill. This secondary lead carbonate is produced by the action of carbonated waters on lead solutions. Its formula is $PbCO_3$.

Physical properties — crystal—orthohombic, cleavage—distinct, fracture—conchoidal, luster—adamantine, may incline to vitreous, resinous, or pearly, H—3 to 3.5, SG—approx. 6.55, color—colorless to white to gray, may discolor brownish, transparent to translucent.

Luminescent properties — Under the long wave lamp this material fluoresces a weak but noticeable creamy yellow to yellow. No reaction with short wave.

Occurrences — Found at Sterling Hill, rarely. It has not been reported from Franklin. The author has one of several specimens collected in 1962 in the old Noble Pit. Along the southern side of the pit there can be found galena. In association with this galena may be seen cerussite.

Associations — Found as white crystals encrusting galena. Also as separate brown masses. Also, as small white crystals in cavities possibly remaining from galena that was removed. Though nothing of this mineral has been collected from the Franklin area it should be suspected since galena has been found at both the Buckwheat and Taylor Road sites.

Tests — The weak yellow fluorescence under long wave coupled with the association of galena may suffice to identify some specimens. If enough material is collected for chemical testing, the following test can be made: Heat gently and it will turn yellow then red-brown as it gets hotter. Allow to cool and a faceted crystalized bead forms. Overheat it and lead will be given off. As the overheated material cools the lead bead will separate from the carbonate. No confusion is possible with scheelite or powellite since they fluoresce under short wave.

CHONDRODITE — (kon′ dro dit) Frequently confused by and associated with norbergite to which the reader is referred. This mineral is a basic fluosilicate of magnesium with the formula $2Mg_2SiO_4,Mg(F,OH)_2$. Notice the similarity between this and the formula for norbergite.

Physical properties — crystal—monoclinic, cleavage—basal, fracture—uneven, to conchoidal, H—6 to 6.5, SG—3.1 to 3.2, color—usually yellow to brown, may be nearly colorless, or, when weathered, slightly buff. Luster—vitreous to resinous too dull when weathered, translucent to opaque.

Luminescent properties — Reported as fluorescing yellow under short wave only. There is considerable lack of reliability here because of the confusion between this and norbergite. The associations, occurrences, and tests will also be the same as for norbergite so reference should be made to that mineral.

CLINOHEDRITE — (klin′ o he′ drit) A calcium zinc silicate formula $H_2CaZnSiO_5$.

Physical properties — crystal—monoclinic, cleavage—perfect, H—5.5, SG—3.33, color—colorless or white to amethystine, luster—vitreous to pearly. Crystals are transparent, massive material is translucent.

Luminescent properties — Palache reported the fluorescence of clinohedrite as a "somewhat orange tint, not easily distinguished from the yellow fluorescence of pectolite." Under our modern lamps we are able to see a very strong orange fluorescence, shot wave, in clinohedrite. The massive material is somewhat less bright than the transparent crystals but is still very good. Infrequently, the mineral may fluoresce a weak orange, long wave. Under the short wave lamp there is also noted a phosphorescence the same color as the fluorescence. There is still some confusion between this mineral and pectolite and some of the reported responses may not be reliable. (See pectolite.) Millson reports a yellowish-orange phosphorescence under unfiltered short wave light. The phosphorescence lasted 175 hours.

Occurrences — The exact location of the original occurrence in the mine, reported in 1898, has never been found. All the clinohedrite apparently came out through the Parker Shaft. It was still collectable on the Parker Dump until it was closed. The largest piece found by this author measured about three and one-half inches across. It was found one night with an old Mineralight, Model SL-2537. A recent report indicated this mineral was found on the Buckwheat Dump. Further study showed the material to be an admixture of wollastonite and pectolite. This is a mistake not uncommon today. Any orange fluorescent material may be wollastonite, pectolite, clinohedrite, or a mixture.

Associations — The less common association is with the minerals nasonite, hancockite, glaucochroite, and roeblingite all from the Parker. In many collections can be seen massive material associated with willemite, calcite, hardystonite, franklinite, and garnet. This is the material that was possible to find on the Parker Dump. The author also has some specimens in which the clinohedrite is associated with margarosanite, willemite, prehnite, and hedyphane. Also seen in these specimens are pink fluorescent pectolite and one of the micas. John Albanese has suggested that much of the orange fluorescent material called clinohedrite is really massive pectolite. If true, this might account for some of the reported orange phosphorescent clinohedrite. It might also give rise to an accurate luminescent test if all orange phosphorescent material was shown to be pectolite.

Tests — Due to the similarity between pectolite and clinohedrite it is difficult to make a positive identification under the lamp. The clinohedrite crystals that have been observed are a stronger orange than pectolite but this has not been authenticated. The phosphorescence of pectolite, which is very brief, may be a positive check for the mineral and would aid in distinguishing between it and clinohedrite. The cobalt nitrate test should be reliable to differentiate between pectolite and clinohedrite. Since the latter is a zinc silicate, the test for that would be proof. Of course, the failing here is the inability to get pure material from most specimens.

CORUNDUM — (ko run′ dum) An oxide of aluminum with the formula $Al_2 O_3$.

Physical properties — crystal—hexagonal, fracture—conchoidal to uneven, H—9, SG—3.9 to 4.1, color—red to purple to purple gray, luster—adamantine, transparent to translucent.

Luminescent properties — This mineral has a very rich red response under long wave lamp. It has been reported to fluoresce very weakly under short wave, but this is not usual.

Occurrences — Always found as scattered crystals and crystal grains in the limestone. It has not been found in the ore body. One reported occurrence was the site of the old Franklin Furnace, long since gone, where excavations for the foundations opened a pocket of crystals in the limestone. There is always the remote possibility of a collector opening a pocket in the limestone while working one of the abandoned quarries of the region. The author might suggest that the old quarry nearest Franklin Pond would be a good place to start. Loose crystals have been found in the mud zone between the Noble and Passaic Pits behind the Sterling Hill mine buildings. In the past, they appeared on the washing table where mud covered calamine was being cleaned. The mud wall is still there and crystals may be garnered by the energetic. These crystals have weathered out of the surrounding limestone indicating there is still value for collectors in working the area.

Associations — It may be found sparingly with any of the following minerals of the limestones: phlogopite, rutile, garnet, spinel, graphite, edenite, titanite, pyroxene, and marcasite. Of these minerals the following were found at the Noble Pit: phlogopite, graphite, pyroxene, and traces of marcasite. Maybe we were close.

Tests — Only the red fluorescent corundum responds so well under long wave. The associations in the limestone should leave little doubt. A chemical test for aluminum can be made but seems unnecessary.

DIOPSIDE — (di op′ sid) A calcium magnesium silicate, formula $CaMgSi_2O_6$.

Physical properties — crystal—monoclinic, cleavage—imperfect, H—5 to 6, SG—3.2 to 3.3, color—colorless, white, light green, luster—vitreous, transparent to translucent.

Luminescent properties — This mineral may fluoresce a fairly bright blue-white in short wave light. It has also been reported whitish under short wave. Those crystals which are gray or greenish in color may fluoresce pale bluish cream, short wave. These observed colors are very similar and the differences may be partly due to personal observation or different lamps used.

Occurrences — Widely scattered throughout the limestone of the region. It is not found in the ore body. Sometimes grains appear banded or grouped in the limestone.

A number of limestone quarries have operated in the region, many yielding good diopside. However, these quarries are invariably closed to collectors and should NOT be entered without specific permission of the owner. On occasion, the Farber Quarry, is open for authorized and carefully controlled field trips of the Franklin-Ogdensburg Mineralogical Society.

Associations — Found in the limestone so it may be expected with any one of several typical minerals: phlogopite, spinel, barite, tremolite, etc.

Tests — There is no reliable fluorescent test. A goniometer may be used to check good cleavage angles when found. The angles are 87° and 93°.

FLUORITE — (floo' ur ite) This halide is calcium fluoride with a formula of CaF_2.

Physical properties — crystal—isometric, cleavage—perfect, fracture—flat conchoidal to splintery to uneven, H—4, SG—3.18; color—colorless to white, gray, purple, flesh, rose red, luster—vitreous to dull in massive forms, transparent to translucent.

Luminescent properties — The fluorescence of the crystals and some of the massive material is the typical bright blue, long wave; duller blue, short wave. Most of the fluorite of the area is thermoluminescent — glows a soft green color when gently heated. Reference in the literature to this type fluorite is under the name chlorophane. This is an old name applied to fluorite that glows green when heated and does not necessarily fluoresce blue though it may fluoresce green. To get this response simply heat a splinter below incandescence and the green response will be seen. Fluorite shatters violently on heating so it is suggested this test be done in a closed pyrex container. Millson's report on Franklin fluories credits it with a 200 hour green phosphorescence obtained under unfiltered short wave. When this material is exposed for long periods of time to sunlight or ultraviolet lamp, it loses its ability to thermoluminesce so a fresh surface is best to observe when checking. It is also wise to store the mineral in a dark corner or drawer.

There are two distinct types of fluorite found at Franklin. The familiar blue fluorescent type is one. The other is the blue-green fluorescent material with the strong thermoluminescence and usually a good phosphorescence. Fluorite from other areas has been found to contain a higher ratio of rare earths when these different luminescent properties have been noted. Whether this is true of Franklin material is not known. Palache reports an analysis of red colored fluorite from Parker. Indicating all impurities found, the analysis was still over 2% short, leading one to wonder if this 2% isn't undetected rare earths.

Occurrences — Both fluorescent types of fluorite have been found in the ore body. The red or flesh varieties have been reported from the Parker and the Buckwheat. Also, purple fluorite has been found at the Buckwheat and old Trotter Mine. Pink masses were also reported from the Trotter. Finding any fluorite at any location will be difficult. The author has been told it is relatively easy to find at the Buckwheat but that must only apply to others, not this collector.

Associations — Fluorite is commonly associated with franklinite, willemite, and bustamite. In the surrounding limestone, it has been reported with quartz and calcite crystals in cavities. Other associations are fluorborite, zincite, hetaerolite and chlorophoenicite. It may also be seen with sphalerite. With this mineral it forms a very pretty color combination under the lamp; orange and green. The author has one specimen of micro crystals with willemite on dolomite that fluoresces blue. This was supposed to have come from the Buckwheat.

Tests — Under the long wave lamp the familiar blue flourescence will be of great help. The thermoluminescence of the fluorite giving a recognizable blue-green or green glow is sufficient to identify the mineral. It is not soluable in hydrochloric acid as is calcite.

HARDYSTONITE — (har′ di stun it) A calcium zinc silicate with the composition $Ca_2ZnSi_2O_7$. This was first reported in 1900 and is, for all practical purposes, always massive. However, this author has seen one specimen that contained definite crystals enclosed in the matrix. They were readily visible under the lamp.

Physical properties — crystal—tetragonal, cleavage—good parallel to the base, poor parallel to the prisms (can not be observed in massive material), H—3 to 4, SG—3.39, color—white to pinkish, luster—vitreous, semi-transparent to translucent.

Luminescent properties — Palache reported this mineral as fluorescent, a dull faint violet or not at all under the "Iron Spark." Under the short wave lamp this mineral is a good to strong blue violet to violet. It has also been reported as fluorescent violet under long wave but this may be questioned. When a mineral is reported to fluoresce violet under long or short wave, care must be taken to be sure it is not reflected visible violet light being observed. A simple test will avoid this mistake in the case of short wave fluorescent minerals only. Place the specimens under a piece of ordinary glass and observe the response. Then remove the piece from under the glass and observe again. If there is a very noticeable difference in the two the mineral is fluorescent. If there is no change the mineral is only reflecting visible violet light. This test is only valid for short wave lamps.

Using the above test, this author has observed a number of good blue-violet fluorescent specimens, but has yet to see a specimen that fluoresces satisfactorily under long wave.

Hardystonite has also been reported to fluoresce a bright blue but this is not common. John Albanese reports a specimen of bright blue fluorescent hardystonite under long wave lamp. The specimen was subsequently found to be admixed calcite and hardystonite. Under short wave the specimen fluoresced red for the calcite and weak or faint violet for the hardystonite.

Occurrences — This mineral was found sparingly on the Parker Dump. It seemed to be more common than some of the other Parker rarities. In the mine it was first found at the 900 foot level of the Parker Shaft and later was found in other parts of the ore body. All of this material was apparently hauled out through the Parker opening since none has been reported from the Buckwheat Dump. It should not be expected at the Taylor Road Dump since this is Buckwheat material. It might be added the mineral is always found with ore body minerals.

Associations — The commonly noted association is with franklinite, willemite, calcite, clinohedrite (or pectolite), and garnet. This was typical of the Parker Dump. It may also be noted with brown vesuvianite and brown apatite. It will not be found associated with the limestone minerals.

Tests — Since there may be confusion over the fluorescence of any particular specimen the under-glass test should be made to determine fluorescence. There is no reliable test for hardystonite with the ultraviolet lamp.

HYDROZINCITE — (hi′ dro zink′ ite) This secondary mineral is a carbonate of zinc. The chemical formula is $Zn_5(OH)_6(CO_3)_2$.

Physical properties — crystal—monoclinic, cleavage—perfect, H—2 to 2.5, SG—3.53 to 3.80, color—white to gray, yellow, bluish, luster—pearly or dull, translucent.

Luminescent properties — The fluorescence of this mineral is strong to fair blue under short wave only. Some observers feel the color should be called blue-white in the brighter spectrum. Although hydrozincite from other localities may show a weak yellow fluorescence, long wave, none of the Franklin material responds under long wave.

Occurrences — Since this is a secondary mineral, usually of sphalerite, it should be anticipated at any locality where sphalerite is found. The continual, but very gradual, formation of hydrozincite is going on at the dumps all the time. Many fine, but generally small specimens have been collected at the Buckwheat Dump in recent years. It is usually coating calcite or dolomite. The calcite-hydrozincite association makes for very attractive red-blue fluorescent specimens. The Taylor Road site yields rather large masses of blue fluorescent hydrozincite in thin coatings on calcite.

On a field trip into the Passaic and Noble Pits considerable hydrozincite was found, mostly as coatings but occasionally as small masses and veins intimately associated with zincite. Another locality far removed from Franklin is the shores of Lake Hopatcong, where barges were formerly loaded for trips to the smelter. Material dropped in the lake has recently been recovered. It is well coated with bright blue fluorescent hydrozincite associated with zincite and franklinite in masses and small crystals. The lack of sphalerite in the specimens suggests the hydrozincite owes its existence to the alteration of zincite.

Associations—See above. As mentioned, sphalerite, zincite, franklinite are possible. Calcite is commonly associated with the dolomite, pyrite may also be found. Palache reports no hydrozincite associated with the calamine of the Passaic-Noble Pits. It is most certainly in the pits now; though no specimens of calamine were found. Palache's work came out in 1935 so we can assume it covers the previous five to ten years. Since that time, the hydrozincite has appeared — a very short period of time indeed.

Tests — A very good aid is the blue fluorescence since it is the only blue fluorescing coating which responds in this area. The only point of confusion might be old blasting powder scars. Chemical verification is relatively easy. It will effervesce freely in hot hydrochloric acid. Also, a heated particle on charcoal with cobalt nitrate added, cooled then reheated will assume the typical green zinc color. (See Smithsonite)

MARGAROSANITE — (mar gar o' san it) This rare silicate of lead and calcium first reported on in 1916 is $Pb(Ca,Mn)_2(SiO_3)_3$.

Physical properties — crystal—triclinic, cleavage—perfect to good, H—2.5 to 3, SG—3.99; color—colorless or white; luster—pearly, crystals are transparent.

Luminescent properties — Palache reports the fluorescence under "Iron Spark" as "a rather lively pale violet." Under ultraviolet lamp the material is a very strong pale blue. There is no response under long wave. This mineral is very rare and is a very beautiful fluorescent mineral.

There is considerable conflict between observers over the minerals margarosanite and barylite. Some contend that the weak fluorescing margarosanite in some specimens is really barylite. Others contend it is margarosanite mixed with axinite causing the weaker response. There may be a solution to the problem from an old source, the "Iron Spark."

Palache reports barylite as vivid blue and margarosanite as lively pale violet. It would seem to follow that by checking the response of many known specimens of these minerals, one might establish a guide of identification. Of course, mixtures would not respond to the guide and would be shown to be mixtures in need of further checking.

Occurrences — This mineral is not found on the dumps today. It had been reported from the Parker Dump but that is now closed. The margarosanite was mined during later operations when waste was dumped in old sections of the mine so little was hoisted out. This is another mineral probably in fine masses buried forever in the reaches of the old mine. A few specimens are available from collectors and dealers.

Associations — Among the minerals associated with margarosanite in the 1898 find were: barite, garnet, hancockite, roeblingite, nasonite, franklinite, willemite, axinite, datolite, manganophyllite. The author has a few specimens of this material associated with hancockite, garnet, pink flourescent pectolite, prehnite, willemite.

Tests — The bright blue fluorescence, pearly luster, bladed translucent appearance along with the association of many complex minerals should be of great help. At the moment it is not possible to differentiate between barylite and margarosanite.

MICROCLINE — (mi' kru kline) This feldspar has a formula of $KAlSi_3O_8$.

Physical properties — crystal—triclinic; cleavage—perfect to distinct; fracture—uneven, H—6 to 6.5, SG—2.54 to 2.57; color—green to grayish green; luster—vitreous, sometimes pearly (when weathered it is considerably duller), transparent to translucent.

Luminescent properties — This mineral is found to fluoresce a weak blue to blue-white to white or cream under short wave only. Weathering may be responsible for the variation in fluorescence.

Occurrences — Tested specimens came from the Buckwheat Dump found in 1958. This mineral was found abundantly during the working of the ore body in the Buckwheat Pit. Much of the material was cast on the dump. The Trotter Mine yielded large green crystals. The only collecting site today is the Buckwheat where it occurs in large masses simply because there seems to be nothing of great interest associated with it and so it has been spared the hammers.

Associations — The tested specimens were associated with quartz, epidote, and calcite. It may also have some ore minerals in the same piece with it.

Tests — The green color, cleavage, and fluorescent response should be sufficient to identify the material.

NORBERGITE — (nor′ berg it) Top member of the humite series of minerals. This basic fluosilicate of magnesium has a formula $Mg_2SiO_4Mg(F,OH)_2$.

Physical properties — This mineral closely resembles other members of the humite series. One other member of this group is chondrodite, also found at Franklin. For this reason the minerals are being discussed together. Crystal—orthohombic (norbergite) and monoclinic (chondrodite); cleavage—basal, sometimes distinct, fracture—uneven to conchoidal, H—Palache reports the hardness as 5.5 for norbergite. The humite series is generally reported to have a hardness of 6 to 6.5, SG—3.1 to 3.2; color—colorless (chondrodite) yellow, yellow-brown, tan, buff; luster—vitreous to resinous, transparent to translucent. When weathered the material is opaque and the luster dull.

Luminescent properties — Attempts have been made in the past to identify these minerals by ultraviolet lamp but this has led to much confusion. There is no known reliable fluorescent check.

The fluorescence of both minerals is reported as yellow to yellow orange under short wave only. The fluorescence will vary from fair to good. Latest indications are that norbergite is the prime fluorescing material and chondrodite is rarely, if ever, fluorescent. However, this is not settled.

In daylight, the minerals are sometimes thought to be different colors. Norbergite tends to be light or dull yellow and chondrodite tends to be a darker yellow-brown shade. Weathered norbergite is very pale yellow and looks almost earthy in color. Chondrodite usually weathers darker in color.

To further confuse the issue, these minerals have also been reported to be closely associated within a single grain. These grains are reported to have a core of chondrodite with a surrounding coating of norbergite. With all this confusion about all we can safely say is one or the other or both these minerals fluoresce.

Occurrences — There is no norbergite-chondrodite found in the ore body. By far, the better places to search for this material are the old limestone quarries. The Franklin Iron Co. Quarry across the street from Buckwheat yields fine masses of this material but the quarry is closed to collectors. The Nicols Quarry, Fowler Quarry and others along the road to Sterling Hill (Cork Hill Road) will produce specimens for the collector.

Associations — This material is always found in the limestone and should be expected associated with any of the typical metamorphic limestone minerals.

Tests — None, due to the existing confusion. However, yellow fluorescing grains, short wave, in limestone will be one, or both, of these humites.

PECTOLITE — (pek' to lit) This hydrous calcium-sodium silicate has a general formula of $Ca_2NaSi_3O_8(OH)$ but at this locality there is a little manganese present.

Physical properties — crystal—triclinic, cleavage—perfect, fracture—uneven, H—4 to 5, SG—2.7 to 2.8, color—colorless, white, gray, flesh, luster—silky to dull, translucent to opaque.

Luminescent properties — Palache reports this mineral as having a yellow fluorescence under the "Iron Spark." The mineral is observed as a good orange to orange yellow under short wave. Under long wave the reaction is weak orange to none. Under short wave there is also noted a brief, bright orange phosphorescence that appears to be a reliable indicator of pectolite. The large masses generally seen in collections have a more chalky orange fluorescence than the firmer appearing orange of clinohedrite. With experience this can be a helpful difference. This author has two or three unusual specimens of pectolite associated with the typical Parker complex. The fluorescence of the pectolite is a strong pink under short wave. This material was identified by the Smithsonian Institute.

Associations — Pectolite has been found with the minerals from the Parker Shaft. It was considered to occur rather infrequently until John Albanese suggested in the April, 1960, issue of his "Notes" on Franklin, that the orange fluorescent material found with hardystonite, busta-

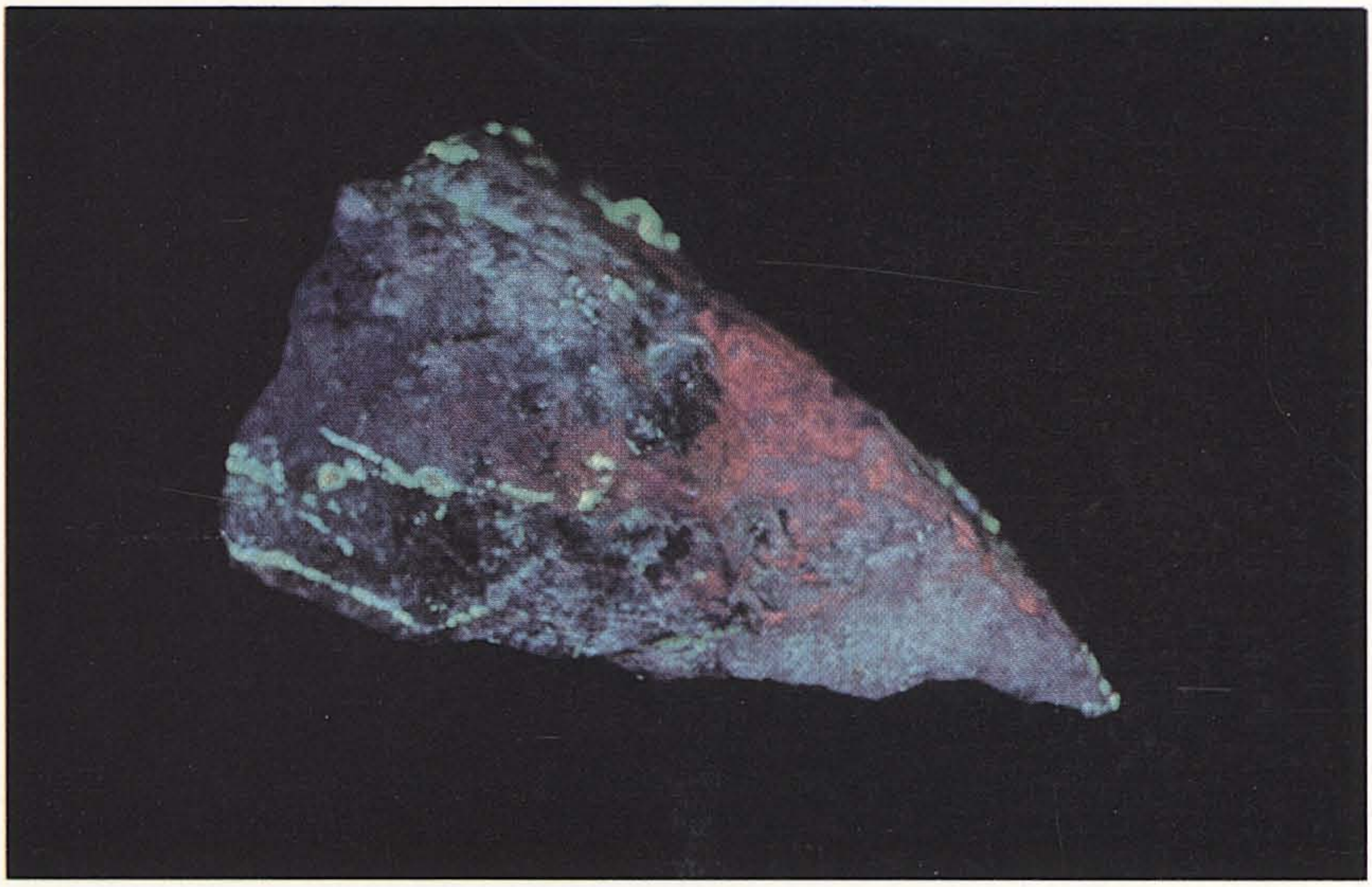


Plate J15. This margarosanite specimen with its blue-white fluorescence offers the collector a pattern of contrasts.

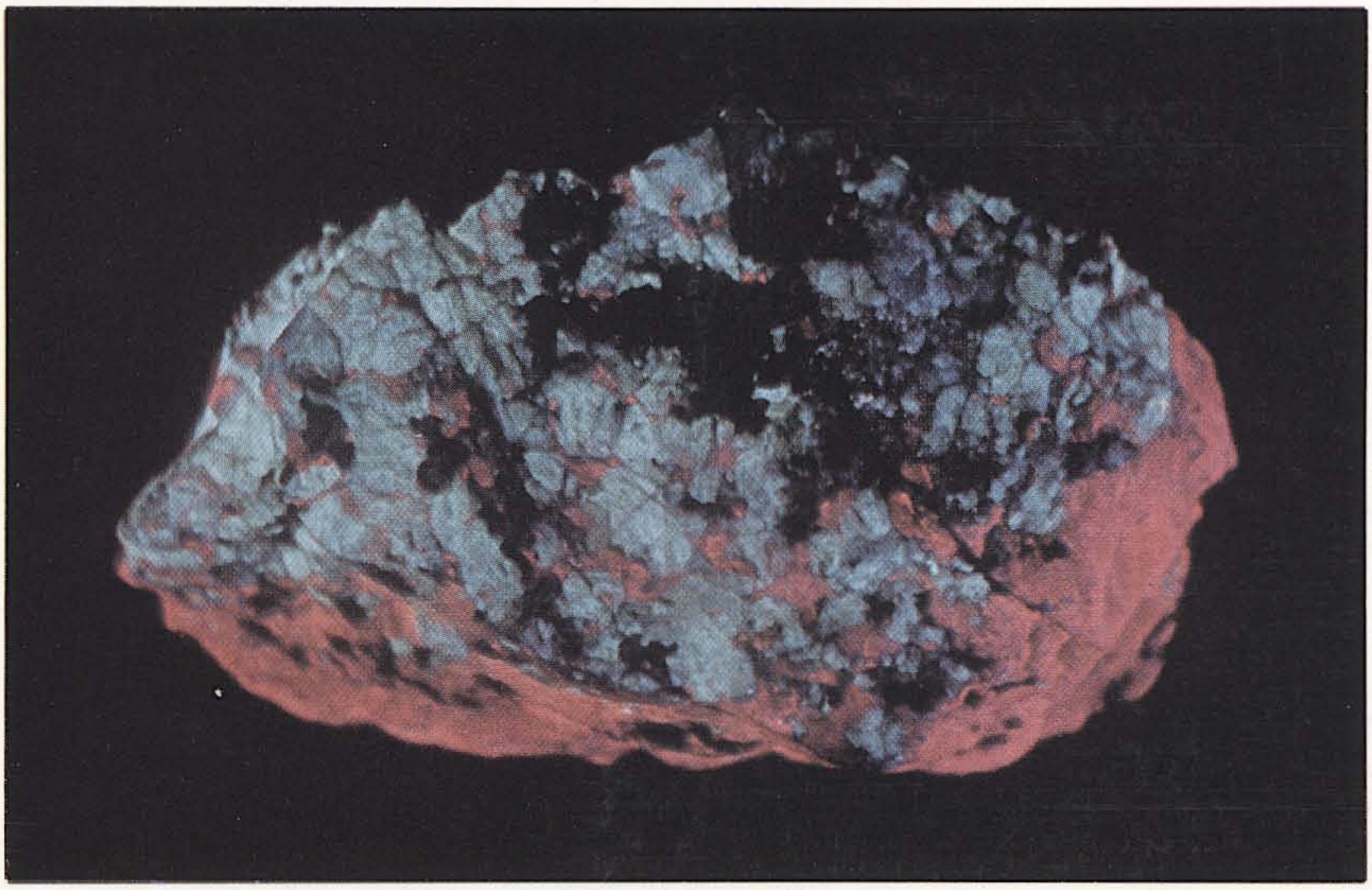
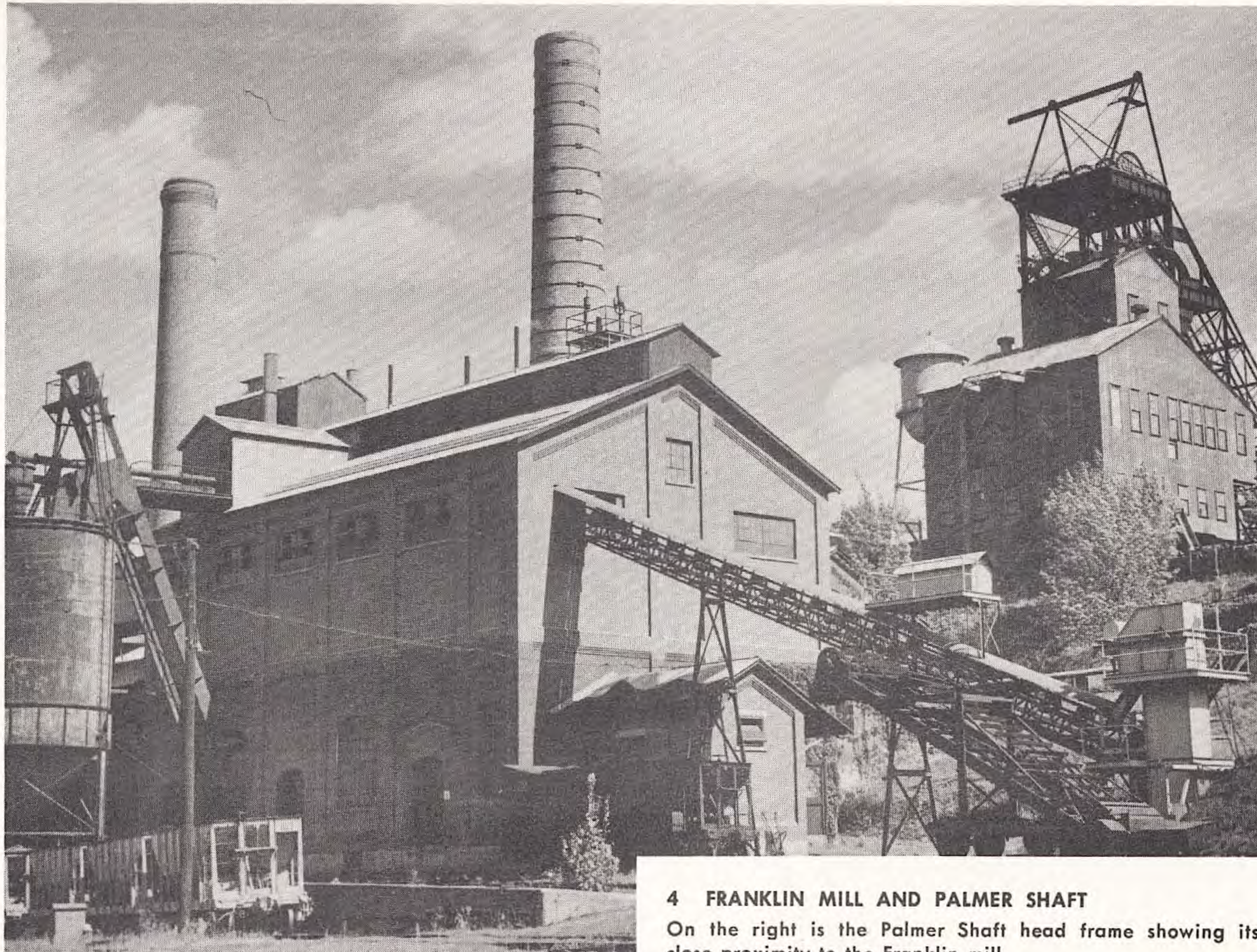


Plate J16. White barite on red fluorescent calcite is a hard-to-find specimen from Franklin.



4 FRANKLIN MILL AND PALMER SHAFT

On the right is the Palmer Shaft head frame showing its close proximity to the Franklin mill.

5 STERLING HILL MINE

View of the old mill at Sterling Hill. Fortunately, Sterling Hill is in operation at present, making it possible for specimens to reach the surface and become available to collectors. The foreground here is the old Passaic Pit that has recently become a field trip site for qualified groups. The dark area, center right, is an opening into the ore body where one can see the original ore location. This is off limits, of course. Black willemite has been found near that area. The walls to the left of the pit still yield numerous specimens of fluorescent calcite. Just out of camera range to the right is the mud zone wall which has yielded such minerals as calamine and corundum. Also out of range to the right is the connected Noble Pit. This area is fruitful collecting and collectors are encouraged to support clubs that make entrance to such places possible.

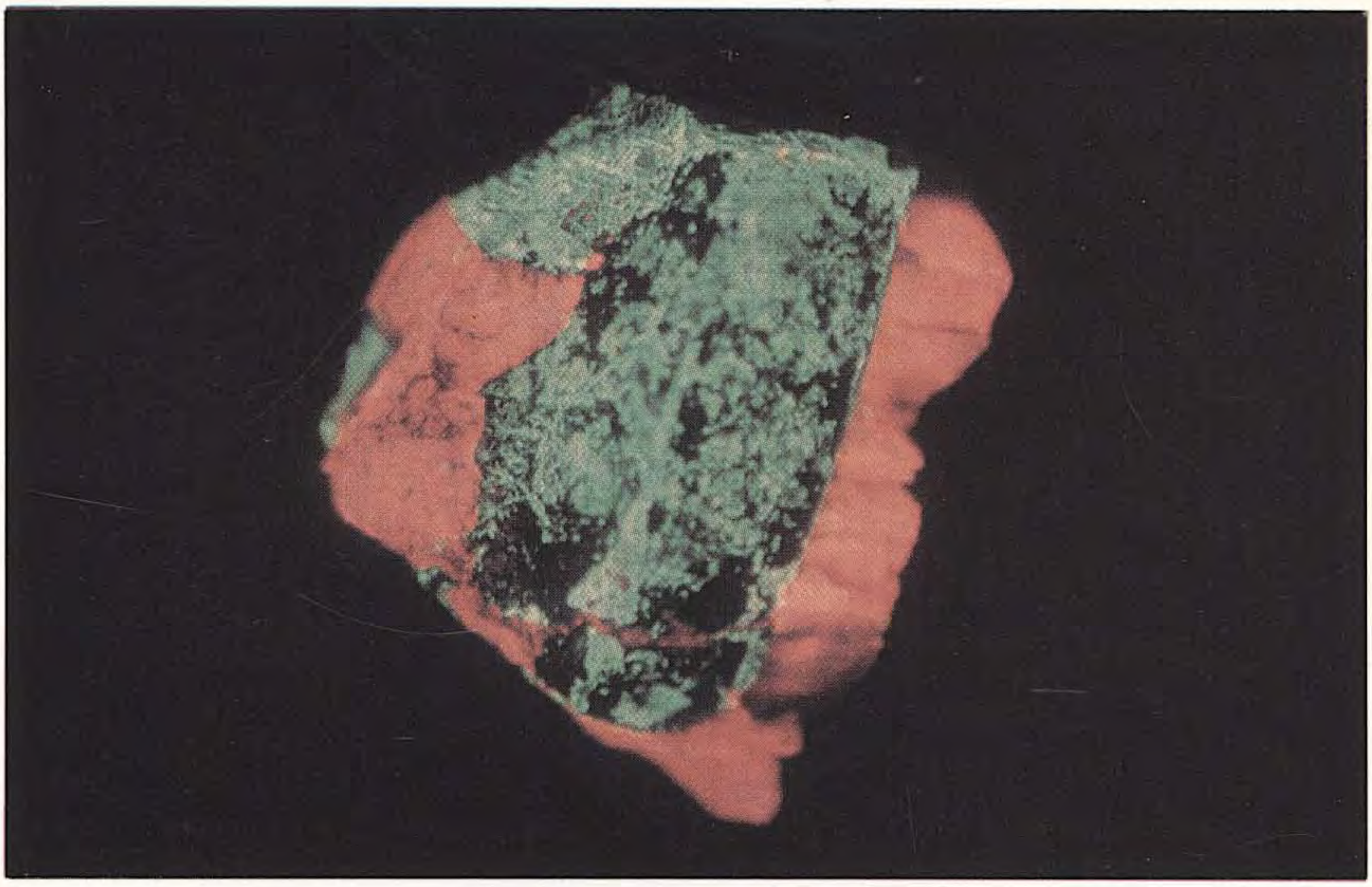


PLATE J1. The beauty of the fluorescence of willemite and calcite from Franklin, New Jersey, has won world-wide recognition.

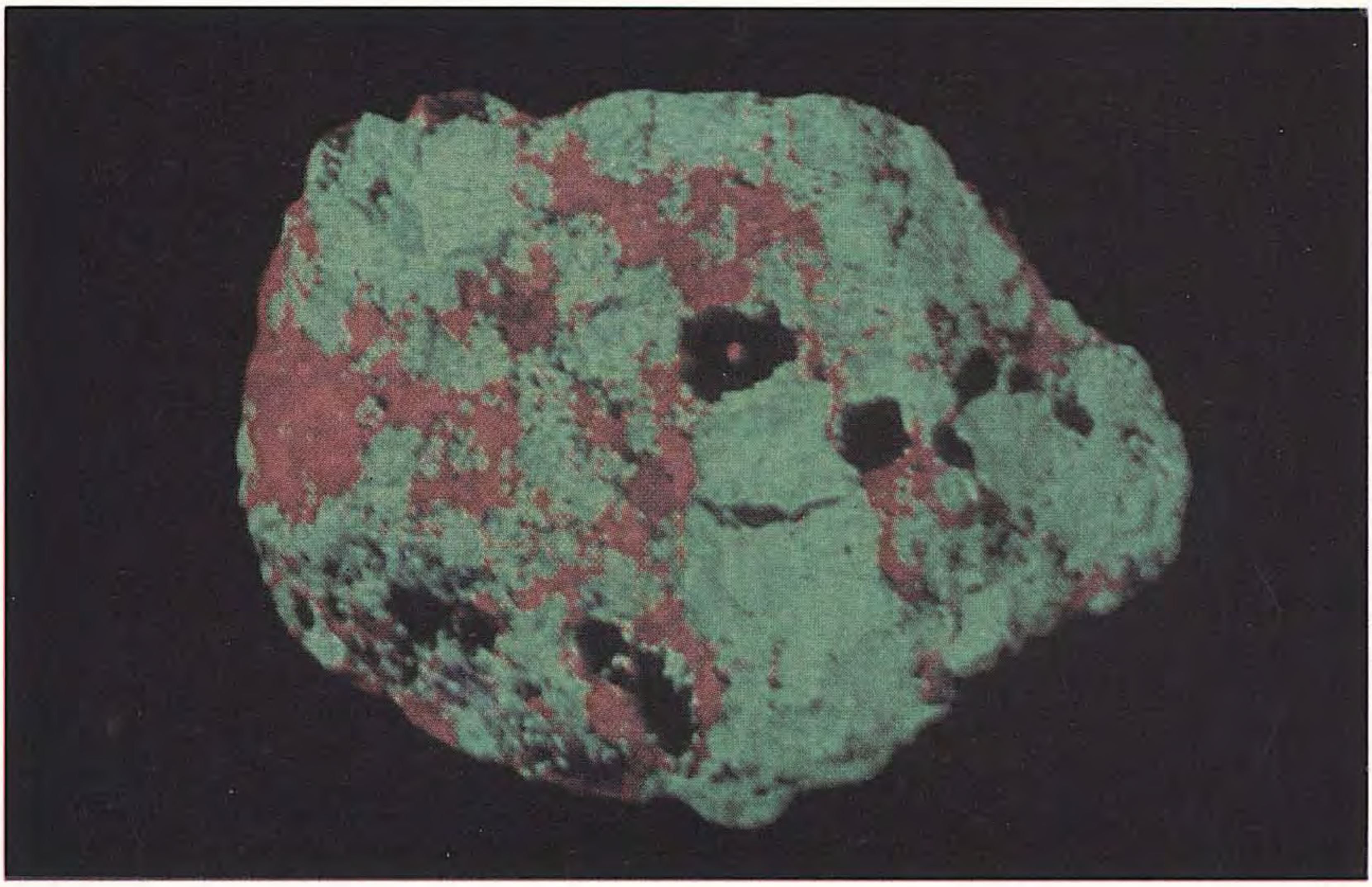


PLATE J2. Typical examples of the wide variety of combinations of colors in which willemite and calcite occur.

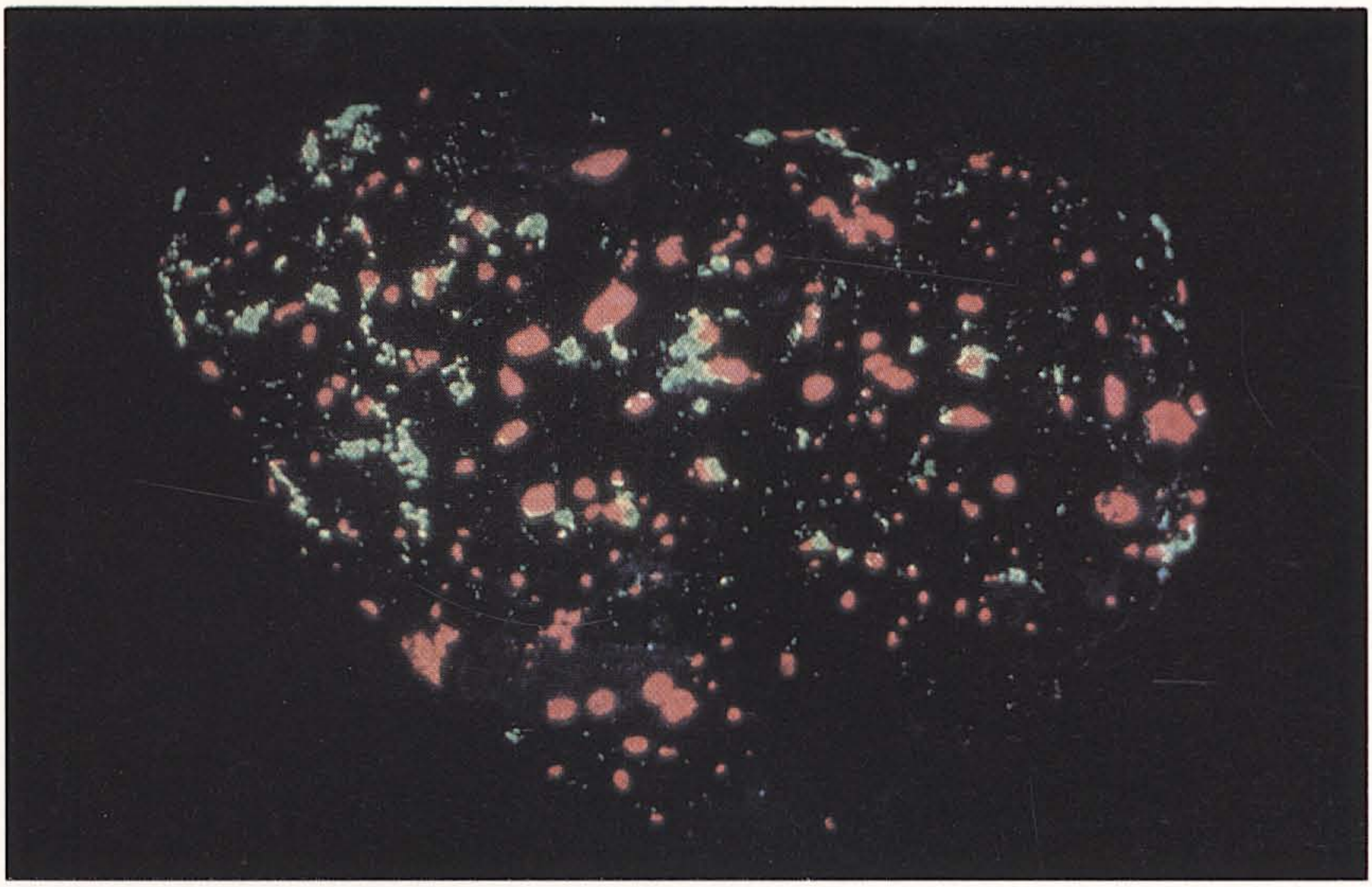


PLATE J3. Polka-dot formation of willemite and calcite in a matrix of zinc-schefferite.

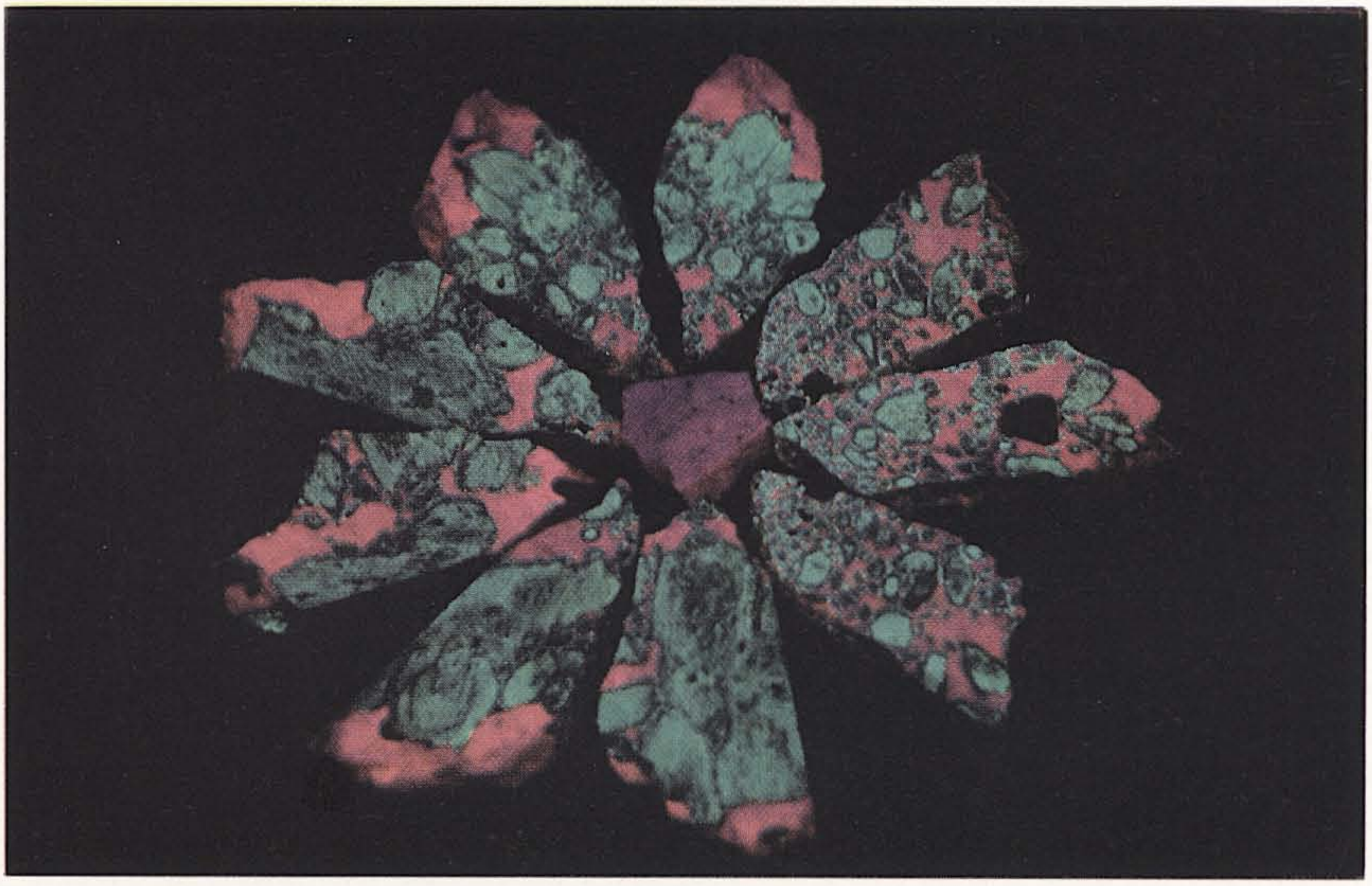
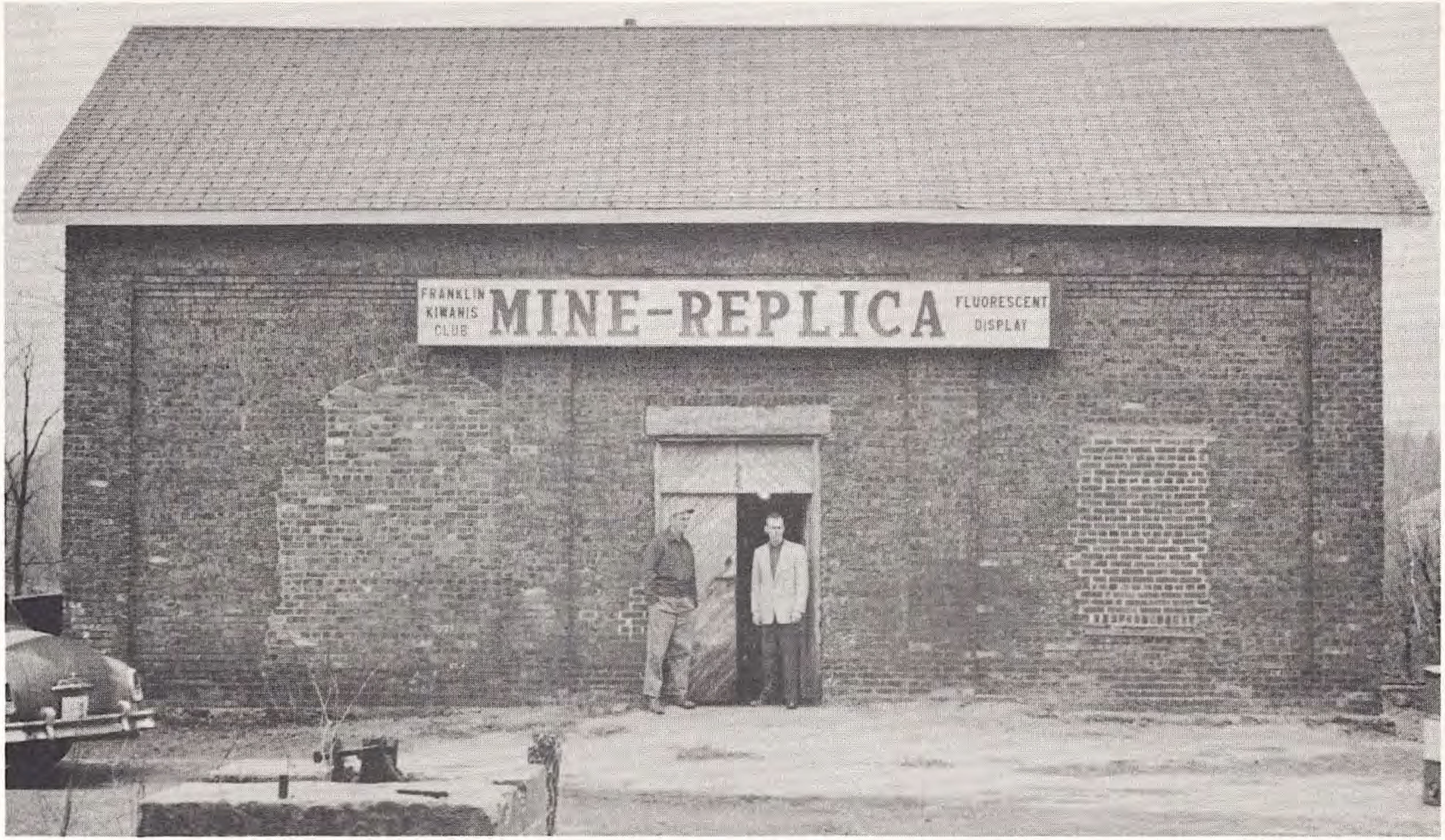


PLATE J4. Vivid, fascinating designs can be made from cut pieces of willemite and calcite.

A. PALE-GREEN FINELY FIBROUS FORM OF WILLEMITE.
B. WHITE RADIATE-FIBROUS FORM OF WILLEMITE.
C. FRIEDELITE (f) WITH SPHALERITE (s) IN A CARBONATE VEIN.
D. WHITE FIBERS OF WILLEMITE COATING FRANKLINITE ORE.
All specimens from Franklin.

6 FIBROUS FORMS OF WILLEMITE

Reproduced from "The Minerals of Franklin and Sterling Hill Sussex County, New Jersey" by Charles Palache. Printed by U.S. Dept. of the Interior, Professional Paper 180.



7 KIWANIS CLUB MINE REPLICA BLDG.

Something new and very interesting in the Buckwheat area is the Franklin Kiwanis Club Mine-Replica display. It is located on the hill above the Buckwheat Dump between it and the old Buckwheat Pit. This excellent civic attempt to preserve the history of the area should be a "must" visit for all Franklin collectors. Needless to say the fluorescent display is an important and fascinating part of the museum diplay. Plans are in effect to continue to enlarge and improve the display.

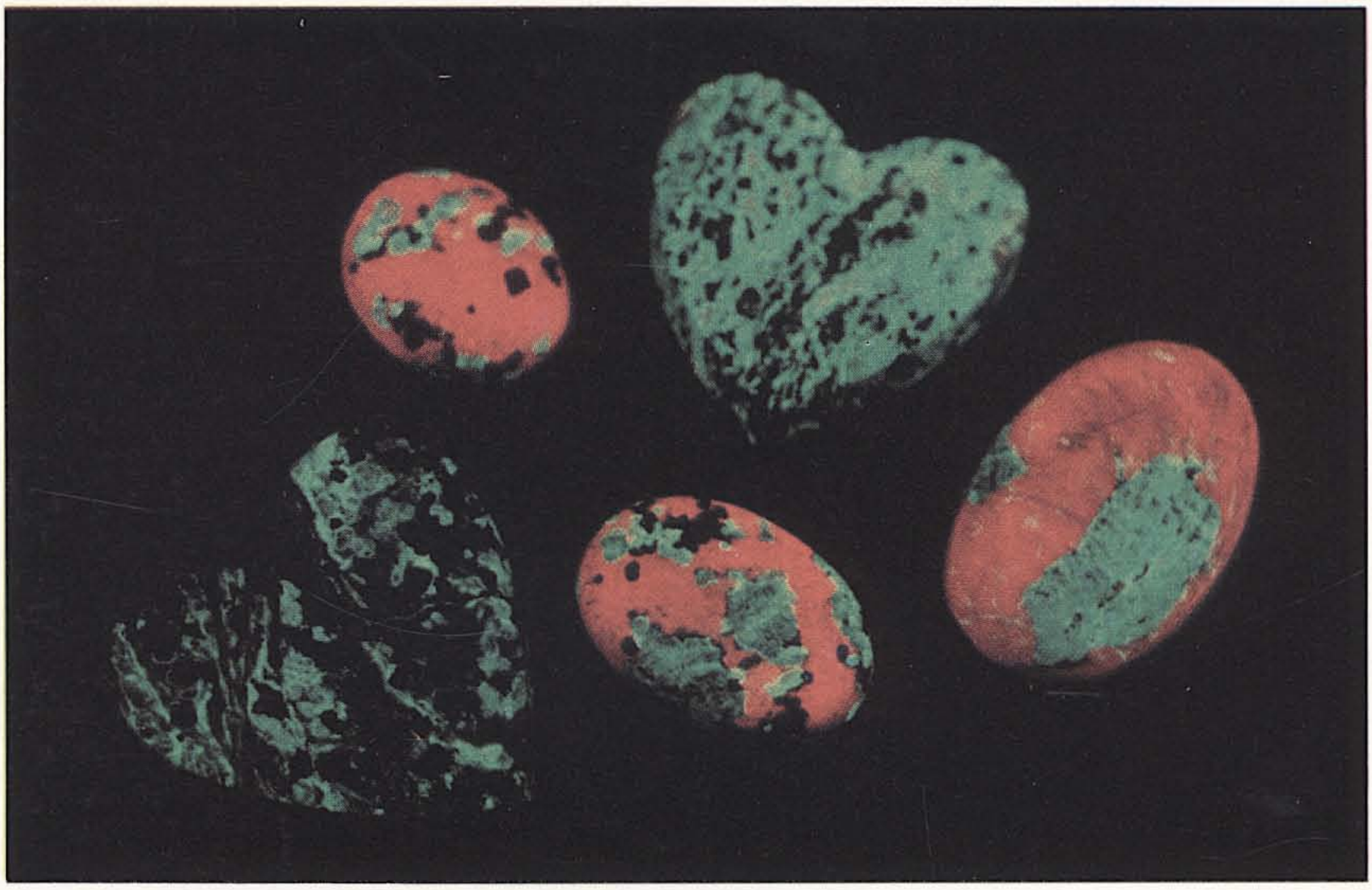


PLATE J13. The willemite and calcite cabochons are beautiful under a MINERALIGHT Lamp and in white light.

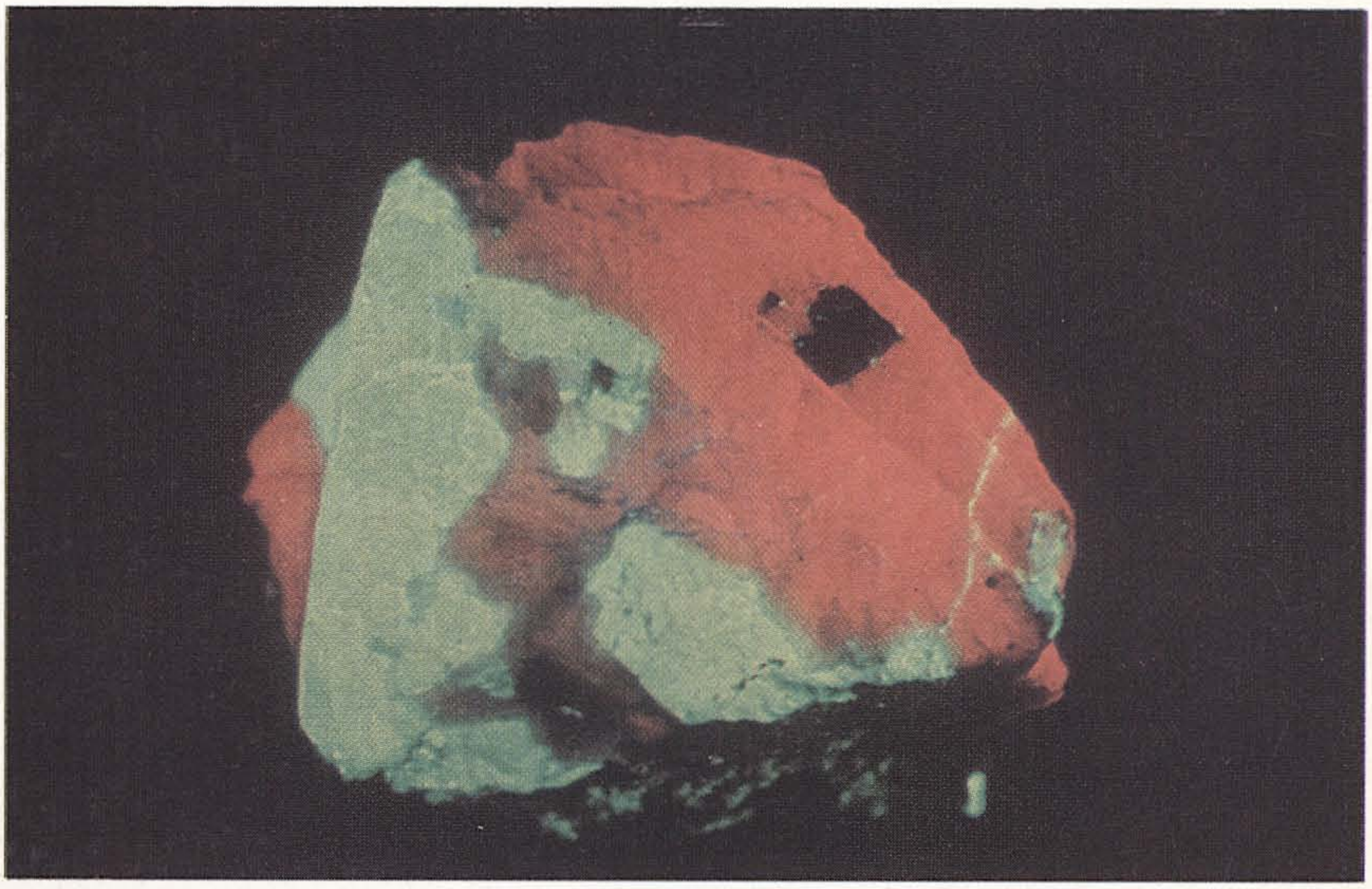


PLATE J14. Brilliant yellow calcium larsenite is high-lighted by red fluorescent calcite and non-fluorescent franklinite.

mite, and axinite is really pectolite. This material is frequently considered to be clinohedrite. It occurs as dull white material in transverse fractures of the matrix. Clinohedrite does not occur in this way. In fine grained red garnet pectolite has been identified.

The original association of the pectolite was with prehnite which would substantiate the specimen checked by the Smithsonian displaying the pink fluorescence. Another association is willemite, garnet, and mica with a coating of barite. The mineral that was frequently unearthed at the Parker Dump was associated with hardystonite, bustamite, axinite, franklinite, and garnet. Much of this may well be pectolite rather than clinohedrite. (See clinohedrite)

Tests — The brief phosphorescence under short wave is reported reliable. Readers might wonder if an "Iron Spark" comparison between pectolite and clinohedrite might be made as was suggested for barylite-margarosanite. The fluorescent differences would not be sufficiently great to warrant using the machine.

A reliable ultraviolet check is as follows: fuse a sample of the pure material in a flame. Observe the yellow coloring in the flame as it fuses. The sample will become a white glass. This glass will fluoresce weakly, white, under the short wave. If there was any long wave fluorescence noted it will have been lost. A further check is the closed tube test for water content indicating a zeolite.

PHLOGOPITE — (flog′ u pite) This variety of mica has the formula $H_2KMg_3Al(SiO_4)_3$. Phlogopite is relatively free of iron and this is most important since iron is a quencher of fluorescence.

Physical properties — crystal—monoclinic, cleavage—perfect basal (micaceous), H—2.5 to 3, SG—2.78 to 2.85, color—yellowish brown to brownish red, luster—pearly, transparent to translucent.

Luminescent properties — Under short wave lamp the lighter colored material will fluoresce pale yellow. The darker the material the weaker the fluorescence. When checking this mica be sure to rotate the specimen in all directions under the lamp. The response seems better when the eye is perpendicular to the basal cleavage. There is no response under long wave.

Occurrences — Found as flakes and crystals scattered throughout the limestone of the region. It is not found in the ore material though may occur on dumps in the overburden waste. The locality originally reported was Sterling Hill but it has since proven common to both areas. The pits at Sterling Hill, the limestone quarries along Cork Hill Road, or any limestone outcrop may produce this material.

Associations — It is typical to the limestone and should be expected with any of the metamorphic minerals.

Tests — In material from this area only phlogopite has been identified as a fluorescent mica. This is a common property of phlogopite found throughout Northeastern United States and the yellow fluorescence should be definitive.

POWELLITE — (pou' ul it) This calcium molybdate has a formula $CaMoO_4$, first found October 5, 1958.

Physical properties — crystal—tetragonal, cleavage—bipyramidal, fracture—uneven, H—3.5, SG—4.2, color—yellowish, luster—adamatine; transparent to translucent.

Luminescent properties — This mineral is reported as a good yellow fluorescence under short wave only. It may be found as a "halo" effect around molybdenite, not too different from the solution halos of willemite.

Occurrences — Recently found on the Buckwheat Dump, it is one of the newest finds in fluorescent minerals from Franklin, the other being scheelite. It is noted always in association with molybdenite either as a coating or intimately mixed with it. Powellite is a common alteration product of molybdenite. Further discussion of the confusion between scheelite and powellite will be given under scheelite.

Following is a portion of the letter I received from Marshall F. Humphrey, who found the original material. "A partial analysis . . . disclosed it to be an alteration product of the molybdenite, however, the concentration of tungsten was so small as to be insignificant. Calcium was present in the spectrographic analysis, but not of sufficient concentration to be a true powellite. This material appeared to be a different mineral at the extreme end of the series. Minor impurities (?) also were noted such as manganese and zirconium. The parent granitic enclosure also contained minute crystals of deep red zircon."

We are deeply grateful to Mr. Humphrey for his correspondence and for a specimen for examination. It is through the efforts of such collectors as Mr. Humphrey that this is more than a hobby, it is a science.

Associations — Always associated with molybdenite.

Tests — The association with molybdenite and the yellow fluorescence is probably sufficient to identify it.

SCAPOLITE — (skap' u lite) The middle member of the scapolite series which runs from marialite to meionite. The composition varies slightly but it is a sodium and calcium aluminum silicate.

Physical properties — crystal—tetragonal; cleavage—fairly distinct; fracture—subconchoidal, H—5 to 6, SG—2.66 to 2.73; luster—vitreous; color—white to gray, transparent to translucent.

Luminescent properties — One of the least bright and consequently least desired fluorescent minerals from Franklin. It is seen as a faint blue response to short wave. A very recent report tells of finding a specimen of red fluorescent scapolite, short wave.

Occurrences — The material was brought out during the working of the Franklin Mine. It does not appear to have found its way to the dump. However, the red fluorescent material was found on the dump. The red fluorescence of this new find indicates this material may be closer to the meionite end of the series than is the blue fluorescent scapolite.

Associations — No associations have been reported.

Tests — None have been suggested as yet.

SCHEELITE — (she' lite) A calcium tungstate $CaWO_4$, the most recent fluorescent find from Franklin.

Physical properties — crystal—tetragonal; cleavage—parallel; H-4.5 to 5; SG-5.9-6.1; luster—vitreous to adamantine (reported waxy); color—yellow; translucent.

Luminescent properties — Reported to be dull yellow or light blue under short wave light only.

Occurrences — A very limted amount of this material was found by Dick Bostwick not far from the Buckwheat Dump. According to Mr. Bostwick, the material was judged to be Scheelite with a high molybdenum content. Mr. Bostwick's material showed a dull yellow fluorescence.

In the August 1965 copy of the "The Picking Table," official publication of the Franklin-Ogdensburg Mineralogical Society Franklin scheelite is described. The editor of "The Picking Table," Frank Edwards, reports the material from the Buckwheat dump fluoresces light blue under short wave only. So, obviously the material has been found at more than one place, on and near the Buckwheat. The implication is that there may be scheelite on the "dump" surrounding the Trotter shaft and Buckwheat pit.

The reader may wonder how a mineral, such as scheelite, can show a variation from yellow to blue in response under the lamp. In most cases, and this is true of scheelite, the degree or amount of impurity affects the response color. In all the scheelite, and powellite, found in Franklin there has been some molybdenum. As a matter of fact, the powellite from Franklin is always associated with molybdenite from which it is derived. Analysis of scheelite from many sources indicates that the amount of molybdenum present affects the fl. response and this variation in response can actually be used to study or estimate quite closely the amount of molybdenum in the ore. A rule of thumb resulting from this study suggests that when a scheelite shows a blue response the amount of molybdenum is relatively low, perhaps well under 1%, while that which shows a yellow response under the lamp is relatively high, up to 50%, in molybdenum.

The following analysis was made of one sample of scheelite from the Buckwheat dump at Franklin.

QUALITATIVE SPECTROGRAPHIC EXAMINATION
FRANKLIN SCHEELITE
(Buckwheat Dump)

Element	Approximate Quantity
Major Constituents	10% or greater
Calcium, Tungsten	
Intermediate Constituent	2% to 10%
Molybdenum	

Minor Constituents

Silicon	1%
Arsenic	1%
Lead	0.5%
Magnesium	0.05%
Iron	0.01%
Aluminum	0.005%
Gallium	Trace
Copper	Trace
Manganese	Trace
Chromium	Trace
Other Elements	None detected

Analysis was done by Smith-Emery Co., Los Angeles, Calif. at the request of Ultra Violet Products, Inc., San Gabriel, Calif.

Associations — The scheelite material is associated with fluorescent calcite, fluorescent willemite, the willemite being scattered like stars, feldspar and scapolite. Of importance for the present in identifying this material is its lack of association with molybdenite plus a reported association with galena in very small amounts.

Tests — None devised as yet.

SMITHSONITE — (smith′ sun ite) This mineral is secondary and is found in limestone and with dolomite. It is formed as a result of action of carbonated water on zinc ore. The formula is $ZnCO_3$.

Physical properties — Crystal—hexagonal; cleavage—nearly perfect; fracture—uneven to imperfect conchoidal; H—4 to 4.5; SG—4 to 4.5; color—white to gray; luster—vitreous, translucent to transparent.

Luminescent properties — Smithsonite varies in its response to ultraviolet lamp. A few specimens have been noted to fluoresce a weak bluish white under both long wave and short wave. In some specimens there may be noted a creamy fluorescence under long wave only. A single specimen seen had a weak gray fluorescence under short wave. The author suspects some of the blue fluorescent coating on calcite to be smithsonite but this has not been proven. All smithsonite is of doubtful response since analysis of fluorescent smithsonite has not been made.

Occurrences — Smithsonite had been collected on the Parker Dump in the past. It has also been found on the Buckwheat. Certainly the possibility of carbonated water acting on zinc ore is great in this region so the mineral should be more widespread than it seems to be. Palache reports this mineral from both Franklin and Sterling Hill as earthy white films on fracture surfaces of zincite. Again, much of the reported hydrozincite may be this mineral. The Palache material does not fluoresce. The most common occurrence at Franklin was as secondary transverse veins associated with some carbonates, quartz, and willemite and sphalerite. Massive smithsonite was also found as a foot thick vein at the old Trotter Shaft cutting the limestone near the ore body. It has also been reported at the Passaic and Noble Pits.

Associations — See those mentioned above. At the Trotter Shaft found with hydrozincite, calamine, limonite in limestone. Also reported associated with sphalerite (cleiophane) in franklinite. Finally, as a coating and crust on manganophyllite with andradite garnet, willemite, and calcite.

Tests — With pure material the test for zinc can be made. No way of identifying it from hydrozincite with the lamp has been devised.

SPHALERITE — (sfal′ u rite) This zinc sulphide has a formula of ZnS, but at Franklin is not found in the pure state. Impurities found with it are iron, cadmium, manganese, copper, lead, sulfur, silicon dioxide, and possibly rare earths.

Physical properties — Crystal—isometric; cleavage—perfect; fracture—conchoidal; H—3.5 to 4; SG—3.9 to 4.1; (Cleiophane—4.063); color—white, yellow, gray, black, red, brown; luster—resinous to adamantine; transparent to translucent.

Luminescent properties —The large majority of this mineral found at Sterling Hill is red to brown in natural color probably due in part to iron present. This material may fluoresce but is generally a duller orange, long wave, than the iron-free variety cleiophane which fluoresces a bright orange, long wave; weaker, short wave. Much of the cleiophane will phosphoresce a good orange, long wave; much weaker, short wave. Sphalerite is also triboluminescent, which means it gives off flashes of light when struck or scratched. Sphalerite is also thermoluminescent.

In many of the specimens showing orange fluorescence there will be noted a blue fluorescent material, usually in spots or as halos around the orange fluorescent sphalerite. This is also sphalerite but sufficient work has not been done on this material to determine the cause of the blue fluorescence. The material also phosphoresces a good blue. The presence of cadmium has been shown in the Franklin sphalerite and since cadmium has been shown to cause a blue response in other materials there may be a connection between the cadmium and the blue fluorescent material.

Occurrences — At Sterling Hill the sphalerite occurs as red to brown masses, granular and cryptocrystalline in nature. Cleiophane, a misnomer applied to the iron-free sphalerite, is from the ore body at Franklin. It is not abundant. It was found in the Trotter Shaft in the pneumatolytic zones at a depth of 350 feet. In the "pegmatite" of the region it was found near the contact zone with the limestone at both Sterling Hill and Franklin. On the dumps at the present time it may be found infrequently. At the Buckwheat as scattered grains in bustamite with willemite, franklinite, and sometimes fluorite (chlorophane). It may also occur as seam fillings in franklinite and willemite.

Associations — See above. Other associations are with galena, quartz, and feldspar. It is also found with jeffersonite or garnet and rhodonite, being enclosed with the latter two minerals.

In the pneumatolytic zones it was found with fluorite, chloanthite, niccolite and arsenopyrite.

The ore from Buckwheat has sphalerite associated with dolomite which may be associated with specular hematite, quartz, and chlorite. It may also be embedded with minor franklinite in calcite.

Tests — Under long wave lamp no other mineral from Franklin exhibits the good orange fluorescence of sphalerite. The strong phosphorescence and the often associated blue fluorescent sphalerite should define the material.

SVABITE — (sva′ bite) This is an arsenic bearing form of the apatite group of minerals. In its occurrence here it can not be distinguished from apatite without extensive analysis, except by association. The chemical formula is

$Ca(F,OH)(Ca,Zn,Mn)_4(AsO_4PO_4)$. According to Palache when the arsenate exceeds the phosphate the mineral is considered svabite, otherwise it is apatite.

Physical properties — See apatite. The commonly noted color of identified svabite is grayish.

Luminescent properties — The luminescence of svabite has been established but the responses are varied. It has been reported to fluoresce orchid to pink, yellowish orange, pinkish orange. All these reactions under a short wave lamp only. The observed color is unique to Franklin and is very difficult to describe. This probably has been the reason for the various reported responses. Also, there is no law that says the mineral must be a specific chemical content before it will fluoresce so differences in each specimen can cause differences in luminescent response. For this report it is assumed the average color to be pinkish orange.

Occurrences — The svabite of Franklin comes from the ore body only. Similar appearing apatite may occur in the limestone. The conclusion has been drawn that the ore supplied the arsenic necessary for the formation of svabite. This being true, the svabite can only occur in the ore where arsenic is available. Since the limestone could not supply arsenic then only apatite can occur there.

The mineral has been reported as having come from many areas in the ore body but never in quantity. It has been reported found on the Buckwheat Dump which well may be the only source remaining.

This material could be found at the Parker Dump. The author was most fortunate in finding the mineral at this locality. Now that the Parker is gone we can only hope the Buckwheat will yield svabite to collectors.

Further discussion on this mineral appeared in the Franklin-Ogdensburg Mineralogical Society publication and illustrates the confusion over apatite-svabite. "There seems to be little doubt that the green quarry material is apatite (from the limestone) and that the grayish white contact mineral that fluoresces is svabite. There is confusion as to the identity of the green colored specimens from within or near the ore body, especially those that fluoresce." The problem is not solved yet since this green ore body material may be svabite or manganapatite. The arsenic content is the clue.

Associations — Svabite is reported to be associated with andradite and franklinite. This is the type material the author found at the Parker Dump. Much of the material found with andradite and franklinite is greenish and is questionable as either svabite or manganapatite. Material that is grayish white in color is commonly noted with calcite and apparently comes from the contact between the ore and the limestone. The calcite fluoresces a strong red and the svabite a good pinkish orange, short wave, making a pleasing combination.

Tests — See the associations discussed above.

TOURMALINE — (toor′ mu leen) At Franklin the magnesia variety fluoresces and should actually be called dravite. The formula is $NaMg_3B_3Al_3(Al_3Si_6O_{27})(OH)_4$. This is generally considered to be a high temperature mineral.

Physical properties — Crystal—hexagonal; cleavage—poor; fracture—uneven to conchoidal; H—7 to 7.5; SG—3 to 3.3; color—brown to greenish, it may appear black but never is; luster—vitreous, transparent to opaque.

Luminescent properties — Under the short wave lamp this variety of tourmaline fluoresces a soft yellow. The lack of iron is important to the fluorescence.

Occurrences — Since the lack of iron is almost a prerequisite for fluorescence, the collector should center his efforts in the limestone quarries, not the ore materials, to find fluorescent tourmaline. It generally occurs as single distorted to good crystals in limestone. One specimen seen in the Gerstmann Museum collection at Franklin is a generous 2″ in length and they come larger.

Sterling Hill has been reported as a locality but whether it is the limestone outcrops or the old pits is not known. Certainly in moving considerable limestone at the pit areas tourmaline must have been unearthed.

Associations — If found in the limestone any one or more of the typical limestone minerals may be with it.

Tests — The brown crystals which fluoresce yellow under short wave may be confused with phlogopite or norbergite. The perfect basal cleavage of phlogopite should preclude it. If norbergite-chondrodite is suspected, a simple fusion test will differentiate. Tourmaline is easily fusible, the others are not.

TREMOLITE — (trem′ o lite) A typical contact metamorphic mineral of impure limestones. It is a calcium magnesium silicate, $Ca_2Mg_5Si_8O_{22}(OH)_2$.

Physical properties — Crystal—monoclinic; cleavage—perfect; fracture—subconchoidal to uneven; H—5 to 6; SG—3 to 3.3; color—white to gray; luster—vitreous, transparent to translucent.

Luminiscent properties — This mineral is reported to fluoresce a faint greenish color under short wave. Other specimens have been reported to fluoresce blue-green or blue-white, usually quite weak. There is no response, long wave. It seems to be most commonly fluorescent blue-white.

Occurrences — Another mineral found only in the limestone, never in the ore. The Franklin Iron Co. Quarry and the Nicol Quarry are both good producers of this mineral. It is possible, however, to have very good luck in any of the other limestone quarries. Keep in mind, however, that all limestone quarries are off limits to collectors unless specific permission is given to enter.

Associations — Found with any of the limestone minerals as: phlogopite, norbergite, magnetite, spinel, corundum, etc. The associations are of little practical value in the case of these limestone minerals.

Tests — There is no real test for this mineral. If found in good size the physical characteristics such as cleavage and prismatic habit coupled with the fluorescence should leave no doubt as to the identity.

WILLEMITE— (wil′ u mite) A major ore of zinc at Franklin with a formula of $ZnSiO_4$.

Physical properties — Crystal—hexagonal; cleavage—basal; fracture—uneven to subconchoidal; H—5.5; SG—3.9 to 4.2; color—colorless, white yellow, various shades of green, reddish, orange, black; luster—resinous to vitreous, transparent to translucent.

Luminescent properties — This mineral coupled with the red fluorescent calcite is primarily responsible for the general interest in Franklin fluorescent minerals. In many a collection where no other fluorescent mineral is found the beautiful red and green fluorescing calcite-willemite is proudly shown. The fluorescence of willemite is most commonly thought of as bright to brilliant green, short wave; usually a bit less bright, long wave. There are, however, specimens that fluoresce better long wave than others do short wave. Many specimens phosphoresce a brilliant to bright green, giving off sufficient light to read a newspaper in a dark room. It has been reported that all the willemite that shows phosphorescence is secondary in nature. The primary willemite is not supposed to phosphoresce. Willemite used in the Millson study gave phosphorescent response of yellow-green lasting 340 hours and green lasting 27 hours.

Albanese suggests that white willemite is always secondary and it is probable that iron compounds found in primary willemite are precipitated out during the formation of secondary willemite. Carying this out further, the suggestion can be made that there may be a connection between the loss of iron and the acquired phosphorescence of the secondary willemite.

The phosphorescence of willemite is most interesting. The willemite usually referred to as fibrous or radiating that forms in seams and cracks in the ore body is very well known for its brilliant, prolonged phosphorescence. This is best activated by the short wave lamp. Another term for this material is brown willemite since much of it appears so in natural light.

Unfortunately, there are several variety names applied to willemite which are convenient to conversation but are not truly accurate. Ordinary willemite is sometimes called alpha willemite, since there is a beta willemite, but the term "alpha" is superfluous and misleading. Much of the willemite that has a yellow-green fluorescence is called "beta" willemite but this is inaccurate. "Beta" willemite is a true yellow fluorescent material with a beautiful orange phosphorescence. Technically, even this material is just willemite with a different activator but for convenience is still referred to as "beta" willemite. It is easier to say "beta" than "the willemite with the yellow fluorescence and the orange phosphorescence." The activator in the "beta" willemite is not known but may be a fractional percent of copper, plus lead. Studies have shown that manganese is probably the cause of fluorescence in all other willemite. Amounts up to two percent seem to cause the brightest fluorescence, while if the amount exceeds four percent the fluorescence is quenched.

Another variety name in common use today is troostite which is applied to the red and brown material normally found at Sterling Hill. This is still just willemite, this time with perhaps a higher iron content.

Investigations have shown that the temperature of the environment in which willemite forms may have an effect on the fluorescence. Also, trace elements may have an effect. Inclusions may darken the fluorescence as is the case of the black willemite from the Passaic Pit. Much black willemite has been shown to have microinclusions of franklinite, some crystallized, which gives it the apparent dark color. This included material must certainly inhibit the fluorescence. Generally, this black willemite is only softly fluorescent. The previously mentioned troostite also has microinclusions, this time of red franklinite. The fluorescence of this material is brighter than the black willemite which would tend to support the idea that the darker material would cause a greater loss of fluorescence.

Two other properties commonly found in willemite are its thermoluminescence and triboluminescence. The thermoluminescence is green.

One interesting note on the sensitivity of willemite to ultraviolet radiation. Natural sunlight was man's first real source of ultraviolet. The atmosphere filters out the short wave and allows the long wave to pass through. Willemite, which is naturally green, will seem a brighter green in sunlight because it is actually being excited by the sunlight and is giving off a green fluorescence which enhances the natural color. This is most effectively seen in a cut gem stone.

Occurrences — As numerous as for calcite. It is not found at any of the limestone sites, of course. On the ore dumps it is found in seams, cracks, as coatings, veins, fillings, crystals, crystalline masses, radiating fans, and in any other way you can imagine. Buckwheat, Taylor Road and various lots and roadsides in between may yield hunks, masses, and scraps. Careful scrutiny may produce gemmy material, micro crystals, even crystal sections.

The red colored material, troostite, is almost exclusively Sterling Hill material. There is a small amount at the Buckwheat. The black willemite is found in the old pit behind the Sterling Hill works. It is also found at Buckwheat.

In some of the Parker Shaft material associated with pink fluorescent pectolite, hancockite, etc. has been noted some willemite that fluoresces a mustard color.

Associations — Willemite will be found associated with practically every other mineral of the ore body. It is best known associated with calcite, zincite, and franklinite. Out of the Parker Shaft came willemite associated with datolite, leucophoenicite, glaucochroite, prehnite, pectolite, margarosanite, bustamite, rhodonite, axinite, tephroite, barite, hodgkinsonite, cahnite, etc.

The yellow fluorescent willemite with the orange phosphorescent (beta-willemite) is associated with non-fluorescent sphalerite from Sterling Hill.

Tests — Willemite is the only bright green fluorescent mineral reported from this area though a very recent mention has been made of finding evidence of a green fluorescent material outside the ore body not yet identified but probably hyalite. Any other bright green fluorescent material found within the ore body would probably get lost in the willemite shuffle. Under an ultraviolet lamp, willemite that fluoresces is readily seen.

WOLLASTONITE—(wul′ us tun′ ite) This beautifully fluorescent mineral has a formula of $CaSiO_3$ a calcium metasilicate.

Physical properties — Crystal—monoclinic; cleavage—perfect tabular; fracture—uneven; H—5 to 5.5, SG—2.8 to 2.9; color—colorless to gray, white; luster—vitreous to pearly, subtransparent to translucent.

Luminescent properties — Under short wave lamp this mineral fluoresces a beautiful, bright orange to orange pink. Under the long wave lamp it fluoresces a weaker pinkish or not at all. In some instances, wollastonite has been reported to phosphoresce a brief orange under short wave, but this has not been confirmed. Tests have indicated the probable activator in wollastonite to be manganese. (See clinohedrite and pectolite)

Occurrences — This is a contact metamorphic mineral which can be expected from the surrounding limestone. However, that material from the contact zone between the ore and limestone seems most likely to fluoresce. It is not found on any of the dumps since it was not mined until after surface dumping ceased at the Parker Shaft.

Associations — Its most common association is the bright red fluorescent calcite from the contact zone where manganese from the nearby material could be provided as an activator. It occurs in small to fair sized masses in the calcite presenting a very beautiful red-orange fluorescence under short wave. It may also be found associated with barite, willemite, and some of the contact minerals.

Tests — The associations and the orange fluorescence should be indicative. In hydrochloric acid the material will dissolve giving shreds of silica. If the cleavage angles can be measured, they should be 84° and 96°.

For the present this concludes the list of reliably fluorescent minerals from the Franklin area. It does not preclude the possibility of others being added to the list in the future. Several minerals are waiting for verification at this time, some of them will certainly join these listed here. Some of these minerals are listed in the next chapter entitled "Possible, Doubtful, and Incorrect Fluorescent Minerals."

Another thought before embarking on a search for these fluorescent minerals, obtain a good ultraviolet lamp. After all, you are going to collect fluorescent minerals. What is the good of spending time and effort to collect them without a dependable lamp. This can only be misguiding and confusing. Collectors are very lucky to have a wide selection of excellent lamps and they can now be fully equipped for fluorescent mineral hunting. Just imagine what life would be like using an old "Iron Spark" machine. Buy and use a good ultraviolet lamp from a reliable and dependable manufacturer.

Chapter IV

POSSIBLE, DOUBTFUL, AND INCORRECT FLUORESCENT MINERALS

The following list of minerals has been compiled to help clarify much misinformation that exists in the literature, especially the older literature.

Along with each mineral will be sufficient comment to help the reader understand why the mineral is no longer considered fluorescent or why it was not included in the preceding chapter.

When the author started collecting fluorescent minerals at Franklin, many fruitless hours were spent searching for reported minerals which didn't exist. One of the purposes of this list is to help other collectors avoid the same waste.

Keep in mind that just because a mineral is listed here does not mean it may not prove to be valid in the future. A number of minerals are included here simply because final investigation is not completed and, therefore, they cannot be included in the Fluorescent Minerals list.

ANGLESITE — (ang′ lu site) A specimen in the Gerstmann collection which is labeled anglesite shows a fair yellow-orange fluorescence, short wave. Whether it is the anglesite or some other mineral coating the anglesite has not been determined.

ANORTHITE — (an or′ thite) Reported to fluoresce white to cream, short wave, or pale blue, short wave. Not enough work has been done to prove that the observed fluorescence is anorthite and not something else. Microcline and tremolite both give similar responses and could have been mistaken for anorthite.

ANORTHOCLASE — (an or′ tho clas) Reported to fluoresce blue, short wave, but was probably confused with microcline or some other similar mineral. Not considered fluorescent now.

BARYLITE — (bar′ i lite) There is a fine chance this will be validated as a fluorescent mineral in the future. It has been reported fluorescent bluish to cream, short wave. The material this author has seen that has been tested and proven to be barylite was a small crystal that exhibited a very weak, pale blue-violet, short wave. In this color response range it is difficult to determine fluorescence. There is considerable massive material seen which has a weaker fluorescence than margarosanite, which is frequently confused with barylite. Some feel this material is barylite, others consider it a mixture of axinite and margarosanite. (See margarosanite)

The case for barylite has been considerably strengthened by recent studies. Albanese reports that considerable pale blue fluorescent material was found associated with hyalophane. The material was x-rayed and identified as barylite. On the strength of this reliable report, barylite will undoubtedly be credited with a pale blue fluorescence.

BEMENTITE — (bi men′ tite) Reported to have a bright green fluorescence under both long and short wave. This author checked several specimens of proven material and saw no fluorescence, strong or weak. Throughout this list will be noted minerals reported to fluoresce green. There is little doubt the confusing culprit is willemite. This green fluorescent mineral prevades the entire ore body and is commonly found intimately associated with many minerals. It can be so finely disseminated as to be invisible to the naked eye but under the searching rays of the ultraviolet lamp, the entire piece might fluoresce green. Bementite does not fluoresce.

BUSTAMITE—(bust′ u mite) Albanese reports that bustamite fluoresces, but rarely. The reported color is deep ruby red under long wave. Palache reported a red fluorescence under the "Iron Spark." Investigations have shown this mineral is usually admixed with red fluorescent calcite. If you have a specimen, check it by crushing a piece which fluoresces, then soak in hydrochloric acid. This will dissolve the calcite. The remaining bustamite can then be checked for fluorescence. All specimens checked by the author proved to be non-fluorescent. Recent studies in the Millson Report indicate bustamite phosphoresces orange for as long as 29 hours under unfiltered short wave lamp.

PLATE J31. The Buckwheat pit is now filled with water and fenced in, but it is rock from here which helped make Franklin famous.

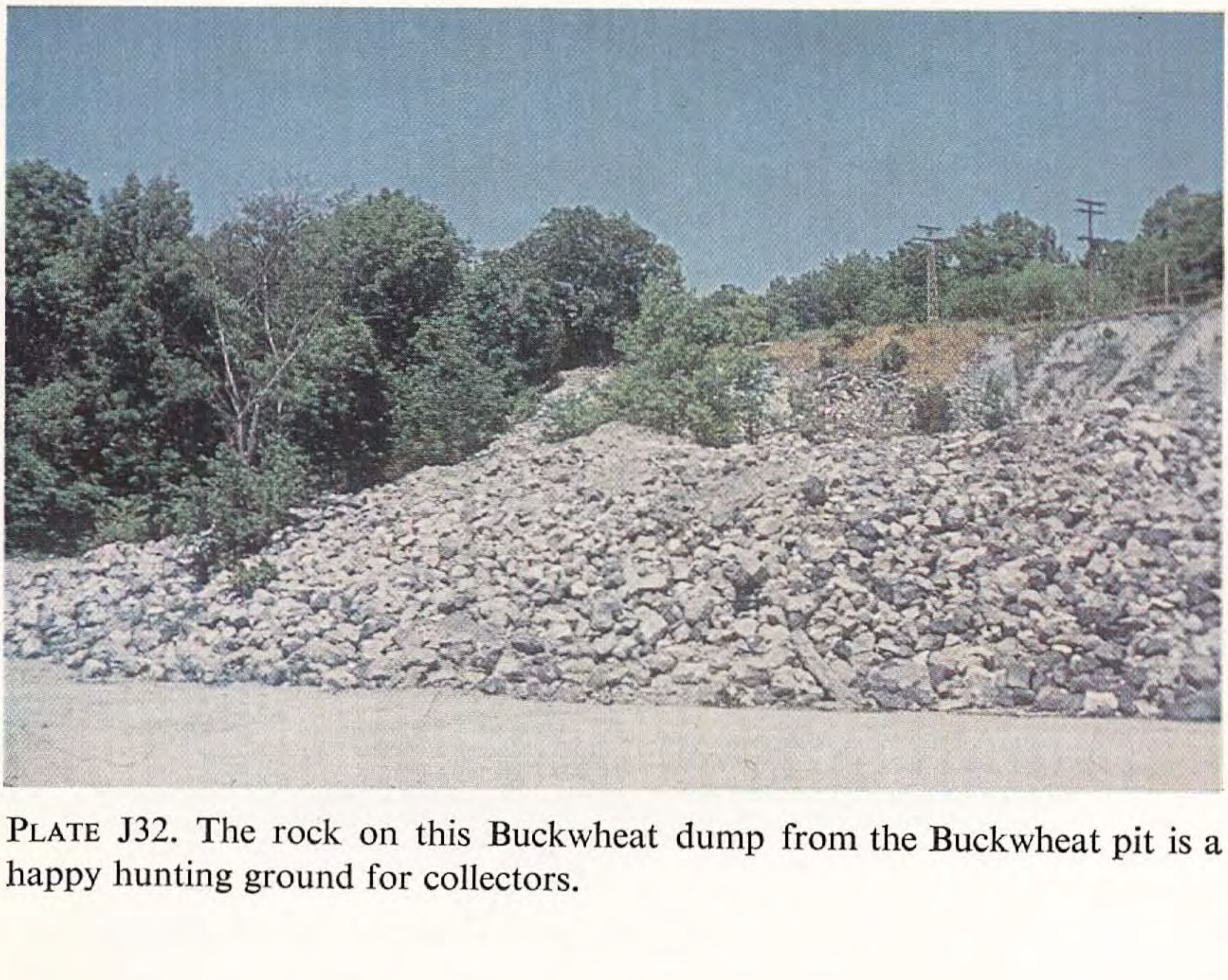


PLATE J32. The rock on this Buckwheat dump from the Buckwheat pit is a happy hunting ground for collectors.

8 BUCKWHEAT PIT IN THE EARLY 1900s
This same photo can be seen in the Franklin Museum.

9 BUCKWHEAT PIT IN THE 1960'S

The Buckwheat Pit in recent times. The danger of attempting to enter this area is obvious. The pit is completely fenced around for your protection. (Glynn)

PLATE J5. Sphalerite provides many beautiful combinations of colors under long-wave ultraviolet.

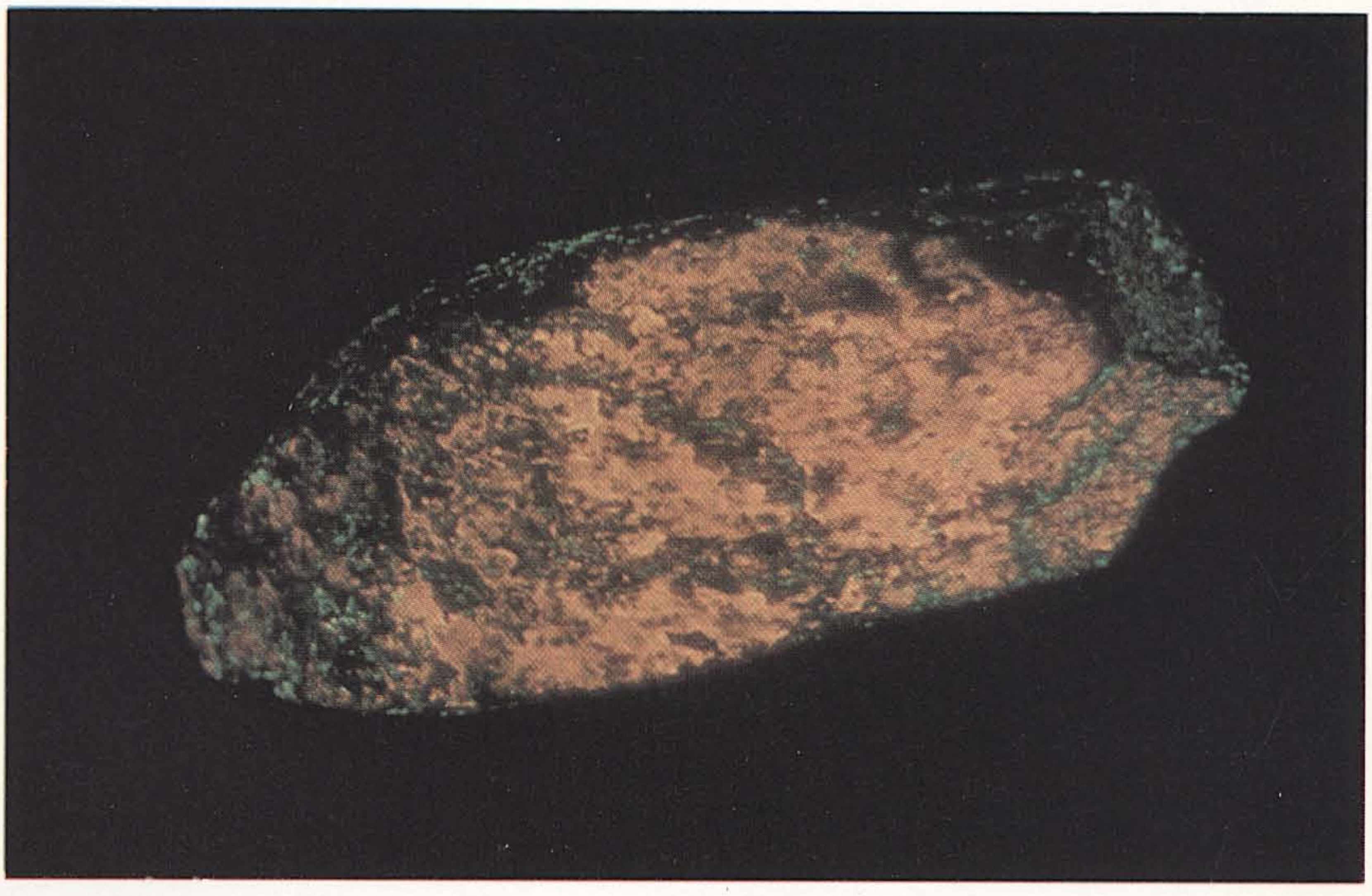


PLATE J6. Pectolite fluoresces yellow and frequently occurs with willemite.

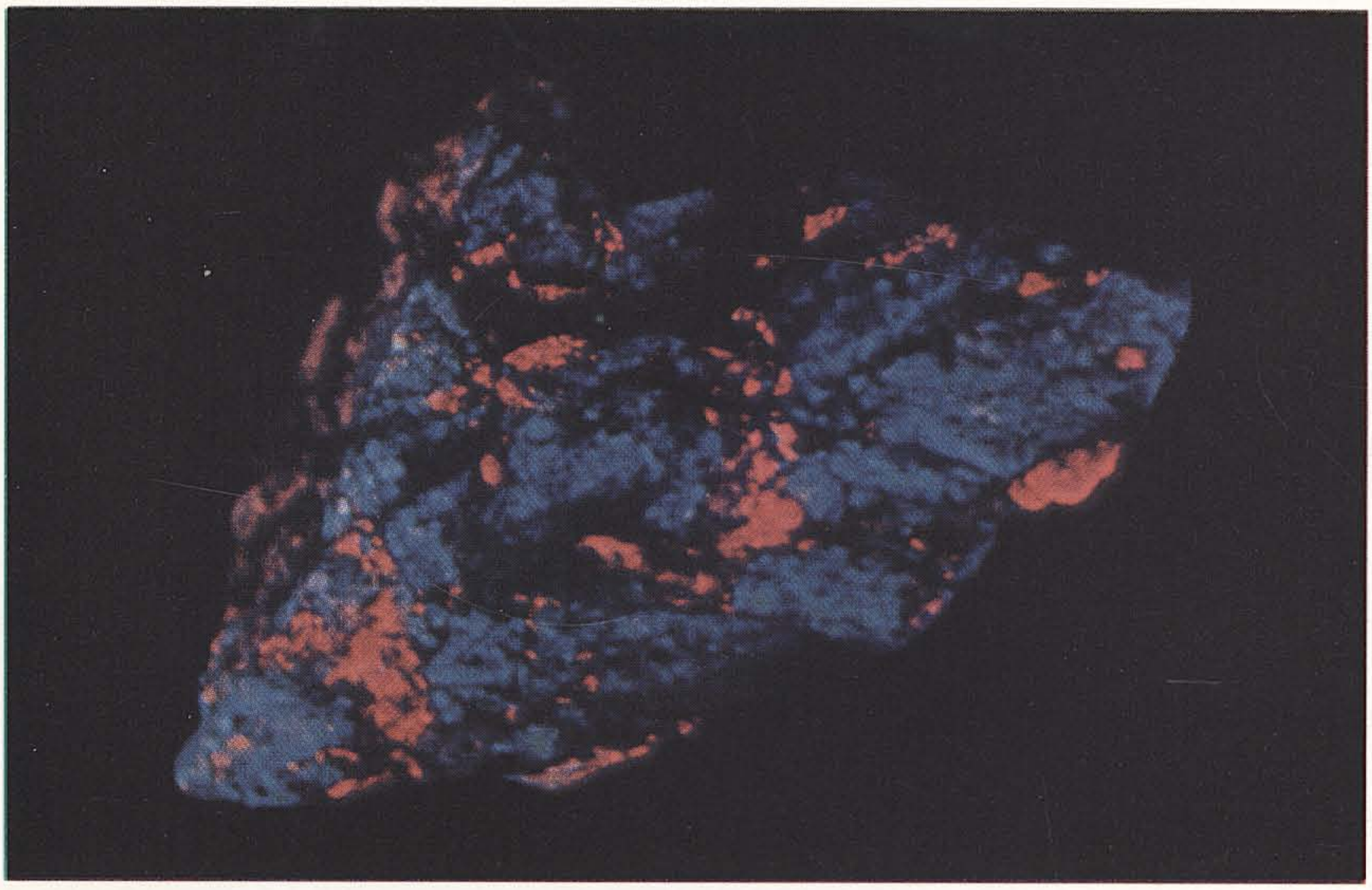


PLATE J7. Beautiful blue hydrozincite on a red calcite.

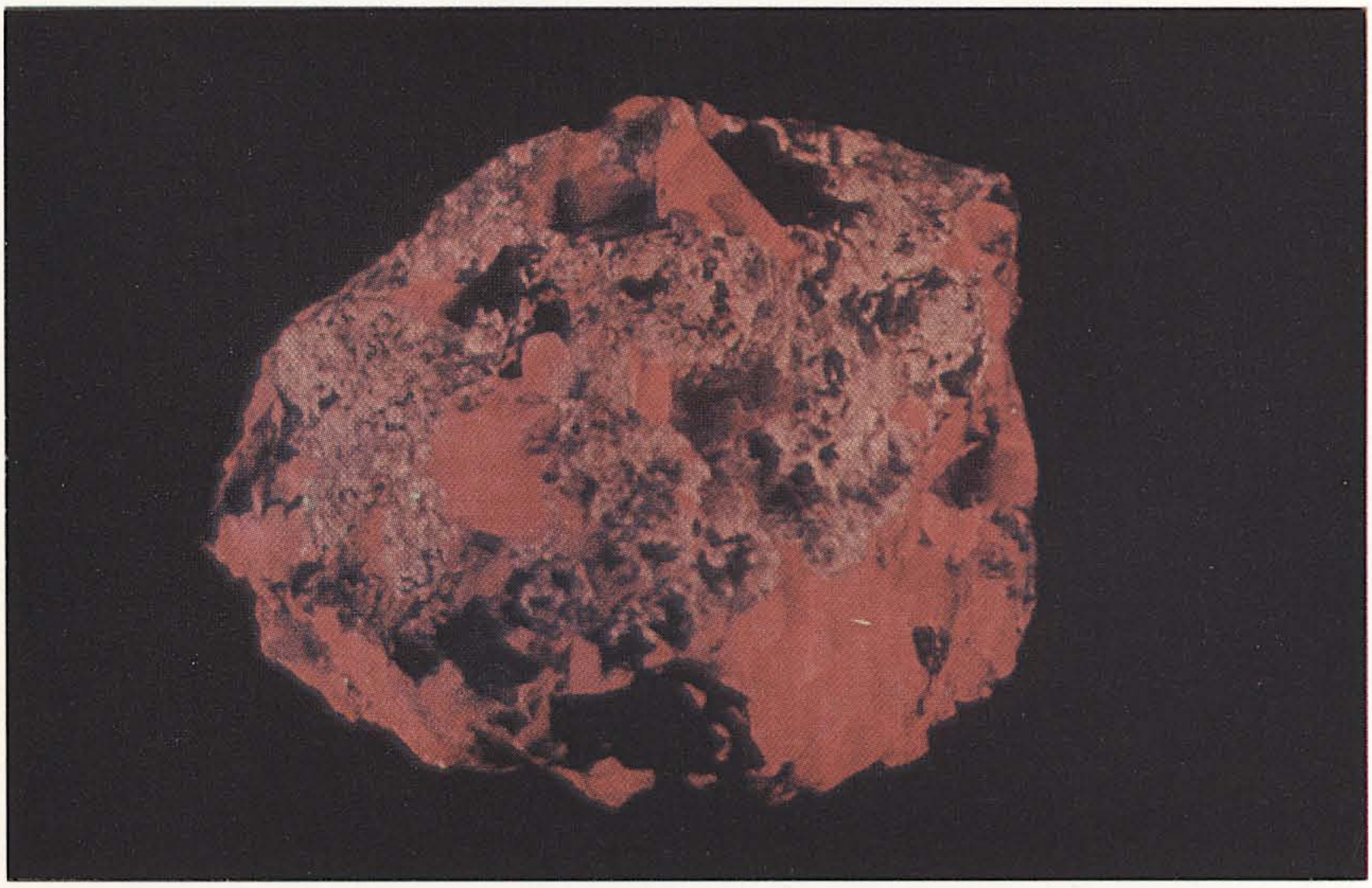


PLATE J8. The rare mineral svabite with its orange fluorescence is shown in a red fluorescent calcite.

10 BUCKWHEAT DUMP BEFORE 1950

Overall view of the Buckwheat Dump which is across the road from the Pit. The road separating the two has a very noticeable dip in it. This is the result of a tunnel that ran from the Pit to the Dump under the road. The tunnel entered the Dump area about where the large pile of overburden is located at the right of this picture. Note the ease of access to the dump from a vehicle. This has made it possible for tons of material to be hauled away. The dump today is considerably smaller in size than this photograph shows.

11 BUCKWHEAT DUMP, 1955

The Buckwheat dump from the same general location as picture 10 except a few years later. Notice the comparison. There is a great shrinkage of the dump in this picture which was taken in 1955.

12 FACE OF BUCKWHEAT DUMP

This picture taken from the bottom looking up the dump at rock face where tons of good fluorescent minerals have been found and carried away.

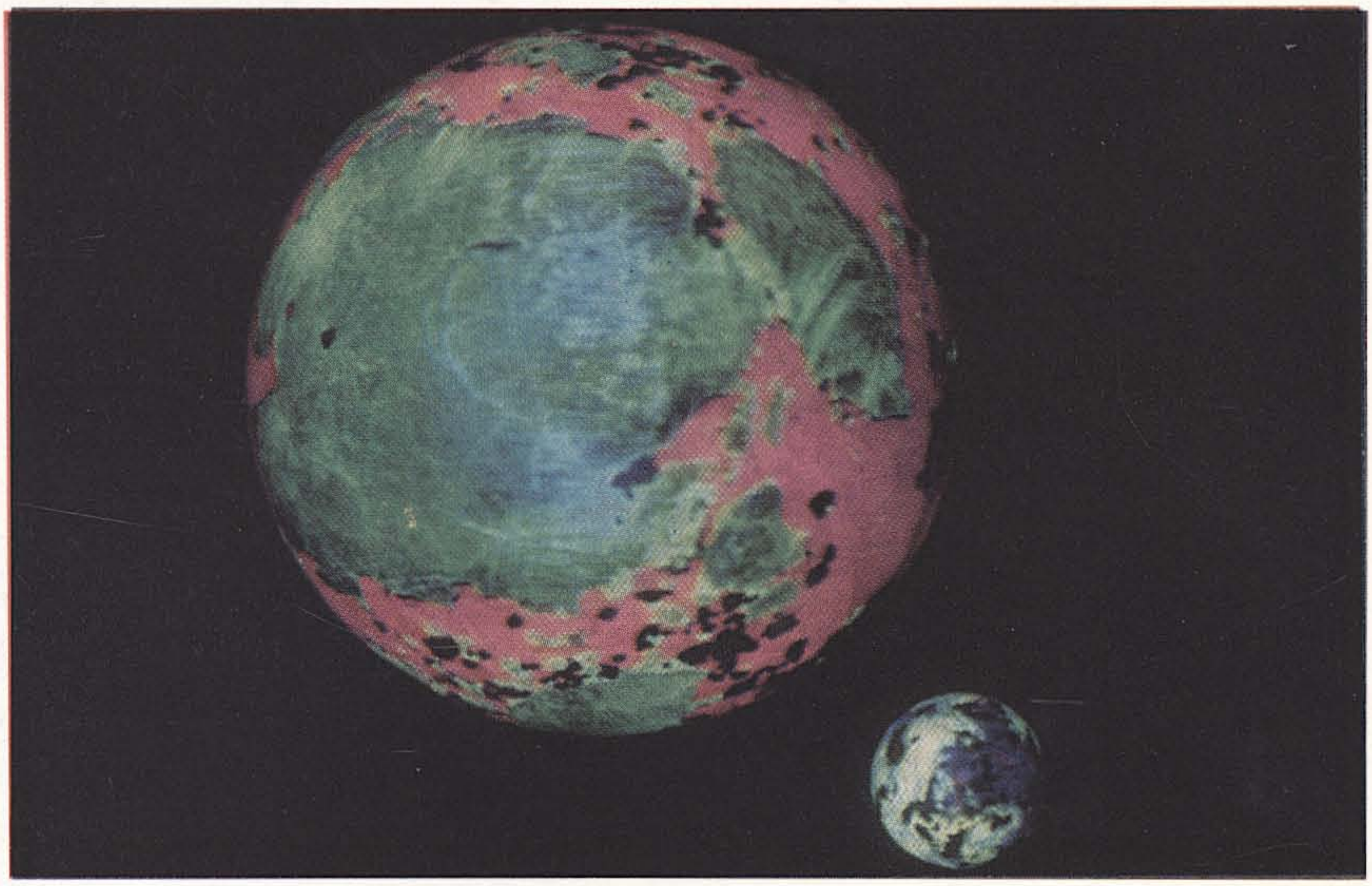


PLATE J29. Polishing adds richness to the fluorescent response of Franklin minerals as shown by this sphere.

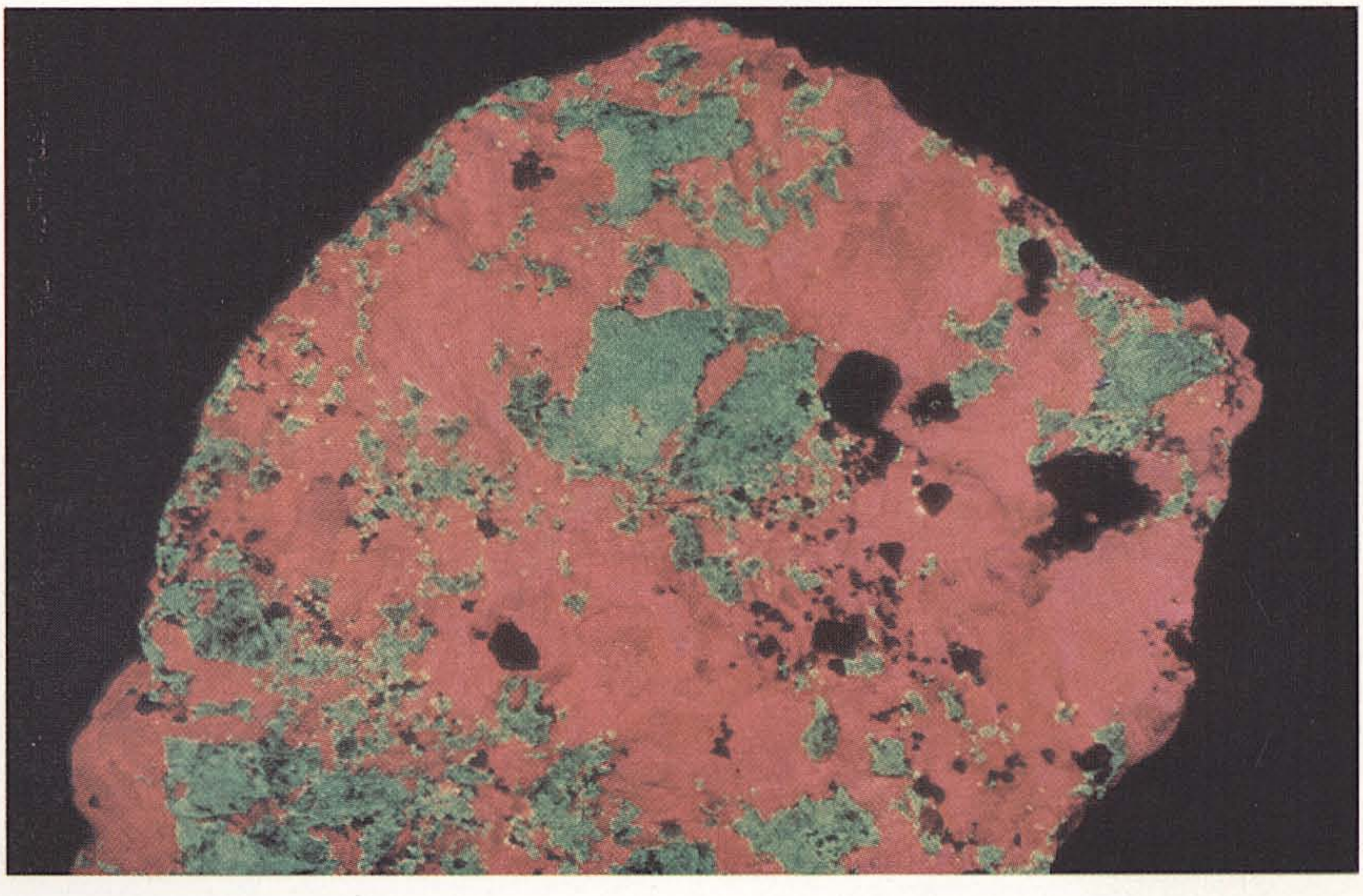


PLATE J30. A choice specimen of willemite and calcite is always prized in any fluorescent collection.

CALAMINE—(kal′ u mine) Many specimens of calamine have been checked by this author in hopes of finding some which fluoresce. Several specimens seem to fluoresce. But, this is only one person's observations and must be substantiated. It is being listed here in hopes others will be encouraged to check their material.

The fluorescence noted was a dull grayish-white under short wave. At first the response was credited to visible light escaping from the lamp. Another lamp was used with the same results. This did not prove too much. All the specimens which showed the fluorescence were checked by the under-glass test. The specimens did fluoresce under the lamp but when the glass was interposed, the fluorescence ceased. The purity of the specimens is not known since they came from different sources, including collections, and couldn't be checked. However, enough evidence has been gathered to suggest further study. All the material checked was the white "worm ore" from the old pits at Sterling Hill.

CALCOZINCITE — (kal′ ko zink′ ite) Previously thought to be a red fluorescent mineral, this is actually a mixture of tremolite asbestos, zincite and calcite. The calcite supplies the red fluorescence.

FLUOBORITE — (floo′ o bor ite) This mineral would bear further investigation. It has been noted to have a weak violet fluorescence, short wave, in at least two specimens. Again, this may be due to visible light emitted from the lamp.

FLUOR-EDENITE — (fluor′eden ite) In 1968, a group of collectors found the first specimens of this mineral to show fluorescence. Subsequent X-ray testing, spectroanalysis, and chemical testing have supported the original identification. The specimens were found on the Gooseberry Dump in the Franklin area.

The fluorescent response of the material is a strong yellow under sw lamp. However, careful examination and testing have shown that the fluorescent material is an admixture of two minerals—norbergite and fluor-edenite.

Careful separation work showed the norbergite fluorescing the typical yellow-orange under sw. The fluor-edenite shows a fine strong blue-white under sw lamp. The yellow response is the result of these two fluorescent colors mixing.

Further work is being done on this new find to completely verify its fluorescent response and also the analysis work done thus far. The mineral fluor-edenite is a member of the clino-amphibole group with a theoretical formula of: $NaCa_2Mg_5Si_7Alo_{22}F_2$.

FOWLERITE—(fou′ ler ite) The reported red fluorescence of this mineral has been shown to be caused by included calcite. It is not now considered fluorescent.

HANCOCKITE— (han′ kok ite) Supposed to have a green fluorescence but this is undoubtedly caused by associated willemite. It is not a fluorescent mineral.

HARDYSTONITE—(har′ di stun ite) Definitely a fluorescent mineral (see chapter III) but in one report hardystonite was credited with a bright green fluorescence, short wave, and a pale yellow fluorescence, long wave. It is frequently associated with willemite and calcium larsenite, and this must have given rise to the erroneous observation. It is not considered to possess these properties.

HEDYPHANE —(hed′ i fane) Palache reports this mineral as fluorescent blue-gray under the "Iron Spark." This reaction is not seen under our modern lamps. It is not normally considered a fluorescent mineral now.

HEMIMORPHITE — (hem′ i mor′ fite) See calamine.

HODKINSONITE — (hoj′ kin sun ite) The red material has been reported to fluoresce bright yellow green, long and short wave, undoubtedly willemite again.

LARSENITE — (lar′ sun ite) Confusion on this mineral probably came about when people began identifying hardystonite which is commonly associated with calcium larsenite, as larsenite. Larsenite never occurs in massive form. It has only been identified in crystals and then very rarely. Massive violet fluorescent larsenite offered for sale or trade should be refused. Larsenite does not fluoresce and is not massive.

MANGANOAXINITE—(man′ gan o aks′ in ite) The name applies to the axinite of Franklin which has manganese present. This is simply a variety name that should not be used since all axinite from Franklin is considered just axinite.

MANGANOCALCITE — (man′ gan o kal′ site) A variety name applied to Franklin calcite because of the manganese content. Franklin calcite should be referred to as calcite only.

MANGANOPHYLLITE — (man′ gan o′ fi lite) Willemite was present when somebody checked this material and reported it to fluoresce green. It does not fluoresce.

MANGANOSITE — (man gan′ o site) Reported to fluoresce pale violet, short wave. This mineral is not now considered fluorescent. Escaping visible violet light may have caused the confusion.

MOOREITE — (moor′ ite) The author has purchased a specimen of allegedly fluorescent mooreite. It fluoresces red just like calcite. Mooreite does not fluoresce, as has been erroneously reported recently.

NASONITE—(na′ sun ite) Previously thought to fluoresce a good pale blue, short wave. It has been proven that margarosanite was intimately associated with nasonite giving rise to the report of blue fluorescence. Nasonite does not fluoresce.

RHODONITE — (ro′ dun ite) Another mineral that frequently has calcite intimately associated with it. Undoubtedly the calcite has been responsible for the reported red fluorescence of rhodonite. Also, the material is reddish and visible light from the lamp could have caused a "glow."

ROEBLINGITE — (ro′ bling ite)This material has been reported to fluoresce red, short wave. After soaking in hydrochloric acid, the fluorescence disappears indicating the fluorescent calcite has been removed. Roeblingite does not fluoresce.

TEPHROITE — (tef′ ro ite) Reported as a bright greenish yellow fluorescent mineral. Again, willemite may have been admixed. Tephroite does not fluoresce.

ZINCITE — (zink′ ite) Until recently thought not to fluoresce. Albanese has reported having fluorescent zincite in his collection. The fluorescence is orange, long wave. The material is finely granulated, compact. One specimen is associated with hetaerolite. Perhaps further study will be made on these specimens and the results could prove favorable.

ZINC-LEAD-SILICOLARSENITE — (zink'led'-si' li co lar' sun ite) No such mineral exists. Some over zealous writer seems to have made a transposing error. When he saw the phrase, "the zinc lead silicate larsenite," he somehow changed it to read "silico." The reported response is the same as that of larsenite. Since there is no such mineral it cannot fluoresce.

This concludes this list at the present time. Collectors should look forward to the time when many of these minerals are finally fully investigated and added to the ever-growing list of fluorescent minerals from Franklin.

Chapter V

FRANKLIN MINERAL MUSEUM

On October 9, 1965 the Franklin Mineral Museum officially opened in the town of Franklin. Prior to this time the amateur collector found it exceedingly difficult to see good examples of typical and atypical Franklin ores and minerals. An amateur who knew an advanced collector might be fortunate enough to see some of the more common ore and mineral specimens identified, thus enabling him to develop background knowledge necessary for fruitful collecting on the dumps. With the opening of the museum this problem was diminished. As with any museum, the Franklin Museum did not have extensive collections of minerals to begin with. However, through the generous efforts of many, many people, the museum approaches the 1970's offering an excellent display of material, fluorescent and non-fluorescent, crystalline and massive, common, uncommon and extremely rare. Though many have contributed one or more specimens to the museum, special mention should be made here of several major contributions.

The E. P. Cook Collection — Mrs. Cook has contributed a very fine and broadly representative collection to the Museum. The collector would do well to study this collection with care since it contains numerous fine examples of fluorescent minerals. The specimens are displayed in regular light so you can make easy comparison with material you might have collected.

Of particular note in the Cook collection on display are the following:

SVABITE — Several very fine masses of svabite showing the common associates as well as the variations in color of this mineral which we have discussed in this book.

HARDYSTONITE — Very rich masses of this mineral, again showing good associations, are displayed.

DIOPSIDE — One specimen of this mineral shows fine ½ inch crystals, something you may never see when collecting. Seeing such fine specimens as this is of great help in learning more about the minerals of this locality.

SPHALERITES — A wide variety of colors, sizes, and associations are shown for this mineral.

FLUORITE — Again, variation is the theme with fine specimens of red, blue, violet, etc. fluorite.

In addition to the above there are excellent display specimens of tremolite, margarosanite, wollastonite, and corundum in the Cook Collection. Mrs. Cook has been a major contributor to the Museum and her collection should add much to your knowledge.

Richard Hauck Collection — Mr. Hauck has been a prime force in preserving Franklin minerals and supporting the new Museum. His collection, containing a number of very rare non-fluorescent pieces is on loan for the benefit of all.

Of the fluorescent minerals displayed by Mr. Huack, the following are of particular note:

AXINITE — Fine bladed crystals of excellent size, showing the type association recognized as typical at Franklin.

CLINOHEDRITE — Outstanding crystals in vugs of massive material. The color and form of these is a rare sight indeed. Studying such specimens, which will probably never be uncovered by an amateur collector, enables one to turn back the pages when the Parker Shaft minerals were being hauled out through the Palmer.

CALCIOTHOMSONITE — A good example of this rare mineral.

MARGAROSANITE — Massive and crystalline bladed material is displayed for your edification.

RADIATING WILLEMITE — An excellent example of this secondary willemite, showing a fine complete fan or circle of radiating crystals perhaps two inches across is in the Huack collection.

WILLEMITE — Numerous examples of crystals, some quite spectacular, are displayed. The great variety of color, form and texture of willemite is evidenced by the Hauck and also the Cook collection.

Lemanski-Kraissl Collection is the newest large collection added to the Museum.— I call it this because the bulk of the collection was purchased from a Mr. Lemanski by Mrs. Alice Kraissl then dedicated to the Museum in her parent's name. This is a broad general collection, again with excellent non-fluorescent and fluorescent material. None of these major contributions are under UV lamp. However, housed in a separate room is a spectacular forty foot long display of typical and rare fluorescent minerals for your viewing pleasure.

The Kraissl collection contains several spectacular pieces among which are:

ARAGONITE — During the mid 1960s large masses of matrix covered with sprays of transparent acicular aragonite crystals were unearthed in the Sterling Hill operation. The Kraissl Collection presents several very beautiful and very large specimens of this material. Under the long wave lamp this material shows a very fine blue-green response, with a long-lifed phosphorescence.

SPHALERITE — Several specimens, including one fine gemmy yellow clieophane may be seen in this collection.

SMITHSONITE — Of particular interest to me is the specimen of smithsonite in the Kraissl collection. The identification has not been verified to my knowledge but I was able to check the specimen for fluorescence. It showed dull red under the lw lamp only. Since smithsonite must be considered a doubtful fl. mineral at Franklin this specimen should be verified and the fl. re-checked.

Additional specimens of interest to fl. collectors will be the wide range of willemites in the Kraissl collection. There are also excellent examples of esperite (calcium larsenite), barylite, barysilite, margarosanite, norbergite, manganaxanite, one good specimen of powellite associated with molybdenite, and, finally, a very fine example of hardystonite in crystals. Don't miss seeing that piece as you study the fine Kraissl collection.

In addition to the many cases of fine minerals displayed under ordinary light, the Franklin Museum also shows a fine assortment of fluorescent minerals in a separate room. This fluorescent mineral display, covering five shelves forty feet long, shows almost every type of fluorescent mineral found at Franklin. The greater portion of the exhibit is calcite-willemite in a spectacular variety of patterns. However, care was taken to assure good representation of the uncommon fl. minerals, too. Large masses of esperite, wollastonite, clinohedrite, radiating willemite, etc. are to be seen. There is also a fine small display of the rarer materials at one end of the room. A careful examination of this material will be of considerable help when collecting the Franklin localities. A detailed description here would be of little value since actual first-hand knowledge is a must and the purpose of these passages is to encourage a visit to the Museum.

Another section of the Museum, worthy of note here, is the Mine Replica section, where an excellent job has been done in portraying the means and methods of extracting the ore of Franklin. Again, a description of this section would serve little value since seeing is believing. Go, visit, and learn for this Museum offers much.

THE EWALD GERSTMANN PRIVATE MUSEUM

The Ewald Gerstmann Private Museum has been in existence for 7-8 years. Mr. Gerstmann, almost single-handedly, started his museum and still offers his museum for the edification of any interested Franklin visitor. Since Mr. Gerstmann is not a wealthy man, his efforts to start and maintain a private museum, though slow, should be recognized. The display of non-fluorescent minerals is outstanding. Mr. Gerstmann has displayed parts of his collection in national, regional and local shows for several years, being awarded special trophies and commendations for his support of shows. His collection contains some of the finest examples of Franklin minerals accessible to visitors of that area. The huge rhodonites, pyroxenes, and many, many other minerals are well worth the time spent in visiting this museum.

Mr. Gerstmann has also installed a very large display of typical Franklin fluorescent minerals which contains some excellent examples of the common and also uncommon fl. minerals of the area. His willingness to display, to discuss, to show his collection to any interested visitor is a refreshing experience anyone should appreciate.

The Gerstmann fluorescent display includes a specimen of wollastonite reputed to be the largest ever recovered. The specimen, weighing in at well over 50 pounds has a band of bright orange fl. wollastonite measuring 7 inches by 4 inches. There is plenty of typical ore associated with the specimen to attest to the validity of the piece. The total fluorescent mineral display is about 14 feet across and six feet high and is displayed in long wave, short wave, and combination wave lamps. There is also an old-time iron spark machine set up and operating so you can see specimens the way they were first studied by Palache and other Franklin experts.

The present location of the Gerstmann Museum, 14 Walsh Road, was established in 1965 and is open to the public almost anytime. It would be in order here to mention some of the excellent fluorescent minerals to be seen on regular display. I might also mention a few of the very outstanding specimens which do not fluoresce but which would certainly be of interest to all collectors.

The Gerstmann Museum displays several specimens of the rarer Franklin fluorescent minerals, margarosanite, scheelite — including some of the original find, aragonite, wollastonite, tourmaline, etc. The Tourmaline display contains several color varieties including green and brown. One very large group of brown xls show a most unusual fluorescent response under the short wave lamp, being strong orange-yellow. The usual response for tourmaline from Franklin is a relatively weak yellow—short wave. In this same specimen are blebs of brown material looking very much like chondrodite-norbergite and responding exactly like the tourmaline. Mr. Gerstmann assured me the tourmaline crystals had been verified though the smaller blebs had not. Immediately, a question is raised concerning the possible confusion, under the short wave, of chondrodite and brown turmaline. This certainly suggests the need for study.

Another interesting specimen Mr. Gerstmann displays is a mixture of calcite — bright red — and dolomite — dull pink. Apparently, this material, has been and is identified as Wolllastonite in calcite by some so care should be taken when dealing with wollastonite specimens. They always fluoresce a distinct orange.

Another very interesting specimen in the Gerstmann collection is a fine small svabite xl in matrix. This is not in the fluorescent display but is on the shelf for study. In addition, fine specimens of willemite, axinite crystals, corundum, and many other specimens are on display for your interest.

Included in the display are a number of verified, typical specimens recently collected from the Trotter "dump." This new collecting site will be discussed under a separate heading. However, Mr. Gerstmann has worked diligently to promote the new site and has on display this excellent guide series of specimens to help the amateur understand better what to look for at Trotter. He also has recently placed on exhibit specimens of a number of newly discovered Franklin minerals which are presently being correctly identified, named, and announced in the literature. Seeing these new minerals as well as the excellent display of known Franklin minerals in the Gerstmann collection is a wonderful experience all collectors would enjoy.

COLLECTING IN FRANKLIN — 1970

Probably the most important statement that can be made about collecting as it currently exists at Franklin is that the new Trotter "dump" is worthy of investigation. It is also very important to note that the Buckwheat is still producing some excellent material, thanks to the occasional "turning" given the dump by the interested local government.

In general, it should be noted that all collecting areas except the Buckwheat and the Trotter are CLOSED to collecors. The Sterling Pit area is still opened, rarely, to organized club groups for very brief periods of time. The Parker, Taylor Road, the Gun Range, the limestone quarries, etc. are all closed. It may be possible to enter with specific permission of the owners but, again, this is almost never granted except for an organized club function. This is another good reason for joining the Franklin-Ogdensburg Mineralogical Society. They conduct a good field trip, expect members to follow safety rules and limits set on collecting and they make it possible for collectors to enter private property under strict supervision. This speaks well for the entire hobby.

The newest collecting locality is the Trotter Dump. It is located near the Buckwheat Pit area and can be reached by a short road behind the bank in town. Actually, this area, totalling nearly 40 acres including the dangerous Buckwheat Pit, never was an actual ore dump. It was created as an equipment storage area years ago by bringing waste rock, including ore, from any and every locality in the general area of Franklin mining operations. This rock doesn't seem to include much, if any, country rock. It is primarily mine waste. The rock was dumped in, covered with sand, more rock dumped, covered with sand, etc. This operation was repeated until the desired depth of fill was achieved. This waste rock now becomes your best source for much of the impossible-to-find Franklin material.

The Trotter property came into the possession of Mr. Amos Phillips who decided to open it to collectors. A small fee is charged and facilities, so far, are quite limited. However, the amount and qualty of material being found is well worth the fee. Of some significance is the fact that Mr. Ewald Gerstmann has been instrumental in helping Mr. Phillips develop the property. Mr. Gerstmann realized the potential of the area for collectors and has been a prime mover in developing the "dump."

What can you expect to find on the Trotter? It might be easier to mention what has not been found as far as fluorescent minerals are concerned. No wollastonite and no pectolite have been found as far as Mr. Grestmann knows. However, hydrozincite, svabite, axinite, clinohedrite, sphalerite, cleiophane, hardystonite, esperite (calcium larsenite), rich masses of willemite, etc. have been found. Some digging is required due to the abundance of sand (which fluoresces) but the results can be most gratifying. In non-fluorescent material, I've seen huge pyroxene crystals, fine one inch rhodonite, good garnets, and large amounts of celsian feldspar. This is only a sampling of what may be found. The waste material includes typical Parker Shaft material, it includes the type rock in which scheelite has been found, it includes the best general fluorescent material I've ever seen. In my opinion, the Trotter "dump" has not yet been fully explored and the results, when known, will equal the highest expectations of the developers. Minerals are currently being found there that just were crossed off the collectable list several years ago.

During the 1960s Franklin, N.J. began to develop the kind of support it deserved as a famous mineral locality. The fact that Franklin was better known elsewhere than to its own people is not unusual. This same fact often occurs when people are involved in the activities of everyday living and lose sight of the larger meanings and values that are present. Such was the case of Franklin and its fabulous minerals. This is certainly no longer the case.

Individuals early recognized the importance of preserving the lore, the beauty, the history that is Franklin's. These people were not interested in personal gain, but rather, were desirous of perpetuating the locale and its history. Some space has already been devoted to the Franklin Mineral Museum in this chapter. Yet, this is only the culmination of the unselfish work of many, a work that is still being carried on by people in the organizations in Franklin devoted to preserving of it's mineral history.

The backbone of that Museum's existence lies in the annual Franklin Mineral Show, sponsored by the Franklin Kiwanis Club each year. Started from an idea expressed by Mr. Ed Selems, this show has grown to be one of the finest on the East Coast. People flock by the thousands each year to attend. Early efforts were geared toward developing the show and supporting the non-profit Franklin Museum. This was important in obtaining funds for that museum, the buildings first, and later the equipping of such a permanent display. The primary purpose of the Franklin Show remains to support the Museum such that it's contents can constantly be improved, expanded, and cared for. At the same time, profits from the Show are applied to the financial support of the Museum itself, amortization of mortgage, insurance and maintenance costs, etc.

For a civic organization to plunge into such a venture as the development and promotion of a mineral museum, with it's supporting annual show, is quite a feat. Most members of such an organization know little if anything about something as specialized as minerals and mineralogy. However, with the guidance of the few who realized the value of preserving this heritage which is Franklin's, the Kiwanians have unselfishly given of their time and effort to make the Museum a reality while preserving and promoting the heritage of Franklin.

Proof of the success of their efforts can be plainly seen by all who enter the Museum. For there, hanging on the wall in the main entry room, is the Resolution passed by the state legislature in 1968, declaring Franklin as the "Fluorescent Mineral Capital of the World." The passage of such a resolution is no easy task and credit can be given to no single individual or group. Private commercial interests, such as Mr. Amos Phillips, owner of the Trotter property, played an important role in bringing interested parties together for such a purpose. Members of the State Legislature, Mr. Ewald Gerstmann, members of the Kiwanis Club, members of the Franklin-Ogdensburg Mineralogical Society, and private individuals interested in preserving the heritage of Franklin were brought together to discuss and agree on the need for such a State Resolution. That Resolution was drawn up, introduced, and passed so Franklin will be known forever as the "Fluorescent Mineral Capital of the World."

But the work goes on. The Museum needs continued support, additional collections and material, expansion of the annual show to strengthen the financial structure of the Museum. One recent step of significance is the acquisition of the famous Buckwheat Dump by the Franklin Mineral Museum, through a leasing arrangement. Under the care of such a group, the famous Buckwheat will be protected from the commercialsim which has threatened to wipe it out. Hundreds of tons of magnificent material had been hauled away for the taking before the Borough of Franklin stepped in some years ago. Still this did not end the savage abuse of the dump material. Now with the stricter controls possible through the Museum the magnificence which is Buckwheat will be available for years to come. Visitors will be allowed a limited amount of material. They will also be given guidance and facilities will continue to be provided which will aid them in their search for the minerals of Franklin.

Let us hope the heritage that is Franklin's shall continue. Excessive exploitation by commercial interests will deplete too quickly the limited reserves of ore and dump material that are available. Careful management of the Buckwheat is one answer. What the future holds for the Trotter area, a commercial property, and other properties holding Franklin ore remains to be seen. Preservation and protection must become the watchword of the present as well as the future if Franklin is to remain the, "Fluorescent Mineral Capital of the World!" Indeed it is!

Chapter VI

CONCLUSIONS

This chapter includes a few explanations and miscellaneous items of value. First, a fluorescent response guide is offered for the reader's use. Checking a mineral with a particular fluorescent color against the guide will offer a means of quick identification by color response. It can be the first step in mineral identification. Its use will save the beginner many mistakes and much detailed searching of the extensive information given in Chapter III.

The brief bibliography is offered to give credit to sources used while doing this study. Generally speaking, these references are recommended reading especially if care is taken to compare this study with information provided in the other texts. Probably the most interesting recent reading is provided by John Albanese's "Notes." Though out of print, these are still available. Recent findings of considerable interest are reported in the regular publication of "The Picking Table," the publication of the Franklin-Ogdensburg Mineralogical Society, Box 146, Franklin, New Jersey. Readers seriously interested in Franklin are urged to join this organization.

The Historical Timeline should prove quite interesting. It traces many of the important or memorable events in the history of the Franklin area without being too long-winded and full of irrelevancies. For more detailed historical reading, Palache and Albanese are recommended.

The description of Modern Equipment is not intended to be all-inclusive, but to review the fine line of ultraviolet lamps manufactured by the leading company in this field. You will find their equipment of excellent quality.

The sketches of the Franklin-Sterling Hill area are intended to show only general relations of places of interest. They will help the reader get to the more important areas with ease.

The series of black and white photographs are intended to furnish historical and current illustrations on the Franklin area. They show the mining and collecting area as it was rather than as it is at the time of printing. Since change is continually occurring, these illustrations should have continuing interest and value to the fluorescent mineral collector.

The many color reproductions are forever beautiful. The fluorescence of minerals from Franklin can never be truly described. They must be seen and these reproductions are the best way to show what cannot be described. A picture may take the place of a thousand words, but you are encouraged to have an ultraviolet lamp of your own and to enjoy for yourself the full beauty and dramatic fluorescent colors of these Franklin minerals.

FLUORESCENT RESPONSE GUIDE

If the collector should find a fluorescent mineral not readily recognized, refer to this quick reference given by color response which can be of great help in getting on the track. Check the color of the specimen against the chart. This immediately gives a brief list of minerals which can be referred to in Chapter III. Reading the separate discussions should narrow the possibilities considerably. Performing the suggested tests should provide a final answer in a majority of cases.

The letters following each mineral name stand for short wave (S), long wave (L), and phosphorescent (P). The first letter is brightest.

GREEN
apatite (S)
willemite (S, L, P)

RED
apatite (S)
axinite (S, L, P)
calcite (S,L, P)
corundum (L, S)
scapolite (S)

VIOLET
calcite (S, L)
hardystonite (S)

BLUE
barite (S)
calciothomsonite (L)
calcite (S, P)
diopside (S)
fluorite (L, S)
hardystonite (S)
hydrozincite (S)
margarosanite (S)
microcline (S)
scapolite (S)
scheelite (S)
smithsonite (S, L)
sphalerite (L, S, P)
tremolite (S)

ORANGE
apatite (S)
clinohedrite (S, L, P)
pectolite (S, L, P)
sphalerite (L, S, P)
svabite (S)
wollastonite (S, L, P)
willemite (P)

BLUE GREEN
calcite (S, P)
fluorite (L, S, P)
tremolite (S)
willemite (S, L)

PINK
pectolite (S)

CREAM TO WHITE
aragonite (L, S, P)
barite (S)
microcline (S)
smithsonite (L)

YELLOW
barite (S)
calcite (L)
calcium larsenite (S, L)
cerussite (L)
chondrodite (S)
norbergite (S)
phlogopite (S)
powellite (S)
scheelite (S)
tourmaline (S)
willemite (S)

HISTORICAL TIMELINE

1640 — The Dutch worked copper deposits in the Delaware River drainage basin.

1664 — Land including Franklin and Sterling Hill given to the Duke of York by King Charles II of England.

1730 — Property called "the copper tract" is granted to Anthony Rutgers.

1749 — Old mine holes are mentioned in land surveys of the area.

1770 — Iron furnace erected at Franklin.

1770 — Lord Stirling owned mining property at Sterling Hill.

1772 — Lord Stirling shipped ore to England in an abortive attempt to smelt copper.

1810 — Fluorite first described, including material from Franklin.

1810 — Dr. A. Bruce discovered the chemical nature of zincite.

1816 — Dr. Samuel Fowler acquired mineral-bearing property.

1817 — Chondrodite, not from Franklin, first discussed.

1819 — French Prof. P. Berthier discovered nature of and named franklinite.

1824 — Vanuxen and Keating discover the nature of willemite.

1830 — Dr. Samuel Fowler painted house with paint containing zinc oxide made from Franklin ore.

1832 — Troostite first discussed in the literature.

1838 — Metallic zinc was reduced from zincite.

1840 — H. D. Rogers reports the "admirable pure" zinc from Sterling Hill was prepared by Hitz for the brass standard weights and measures for United States Customs Houses.

1844 — Alger became property owner and was active in disseminating specimens of Franklin material to engender interest in the area.

1850 — First successful operation of properties by the New Jersey Zinc Co.

1850 — The mineral phlogopite is first discussed.

1851 — The iron-free sphalerite, cleiophane, is discussed in the literature.

1852 — Stokes named the phenomenon of fluorescence after the mineral fluorite.

1852 — The Buckwheat "leg" of ore reported discovered.

1854 — The mineral apatite is discussed.

1870 — Calamine deposits at Sterling Hill (Noble and Passaic Pits) exploited.

1877 — Franklinite or Sterling Hill Mine at Sterling Hill opened.

1880 — Trotter Shaft put into the Franklin deposit.

1889 — Tremolite first discussed in the literature.

1890 — East end of Mine Hill (Franklin) drilled and proves existence of a north extension of the eastern leg of the ore body.

1891 — Exploratory work done on the Parker Shaft.

1894 — Cerussite discussed for the first time.

1896 — Parker Shaft sunk.

1896 — New species in the Parker Shaft found.

1896-1910 — Sterling Hill inactive.

1897 — All properties consolidated under the New Jersey Zinc Co.

1898 — The mineral clinohedrite discussed from Franklin.

1898 — Age of the Ores established as 1,360,000,000 years old (very approximate).

1899 — The mineral hardystonite from Franklin first encountered in the mine.

1910 — Hoisting began at the Palmer Shaft.
1910 — The mineral norbergite encountered.
1913 — Franklin Furnace became the Borough of Franklin.
1913 — Sterling Hill shaft sunk and underground work started.
1916 — The mineral margarosanite from Franklin discussed.
1923 — The mineral calciothomsonite first discussed.
1928 — Discussion on calcium-larsenite first appears.
1928 — Palache's early report on fluorescence of Franklin minerals.
1928 — Chondrodite-norbergite at Franklin first discussed.
1929 — Barylite first discussed from Franklin.
1930 — Discussion on apatite-svabite first appears.
1935 — Palache's Professional Paper #180 appears.
1954 — Palmer Shaft ceases operations in September. Mining at Franklin ended.
1958 — Powellite found on the Buckwheat Dump.
1959 — John Albanese first publishes his "Notes."
1959 — Franklin-Ogdensburg Mineralogical Society is established.
1961 — Albanese ends publication of his "Notes."
1961 — Powellite-scheelite controversy begins.
1963 — Parker Dump disappears under the fire house.
1968 — State of New Jersey officially recognizes Franklin as the "Fluorescent Mineral Capital of the World."

ULTRAVIOLET FIELD LAMPS

There is certainly a wonderful array of equipment available today for the collector. Our friends of years back had to suffer with smelly, noisy, dangerous "iron spark" gap machines and other limiting and cumbersome equipment. Today there is no such predicament. Fortunately, the opposite is true. Collectors are able to select the equipment that best suits their needs. As in buying any major appliance, an ultraviolet lamp is a major appliance for a mineral collector. Careful selection of a reputable firm that offers a truly broad selection of equipment is very important. Ultra-Violet Products Inc. is such a reliable firm. They offer the broadest possible selection of ultraviolet equipment from beginner lamps right up to industrial-type lamps costing a considerable sum. They particularly specialize in inexpensive lamps for collectors. Ultra-Violet Products, Inc. is the manufacturer of the well-known MINERALIGHT Short Wave Lamps and BLAK-RAY Long Wave Lamps, both names being registered trademarks. They also manufacture inks, chalks, crayons, etc. for labeling and marking specimens. Further information is obtainable from any MINERALIGHT Lamp dealer.

The varied line of MINERALIGHT Lamps is truly fine. The broadest possible selection is available to the collector. Of particular interest to the Franklin collector are the fine short wave lamps because the great majority of minerals from this locality respond best under short wave. In the MINERALIGHT Series are three excellent short wave portable lamps, the relatively new MS-44, and Model M-14. These lamps are inexpensive filtered lamps that provide an excellent, handy source of short wave radiation. Model MS-44 is part of a revolutionary family of lamps that incorporate features most wanted by rockhounds. These include: higher intensity to create brighter fluorescence than any previously available lamp, a removable filter assembly to detect rare earths and achieve maximum phosphorescence, reasonably-priced, long-lived, low cost 12 volt disposable battery, fatigue-free carrying handle, 6-watt ultraviolet tube, large filter and reflector area, built-in flashlight, and many other desirable features.

MINERALIGHT Lamp Model UVS-11 is a short wave ultraviolet single tube 4-watt unit with over double the intensity of similar models. It operates off of alternating current or two "B" batteries with the company's battery adapter. The pocket-sized MINERALIGHT Model M-14 Short Wave Lamp is fully transistorized and is part of the world's first family of miniaturized, cordless, 4-watt nickel-cadmium battery-operated lamps. It is a lamp that is rechargeable hundreds of times for hundreds of hours of use with the same battery.

The combined long wave and short wave lamps, MINERALIGHT Multi-Band Models MSL-45, UVSL-15, and M-15, make available in one lamp the wavelengths that are most useful at Franklin. Both wavelengths may be used together or, with the wavelength selector, each wavelength may be used independently. Either wavelength is more than adequate for the job and the versatility of the three models has made the MINERALIGHT Multi-Band Lamp an overwhelming favorite among mineral collectors.

For the collector of long wave minerals, there are the portable BLAK-RAY Long Wave Lamps, Models ML-46, UVL-21 and M-16. Model ML-46 Long Wave Lamp, like the MINERALIGHT Lamp Models MS-44 and MSL-45, provides higher intensity than any other comparable lamp. It has the same excellent features, including the removable filter assembly.

All three hand lamps — MINERALIGHT Short Wave, MINERALIGHT Multi-Band, and BLAK-RAY Long Wave Lamps — are excellent for field work because of their intensity and complete portability. They do a truly remarkable job on the Franklin minerals because of the very obvious brighter fluorescence they cause due to the maximum ultraviolet available from each lamp.

A WORD ABOUT THE MS-SERIES LAMPS

This author was pleased to be asked by Ultra-Violet Products, Inc. to field test the MINERALIGHT Multi-Band Model MSL-45 that was introduced late in 1969. It is easy to use, produced excellent coverage of material, and is a very fine piece of equipment. I have not tried the MINERALIGHT Short Wave Model MS-44 nor the BLAK-RAY Long Wave Model ML-46, but they are the same basic design and incorporate all the good features of the MSL-45 Lamp. All three lamps have a higher intensity and cover broader, deeper areas than ever before possible with a 12-volt self-contained battery-operated lamp.

They also have a number of other useful features: an adjustable hand grip, built-in flashlight (that's a big help), removable filter assembly for an unfiltered energy source, convenient switching operation, and durable construction.

Even the Multi-Band Model, with half of the 6-watt tube coated for long wave, produces more ultraviolet energy than most other lamps.

This is convenience that has never been available before. Not only can one prospect the dumps of Franklin, but any accessible fluorescent area in the country will now be easier to cover after dark. These lamps can be carried into any home, office or store and specimens can always be examined without having to hunt for an electrical outlet or finding a place to put down a heavy set of batteries.

The following quotations from a number of experienced rockhounds are just a sampling of the reception given the

MS-44 Short Wave and MSL-45 Multi-Band Lamps:

"The new light is fantastic and we have never been so pleased with any other." J. K., Albuquerque, N. M.

"I was particularly impressed by the power of the unit." R. M., Berkeley, Calif.

"It is the most powerful of any portable I have seen. The handle is ideal. The flashlight is ideal." B. B., Bothwell, Wash.

"The flashlight . . . is one of the finest ideas imaginable freeing one hand . . . I liked the dual purpose (filter) idea." J. C., Barstow, Calif.

For collectors who are limited in funds, collecting at Franklin holds no great problem. It is not too far from civilization and it has two collecting areas: The Trotter dump and the Buckwheat dump, both of which offer potentially exciting fluorescent mineral discoveries. On location is a small booth, referred to before, equipped with a 110 volt outlet all collectors may use. This is really the greatest idea since MINERALIGHT Lamps first came into use over thirty years ago. However, most collectors won't be satisfied to be dependent on this umbilical source of power provided for their use. Collectors want to range far and wide in search of the rare and unusual. This is possible at lower cost today than has ever been possible before thanks to the completely portable MINERALIGHT and BLAK-RAY Lamps.

There is considerably more equipment than has been mentioned, but the above units are particularly useful when working at Franklin. When deciding to buy equipment at all, the collector should go to a reliable dealer who will carefully help make the best choice for the money spent. Buy and use good equipment suited to your special needs.

FLUORESCENT MINERAL LIST

Mineral Name	Short Wave Response	Long Wave Response	Phosphorescence
Apatite	Orange, greenish	Dull red	None
Aragonite	Weak yellow cream	Good yellow cream	Yellow-cream
Axinite	Good red	Red, often strong	Very brief red
Barite	Blue, bluish cream	None	None
Calciothomsonite	None	Blue	None
Calcite	Pink to red to violet, blue or blue-green	Same as short wave but varies in strength	Brief red
Calcium-Larsenite	Bright yellow	Fair yellow-white	None
Cerussite	None	Weak yellow	None
Clinohedrite	Strong to good orange	Weak orange	None
Chondrodite	Yellow	None	None
Corundum	Dull, deep red	Good rich red	None
Diopside	Fairly bright blue	None	None
Fluorite	Blue, blue-green	Strong blue, blue-green	Blue-green
Hardystonite	Violet, blue-violet	None	None
Hydrozincite	Blue, blue-white	None	None
Margarosanite	Strong pale blue	None	None
Microcline	Weak blue-white, white, cream	None	None
Norbergite	Yellow to yellow-orange	None	None
Pectolite	Orange to orange-yellow, pinkish	Weaker orange	Orange
Phlogopite	Pale yellow	None	None
Powellite	Good yellow	None	None
Scapolite	Faint blue, red	None	None
Scheelite	Dull yellow or bright blue	None	None
Smithsonite	Weak bluish white	Same as short wave creamy	None
Sphalerite	Fair orange	Strong orange, blue	Same as long wave
Svabite	Pinkish orange	None	None
Tourmaline	Pale yellow	None	None
Tremolite	Blue-white, blue-green, greenish	None	None
Willemite	Bright-good green, yellow-green, yellow	Good to weak green	Green, orange
Wollastonite	Bright orange	Weaker orange	Brief orange

Rhodonite Zinkit
Cleiophane

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