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departments

PARAVAUXITE, Contacto vein, Llallagua, Bolivia, Mark C. Bandy collection. The crystal spray is 2 cm across. Photographed by Jeffrey J. Kurtzeman, Phoenix, Arizona.

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editorial matter

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Editorial

ARE MUSEUMS ON YOUR CHARITY LIST?

Have you given any thought lately to the needs of your favorite museum? Perhaps you have never thought of any of them in terms of being "needy." Well, as a matter of fact, most of them are. The needs, as far as mineral museums are concerned, are simply stated — more funds with which to hire curators, run the physical plant, produce the displays, and purchase specimens.

I am not suggesting that our readers dig into their pockets and make cash donations to various mineral museums, although this is a fine idea for those who can afford it, and the donations are tax-deductible in the U.S. There are ways in which individual collectors, mineral clubs and even federations can contribute to museums without anyone really feeling the pinch. The most obvious means is through donating mineral specimens. Small museums for the general public may, of necessity, limit their collections to display type specimens. Many also restrict what they display to specimens from specific geographic areas. Since collections at different museums may be quite dissimilar, one should determine what is wanted before offering any minerals. Larger public and university museums want to add research, or reference, material as well as the fancier things. They have assumed a responsibility for gathering specimens because of their potential utility as study objects. By and large these are not glamorous specimens so the curator does not have to suffer anguish as they are sectioned for microscopy examination, cored, sawn, or powdered for various tests and a variety of analyses. These collections are generally thought of as systematic but they are not limited in scope to the finest available specimens of each different mineral species. Ideally they offer depth in locality representation. A complete systematic collection would have pyrite, for example, from every significant occurrence that has produced it. Often, in studying a particular mineral or family of minerals, a researcher will want to compare the characteristics of a large number of specimens from a wide variety of localities. Naturally no systematic collection of this kind even approaches being "complete."

The role the collector can play, then, becomes obvious. Individually or through his club and federation he can help the collections of these museums grow. What could be more fitting than the donation of a fine display specimen to a museum that has afforded the collector countless hours of pleasure by allowing him to view its mineral collection? I know of at least one important museum for which the local mineral club annually purchases an exhibitable specimen. Wisely they consult with the curator before deciding on the specimen, to avoid selecting something he is reluctant to display. This is a good and appropriate use for surplus funds arising from such things as profitable mineral shows.

There is no better time for collectors to start programs leading to the periodic donation of minerals to museums. The recent rapid escalation of specimen prices means that tight budgets have become inadequate to permit a museum to purchase a representative cross-section of new material. Where ten specimens could be purchased before, the same money may now buy only one specimen. Good curators know that the best time to buy is when the material first appears. Shortly thereafter the prices tend to rise and the selection becomes poorer.

There is plenty of opportunity for the individual to contribute as well. This idea has been touched upon in an earlier editorial concerning support of educational programs by providing good samples of common minerals to schools. Museums building systematic collections would be grateful for such material too. Most collectors are quite surprised when they learn that the Smithsonian, the Royal Ontario Museum, the British Museum (to name a few) would be thrilled to receive a large cleavage of siderite, a broken mass of chalcopyrite, some crumbs of anorthite, etc. from localities not already well-represented in their collections. On virtually every collecting trip sponsored by a club at least one member finds a specimen that these museums would be happy to have which is of little or no appeal to the collector and may even be left behind at the place where it was found. It is a difficult thing to get collectors in the frame of mind where they are always alert to the possibility that some museum may want or need specimens they don't even care to carry home.

One example may help to illustrate the need of such material. For several years outstanding specimens of wolframite from Panasqueira have been available through mineral dealers. Naturally, by purchase and trade, the Smithsonian acquired a very good selection of these specimens. Recently a research mineralogist wrote to the Smithsonian requesting pieces of wolframite for analysis from as many different localities as the Museum had to offer. The Museum could not supply a sample from Panasqueira for it would have necessitated destroying one of the fine exhibit pieces. Subsequently several dealers were asked if they could supply broken pieces for study purposes. All responded that they had lots of it and would donate it promptly. It had never occurred to them that the Museum wanted what they regarded as waste to be thrown away.

Two cautions are in order. Those who may be stimulated to respond to this editorial by donating minerals should be willing to trust the judgement of the curators as to their useability. Don't be upset if study material is judged unsuitable for the collection and refused. Don't put *strings* on your gifts, particularly when they are of display type. The curator must be permitted to guide the development of the collection he curates. If he should decide that the best course is to trade a specimen that you contributed for another specimen, it must be assumed that he knows best. Your gift is still being used to improve the collection.

Why not help the museum of your choice?

John S. White Jr.

THE COLLECTOR

by Richard A. Bideaux

Quoting from *The Naturalist's Leisure Hour and Monthly Bulletin*, Dr. A. E. Foote, Feb., 1892: "The steady growth of interest in scientific studies has caused an increase in my business in the past three years. Never have my sales been so large, and never have so many choice additions been made to my stock in the same length of time. Space will only allow of specifying a few of the most recent and important of these additions. . ."

"Minerals from Africa. The most important of these were collected at the Antimony mines of Algeria. These mines had not been worked for years, but by having blasts put in, a number of good specimens were secured. Nadorite, an antimonio-chloride of lead in fine groups of crystals was obtained by a week's trip. Specimens can be supplied at from 10¢ to $3.50. (Ed. note: The Bureau of Labor Statistics estimates that the dollar in 1892 was worth $4.82 in terms of today's dollar. Bear this in mind when reading Foote's prices.) Senarmontite, an oxide of antimony, found only at one locality, was collected during another week's trip. Fine octahedrons and groups of crystals in the gangue can be supplied at from 10¢ to $5.00. Valentinite, also an antimony oxide, but fibrous, from 5¢ to $2.00."

"Italian Minerals. During a trip into the mountainous regions of Sicily, I secured the finest specimens of Sulphur I have ever seen; beautiful large groups from $5.00 to $15.00 smaller groups, very nice 25¢ to $3.50; single crystals, some bituminous, 10¢ to $1.00... Aragonite—Undoubtedly the most brilliant and beautiful groups of this species occur in Sicily, fine specimens from $1.00 to $5.00 each. Several extra fine and large groups from $10.00 to $15.00 each. One of these, at $25.00, is the most beautiful of its kind that I have ever seen. . ."

"Elba minerals were procured by a week's visit, both by purchases from the miners themselves and by selection from the best old collection on the Island. This had never been broken into before. Hematites, an infinite variety of sizes, colors and forms. Fine large groups of extra large crystals, 50¢ to $7.50. Pyrite, very brilliant pentagonal dodecahedrons (pyritoid), and other forms, 5¢ to $2.50. Ilvaite, now rare, 25¢ to $5.00. Toumaline, various colors, $1.00 to $5.00."

"Vesuvian minerals-A week spent at Naples and Vesuvius (which was ascended), where various purchases were made, gave me the largest collection of Vesuvian minerals ever brought to America. Among other purchases was the entire remainder of the stock of the well-known guide, dealer and collector mentioned in Baedeker and other guide books as "Maccaroni," or Andrea Anastasio...There are an immense number of specimens of typical species, such as Vesuvianite, Tenorite, Leucite, Sal-Ammoniac, Biotite, Melanite, Meionite, Anorthite, Sodalite,... 25¢ to $5.00."

"English Minerals. As persons familiar with my previous collecting trips are aware, I have on several occasions visited all the important English localities... in 1889, a leading mineralogist and myself drove to the principal localities in Cumberland, securing many choice specimens. Twin ("butterfly") Calcites, 25¢ to $5.00. Barite, crystals and groups of many colors and shapes, some doubly-terminated 5¢ to $3.00. Fluorites, several thousand of many colors, including the deep blue, the new blue lined, green, yellow, etc., 5¢ to $10.00. Witherite, in groups and single crystals, some doubly-terminated, 75¢ to $7.50 ... Our visit to the charming "Lake Region" secured fine linarite groups, 15¢ to $3.50, also Caledonite, $1.00 to $5.00, also Mimetite, 10¢ to $3.50."

"A previous drive through Cornwall with another collector had given me many minerals peculiar to this locality, such as Redruthite, Childrenite, Cronstedtite, Torbernite, Ludlamite, Cassiterite, Chalcophyllite, and very many others."

"Matlockite, phosgenite, and Anglesite. When at the American Exposition in London, in 1887, I secured from the only good collector at the locality the finest specimens of Matlockite and Phosgenite that were ever seen in London ... During 1891, this collector died, and all of the best specimens from his collection have been sent to me for sale in this country...Matlockite crystals and groups, $1.00 to $25.00. Phosgenite crystals and groups, $1.50 to $15.00. Anglesite crystals and groups, 50¢ to $7.50. Anglesite, Pseudomorph after matlockite, an absolutely unique specimen, $20.00..."

"Many other European localities have also been personally visited, especially those of Hungary, Switzerland, Germany, France, etc., but space does not allow the mention of any except the gold mines of Nagyag and Schemnitz. From these the rare tellurides. Nagyagite, Sylvanite, Krennerite, etc., and remarkably fine crystallized golds were obtained at from $1.00 to $10.00..."

"American Localities. Since our last catalog was published personal visits have been made to the best localities in Mexico, Arizona, California, Utah, Nevada, Colorado, Tex-

as, New Mexico, North Carolina, and other Southern States."

"Arizona Minerals. Probably the most remarkable discovery made was that of the two new species described by Prof. G. A. Koenig, Paramelaconite, an oxide of copper in fine large crystals resembling Anatase, and Footeite, an oxy-chloride of copper in well-defined blue crystals... Cuprite crystals, very fine, 50¢ to $5.00, Azurite groups, balls and crystals, equal to those from Chessy, France, 10¢ to $5.00... Some of the red skeleton crystals of vanadinite from Yuma County, similar to the pyromorphite from Ems, are the largest Vanadinite crystals ever seen, 10¢ to $1.00. The Yuma County minerals are certain to be more expensive in the future, as all mining operations have been suspended in Silver District..."

"The Mexican Minerals... Argentite, crystals and groups, 25¢ to $5.00. Pyrargyrite, crystals, groups, and massive pieces, 25¢ to $10.00. One very fine crystal, about 1 1/4-inches long and 1/2 inch in diameter, shows fine red translucency. This is one of the finest crystals ever found in Mexico and is worth $50.00 ... Topaz—On my last visit to San Luis Potosi, Mexico, I secured some of the best specimens of this very beautiful gem mineral ever seen. Crystals on the gangue, 25¢ to $5.00. Separate crystals, 5¢ to 50¢..."

"California Minerals... So far as I know, my week's visit at Borax Lake, near Death Valley, is the only one made to this region by an experienced mineralogist. The shipping point from the Borax region is in the desert, and such a trip involves great danger and hardship at any time. All work is entirely stopped at Death Valley during the summer."

"Hanksite-A month previous to my visit to Borax Lake, an eight-inch hole had been drilled to a depth of over one hundred feet, for the purpose of exploring the immense alkaline deposit. At thirty-five feet a small cavity was struck from which were pumped through the drillhole the finest crystals ever found... I secured all except a very few that were given to one person before I visited the place. Besides the value these drill-hole crystals have from their size and perfection, it is very probable that this pyramidal form will be as rare as it was the first time it had been found in fifteen years work, although other wells had been previously sunk. Crystals and groups of this pyramidal form, $2.00 to $10.00. Sulphohalite, the new species first brought from Borax Lake by me, was pumped from the same cavity..."

"Utah Minerals. Several visits to this territory have supplied a remarkable series of the Tintic Copper Arsenates and Phosphates so ably described by Pearce and Hillebrand. They resemble very much the specimens found in Cornwall in earlier days, but now seldom seen. Clinoclasite, is the most beautiful of the Tintic species. This mineral, heretofor so rare, can be supplied in good specimens at from 25¢ to $2.50. Tyrolite, hitherto very rare, especially in crystals, from 5¢ to $2.50... Conichalcite, Scorodite, Olivenite, Mixite, Libethenite, Anglesite, Embolite, Utahite and other specimens were also obtained at Tintic..."

Continued on page 261

FM friends of mineralogy

by Dona Lee Leicht,

Secretary-Treasurer of FM Region 14

We of Region 14 are proud of its activities and accomplishments. We feel some of these are pioneering efforts, different from any carried on by other regions, which are contributing to the greater strength and outreach of Friends of Mineralogy. A few of these include: initiation of FM-arranged collecting trips to achieve extraction, distribution and preservation of uniquely fine mineral specimens otherwise lost forever; cooperating closely with neighboring societies, museums, and educational institutions to develop and support educational, scientific, and cultural programs; setting up educational exhibits both locally at shows and permanently for Museum and University display; establishing an x-ray-optical laboratory for mineral identification to be financed, outfitted and operated by the region and its individual members as a service to all. These and other projects are described below.

Region 14 of the Friends of Mineralogy covers the entire Southern California area, from Bakersfield to the Mexican border, and includes also the State of Hawaii. The Regional Coordinator is Wayne Leicht. Dona Leicht serves as the Secretary-Treasurer. With 67 members, our membership appears to be the largest of any region.

The first meeting of this region was held in April 1972. The meeting centered on discussion of FM goals and projects to be achieved within the region, and how they could best be accomplished. Since that first formulative meeting there have been five more formal meetings, and countless informal meetings of members discussing various aspects of FM.

The Southern California area encompasses some of the most interesting mineral deposits in the country, and FM initiated a field trip to one of the most unique specimen areas. In the early part of the summer of 1972, the region investigated the possibilities of collecting the now famous laumontite crystals occurring at the tungsten mine of the Union Carbide Company, at Pine Creek, near Bishop, California. Contact was made with the company and they consented to allow only three collectors into the mine for the purpose of collecting these fine specimens. It was the intention of the group to collect and preserve the specimens and distribute them to various museums, universities, and schools, where they could be displayed for appreciation by countless thousands of collectors. The three members to conduct the expedition were selected by drawing lots. Many truly unique specimens of laumontite were recovered and they have been distributed to collections where they can be most securely preserved. These include the Harvard Museum, the Los Angeles County Museum of Natural History, the San Diego County Museum, the Natural History Museum of Bern, Switzerland, the University of Michigan Museum, and many other universities and small museums around the globe. Many single crystals were set aside for use in Region 14 promotional endeavors. Two mineral auctions were conducted by the Mineralogical Society of Southern California, in which FM was allowed to participate. Region 14 members donated specimens for the auction, in behalf of FM, in addition to the laumontites, and over $250 has been raised for Region 14 activities. At the forthcoming Tucson show some of these specimens will be used as prizes for the educational exhibits competition.

The region has also produced educational exhibits at various local shows. A portion of the funds raised at the auctions was used to purchase two display cases to be used for educational exhibits. Bronze plaques were placed on these cases noting the FM donation and the date. They are being stored for FM in the garage of the Mineralogical Society of Southern California, through the courtesy of the Society, and are made available to any collector or society wishing to use them for educational displays. Recently, they were used by California State University at Los Angeles for displays of self-collected minerals by the students during the University's open-house.

Region 14, in February of each year, just prior to the meeting of the Pacific Micromount Conference, joins with several mineral societies in the area to sponsor a lecture by a prominent mineralogist. The region has acted as a coordinating agent in this affair. The lecture is held at the auditorium of the Los Angeles County Museum of Natural History and admission is free. Each society and FM contributes funds to stage this event. Lectures have been given by Peter Embrey, London, England; Pierre Bariand, Paris, France; Hugo Strunz, Germany; Werner Lieber, Germany; and Hans-Anton Stalder, Bern, Switzerland.

Currently the region is planning a compilation of the various public and private mineral collections that are displayed and available for viewing by the public in the Southern California area. This listing will include pertinent information as to type of display and hours of viewing, together with data on the history of the collections.

Our region works very closely with the Mineralogical

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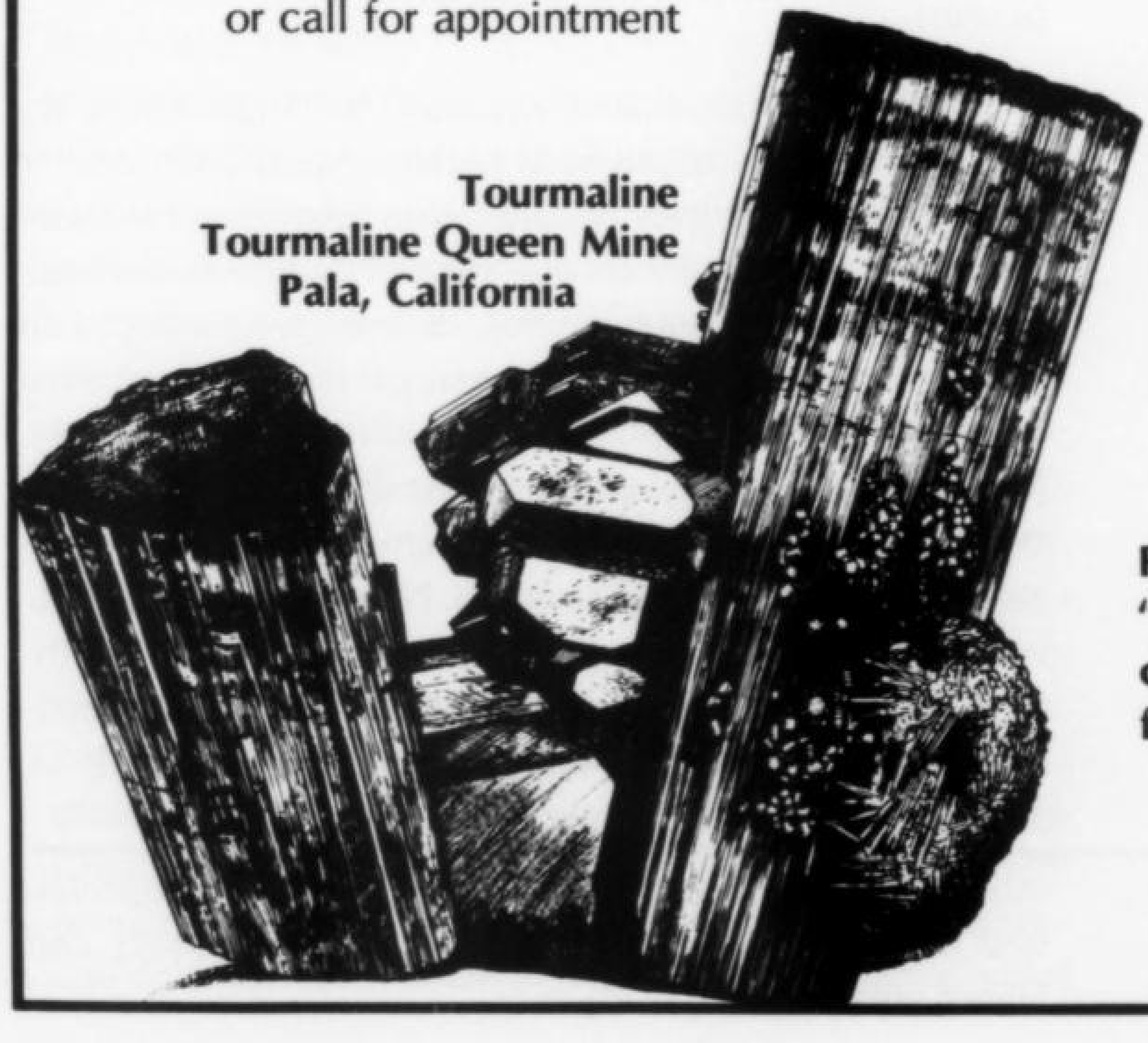

Tourmaline
Tourmaline Queen Mine
Pala, California

An American Mineralogist
Part I

by Arthur Montgomery
Lafayette College, Easton, Pennsylvania 18042

Fig. 1. **Samuel G. Gordon. 1897-1952.**

PREFACE

Sam Gordon was two kinds of American mineralogist. He is best known as a highly proficient professional scientist, author of many works on crystallography and descriptive mineralogy, and describer of eight new mineral species. But he remained always an amateur and field collector at heart, who dug up marvelous minerals in far-off corners of the world and wrote classic stories about their discovery. In between times, he authored *The Mineralogy of Pennsylvania,* founded *The American Mineralogist,* and, while curator for thirty years at the Philadelphia Academy of Natural Sciences, built up one of the world's notable institutional collections and museum displays.

All this was done despite little schooling, minimum equipment and financial resources, few returns of professional honors and material rewards. His life and work came to an end on a deeply discouraging note. But that was what he chose to do: devote his life, in his own way, to the minerals he loved.

This series of articles is partly biography and partly a selection of his scientific and popular-interest writings. Most of his published works appeared in journals reaching too few mineral-minded readers. May these documents, therefore, substantiate the important place he deserves in American mineralogy, and bring him back into our midst!

Sincere appreciation goes to the Academy of Natural Sciences of Philadelphia, to Dr. C. E. Goulden, scientific director, and Dr. H. R. Roberts, former director, for permission to reprint various Gordon publications appearing in the Academy's journals.

I am deeply grateful to the following for generous aid in furthering and filling in portions of the Gordon biography: Harold Arndt, Arthur Boucot, Harold Evans, John Frankenfield, Morris Kissileff, Louis Moyd, George Vaux. Very special thanks go to Bertha (Mrs. Samuel G.) Gordon and Edgar T. Wherry, whose helpful recollections are a vital element in this story and lend it authenticity and greater usefulness.

EARLY INFLUENCES

Samuel George Gordon was born in Philadelphia in 1897. The family circumstances were poor, with little financial support available for the boy's schooling. One cannot discern, in the home life and Jewish family background, any influences operating in favor of intellectual pursuits.

Not far from Gordon's home was the Wagner Free Institute of Science. It had been founded many years earlier to provide free courses of instruction in science for those who could not afford them elsewhere. In addition to chemistry, physics and mathematics, courses were offered in botany and geology. One of the younger teachers happened to be Edgar T. Wherry[1], who had received his mineralogy Ph.D. not long before at the University of Pennsylvania. Wherry had begun his scientific studies at Wagner, since he lived in that neighborhood also. Not only was he a dedicated teacher, but a naturalist of the old school, broadly grounded in chemistry, botany and geology, with boundless energy for field trips and the collecting and study of all kinds of natural-history specimens.

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[1] Dr. Wherry has made outstanding contributions to mineralogy and botany. Much honored by mineralogists and botanists, he remains above all a natural scientist, one of those few who bridge the gap between increasingly specialized disciplines by interpreting nature in a broader and higher sense.

Gordon came to Wagner when he was about fourteen, eager to learn about science. Fate led him to enroll in the chemistry course taught by Wherry. It is certain that the older man provided the spark of encouragement which kindled the boy's mental capabilities, inspired an insatiable intellectual curiosity, and turned him towards a life-long career in science. Wherry was Gordon's teacher, mentor and friend, to whom credit is due for much of the later accomplishments of his student.

Wherry had a small chemical laboratory in the basement of his home. Gordon followed suit. He was further stimulated to begin local excursions, under his teacher's leadership and together with a group of fellow students from Wagner, for the purpose of field observations and the collecting of botanical and geological specimens. Wherry, an ardent mineral collector, gave considerable popular mineralogy in his chemistry lectures, referring as much as possible to various minerals of Pennsylvania as potential sources of the chemical elements studied in the course. There was, in addition, a good mineral collection on display at the Institute, with regional minerals very well represented.

After completing the chemistry course, Gordon and about a dozen other students signed up for Wherry's geology course at Wagner. This was as strong in mineralogy as geology, used the Philadelphia area as its field laboratory, and served to awaken in the boy a passionate regard for minerals, as much for their beauty and crystallographic perfection as for their scientific interest. The teacher, already a member of the Philadelphia Mineral Club (later to become the Philadelphia Mineralogical Society), encouraged his proteges to attend its meetings and consider joining as student members.

Even at that early time Gordon gave notice of an unusual personality which, together with his quick and fertile mind and capacity for persistent effort and strong leadership, exerted a powerful influence on his fellows and helped him attract close associates and capture loyal friends throughout his life.

ENTERING THE PHILADELPHIA ACADEMY

The Philadelphia Mineral Club had its monthly meetings at the Academy of Natural Sciences. That venerable institution had for many years promoted both the serious study and popular cultivation of various fields of natural science. Philadelphia had been a cultural center for widespread interest in the natural sciences since the early eighteen hundreds. In those earlier days it had been fashionable to be interested in nature, to dabble in courses of study, and to collect specimens and maintain in one's home glass cabinets displaying fossils, shells and minerals. As a result, and chiefly through the gifts of wealthy laymen members, important scientific collections in botany, zoology, and geology and mineralogy were housed in the Academy. Excellent geological and paleontological collections were included; above all, there was the outstanding private mineral collection of William S. Vaux, which had been willed to the institution and moved there after its donor's death shortly before the turn of the century.

Among other educational bequests, the Academy had received funds from the Jessup family to establish a Jessup Student Fellowship. This award went yearly to a student of unusual promise in one of the natural sciences, who would receive a small salary and work part-time as an assistant in the department of his interest. Gordon was encouraged, probably by Wherry, to apply for this fellowship in the department of geology. He received it in 1913, and so began at the age of sixteen his long association with the Academy.

Frank J. Keeley was the honorary curator of the Vaux collection and in charge of the mineral exhibits. The Academy, because of its modest size and insufficient public support, was proverbially short on funds for adequate staff salaries. Keeley had a private income, thus could assume the Vaux mineral curatorship in an honorary capacity. In young Gordon he found an assistant full of enthusiasm for hard work and eager to handle and come to know fine minerals. The Vaux collection consisted of about 12,000 specimens. When such a large private collection comes to an institution like the Academy without having its own catalog, its specimens are apt to require a complete overhaul of reorganization, renumbering and reclassification. A large number of its better-quality commoner minerals, representing as many distinct species and important localities as possible, must be selected and arranged for museum display. The remainder is kept in drawer-cabinets, in this case in the ground-floor rooms set aside for mineral storage behind the large Geology Hall near the main entrance of the building.

The Academy benefited from Gordon's labors on the Vaux collection, and the student gained the practical

Fig. 2. **Philadelphia collectors (about 1910) including S. G. Gordon (holding satchel), E. T. Wherry (second from left), J. Frankenfield (third), R. Rosenbaum (fifth), W. Kanbe (seventh).**

working knowledge of minerals, dealing with their appearance, properties, localities and geological association, which most young mineral collectors are anxious to acquire.

INTEREST IN MINERAL OCCURRENCES

At this beginning period in Gordon's development as a mineralogist, his interest was centered on field occurrences of minerals. Certain minerals are found in association with particular rocks. Why? Knowledge of why minerals occur where they do provides a key to understanding their chemical make-up, related in turn to the chemistry of the surrounding rocks, and their geological origin. There is no question but that Wherry's influence was paramount here, aided by the extremely active field collecting Gordon and his friends were doing throughout a widespread and varied geological terrain centering on southeastern Pennsylvania. Such interest in mineral occurrences made him feel that minerals ought to be classified genetically, according to their geological association and origin. He found it especially useful to apply these ideas to Pennsylvania mineral occurrences, where for a long time he had been recording detailed observational data on rock associations and particular geologic environments. Those ideas, supported by field experience, led to his first publication, entitled *An arrangement of minerals according to their occurrence,* with Wherry as senior co-author. It appeared as a 32-page article in the *Proceedings* of the Academy for 1915, (Vol. 67, p. 426-457), in which about 800 minerals were classified according to different types of geological occurrence and origin.

This was a crucial point in Gordon's development as a mineralogist and scientist. He was eighteen. He should have been thinking about college and aiming toward subsequent graduate study culminating in advanced degrees in geology and mineralogy. That's the path normally followed by young men aspiring to be mineralogists and professional scientists. Not only does an advanced degree, and especially the Ph.D., lead to scholarly associations and remunerative positions, as in teaching and research; just as important, it exposes a student to the rigorous intellectual training and scientific discipline under exacting teachers which prove indispensable to the making of a professional scientist. Gordon had become so useful to Keeley and the Academy as a Jessup Fellow that he was appointed as assistant curator of minerals in 1915 and given a regular salary of about a thousand dollars a year. Accepting that position meant giving up chances for the normal educational training open to a student of his intellectual promise. How well he recognized that, we do not know; but it's clear that he unhesitatingly did what he most wanted to do. Lack of family financial support could have been a deciding factor also. One feels that, by remaining at the Academy and relying for his future education upon part-time enrollment in night-school courses offered by near-by colleges, he made a decision harmful to his future.

The courses he could take in off-hours would be limited primarily to those in the basic sciences. For his training as a mineralogist, and the learning of the specialized advanced techniques peculiar to mineralogical research, he would mostly have to teach himself. That he became an accomplished mineralogist and highly proficient professional scientist despite such educational handicaps, proves the caliber of the man. What he might have further achieved in mineralogy, with more education and better training, can only be conjectured.

From the years 1915 to 1920 Gordon worked at the Academy as an assistant curator, but he never missed a chance on weekends and holidays to get out into the field for mineral collecting. His interests remained concentrated on the investigation of Pennsylvania mineral localities and their geological surroundings. All of the specimens he picked up on mine dumps and pried out of quarry walls, some of them unexcelled in Pennsylvania for rarity, crystallized quality and beauty, he contributed to the Academy. During that same period, too, he became one of the most influential members of the Philadelphia Mineralogical Society, serving as its secretary for many years. He and his closest mineral-minded companions greatly invigorated that amateur organization, broadened its activities, and much enlarged its membership. A related concern of his was the general status of American mineralogy and its lack of a representative scientific journal.

FOUNDING THE AMERICAN MINERALOGIST

At that time there were not many American professional mineralogists. They made up a small, rather inarticulate group among the large membership of the Geological Society of America. A few of them, however, had been trying to create an independent scientific society. This was not realized until 1919. Just as vital to the future of American mineralogy was the need to develop a specialized journal. Such an undertaking seemed insuperable, when judged from a practical financial standpoint. Gordon nevertheless accepted the challenge, with his unlimited enthusiasm, encouraged also by Wherry and a number of his own mineral-amateur friends in both the Philadelphia and New York Mineralogical Clubs. He made up his mind to develop such a journal, regardless of the difficulties. The story of how he achieved it, so as to bring into being what was gradually to become the world's foremost journal of mineralogy, was described in 1969 by George Phair, archivist of the Mineralogical Society of America. The following excerpts from his detailed account, published in the September-October, 1969, issue of *The American Mineralogist* (The American Mineralogist: its first four years, v. 54, p. 1233-1243), made widely known for the first time Gordon's key role in the combined amateur-professional journalistic undertaking:

The early files show that the late S. G. Gordon, then Assistant Curator at the Academy of Natural Sciences, Philadelphia, was the prime instigator and organizer of The American Mineralogist. *To be sure, an organization of American mineralogists with its own vehicle of publication had been proposed in academic circles as early as the 1913 meeting of the Geological Society of America,*

Fig. 3. **Pennsylvania collectors (about 1912) including Gordon (second from left), H. W. Trudell (third), E. Benge (seventh).**

but nothing had come of it for want of a means of implementation. Gordon conceived the idea of implementing publication by working through the nation's larger mineral clubs. In this less specialized era the number of practicing professionals who could be relied upon to support a mineralogical journal was open to debate, whereas the membership in the larger mineral clubs was a known quantity. Gordon himself was a member of the Philadelphia Mineralogical Society and had connections in the New York Mineralogical Club (76 members) and in the Mineral Collector's Association, a nationwide organization (80 members) ...

Gordon was 19 years old when he recruited and set up the staff of what was to become The American Mineralogist ...

Gordon spent much of 1915 contacting individuals and organizations and by early 1916 had assembled a staff. With becoming modesty he took upon himself the nominally secondary role of an associate editor but, in fact, remained a major force in the enterprise ...

In a footnote to a long letter to Gordon dated December 31, 1915, Dr. E. T. Wherry had written 'Let me know how the proposed Mineral Collector is coming on; I want to be an assistant editor of it.' Wherry was named Managing Editor, but for all practical purposes was the Editor! ...

Because Dr. Wherry combined the broad gauge interests of the born naturalist with the disciplined skills of the professional scientist and, above all, could speak the layman's language, he seemed the ideal man to bridge the communications gap between amateur and professional. He more than lived up to this promise ...

The only member of the staff to have his name in full capitals on the letterhead of The American Mineralogist *stationery was the Publisher, Robert Rosenbaum, whose job it was to make printing arrangements and solicit new subscribers ... As time went on, more and more of his duties fell to other members of the staff and in particular to the Business Manager, H. W. Trudell who, so far as the files can tell us, was appointed later in the year to bring order into the bookkeeping chaos.*

Trudell put in a normal work week as treasurer of a leather firm and transacted the business of The American Mineralogist *after hours and on weekends. In later years Gordon was to name the new mineral* Trudellite *after his life-long friend ... Trudell died at the age of 84 in 1964 ...*

And a Philadelphia enterprise it truly was! Even at this early stage in the journal's history the setting of policy, and the actual operations had devolved largely upon three men, Wherry, Gordon and Trudell. For the ensuing four years this trio was to give unstintingly of themselves and of their resources, and the journal was seldom out of debt financially to one or all of the three ...

Once the staff had been appointed, the next orders of business were, (1) naming the journal and (2) defining its scope ...

It is apparent that the title finally agreed upon, The American Mineralogist, *was a compromise thought to exhibit the necessary level of dignity while keeping the human touch. It appears to have been suggested by Gordon ...*

Several points are worth noting in connection with Dr. Phair's account. Most persons, except for Wherry, who labored mightily to start this journal and keep it going, were amateurs and close associates of Gordon. Trudell and Rosenbaum were life-long friends. In later years, as the journal understandably became increasingly specialized in scientific mineralogy, the early amateur associations and support fell away. The present journal, as a sad result, has hardly anything in it to attract the interest of mineral amateurs, most of the published material being far too technical to be easily understood by anyone except specialists. This has been one of the factors contributing to an ever-widening gap in understanding and association between professional mineralogists and the thousands of more educationally-oriented mineral amateurs in this country.

It needs to be realized that the contributions of Gordon and his associates to the founding of this vital organ of American mineralogy had been largely forgotton, if ever known, by present-day mineralogists until the publication of the Phair article. It was fitting indeed for the record to be set straight at long last by having the account printed in a special issue of the journal on the occasion of the fiftieth anniversary of the founding of the Mineralogical Society of America.

FIRST PAPERS ON DESCRIPTIVE MINERALOGY

In the fourth number of the first volume of *The American Mineralogist* (October, 1916, p. 55-56) Gordon published a short paper on "An occurrence of lamellar calcite (argentine) in Pennsylvania." As Gordon's first paper on descriptive mineralogy, it shows careful observation, study and interpretation of a mineral occurrence. Descriptive details, although painstakingly reported, were not enough for the author. It is evident that his main concern was the geological environment and manner of origin of the minerals described. A second descriptive paper, appearing two years later in this journal (3, 1918, p. 27-29) was in a more popular vein. It was entitled, "Famous Mineral Localities; 3, Amelia Court House, Virginia." Here was revealed another side of Gordon: his interest in travel, enjoyment of companionship on field excursions, and bent for writing about collecting experiences in a vivid and human way.

Two more published papers, in 1920 and 1921, accentuate the author's keen interest in the geologic surroundings and genesis of minerals as well as being petrologic studies of the associated rocks. The first, "Ordovician basalts and quartz diabases in Lebanon County, Pennsylvania" came out in the *Proceedings of the Academy of Natural Sciences of Philadelphia* (Vol. 72, 1920, p. 354-357). This short geological study tells us of the continuing influence of Wherry, both as one who had already published papers on related rocks of the same region and a critical reader of Gordon's effort. We learn something too about the additional guidance of Keeley, who was primarily a petrographer and mineral microscopist. What is strikingly evident, even at this early stage, is the young curator's wide-ranging study and growing proficiency in advanced laboratory techniques applicable to several related fields of geology and mineralogy.

Fig. 4.* Sam Gordon at the Mt. Hope iron mine, New Jersey, in 1915. *Photo by H. W. Trudell.

The second paper, "Desilicated granitic pegmatites," appearing likewise in the Academy *Proceedings* (Vol. 73, 1921, p. 169-192), was a more lengthy report. It presented extensive descriptive data on certain unusual deposits of coarse-grained pegmatitic rocks rich in plagioclase feldspar and the aluminum-rich mineral, corundum. The deposits treated in detail were both those of Pennsylvania and Maryland, studied by the author in the field and laboratory, as well as a number of occurrences elsewhere already described in the literature. Gordon analyzed and interpreted all of the available data on such deposits in terms of the rock types involved, chemical relationships, and diagnostic mineral associations, ending up with his own independent (and somewhat immature, it must be admitted) conclusions as to the geological origin of the deposits. The study required a thorough search of the pertinent literature, extensive field work, and a painstaking petrographic laboratory investigation.

Several additional short descriptive papers on mineral occurrences were published during this period, between 1916 and 1921, in *The American Mineralogist* and the *Proceedings* of the Philadelphia Academy.

THE MINERALOGY OF PENNSYLVANIA

During Gordon's first eight years at the Academy he was busy compiling all possible data on mineral occurrences and localities in Pennsylvania. This was a truly ambitious undertaking. It grew out of his indefatigable field collecting and creative concern for the geological associations and origin of the minerals collected and studied. It led finally to the publication of one of his finest scholarly achievements, and the work by which he is perhaps best remembered. This was *The Mineralogy of Pennsylvania,* a separate volume published by the Academy in 1922 as its Special Publication Number 1.

This work stands out as one of the very best we have in this country of the type known as a "State Mineralogy." Gordon had one real advantage to start with, as he explained in his preface: the considerable amount of earlier published data on Pennsylvania mineral localities. The well-known mineralogist-chemist, F. A. Genth of Philadelphia, had published in 1875 as a Bulletin of the Pennsylvania Geological Survey a detailed compilation on the *Minerals of Pennsylvania,* listing the minerals and localities known at that early date. Other descriptive mineralogists, including some amateur collectors, such as E. Benge and E. T. Wherry, T. A. Rand, and John Eyerman, had authored similar but less complete publications. Gordon built a greater work out of all of them. His book, of 255 pages together with numerous illustrations, treated the geology of the whole state, explained the geological formation of minerals in general, covered the descriptive mineralogy of the state minerals in particular, and went into the localities, occurrences and stages of formation of these last in detail. The history of mineral collecting and study in Pennsylvania was well described also. This volume has gone through three printings. The best proof of its continuing value to mineralogy is its very active present-day use by Pennsylvania collectors and its influence in promoting a higher degree of scientific interest among these amateur readers. Gordon was just twenty-five when it was published.

The Collector, continued from page 253.

"*Colorado Minerals.* Amazon Stone, Microcline... I have not received a specimen for about ten years, and for some time past the most of the specimens sold to tourists at the foot of Pike's Peak have been supplied by me. Good crystals can be supplied at from 10¢ to $50.00. . Smoky Quartz, Cairngorm Stone. The great crystal four feet and ten inches long, exhibited at the Expositions in Philadelphia, London and Paris, was sold to the National Museum in the Jardin des Plantes, Paris; many beautiful specimens of all sizes are offered at from 5¢ to $10.00. Gold. In 1891 a visit to the celebrated mining camp of Breckenridge secured a number of choice groups of crystals from $1.00 to $15.00 each; one extra beautiful, measuring 1 7/8 x 1 3/8 inches showing the crystals well on both sides is valued at $50.00..."

"Pyrite. The brilliant groups from Central City have long been famous. As the mines are steadily increasing in depth, specimens are becoming much more rare. By purchases from a fine old collection, I am enabled to offer good specimens at from $1.00 to $5.00; one remarkable specimen, exceedingly brilliant, 6 1/4 x 3 3/4 inches, $25.00."

"*Arkansas Minerals.* It is known to most collectors that on my visits to Magnet Cove, in 1874 and 1875, I obtained the most remarkable specimens of Brookite, Rutile, Aegirite, Schlorlomite, and the other rare species of this interesting region. From that time until the present day not a year and scarcely a month has passed that I have not received boxes of these minerals from the Cove. These shipments have amounted to many thousands of pounds; boxes weighing several hundred pounds have been received during the past month...Brookite, in all of the various forms described by Dana, Von Rath and others, 5¢ to $5.00... Rutile, var. Nigerin, in fine large masses of aggregated crystals; very brilliant, at from 25¢ to $1.00 per pound, according to quality. Twins, sixlings and eightlings of Rutile, known as "rosettes," from 25¢ to $2.50..."

"*Canadian Minerals.* Zircon. I still have a good assortment of the twin crystals which I was the first to describe at from 25¢ to $5.00; simple crystals, in and out of the gangue, some associated with Titanite, from 5¢ to $3.50. A twelve pound crystal, sold to the Vaux Collection in the Academy of Natural Sciences, Philadelphia, was the largest ever found. Titanite, in simple crystals and in twins, in and out of the gangue, from 5¢ to $5.00; a perfect crystal weighing eighty pounds was sold to Harvard College..."

"*New York Minerals...* Fluorite, green, from Muscolonge Lake. Large specimens of this recent find, at exceedingly low rates, 50¢ to $3.50. A fine museum specimen, twelve inches square, $5.00. Another, 10 x 15 inches, showing cubes 4 inches across, $7.50... Over one ton of black tourmalines were shipped in from Pierrepont, 5¢ to $1.50..."

"*New Jersey Minerals.* Franklin... Rhodonite, var, Fowlerite, the most beautiful crystals found in the world. For over a year I made almost monthly visits to the locality, hiring men to work over the dumps and purchasing all the specimens obtainable... 25¢ to $5.00. Zeolites from Bergen Hill. During the progress of the work of building the tunnels and cuts, I frequently visited this celebrated locality, purchasing directly from the miners, then, in 1881 and 1882, after it seemed certain that no more work would be done, I purchased all the best collections of Bergen Hill minerals that were known at that time, one of these that of a physician living at the locality, filled over forty boxes..."

And on and on and on, Foote hasn't run out of space, but we have. "Everyone should visit these buildings, and a call at 4116 Elm Avenue would convince that here is the largest stock of minerals and scientific books in the world, over 300 tons..." And how would you like to have spent a day there, with a hundred dollars to spend?

Yedlin on Micromounting

About fifteen years ago the Smithsonian received from the University of Athens, Greece, some four hundred pounds of Laurium slags, recovered from the beaches during low tides, and gleaned by geology students for an exchange. Not too fruitful was this harvest, however, for the vast majority of the slags were rather small, well rounded, and were probably the resulting wastes when a French company reworked them for lead and silver during the turn of the nineteenth to twentieth centuries.

As a result the nodules were small and hard, and the rare oxychlorides were notably scarce; the major quantities producing twinned cerussite crystals, needles of aragonite, and, on occasion, good tetragonal crystals of phosgenite.

One lucky break produced minute blue crystals, so small as to be almost indistinguishable in crystal form. These rested directly on the slag matrix, and were occasionally associated with long prismatic phosgenites. Many hours with a breaker uncovered a few additional specimens, but none of such size that they could be determined under the usual low powered stereo-microscope. It was speculated that the blue material might be in the boleite-cumengite group, and the usual dilemma presented itself: Should we crush all the material for testing and know what we had, or should we preserve the material and not know its idenfuse material might become available, and this proved to be the case.

In the latter part of 1972 we visited the Royal Ontario Museum in Toronto and were promptly shown an eighty pound case of similar Laurium slags, but recently air mailed from Athens by a Canadian collector. "Go to it.", suggested Dr. Joe Mandarino, curator of mineralogy there. "It isn't too often that we get free manpower to break up and inspect rough material."

It was from this melange that we uncovered more of the blue mineral, in crystals large enough to study at about 40 X of a microscope. Again we visited the Smithsonian (National Museum of Natural History) and met Roland Rouse, who had begun doing X-Ray work on the first lot of samples. We supplied several additional specimens, blue and greenish blue, and as surmised, boleite, pseudoboleite and cumengite were identified. Rouse's findings were incorporated into the accompanying chart supplied by him. The first four specimens (1-1 through 1-4) are from the Royal Ontario Museum material. The fifty (3-1) was furnished by Paul E. Desautels from the Smithsonian supply. Rouse's forwarding letter (dated, Sept. 8, 1973) follows. His reference to Winchell therein is of Dr. Robert Winchell of California.

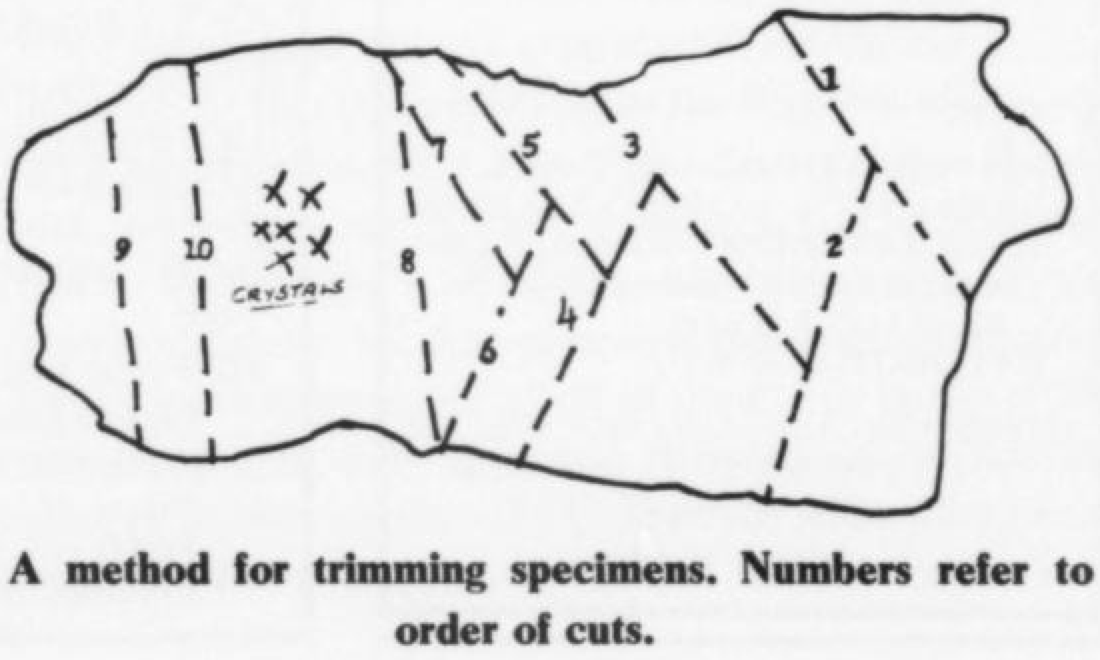
Dear Neal,

Having finished a survey of your Laurium specimens, I am submitting the results to you on the enclosed sheet. Feel free to use this data as you wish including publication. I think numbers 1-2 and 1-3 deserve further study by single-crystal methods and with your permission I will retain them for this purpose. The powder pattern of the green crystals seems to be that of a pseudoboleite + boleite mixture. However, the pattern was not of the best quality and there may have been subtle differences between it and the standard patterns of these two minerals, which I could not observe. Interestingly, Winchell was able to synthesize both pseudoboleite and boleite in a deep green form. He could not find any differences in the patterns of the green materials when he compared them to the patterns of the natural blue crystals. Number 1-3 looks like a single crystal with a tetragonal morphology and might be a single crystal of pseudoboleite. It could also be an undescribed mineral, as we have reason to believe that there exist compositions intermediate between boleite and pseudoboleite. Single crystals of pseudoboleite are unknown in nature; however, Winchell was able to synthesize discrete crystals which are not overgrown on boleite. Winchell and I are writing a review article on the boleite group. I will send you a preprint when it's ready.

Yours sincerely,
Roland Rouse

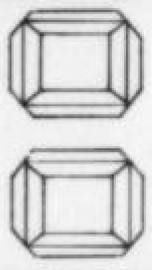
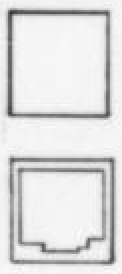
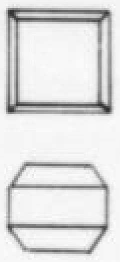
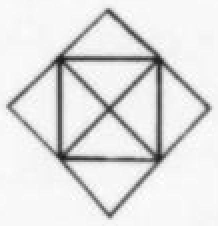
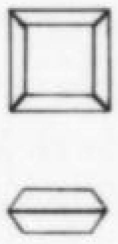
Some random notes:

1. Wurtzite - sphalerite from Thomaston Dam, Connect-



A method for trimming specimens. Numbers refer to order of cuts.

BLUE MINERAL IN SLAGS OF LAURIUM, GREECE.

NUMBER	COLOR	HABIT	NAME	COMMENTS
1-1	Blue		Boleite & Pseudoboleite	X-rayed. Typical pseudoboleite overgrowths on boleite.
1-2	Bluish Green		Boleite & Pseudoboleite	X-rayed. Despite color difference pattern corresponds to boleite & pseudoboleite.
1-3	Blue		Pseudoboleite (& Boleite?)	X-rayed. Possibly a *single* crystal of pseudoboleite (can't be sure yet. 9-8-73).
1-4	Blue		Cumengite & Boleite	Not X-rayed, but form is unmistakably that of cumengite overgrown on boleite.
3-1 (From Desautels)	Blue		Cumengite	X-rayed. Morphology identical to that of synthetic cumengite.

Roland Rouse at National Museum Natural History 9/19/73

Continued on page 288

Black Quartz from Vitoria da Conquista, Brazil

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Jeannine O. Cassedanne

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National Research Council (C.N.Pq).
Rio de Janeiro, Brazil

Numerous and magnificent specimens of crystallized black quartz, actively exported, can be seen in the Brazilian mineral-dealers' shops. The location being generally given as "Bahia" without more information, we searched for the exact location of the occurrence. It will be described below because very good specimens are still recoverable from the dumps.

LOCATION AND ACCESS

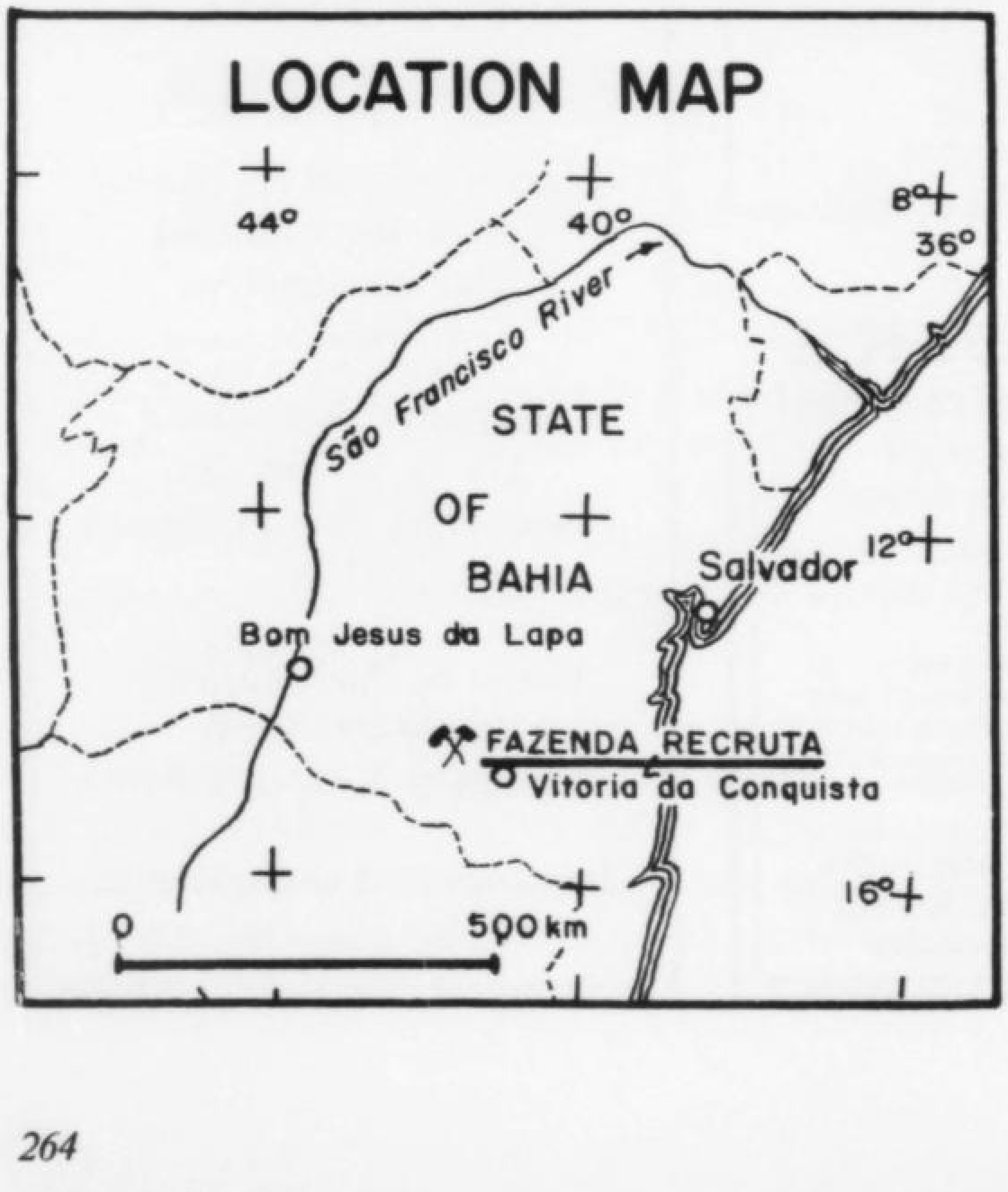
The black quartz occurrence is to the northwest of Vitoria da Conquista (elevation 990 meters) and approximately 350 kilometers southwest of Salvador (see location map) in the Recruta Farm (= Fazenda).

Vitoria lies on the main paved highway from Rio de Janeiro to Salvador ("Rio-Bahia") 1,160 kilometers from the former and 495 kilometers from the latter.

From Vitoria da Conquista, access to the mine is easy for the first 23.5 kilometers, via the good unpaved road to Bom Jesus da Lapa. From there a jeep road runs to the north and may be followed for one kilometer. The rest of the trip (0.5 kilometer) is made on foot. The mine is not visible from the main road.

DESCRIPTION OF THE OCCURRENCE

The black quartz occurrence is located on the western slope of a large plateau called "planalto bahiano" and formed by Algonkian metamorphic rocks. The region surrounding the mine is gently undulated with a scrubby thorny scattered vegetation (= caatinga).



The workings at the elevation of 835 meters, consist of an irregular excavation along a hydrothermal lenticular vein of quartz that strikes EW with a 50°N dip. This vein is frequently subdivided in two branches, and includes many elongated vugs reaching up one meter in length. These vugs are coated with sharp well-formed black quartz crystals.

The width of the vein is variable, reaching occasionally two meters. The visible longitudinal extension is nearly 30 meters. The wall-rock, in which the vein is concordant, is a micaceous, white and grey quartzitic, poorly banded gneiss.

The vein was a little tectonized before and after the deposition of the black quartz. Fragments of the latter are frequently cemented by brown chert and milky botryoidal chalcedony. Green surficial soil formed by the decomposition of the gneiss is very abundant in and near the vein and contains many embedded specimens.

The mining is manual and consists only in sorting fragments with good crystals from the druses, in order to sell them as specimens. The price for one kilogram of sorted material of very good quality was about 50 cents (U. S.) in 1970.

Today the occurrence is temporarily abandoned after having produced many tens of metric tons of specimens. However, the dumps still enclose many large crystallized specimens for any mineral collector to enjoy (see the photos).

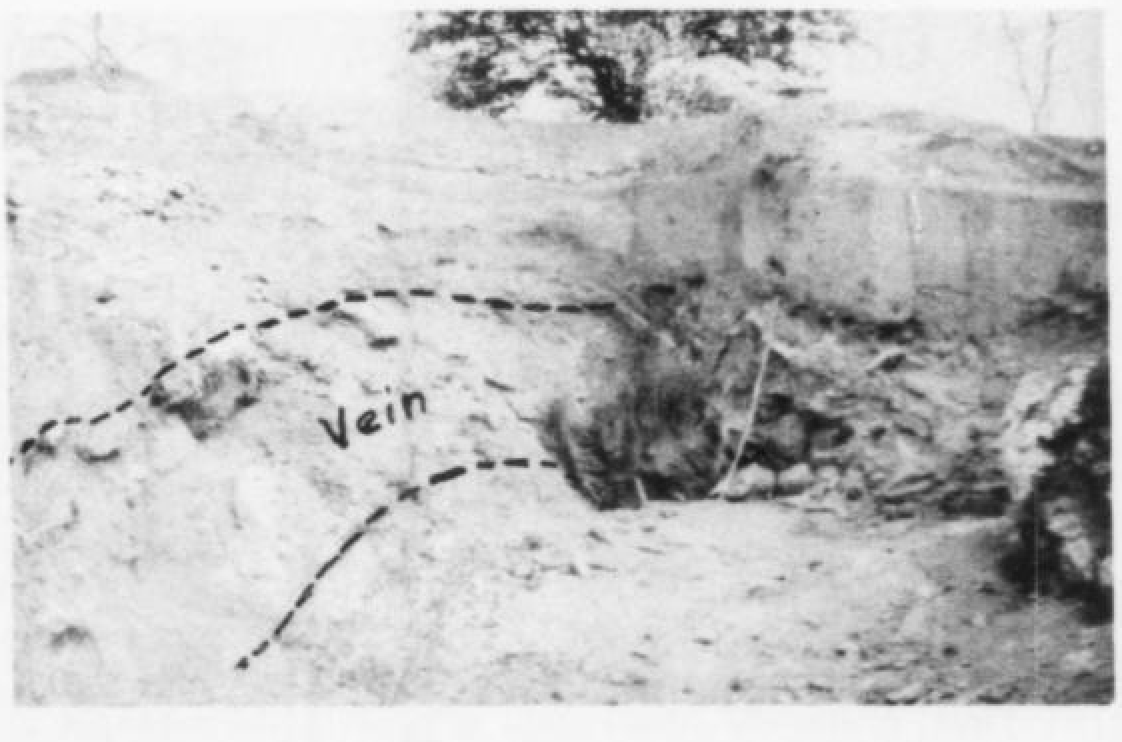


Fig. 1. **The pit. Sketch from a photo looking North.**

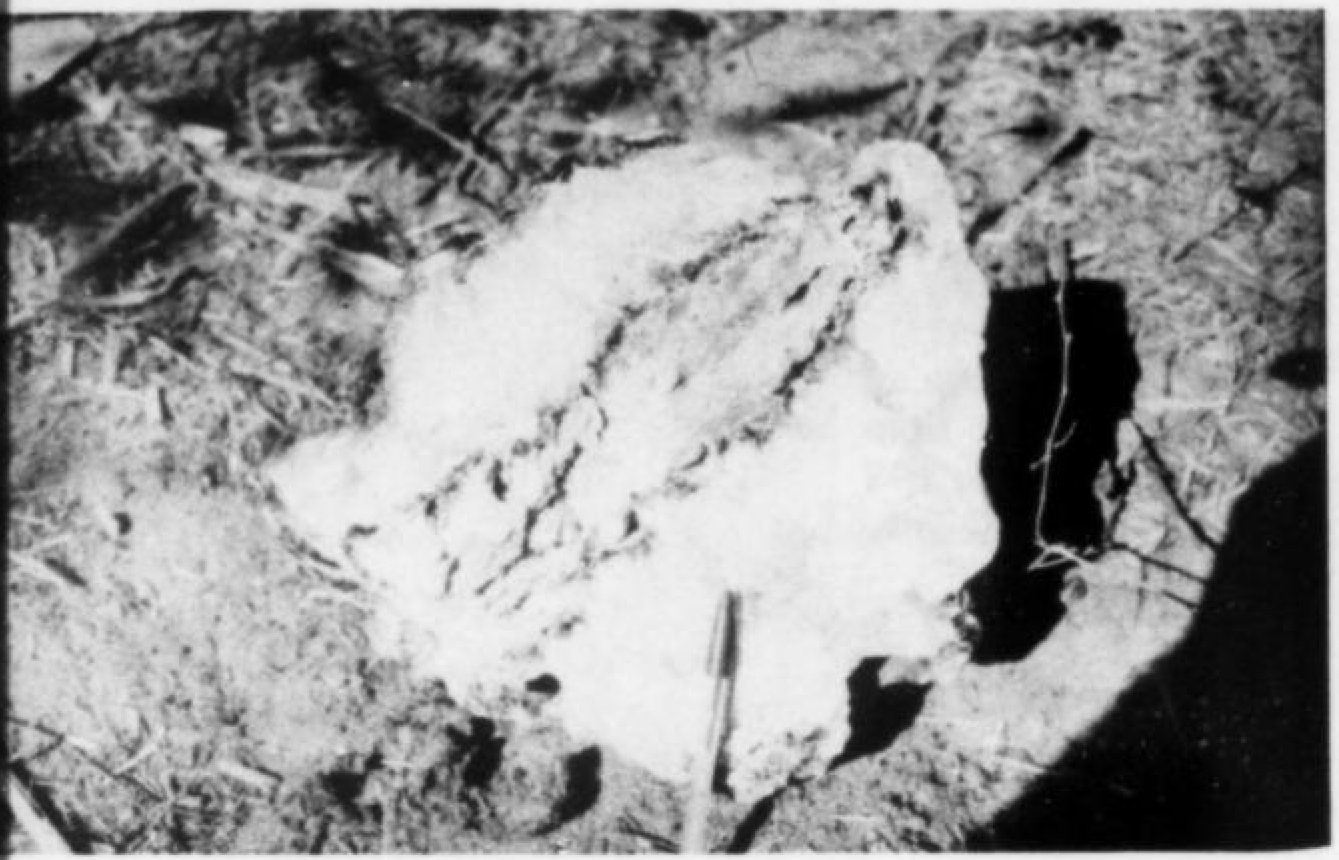


Fig. 2. **Core of barite surrounded by milky quartz.**

Fig. 3. **Specimen of platy aggregate from the dumps. Scale is 3 centimeters in length.**

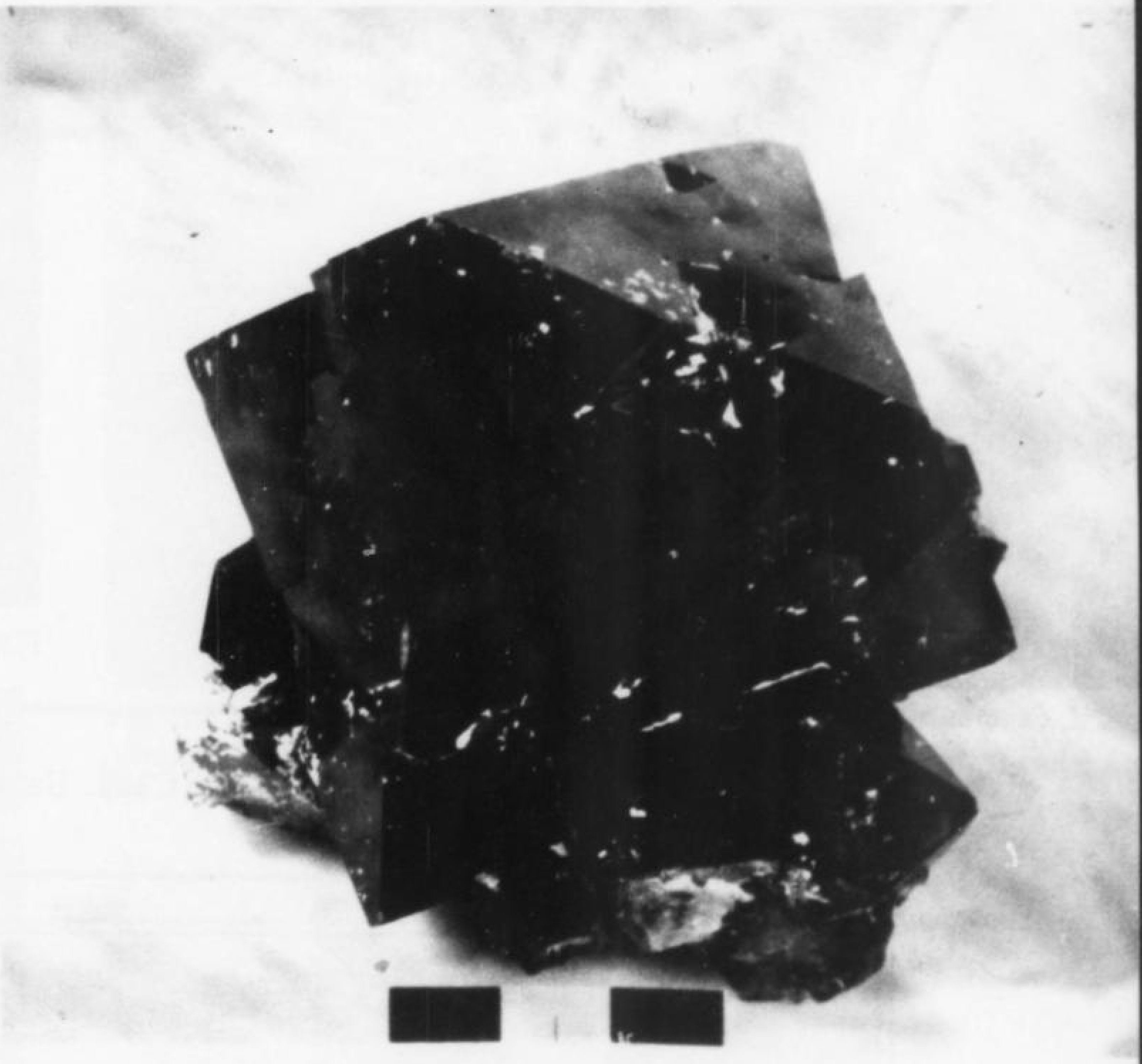


Fig. 4. **Specimen from the dumps. Scale is 3 centimeters in length.**

DESCRIPTION OF THE SPECIMENS

Specimens are single or aggregate crystals or, more frequently, plates, whose length may reach up to 50 centimeters and weight a few tens of kilograms.

Crystals form only one habit: a very uncommon and crystallographically determined double-ended pyramid {1012} without prism, with the *c* axis parallel to the matrix surface (J. P. Cassedanne — in press). Each crystal is single or formed by an aggregate of stepped or parallel growing pyramids. These always have sharp edges which vary from 1 centimeter to more than one decimeter in length.

The faces, always brilliant, are smooth or with thin growth figures. Some have steps when in contact with an another adjacent crystal. Externally, the specimens are opaque black, very rarely smoky and translucent and sometimes having a thin iridescent superficial film. Locally, millimetric size transparent doubly-terminated quartz crystals coat the faces of the black pyramids.

It is possible to observe in the large specimens that crystallization generally began around a barite core, with a compact irregular mass whose colour varies from white to dark grey. The salient faces occur only in the druses where the crystals are dark, as can be seen on sawn specimens where a black layer of approximately one centimeter in thickness covers a grey nucleus. The limit between the coloured zones is parallel to the external faces of the crystals.

Tectonic movements have locally sheared the quartz.

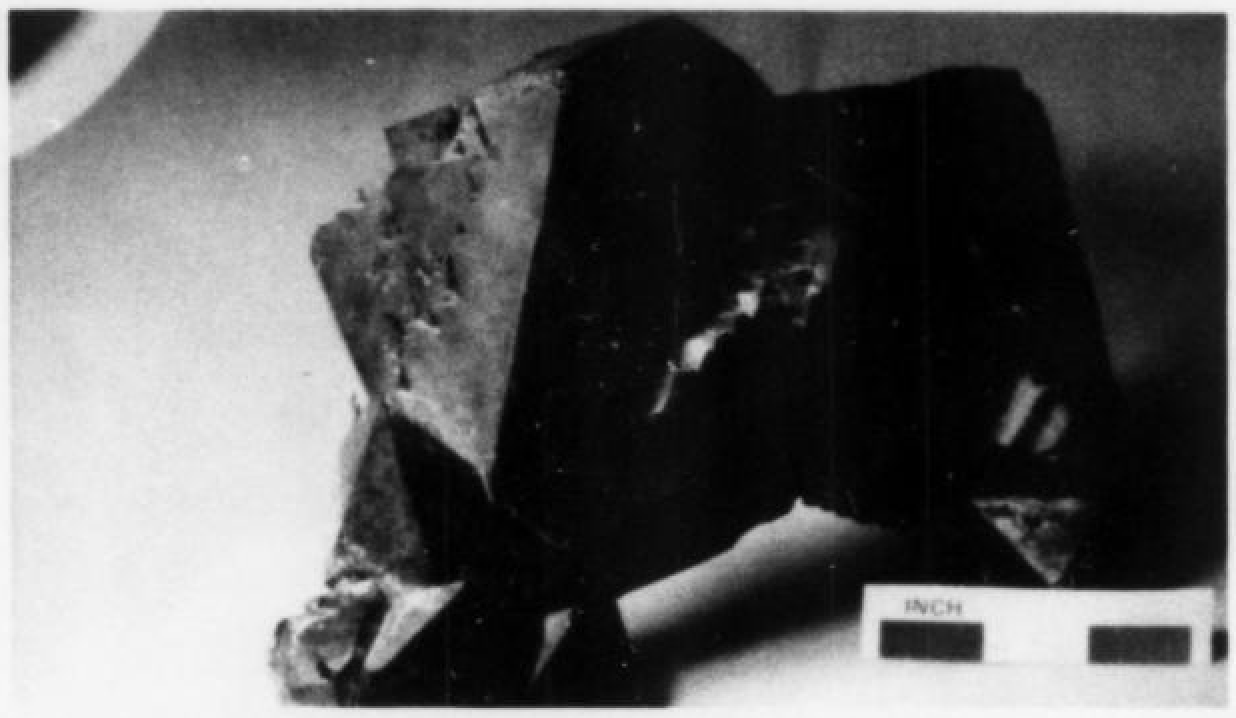


Fig. 5. **Specimen from the dumps. Scale is 3 inches in length.**

Fig. 6. **Close-up of a specimen from the vein. Scale is 3 inches in length.**

The resulting fragments are irregularly cemented by white, beige or brown spotted flint, with conchoidal fracture, or by chalcedony.

The barite (d = 4.22) is translucent, transparent or yellowish with rare, very rough faces. Samples are scattered in the soil or included in the quartz specimens.

Chalcedony, younger than the quartz, is white, mammillary or perfectly botryoidal and is commonly found on the aggregates of quartz crystals forming attractive specimens. It shows alternating strips of clear and slightly darker colour in sections.

The specimens figured herein and the photographs are from J. P. Cassedanne.

REFERENCE

CASSEDANNE, Jacques P. & Jeannine O. CASSEDANNE. Sur une forme rare du quartz. *Anais Acad. bras. Ciencias,* Rio de Janeiro (in press).

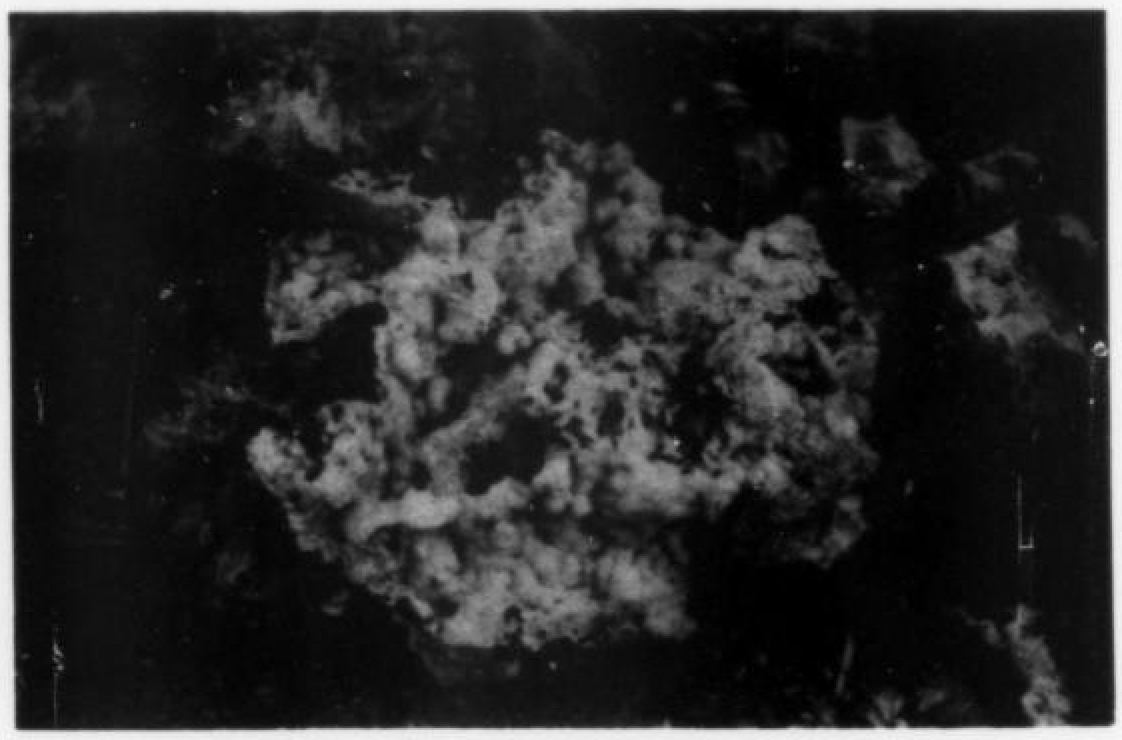
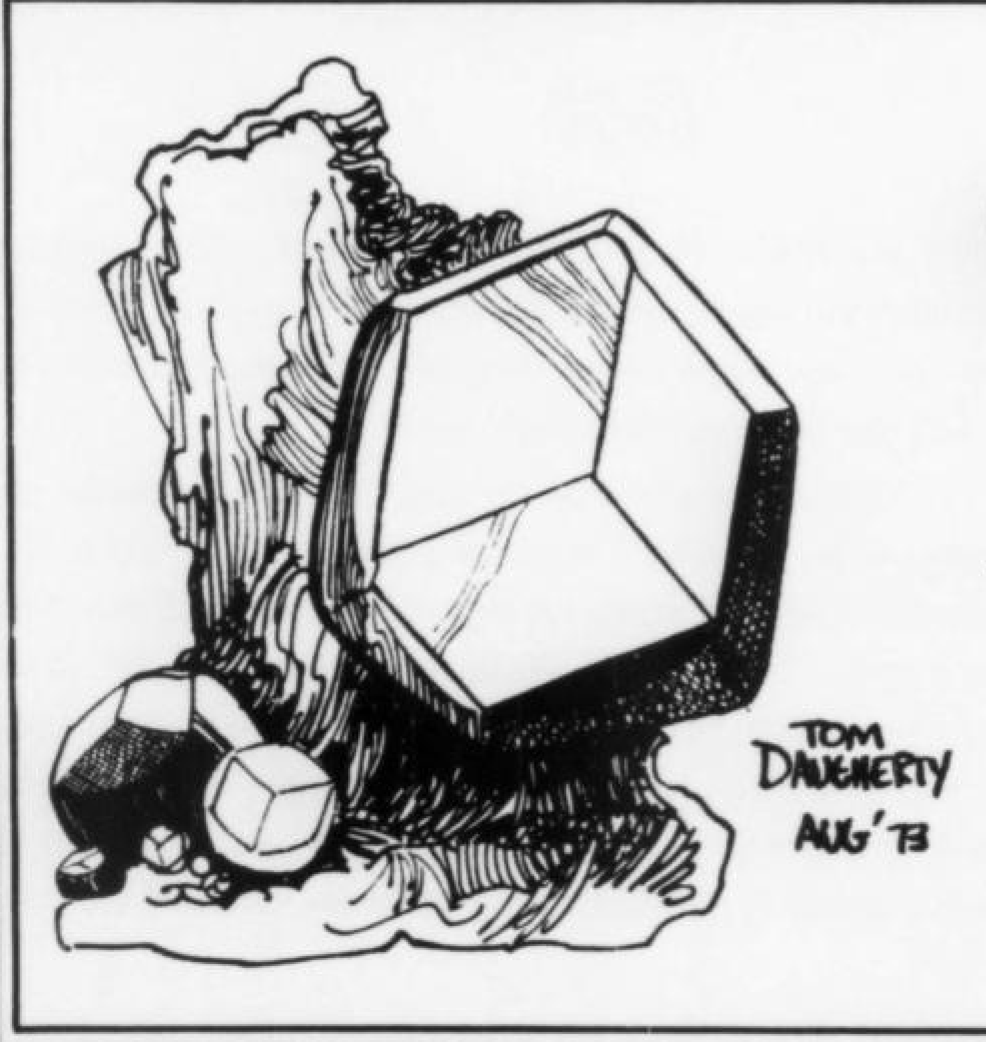


Fig. 7. **Chalcedony upon broken black quartz.**



Extreme Symmetrical Distortion of Pyrite from Naica, Mexico

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Washington, D. C. 20560

INTRODUCTION

Pyrite and cuprite are two isometric minerals known in many instances to appear to defy isometricity and grow in one direction several tens to thousands times longer than in the other directions. Thus these crystals are sometimes observed in long hairlike, or filiform, growths which are, nevertheless, still single crystals. Pyrite occurs in a wide variety of such elongated crystals. Extreme filament development is well-represented by pyrite from Hall's Gap, Kentucky (Fig. 1). The crystal habit that really made this locality famous, however, is that of the rings (Berndt, 1969; Bideaux, 1970) shown in Fig. 2. "Filiform" pyrite crystals from the Clackamous River, Oregon, and from Haledon, near Paterson, New Jersey, (Fig. 3) emerge from cube faces and grow in directions normal to these surfaces. They may grow in two or even three directions simultaneously. Some filaments actually change directions during growth, making sharp 90° turns but always remaining parallel to one of the three primary axes. Described here is symmetrically distorted pyrite from Mexico, a relatively newly discovered mineralogical curiosity.

***Fig. 1.* Pyrite filaments. Hall's Gap, Kentucky.**

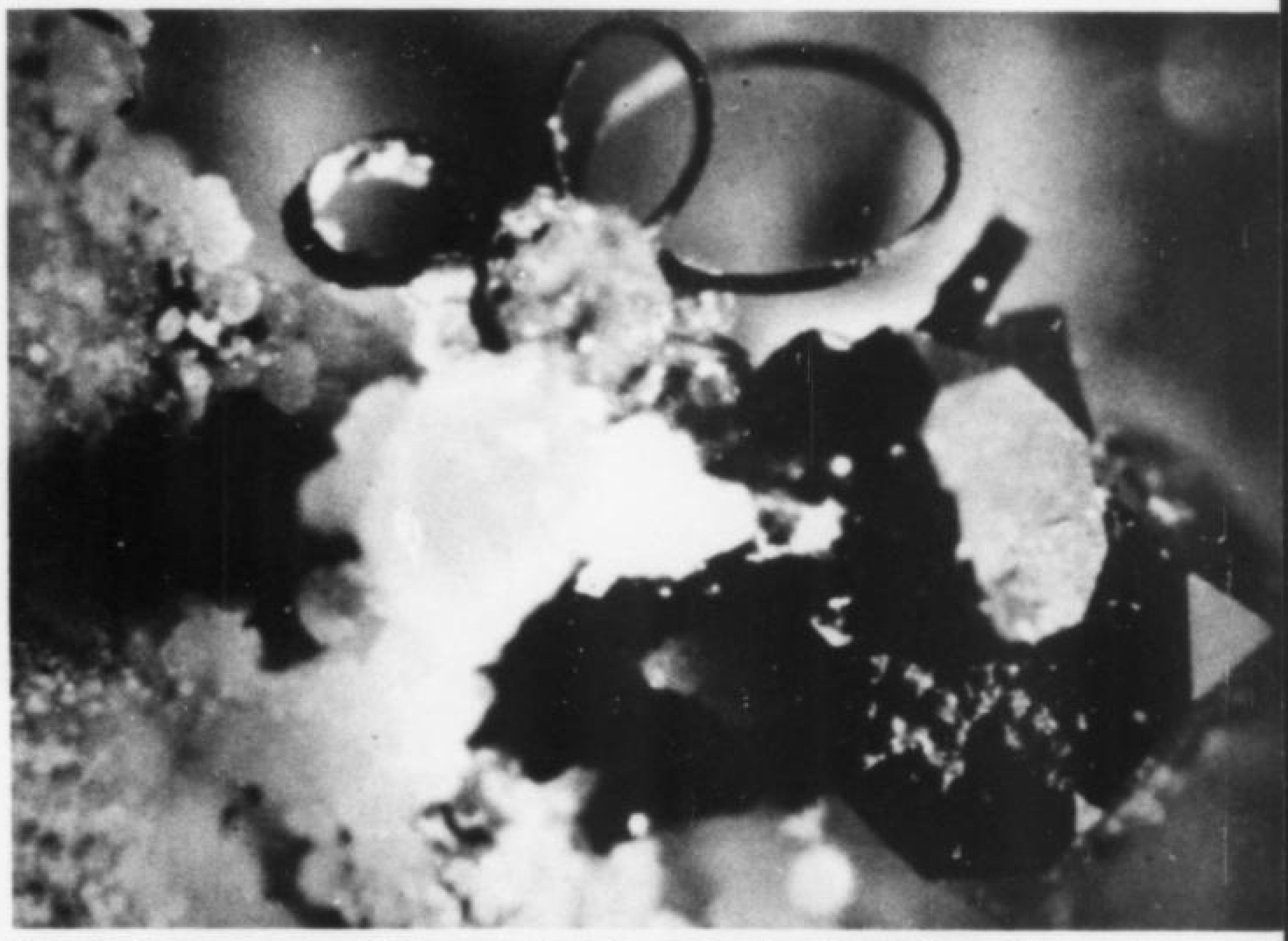

Fig. 2.* Pyrite rings with normal pyrite crystals. Hall's Gap, Kentucky. Douglas J. Berndt collection. *Photograph by Ben Kinkead.

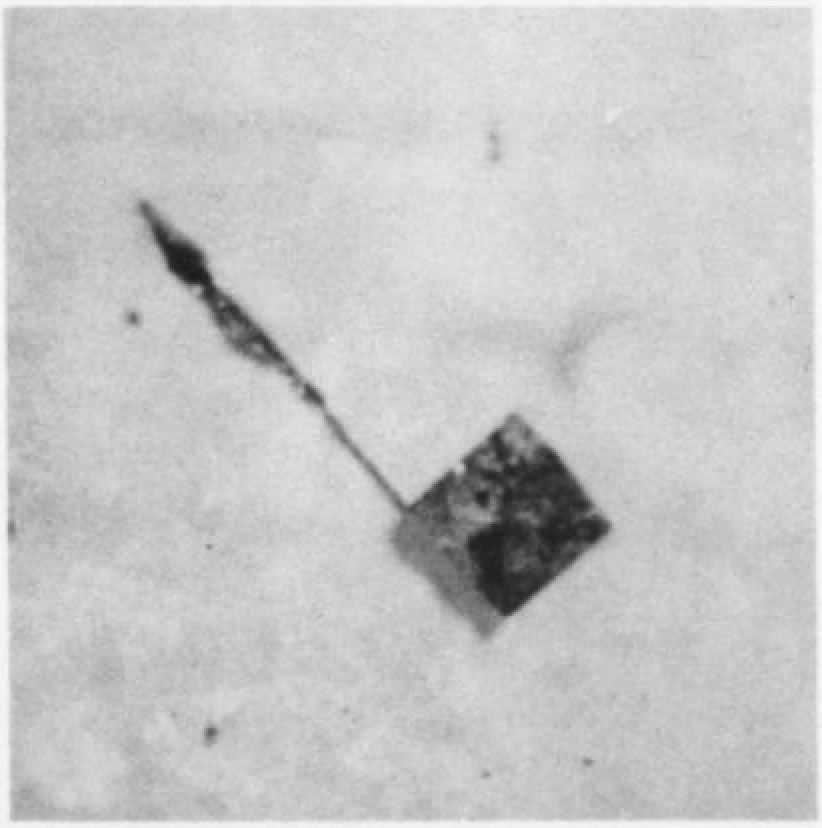

***Fig. 3.* Pyrite filament growing from pyrite cube. Haledon, near Paterson, New Jersey.**

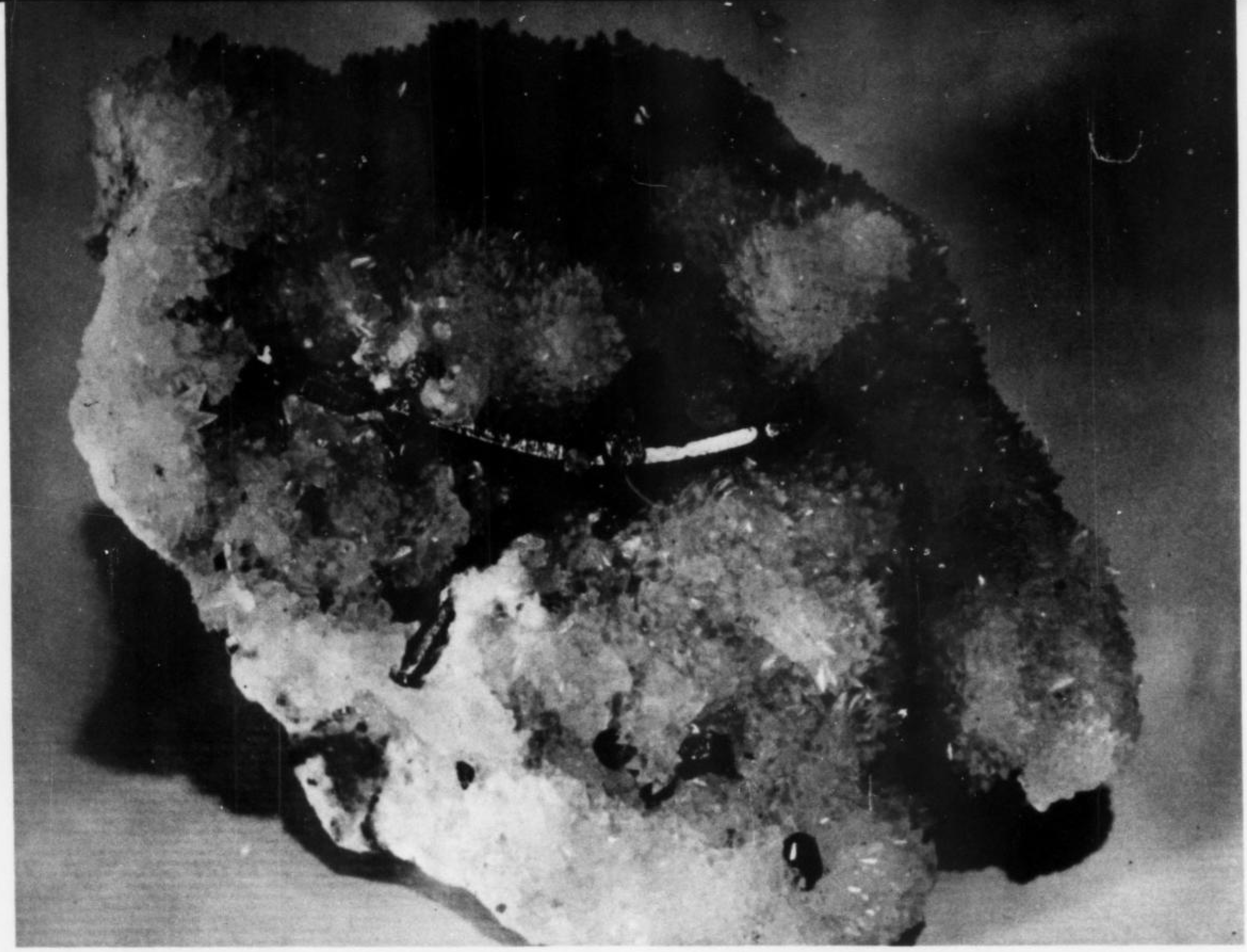

Fig. 4. **Pyrite. Naica, Chihuahua, Mexico. The longest crystal is 5 cm long. Smithsonian Institution specimen.**

The U. S. National Museum of Natural History (Smithsonian Institution) was the happy recent recipient of several specimens from Jack Young, of Lyko Mineral & Gem, Inc., El Paso, Texas. They came one at a time beginning with a small thumbnail-sized specimen and culminating in the specimen figured herein (Fig. 4). What makes this material so exciting is that the pyrite on all of the pieces is in long prismatic crystals and these, in my experience at least, are totally unique. Goldschmidt (1920) illustrated

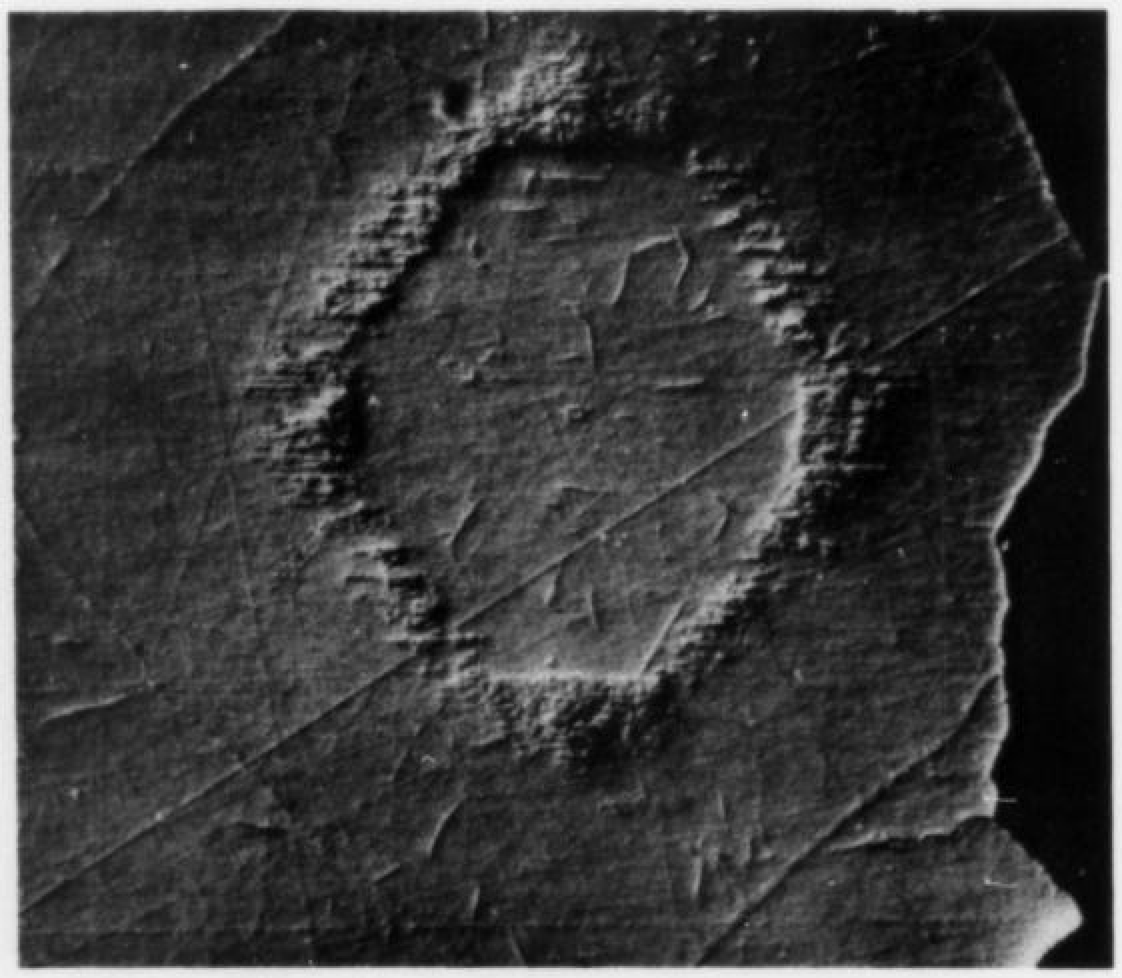

Fig. 5, a. **Pyrite. Naica, Chihuahua, Mexico. Cross section showing four distinct growth eqisodes.**

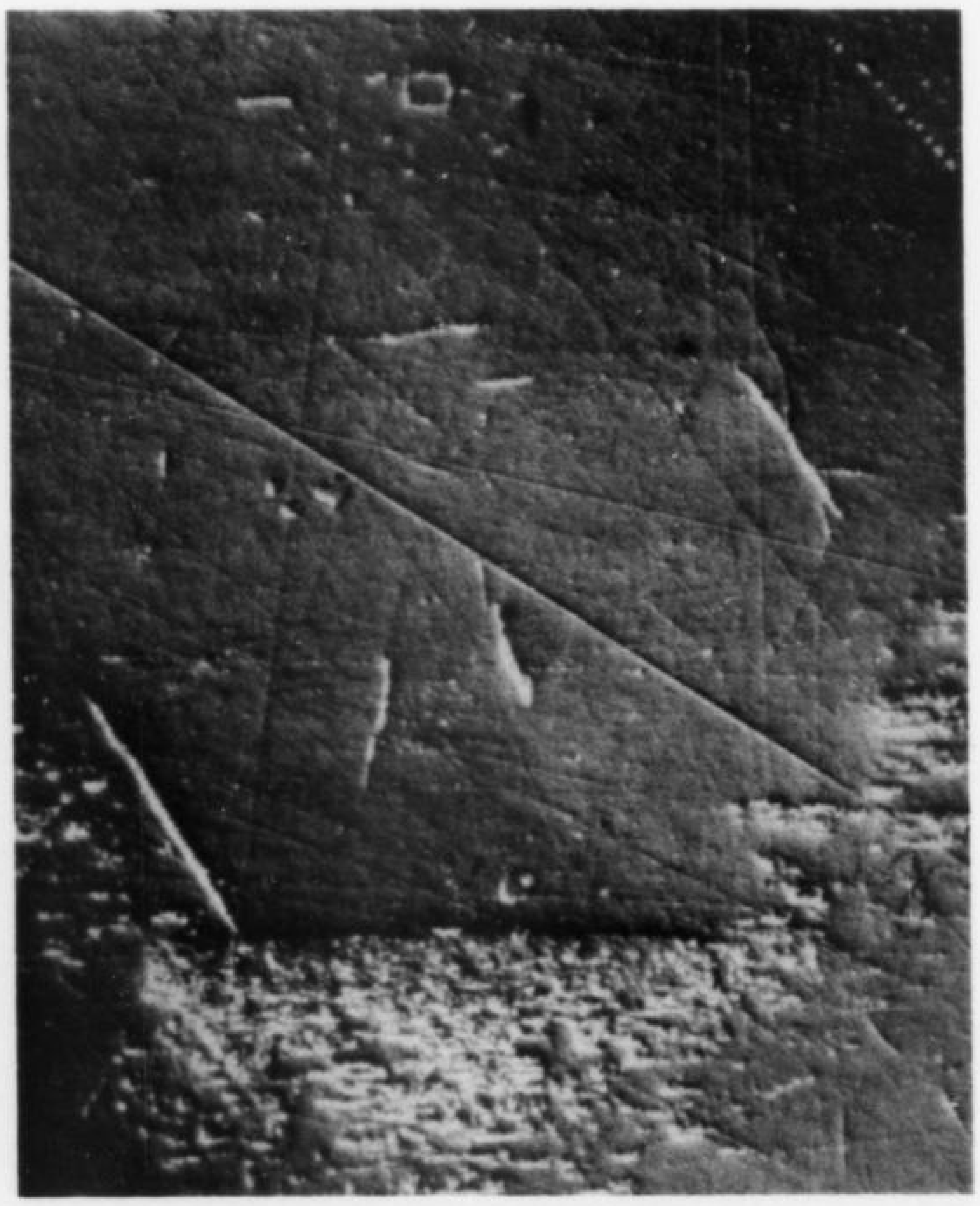

Fig. 5, b. **Enlarged section of portion of 5, *a.***

Fig. 6. **Pyrite ring. Hall's Gap, Kentucky. SEM photograph at 500X magnification.**

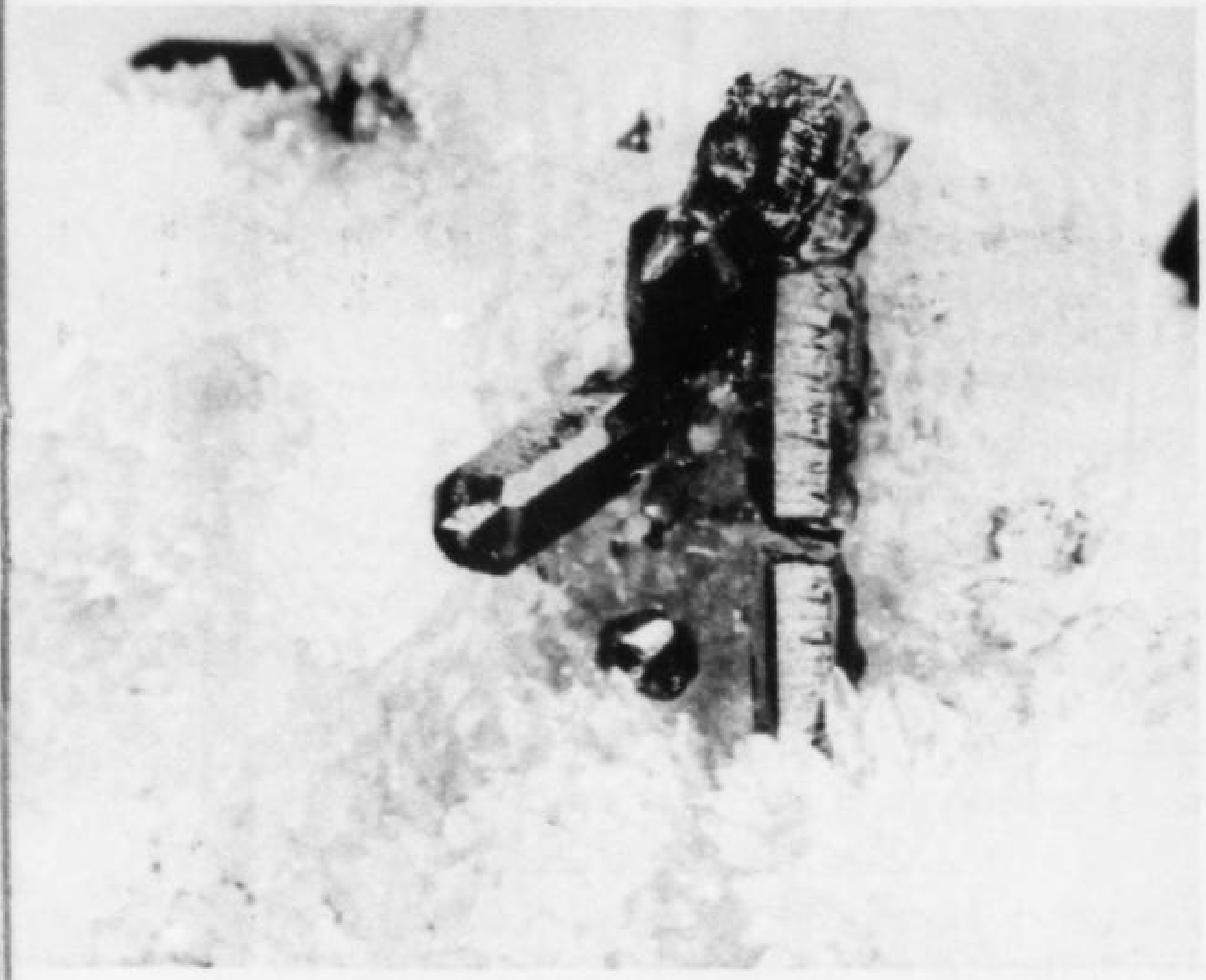

Fig. 7. **Pyrite. Naica, Chihuahua, Mexico. Note gap in crystal occupied by calcite.**

similar crystals but the combination of forms comprising the Naica crystals is quite different. Still another interesting characteristic is a uniformity in diameter that is quite unusal. The crystals do not appear to occur in diameters of less than 2.1 mm or greater than 2.4 mm.

The locality is reported as Naica, Chihuahua, Mexico — a mining district that has been worked primarily for lead, zinc and copper, and in which is located the famous gypsum locality Cave of the Swords.

THE INVESTIGATION

In an attempt to learn something about the crystals which might help to explain the peculiar habit an electron microprobe analysis was made on a section cut normal to the long axis of a crystal. In Figs. 5a, b it can be seen that the crystals experienced several episodes of growth. A central, sharply defined core is revealed having a rectangular cross-section and an average thickness of approximately .03 mm. Surrounding this core is a second generation with a diamond-shaped cross-section. What must have been the surface, at the time when generation two ceased its growth, appears to have been "fuzzy" looking. It is possible that this fuzzy surface may have looked much like the pyrite from Hall's Gap, Kentucky, which behaves as a single crystal, even though not looking much like one (Fig. 6). Third and fourth generations ensued, separated from each other only by a sharply defined, but narrow, diamond-shaped contact. Microprobe traverses across the complete section failed to show any compositional inhomogeneities. The crystal is essentially pure iron sulfide, insofar as can be determined by the microprobe.

Fig. 8. **Pyrite. Naica, Chihuahua, Mexico. Same specimen shown in *Fig. 7* after calcite has been dissolved away revealing the connecting filament.**

Examination of several specimens donated to the Smithsonian by Manuel Ontiveros, Ontiveros Lapidary Shop, El Paso, Texas, turned up two with crystals interrupted in their continuity by areas occupied by calcite (Fig. 7). The calcite on one of these was carefully dissolved away with hydrochloric acid and, in so doing, a tiny filament was uncovered linking the two portions of the interrupted crystal (Fig. 8). The filament was subsequently removed and x-rayed, it is pyrite.

X-ray diffraction powder patterns made of sections through the crystal shown in Fig. 5a, b contained only the lines for pyrite.

The growth of the pyrite crystals from Naica, it seems safe to assume, followed the general sequence (1) crystallization of long, delicate, probably flexible "filaments" of pyrite, some so long that they curved, (2) crystallization of several generations of pyrite upon the primary pyrite filaments, causing them to become fatter. It is clear that calcite crystal growth occurred between the two stages outlined above as calcite crystals have been found that enclose the first stage filament and also interferred with the pyrite that was deposited upon the filament during its fattening. The fortuitous "freezing" of a segment of the original filament in calcite so that later generations could not be added to it provides all the evidence that is needed. The embayments in the facing ends of the interrupted crystal conform to calcite morphology indicating that calcite crystals grew upon the filament prior to the "fattening" stage of pyrite growth.

It appears that the contact between some of the different generations of growth are at least slightly weak. Several of the broken crystals show discontinuities in the break surface, emphasizing the episodal nature of their growth history.

MORPHOLOGY

To a great degree the extreme distortion of the forms making up most of the surface of these crystals is due to the nature of the seed crystal upon which subsequent pyrite grew, that is, the filament. The forms along the length of the crystals are the cube, which is alternately wide and narrow, and a composite of two forms, the pyritohedron and diploid. Lateral striations across the length of these composite "faces" are the product of oscillatory combinations of two diploid faces (e.g. (132) and (132)), while the influence of the pyritohedron is revealed in the presence of triangular mounds aligned along one edge (Fig. 8). Still another diploid may have been involved in producing these mounds. The constructed drawing (Fig. 9) was made only for the purpose of identifying the forms present and it is not the product of goniometry. It is based upon the assumption that the indices of the diploid are probably {321}. Fig. 10 shows very well the habit of the crystals and the typical development of most of the forms, both at the "termination" and where they are elongated. In this photograph the cube faces are the darkest. One of them is centered at the end and the other extends from the base of the crystal to the edge of the "termination" and was nearest to the camera.

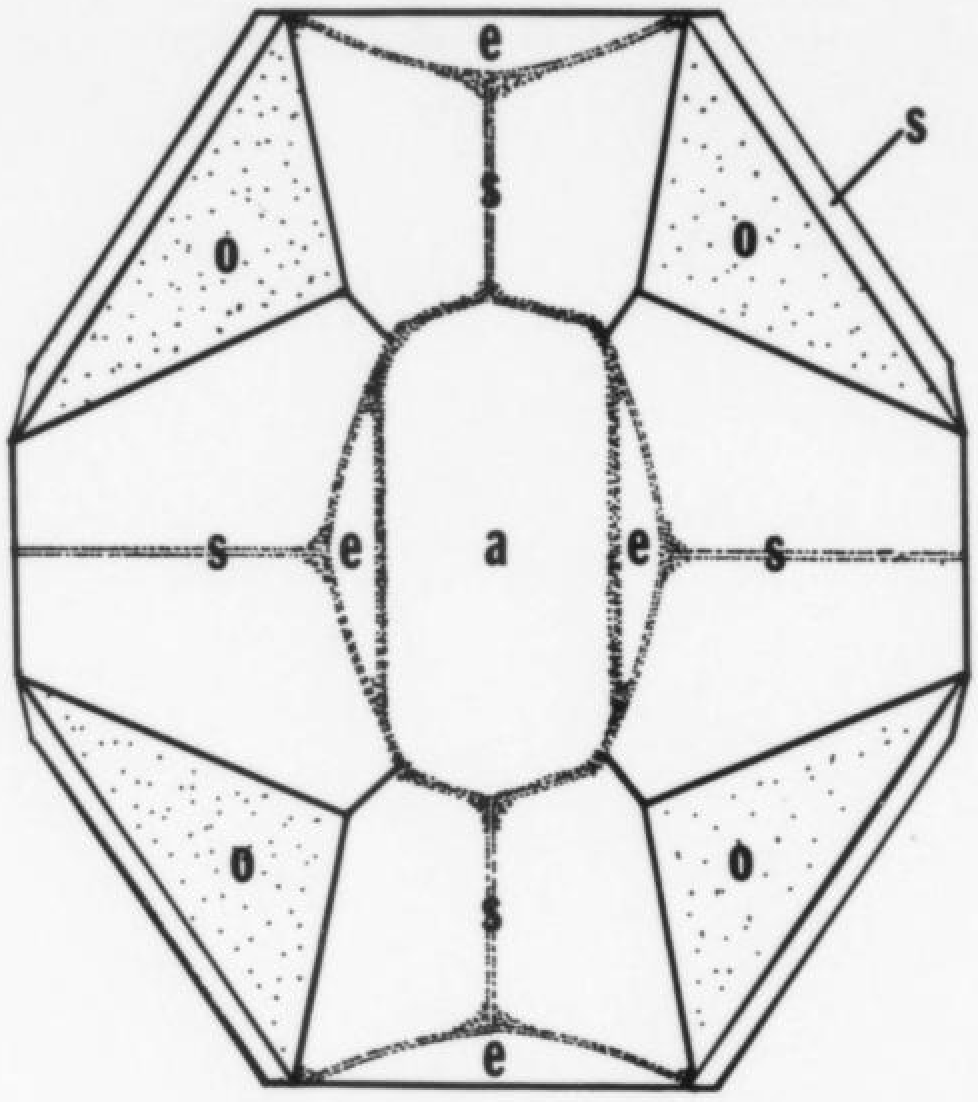

Fig. 9. **Drawing of "termination" of Naica pyrite. The forms shown are the cube (*a*), the pyritohedron (*e*), the diploid (*s*), and the octahedron (*o*).**

Fig. 10. **Pyrite. Naica, Chihuahua, Mexico. Typical isolated crystal.**

Pyrite is found in a wide variety of growth habits. Many of these are very beautiful and even dazzling. For the dedicated fan of unusual or rare crystal development, however, it is hard to imagine that this Naica pyrite has many rivals. It is destined to become a genuine collector's item, particularly in view of the apparent rarity of specimens. My guess is that only some 100 or so specimens were collected and most of these dispersed before their value was fully appreciated. Many collectors who buy Mexico minerals from southwestern U. S. mineral dealers may possibly already have specimens in their collections. If so, they are very fortunate.

ACKNOWLEDGMENTS

The reader's attention is directed to the valuable contributions of my Smithsonian colleagues — Joseph A. Nelen, for electron microprobe analysis, and Pete J. Dunn, for x-ray diffraction analysis. Nancy Harris and Pete J. Dunn also contributed helpful suggestions toward improving the manuscript.

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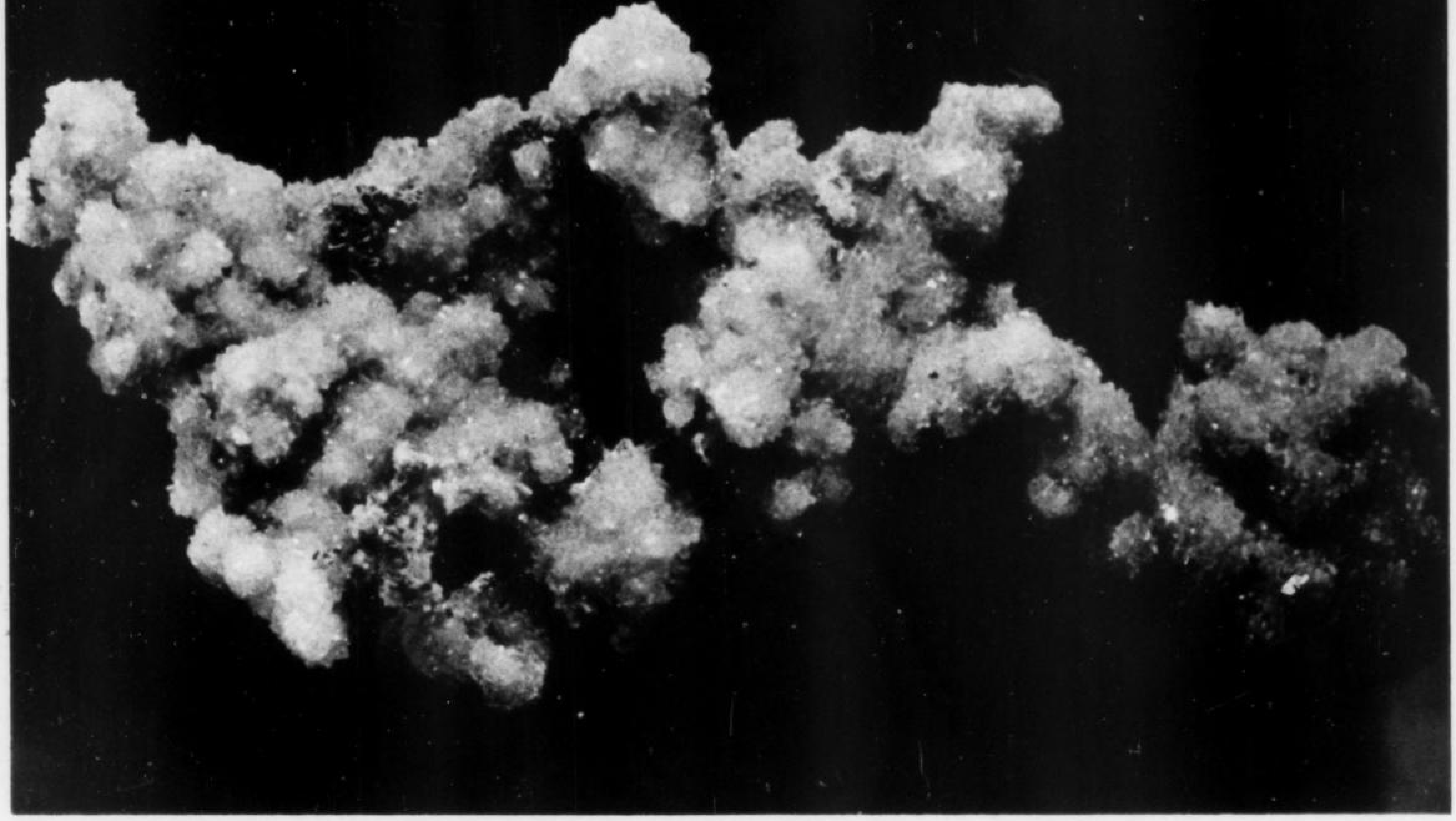

Fig. 1. **Colemanite, Death Valley, California.** *Photo by Joel E. Arem.*

Colemanite: *Type Locality and Describer*

H. Earl Pemberton, 1638 Hill Street, Santa Monica,
California 90405

Dana 6th (Dana, 1892, p. 882) and Dana 7th (Palache et al., 1951 p.349) give the credit for first describing colemanite to "*Neuschwander*, in *Hanks* (3rd *Rep. Min. California*, 86, 1883)" and report the type locality as Death Valley, Inyo County, California. Hey (1962, p.389) and Strunz (1970, p. 261) credit "Evans, 1884" and do not indicate the type locality. A review of the history of this difference in credit for first description suggests that the credit should be "Hanks, 1883" and the type locality, Death Valley; and that if "Evans, 1884" is to be accepted then the type locality is the Calico Mountains, San Bernardino, County, California. The only reference work known to the writer which credits "Hanks, 1883" is Pabst's edition of *Minerals of California* (1938).

Colemanite was first described as a new variety of priceite by Henry G. Hanks, California State Mineralogist, in his annual report to the Governor for the fiscal year ending June 1, 1883. He identified the type locality as Death Valley. His description included an analysis, in March 1883, by Thomas Price, a fellow San Franciscan and the city's leading assayist, after whom *priceite* was named. The material was massive, "appearing like semi-crystalline calcite." Hanks added that "The name *colemanite* was given by the discoverer of the mineral in honor of William T. Coleman, of San Francisco, who has been identified with the borax interests of the Pacific Coast from the commencement." The name of the discoverer was not given.

In his report to the Governor for the fiscal year ending June 1, 1884, Hanks (p.314) repeated the description of colemanite from his 1883 report and added: "Since it was published, colemanite has been found in magnificent crystals... Professor G. vom Rath, of the University of Bonn, who was in San Francisco when the first crystallized specimens came to hand..." was given some of the crystals for study. This was in January, 1884. (Bodewig and vom Rath, 1885, p. 179).

On February 4, 1884, J. T. Evans, an assistant in Thomas Price's assay office, in a paper read before the California Academy of Sciences, described briefly the crystallography of colemanite and compared the characteristics of massive and crystalline material. He also added: "Locality, Southern California, where it was discovered by R. Neuschwander, October, 1882." This was the first and only mention of Neuschwander in the early mineralogical literature. It should be noted that Evans did not localize the source to Death Valley.

Later in 1884 two papers were read in Europe describing the crystallography of colemanite: Bodewig and vom Rath (1885) who had received their material from Hanks, and Hiortdahl (1885) who also received his material from Hanks.

In December 1884, A. W. Jackson of the Mineralogy Museum of the University of California, Berkeley, published a brief note on colemanite and in 1885 published a lengthy paper on the morphology of the mineral. He described the source of his material as follows: "In September, 1884, Mr. Evans kindly presented to me a single beautifully developed crystal fragment with permission to make a thorough study of it... This work was about completed when I unexpectedly received from the owners of the deposit in which the mineral occurs (Coleman, see below) about twenty-five more crystal fragments and later still, from State Mineralogist, Mr. H. G. Hanks, one more finely developed crystal." Jackson stated specifically that the material was from Death Valley.

A year later Jackson (1886) published a second study of colemanite morphology, starting with the statement that since the publication of the 1885 paper he had learned the material of which the earlier study was based "came from the Calico Mountains deposit in San Bernardino County and not from Death Valley, as therein stated." He explained that after the publication of the 1885 paper "Mr. Coleman has placed in my hands some crystallized colemanite from Death Valley, which in part is quite similar to the colemanite from Calico District and in part dissimilar in habit." Since Jackson's 1885 material included crystals from Evans and Hanks the writer concludes that the crystals described in 1884 by Evans and the crystals used in the two European studies, which were received from Hanks, were also from Calico.

The remainder of the data pertinent to the question of describer credit and type locality is found in the commercial history of the discovery. The key figure in that history is William C. Coleman.

Coleman was an early San Franciscan, a leader of the Vigilante Committees of the 1850s, and the owner of a commission house which became distributor for F. M. "Borax" Smith who owned the West's first "cotton-ball" (ulexite) deposits at Teel and Columbus marshes in Nevada. In 1881 Coleman learned of the extensive ulexite deposits on the floor of Death Valley, and sent two of his agents, William Robertson and R. G. Neuschwander, to examine the property. They promptly purchased it. Neuschwander was put in charge and developed and managed the Harmony Borax Works of twenty-mule-team hauling fame.

Convinced that further prospecting should be done in the Death Valley region, Coleman sent out scouts looking for borax minerals. "In December, 1882, a Coleman prospector, working his way up a small canyon on the east side of the Valley found a new form of borax... occurring as an outcropping on the wall of the canyon... It was named colemanite in Coleman's honor." (Woodman, 1951, p.24) The archives of the U. S. Borax and Chemical Corp. do not show that Neuschwander was the discoverer of the new borate mineral, but as Coleman's manager at the Death Valley operations he probably first reported the discovery and sent specimens to Coleman, and on this basis was given credit as discoverer in San Francisco.

This discovery was quickly followed in early 1883 by the finding of veins of colemanite on the west flank of the Greenwater Range along the east side of Furnace Creek Wash, near the present site of Ryan (sec. 8, T.25 N., R.2 E., S.B.M.) and on the east flank of the Greenwater Range at the original site of Ryan (sec. 12 ext., T.24 N., R.4 E., S. B.M.). These deposits were either found by Coleman's prospectors or promptly acquired by him from the discoverers.

At about the same time these events were transpiring in Death Valley, colemanite was discovered in the Calico Mountains, 100 miles to the south. In early 1882 rich deposits of silver had been discovered in the Calicos and prospectors combing the hills for silver found colemanite. These deposits were not discovered by Coleman's men but the richest deposit, at Borate, was soon acquired by Coleman's agent, Robertson. (*San Bernardino Times* and *Calico Print* in Hanks, 1883, Pt. 1, p.28-29). The exact date of this discovery is not known but the archives of the U. S. Borax and Chemical Corporation show it as in 1883 and it was long enough in advance of June 1, 1883 for Hanks to include the undated newspaper accounts in his report for the fiscal year ending on that date. As soon as Coleman purchased the Calico property he started development, since it was the only one of his new colemanite properties that was close to transportation. Production started in early 1884.

On the basis of the above mineralogical and commercial records, the writer suggests that the describer, date and type locality for colemanite should be "Hanks, 1883, Death Valley, Inyo County, California." The reference in Dana 7th, "*Neuschwander*, in *Hanks*, 1883" is plainly in error because there is no mention of Neuschwander in either Hanks' 1883 or 1884 reports. Moreover, there is no record showing that Neuschwander ever described the mineral and no firm record that he was the discoverer.

Death Valley is accepted as the type locality because it would be quite natural for a Coleman scout to name the new mineral for his noted employer. Coleman's scouts were active in the Death Valley region in 1882-3, but the

***Fig. 2.* William T. Coleman. 1824-1893.**

first report of a representative in the Calicos was that of the purchase of claims in that area by his agent, Robertson.

February 4, 1884, the date Evans read his paper, may have been prior to the release of Hanks' 1883 report from the printers, but the date of the letter formally transmitting that report to the Governor, shown in the printed issue was June 1, 1883. Entirely apart from the question of date priority, the crystals on the basis of which Evans added some data to Hanks earlier description of the physical and chemical characteristics of the mineral, were apparently from the Calico Mountains, not from the locality which was the source of the material first given the name colemanite.

The above record suggests that it may be appropriate to change the locality source of colemanite crystals depicted in Goldschmidt (1913). Apparently the only drawings shown as Death Valley material which are in fact from that locality are Figures 31-38 (Tafel 234-235), Jackson's (1886) Figures 5-8a, the others being from the Calico Mountains.

The author is indebted to Lew Hastings and Phil Ashbraner of the U. S. Borax and Chemical Corp. for providing a search of pertinent records in the company archives, and to Mrs. J. V. Campbell, Archivist of the California Academy of Sciences Library for information from their records. Thanks are also due to Dr. Adolf Pabst of the University of California, Berkeley, for reviewing the manuscript and offering helpful suggestions. The photo reproductions were prepared by Charles H. Baines.

Fig. 3. **Henry G. Hanks. 1826-1907.**

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ERRATA

Volume IV, No. 4, "Idocrase (Vesuvianite) — a 250-year puzzle" by Joel E. Arem...

p. 166, Table 2: Bohemia, Moravia should be listed under Czechoslovakia, not Germany

Under Germany delete "Grossherzogsthum"; Pleystein is the same as Pleistein

Under United States change Crestmore, California to Riverside County, not San Benito County; Dallas Gem Miner should read *near* Dallas Gem Mine

p. 174, change the Pabst reference to:

Pabst, A. (1936) Vesuvianite from Georgetown, California. *Amer. Min.*, **21**, 1-10.

What's New in Minerals?

BRANNOCKITE

The editor has just received a photograph of brannockite (Vol. 4, nr. 2, p. 73, 1973) that illustrates the beauty of the mineral better than the photograph that accompanied the article. The photograph, Figure 1, shows a group of brannockite crystals that is 1 mm in diameter. The specimen is in the Douglas J. Berndt collection and the photograph was taken by Richard H. Alvey. Both of these gentlemen live in Kingsport, Tennessee.

Berndt reports that brannockite has also been found in the Lithium Corporation of America's spodumene mine, near Bessemer City, North Carolina, about 35 miles from the type locality near Kings Mountain, Both mines are in the same pegmatite and their mineralogy is very similar.

STOKESITE

Stokesite, a calcium tin silicate, was discovered by A. Hutchinson, in 1899, on a specimen of axinite from Roscommon Cliff, St. Just, Cornwall, England. At the time of the discovery the specimen was in the collection of the University of Cambridge and the 10 mm long crystal had been labelled gypsum, which it resembled. A full description by Hutchinson appeared in *Mineralogical Magazine,* volume 12, pages 274-281, 1900. The accompanying drawing is from that article. In spite of the resemblance to gypsum, stokesite is orthorhombic.

P. Gay and K. O. Rickson published the first x-ray data for stokesite in the same journal in 1960. They wrote that since the original description "no further occurrence has been described, and the original crystal and fragments in the Museum of the Department of Mineralogy and Petrology, Cambridge, remain the only known example of this mineral."

Happily, there is now a second locality for stokesite. Mr. Neylson Barros, who lives in Governador Valadares. Minas Gerais, Brazil, owns and operates a large and important gem pegmatite — Corrego do Urucum, near Galilea, Minas Gerais. This pegmatite is the recent source of a large number of fine specimens of peach colored beryl (morganite). In the course of removing the beryl from its immense pocket, Mr. Barros discovered a number of spherical clusters of crystals (Fig. 2) measuring up to nearly 3 cm in diameter. Mr. Barros very graciously supplied the Smithsonian Institution with several of these complete balls for the purpose of identification. To everyone's amazement and delight the mineral turned out to be stokesite. The x-ray diffraction pattern is a perfect match for stokesite and the density (3.231 ± 0.005 vs. 3.185 by Hutchinson) corroborates the x-ray evidence.

When the stokesite balls are split open they reveal a solid mass of platy crystals diverging from a central point in spokelike fashion. The surface of the balls is rough. The tips of all of the

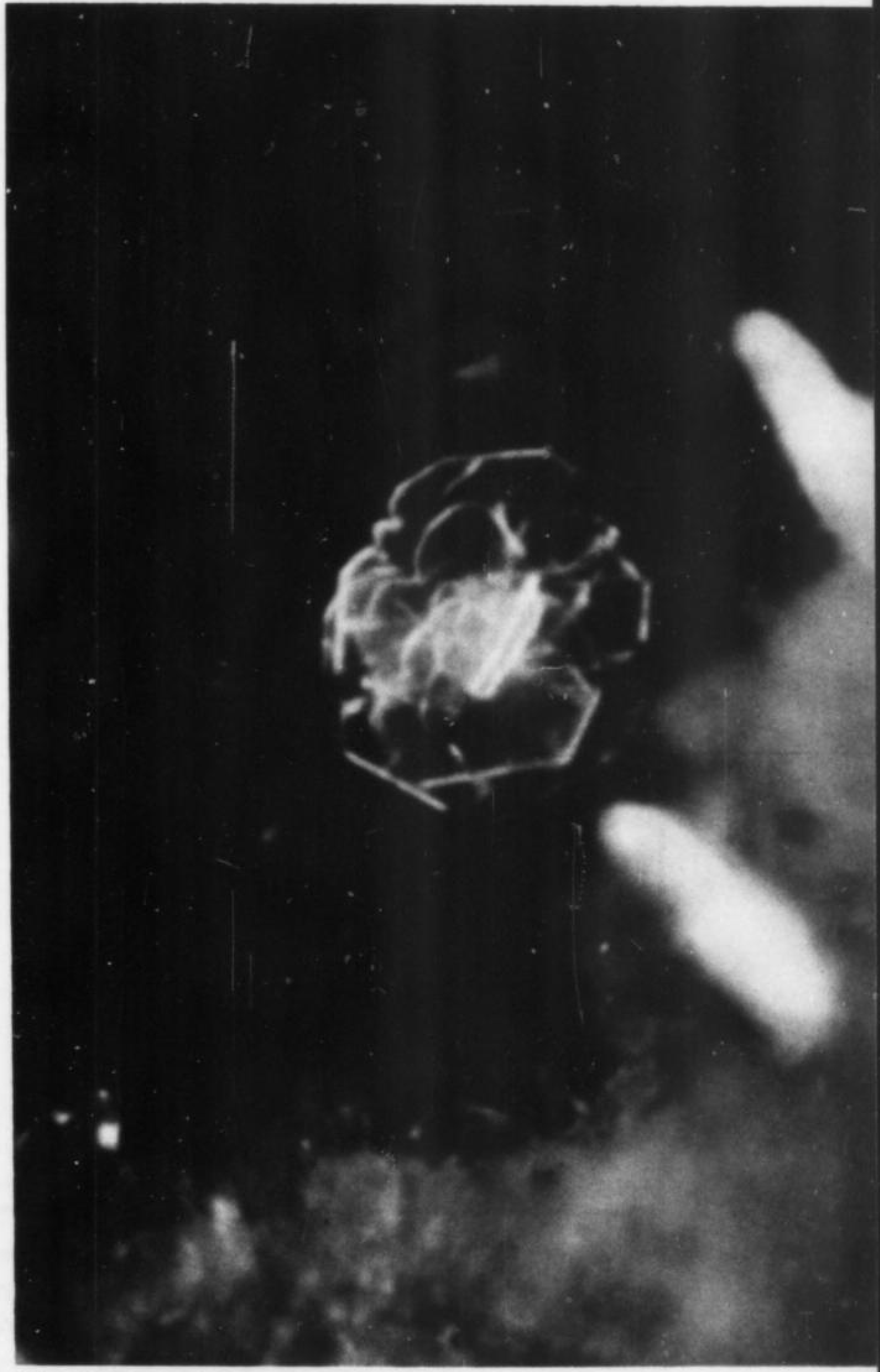


Fig. 1. **Brannockite rosette.**

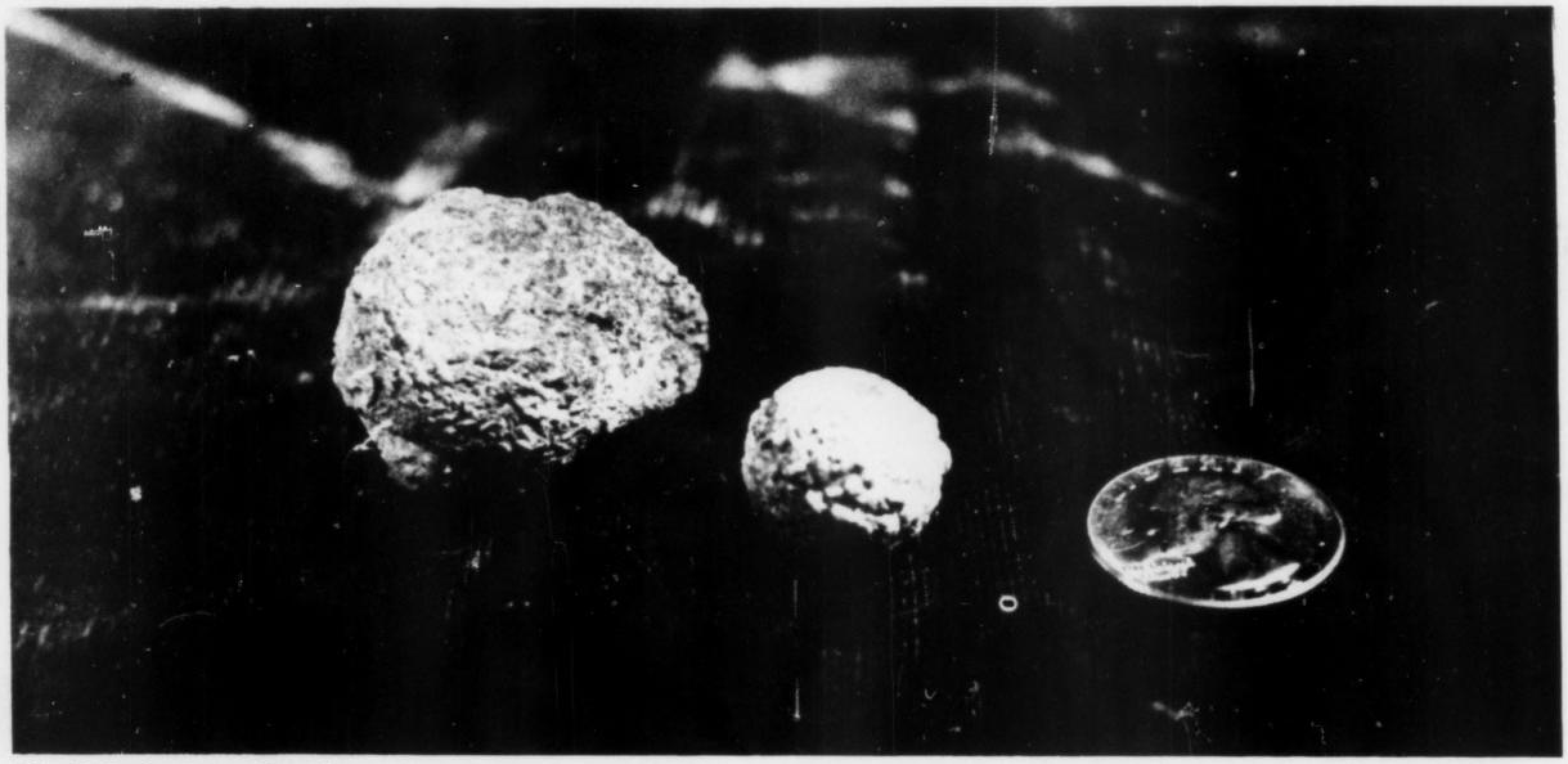
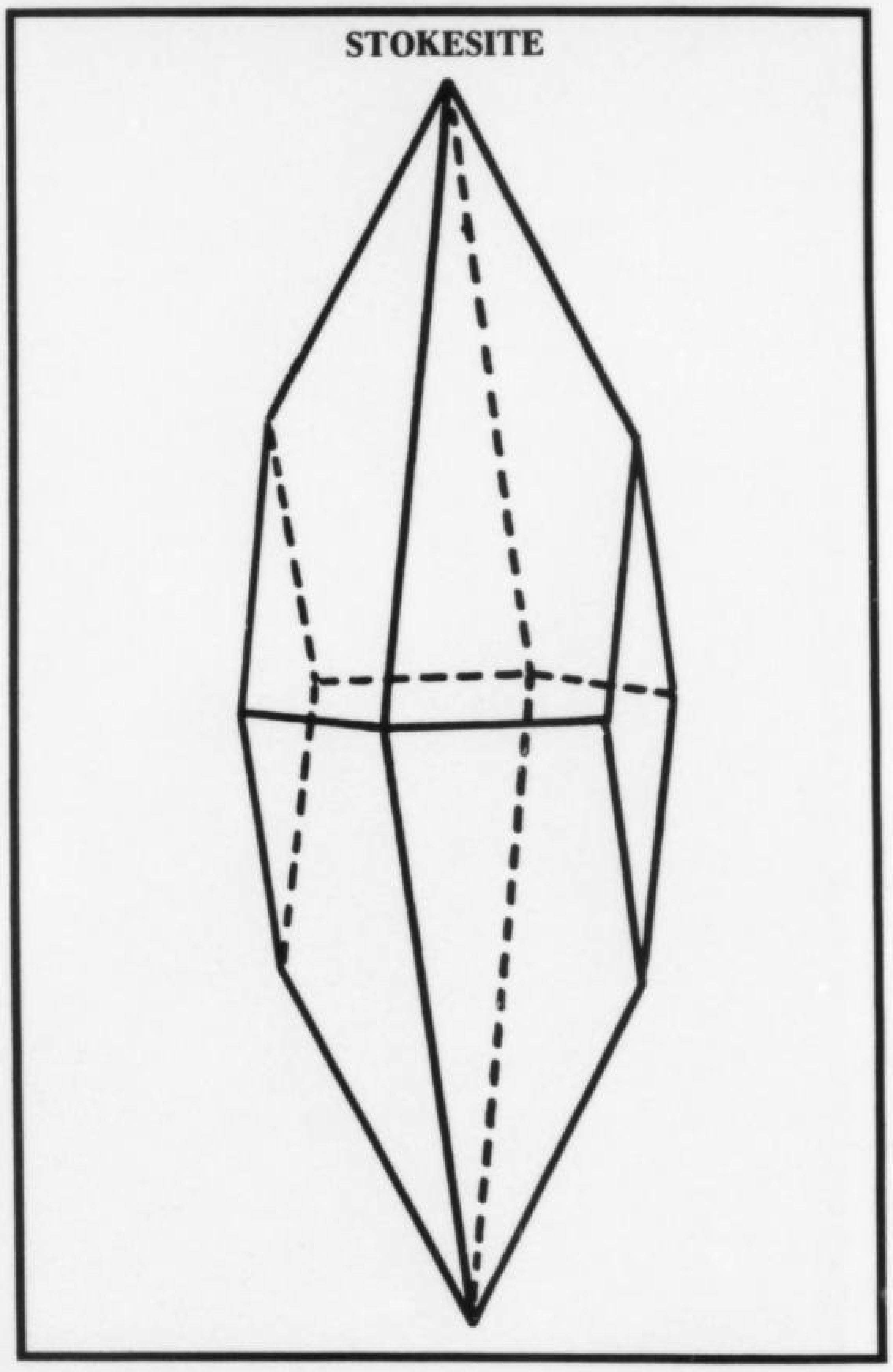


Fig. 2. **Stokesite — Brazil.**



crystals would just touch a spherical shell placed around the ball but there are depressions between adjacent crystals. The terminations which measure about 2 x 1 mm on the ball surface, appear to be randomly arranged relative to each other. Some platy albite is embedded in the balls making it appear that the latter were once attached to earlier albite crystals. Tinier (about 1 mm) spheres of tan to slightly pink titanite are found in small numbers on the surface of the stokesite balls. Even smaller, yellow-brown, etched looking crystals of microlite are also scattered over the surface of the balls.

Continued on page 294

Fig. 1. **Mark Chance Bandy.**

The Mark Chance Bandy Collection

Robert W. Jones

3520 N. Rose Circle Drive
Scottsdale, Arizona 85251

The year 1973 is the tenth anniversary of the passing of Mr. Mark Chance Bandy, renowned mining engineer. As of this writing Mrs. Jean Bandy is making plans to place her husband's collection in a public museum. It seems appropriate, therefore, that this collection of outstanding display and study minerals be described and that a summary of his life's work appear in the *Mineralogical Record.*

In his lifetime Bandy devoted much energy to obtaining fine specimens for a number of schools, universities, and museums the world over. At first he was not much interested in specimens for himself. His prime thought was always for the science to which he devoted his life. Yet in the forty and one years since he graduated from college, Mark managed to put together a fabulous collection. It is ironic that much of the collection remained unseen by him until his retirement, for he exchanged with museums while he was in foreign countries and his specimens were always sent to his parent's home in Iowa for storage until his return.

Through his efforts the National Museum of Natural History in Washington, D. C., Harvard University, the American Museum of Natural History in New York, and the British Museum (Natural History) in London all benefited from his work and his zeal in collecting.

In addition to his efforts in the field, Mark also made several notable contributions to the literature. As a part of his work at Llallagua, Bolivia, he conducted a thorough study of the mineralogy of the tin deposits there. His findings were recorded in a company paper which Mrs. Bandy has been kind enough to allow me to study. It is hoped that this paper will soon be made available to the public. In addition, Jean and Mark collaborated in translating into English George Bauer's *De Natura Fossilium*, a major work.

Born in Iowa, Mark Bandy's love of minerals, fossils, and natural history became his avocation as well as vocation. He graduated from Drake University in 1922 and was awarded the Lydia Roberts Fellowship, graduating with a degree in Mining Engineering from Columbia in 1925. He worked several years in Mexico and Venezuela, returning to this country in 1929 to marry Jean. Because funds were short the Bandys were content to honeymoon in Chile, where Mark's new job took him to the famous copper mines at Chiquicamata, high in the Atacama Desert. In 1933 Mark had his first real vacation and used it to visit Easter Island, where he studied and described the geology of that remote place. 1935 saw him on a collecting expedition sponsored by Harvard and the Smithsonian, traveling through northern and central Chile. The trip resulted in some excellent finds and, upon his return to the States, he earned his doctorate studying the sulfate minerals he had collected. Six new species were reported and one, bandylite, was described by Palache and Foshag and named for him. *(American Mineralogist,* **23**, *85-90, 1938)*

During all this Jean was his almost constant companion. They worked side by side on many ventures. After Mark accepted his doctor's degree he won a position with the Patiño mines in Llallagua, Bolivia, and for the next eleven years they were stationed there. It was during this time that Jean and Mark translated George Bauer's second tome on mining and minerals. Bauer's other important work, *De Re Metallica*, had been translated by Herbert Hoover and his wife prior to the time when Hoover became president. The Bandys' translation of Bauer's (Agricola) *De Natura*

Fossilium was published as Special Paper 63 of the Geological Society of America, in November 1953. Copies of this translation are still available.

Mark Bandy's work at the tin mines of Bolivia was both rewarding and fruitful. His contributions to the science of mineralogy were significant. He aided many who studied the deposits first hand. His own excellent study could only have been done by someone with the skill of a mineralogist combined with the love of a collector. His paper, "Mineralogy of Llallagua, Bolivia", (not to be confused with Sam Gordon's work) does not reveal the trials and tribulations he had to suffer as manager of the mines. He reveals nothing of the labor unrest, work slowdowns, even revolts with which he had to deal while attempting to maintain production. He knew the miners and their problems well and had empathy for them. This stood him in good stead during his years in the high country of Bolivia. It probably saved his life for during one period of labor strife Mark and others were held hostage in the mine by workers who threatened their lives if demands of the miners weren't met. The fact that Mark survived is mute evidence of his excellent rapport with the workers. One other "Anglo" didn't survive under similar circumstances, having been dragged through the streets and around the town square by miners who disliked the fellow. So, managerial life in Bolivia wasn't all roses!

Once Jean and Mark left Bolivia they went to work for the Economic Cooperation Administration in Europe. This was an outgrowth of World War II designed to help develop resources there. This was preceeded by a short stay in Los Angeles where Mark did some work for the Gemologic Institute. The European work was followed, from 1951 to 1954, with some significant work in Africa. Mark recovered some very rare and outstanding mineral specimens which ended up in the museums of this country. From Africa the Bandys spent a year in Scotland, where Mark taught at The University, St. Andrews. After that they returned to the United States but only briefly while Mark worked for Charlie Steen, the "Uranium King". One more trip out of the country took Mark to Ghana in search of diamonds. It was in Ghana that he began to suffer seriously from the disease to which he later succumbed.

Such travels gave Mark a chance to meet people, collect specimens, and develop opportunities which led to the acquisition of fine minerals for museums and schools in the United States. His own collection grew as gifts were added and exchanges were made. Sometimes the Bandys met and dined with royalty and the wealthy of the countries they visited. This also led to the acquisition of material. It had to be frustrating, however, for most of their collection was stored away and it wasn't until they settled in Wickenburg, Arizona, that they were able to get it unpacked and displayed. They built a special building at the rear of their property, a building ideally suited for displaying minerals on open shelves where they could be seen and handled for study. Well lighted, relatively dust free, air conditioned, and with perhaps six hundred specimens displayed, this little building is a treat to enter. It has been visited by nearly every important person in the hobby today and just as many "unknown" collectors whom Jean and Mark hosted with great enthusiasm and hospitality as they showed their collection to all who were interested. Jean continues to show the genuine enthusiasm and sincerity to visitors which has always made a visit there a great pleasure. The love of minerals which Mark showed, his enthusiasm for sharing knowledge, and his pleasure in entertaining people continues to be eloquently expressed by Jean.

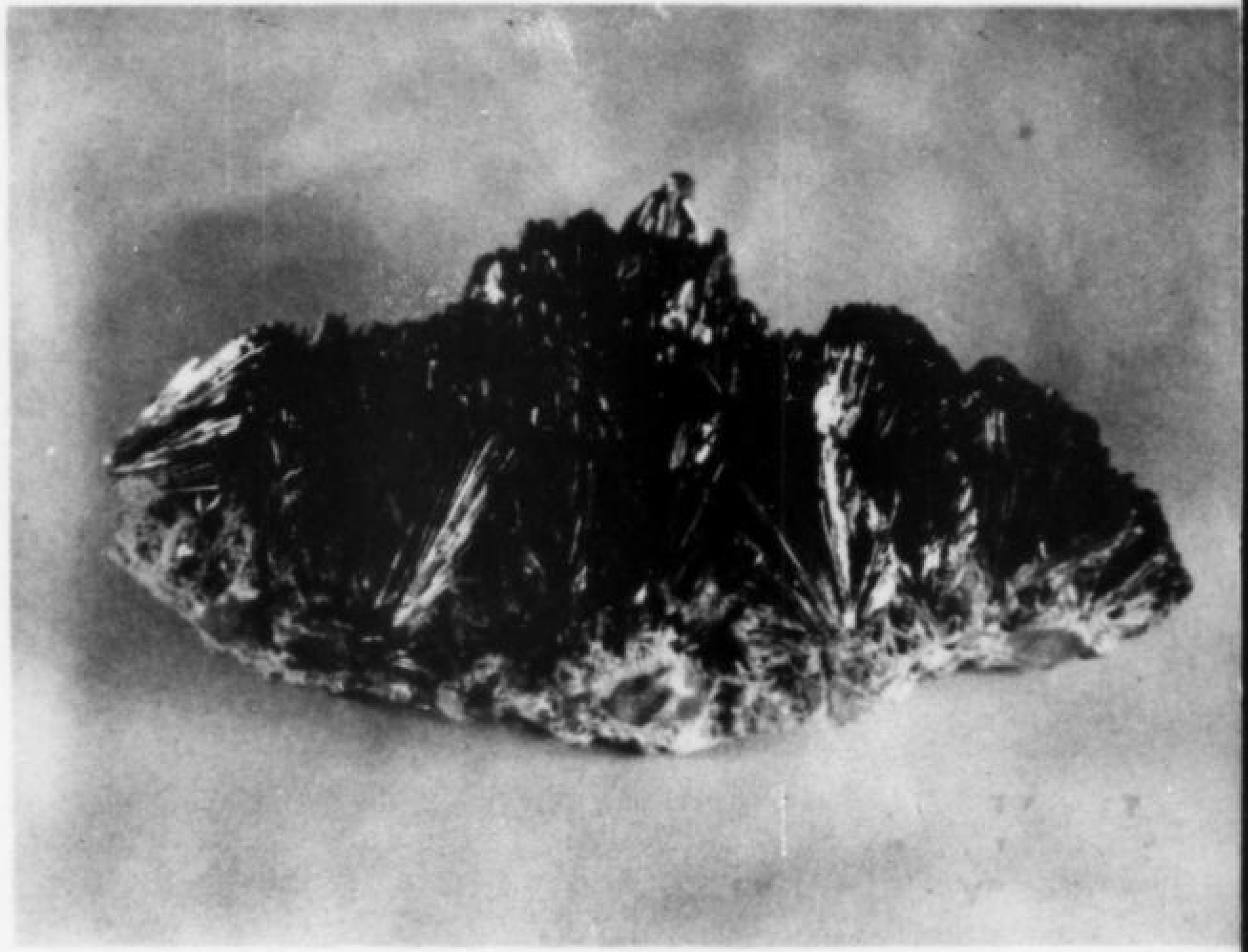


Fig. 2. **Stibnite. Rio Mulato, Bolivia. Bandy collection.**

Space simply does not permit an in-depth discussion of the Bandy collection here. However, when grouped by localities where Mark and Jean spent much of their lives together, some comments can be made.

The Bolivian minerals in the collection represent a large segment of what one sees on a visit. Mark's eleven years in the tin mines around Llallagua (Yuh yah' wuh) gave him ample opportunity not only to study the paragenesis of the ores and minerals but to collect fine display and study specimens. The largest cassiterite in the collection is a seventy five pound beauty measuring some 35 cm across. The crystals are almost brilliant and measure 5 cm across. The specimen is from Araca, Bolivia. A second equally large cassiterite from Monserrat looks nothing like the first in crystallization. It is a 30 cm high mass of very fine acicular pale brown needle tin which has a fine resinous luster. Both these large specimens are among the finest of their type extant. In addition to these giants, there are over a dozen more cassiterites from various Bolivian localities in the collection. They show fine twinning or unusual crystal form which makes their study most informative. Associated minerals aid in the study of the paragenesis of the deposits. Mark selected these specimens particularly because of this value.

The most common Bolivian mineral in the collection, and at Llallagua, is wavellite. Wavellite was the last abundant mineral to form there, deriving its phosphate from the earlier apatites. It is found associated with and often coating quartz, pyrite, cassiterite, cylindrite, the vauxite series, stannite, arsenopyrite, bismuthinite, pyrrhotite, and a host of other less important minerals. The wavellite is tan in color though may be creamy or tinted, and it forms coatings ings all over and between crystals. It may even be seen as translucent veils suspended between crystals of quartz or other minerals. The most splendid specimens are radiating balls of nearly white or creamy crystals of excellent luster and size. The finest balls in the collection are usually less than 1½ cm but can reach two cm. One 15 cm flat plate of quartz crystals has a fine scattering of ten mm creamy yellow lustrous wavellite balls perched all over it.

One of the rarer minerals in the mines of Bolivia is bournonite. The Bandy collection boasts two fine small cabinet specimens showing crystals with cogswheel twinning. The better crystal is about three cm across and ten mm thick. The edges are somewhat rounded but the luster and positioning are excellent.

Very large specimens of siderite, mostly from Mosojllacta are another feature of the collection. The crystals are not as sharply rhombic as the more recent St. Hilaire, Canada, material. They show, instead, the rounded habit resulting from the repeated alternating growth of faces. Their color is tan, though a few show an iridescence. Some are pseudomorphed by goethite and are black in color. The largest crystals approach fifteen cm and are a deep tan color with pearly luster. A frequent association with highly modified pyrite adds to their attractiveness as specimens.

The vauxite-paravauxite-metavauxite suite from Llallagua, found nowhere else in the world, is very well represented in the Bandy collection. The same can be said for the slightly more common childrenite from there. The vauxites are micro-radiating aggregates of tabular crystals showing fine blue color. The mineral was fairly common at Llallagua appearing in most veins worked. Bandy considered them of hypogene origin, which is at variance with other findings. He suggests the order of occurrence as being wavellite, metavauxite, paravauxite, vauxite.

Paravauxite occurred as delicate plates of small crystals to ten mm intergrown to form a continuous mass. The color is from cream to pale green to colorless. It is the most common of these three phosphates. A number of truly fine plates of paravauxite are in the Bandy collection and I suspect the collection contains the finest grouping of paravauxite specimens to be seen together.

Metavauxite is the least common of the three members of the suite. It occurs in silky tufts of microscopic size with paravauxite usually on it. Most of the metavauxite specimens show some alteration due to its instability but they are interesting nonetheless.

Apatite crystals of magnificent size and form can be seen in the Bandy collection. One fine flat tabular crystal about five cm across is my favorite. Excellent crystal form can be observed on these apatites, which are colorless and nearly transparent. Their reaction under the ultra violet lamp is exciting, a bluish pink when the long wave tube is used.

Fig. 3. **Quartz on cassiterite with coating of wavellite. San Jose main vien. Llallagua, Bolivia. Bandy collection.**

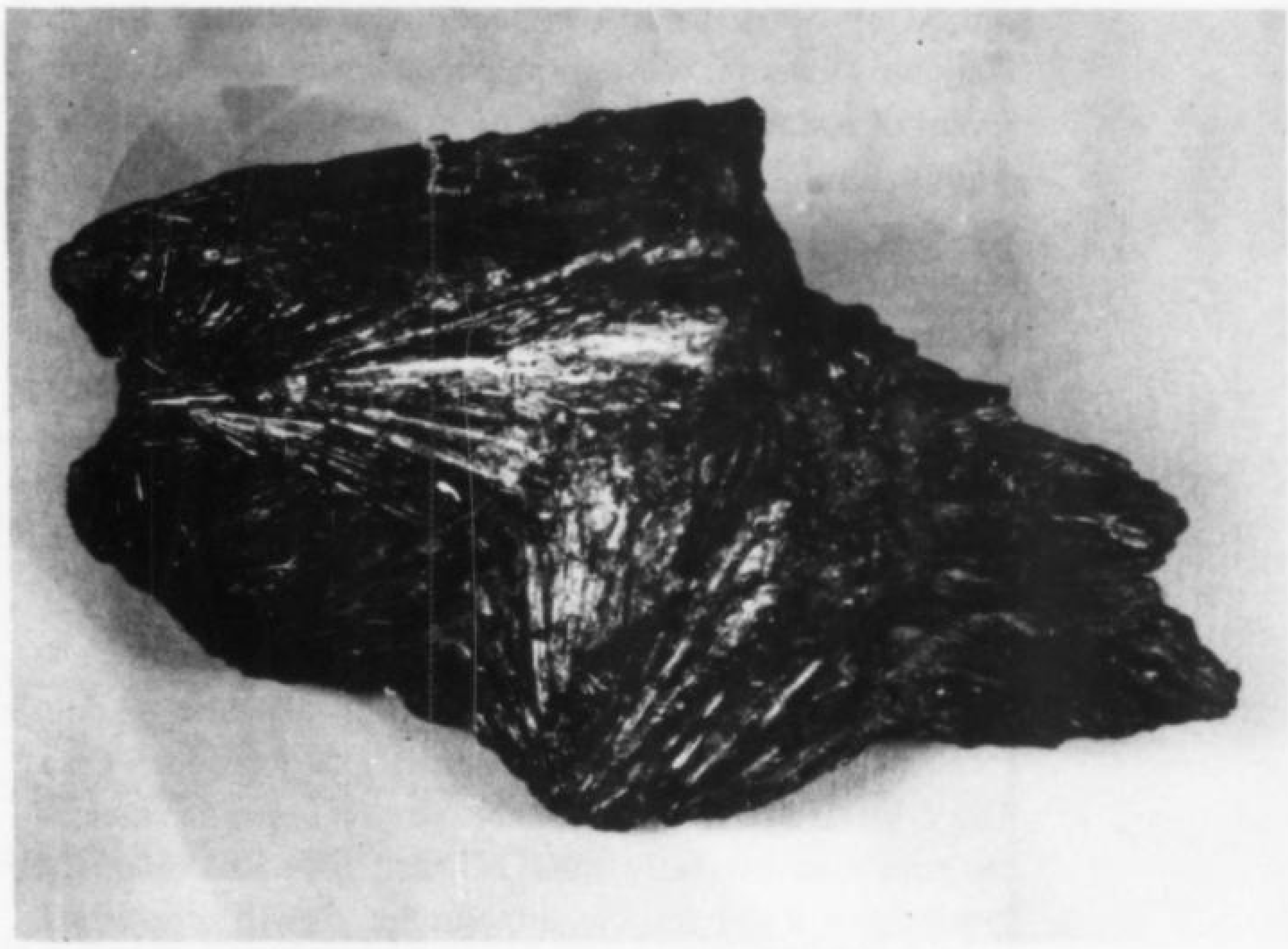


Fig. 4. **Cylindrite. Trinacri mine, Poopo, Bolivia. Bandy collection.**

There are a number of ore minerals in crystal form to be seen in the collection. There are fine stannite, cylindrite, and bismuthinite specimens. These are not flashy in color but are astounding in crystal form. Pyrite is a relatively common mineral from Bolivia and abundant in the collection. Excellent octahderal crystals in plates to 30 cm across can be studied. The crystals are seldom as much as three cm across. They often show a somewhat velvety luster. This is due to the repeated cubic growth patterns on the octahedral faces. Other pyrites are brilliant, showing little in the way of growth patterns on the faces. Still others are modified cubes showing dodecahedral faces. All the pyrite shows modifications to some degree.

A second fine locality suite of minerals in the collection

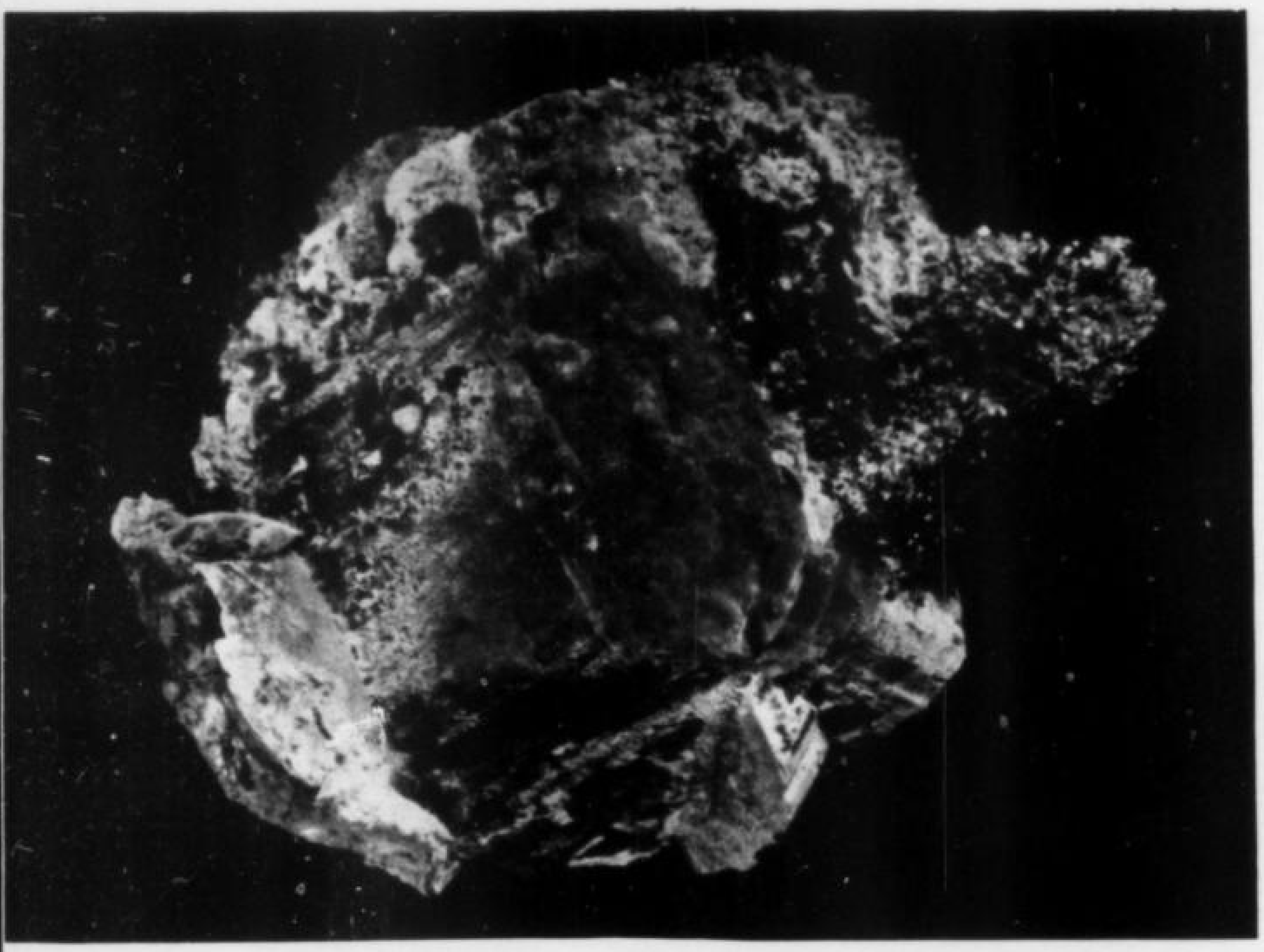


Fig. 5. **Siderite 12.5 cm across. Mosojllacta, Bolivia. Bandy collection.**

come from Tsumeb, South West Africa. These were acquired by Mark from a collection he obtained for the National Museum. Most notable to me is the fine 10x15 cm group of malachite after auurite crystals. The crystals are doubly terminated and stacked one above the other. Individual crystals are about 8 cm long. The color is deep green with good luster. This specimen is accompanied by several fine azurite groups from the same mine. Cerussite is also present in a fine reticulated group partly coated with malachite and azurite. Though not from Tsumeb, there are several excellent azurite roses from Chessy, France, and Bisbee, Arizona.

Mark Bandy's work in Southern Rhodesia made it possible for him to acquire some excellent hopeites and parahopeites. The best is a 10x18 cm group of white to pale green hopeite crystals reaching nearly two cm in length. The crystals are closely stacked so the upper surface of the specimen is nearly solid. Viewed from the side, the specimen is a remarkable sub-parallel growth of crystals. There is also an excellent parahopeite from Broken Hill about half the size of the specimen described above with crystals about as large. These specimens were among Dr. Bandy's favorites. His favorite from Southern Rhodesia is one of the world's finest kermesites. It was presented to him when he visited the Globe and Phoenix mine, Que Que, in the early 1950's. The specimen consists of a number of very fragile radiating sprays of kermesite attached to and holding together broken chunks of matrix rock. The sprays seem to lack the good red color of some kermesite but it can be seen in transmitted light. The major crystals are about five cm long. The entire specimen is perhaps 18 cm across.

Mark spent quite a bit of time in Chile, primarily at Chuquicamata. His collection, therefore, reflects this period of his life. Excellent specimens of finely crystallized kröhnkite, atacamite, rashleighite, leightonite, natrochalcite, brochantite, and others can be seen. Massive krohnkite is also found in the collection. The crystallized kröhnkite may be the largest in the world with a single crystal seven cm long. Such a rare mineral in such fine size is indeed a treat to see. Of even rarer vintage is the specimen of leightonite in fine radiating pale blue crystals covering a rock mass some ten cm across. Bandylite is also displayed in the collection in both altered and unaltered condition. Mark is credited with the discovery of leightonite and is recognized for his

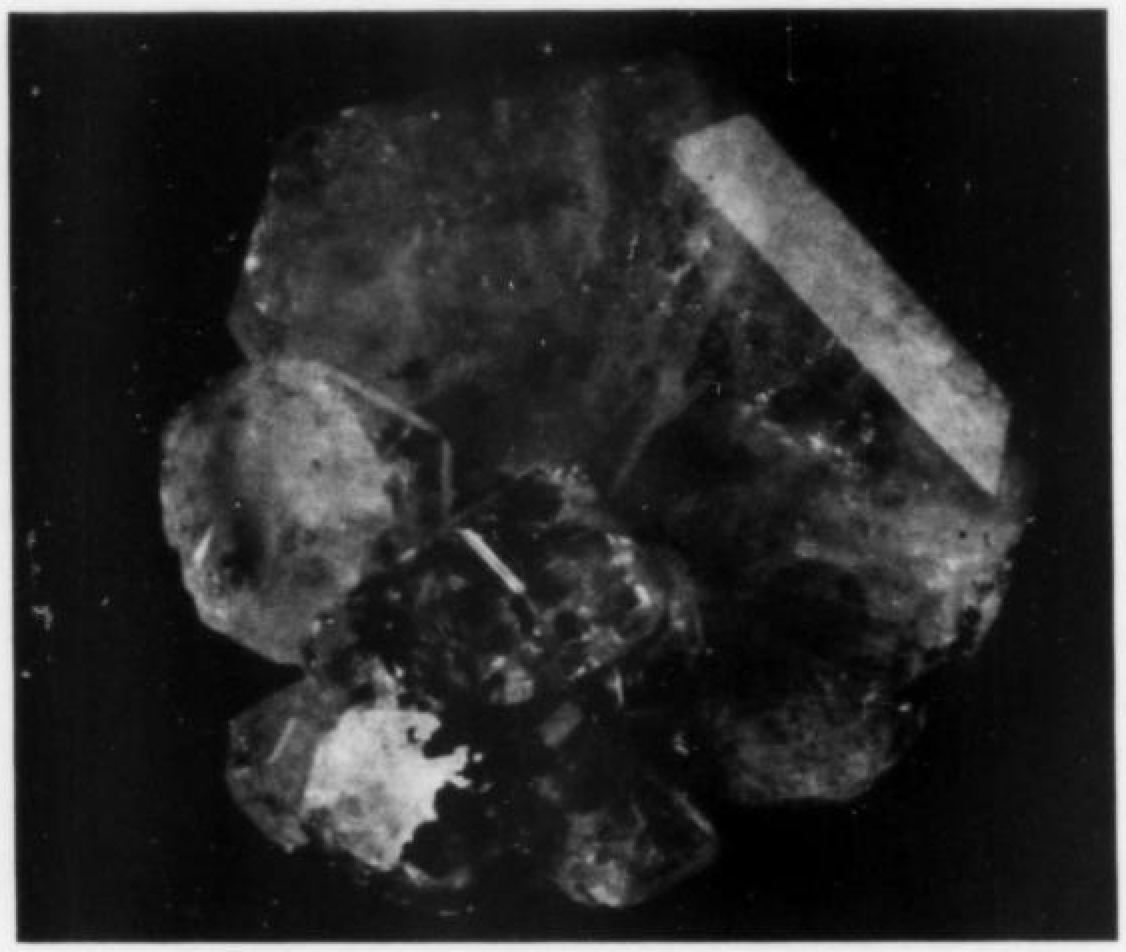


Fig. 6. **Apatite 5 cm in diameter. Level 295, Contacto vein, Llallagua, Bolivia. Bandy collection.**

Fig. 7. **Bournonite crystal 2.5 cm wide. Oruro, Bolivia. Bandy collection.**

discovery work by the mineral which bears his name, bandylite, from the Quetina mine, near Calama, Chile. There is even an excellent piece of rough turquoise in the collection from Chile. It is good color and the matrix is limonitic, typical of the copper deposit at Chuquicamata.

It is difficult to know where to stop in describing the Bandy collection. Suffice to say there are fine specimens from many, many classic localities in addition to the places where Mark worked and collected. Austrian epidote, English calcites, a twenty cm Japanese stibnite blade, a variety of gold specimens, fluorites from everywhere (or so it seems), ramsdellite, pyromorphite, wulfenite, vanadinite, Cheshire, Connecticut, barite, excellent type locality creedite, and so many other fine minerals that it is impossible to list them all. Seeing the collection is the only way one can even begin to sense the depth of history and mineralogy which has been built into it. Seeing the collection is really the only way to gain an insight into the man who built it for it truly represents Mark Bandy's life work. Once placed on public display scores will derive great pleasure from seeing what has been wrought by the work of Mark and Jean Bandy in building their collection.

In closing I would like to quote Mark Bandy himself for this one thought says more about the driving force behind the man than anything I could write. In writing for the Drake University Magazine in 1961 Dr. Bandy said, "But the pleasure a collector gets from a specimen he purchases can never equal that of a collector who, after traveling a long distance and either entering an old mine or climbing a high cliff, comes upon and opens a vein or vug in a rock and takes therefrom a beautiful specimen, even though it may be a common mineral and far from rare". Well said, Mark Chance Bandy! Well done!

(Photographs for this article were done by Jeffrey Kurtzeman. Phoenix, Arizona.)

Bjarebyite, $(Ba, Sr)(Mn,Fe,Mg)_2Al_2(OH)_3(PO_4)_3$, A New Species

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INTRODUCTION

The Palermo No. 1 pegmatite, near North Groton, New Hampshire, is famous for an extraordinarily long list of mineral species, of which no less than 50 phosphate species have been reported, about 60% of all known pegmatite phosphates (Moore, 1973). This apparently has resulted from a series of retrograde reactions, such as metasomatic and hydrothermal reactions over a range of temperatures upon primary phosphate giant crystals such as triphylite, graftonite and amblygonite. From the triphylite, low temperature oxidative reactions led to a large number of secondary phosphate hydrates such as laueite, strunzite and phosphosiderite. Where reducing conditions prevailed, ferrous phosphate hydrates arose such as ludlamite, phosphoferrite and vivianite, the reducing environment indicated by the presence of coexisting late sulfides. Hydrothermal attack upon amblygonite led to augelite, wardite and crandallite. Exchange reactions between triphylite and adjacent amblygonite produced compounds such as scorzalite and childrenite. Introduction of Ba^{2+} and Sr^{2+} at this stage resulted in such exotica as palermoite and bjarebyite, the latter a new species and the subject of this paper.

PARAGENESIS

We feel that a detailed account of the bjarebyite paragenesis is justifiable even though the species is at present most rare with but a few crystals discovered. This is because the Palermo pegmatite has received much attention from collectors and many examples of this paragenesis have been seen by the senior author in private collections suggesting that bjarebyite may be "discovered" in many collections upon closer scrutiny.

The type specimen was collected in 1947 by the late Mr. Gunnar Bjareby and bears the label "Dickinsonite (ND = (not determined)), No. 2260". The sample, originally 4 x 4 x 5 cm, was broken into four pieces to provide enough material for study. The mineralogy is extraordinarily complex and includes the species amblygonite, augelite, childrenite, siderite, scorzalite, quartz, minor sulfides, Fe-Mn oxides, bjarebyite and palermoite. It derived from a small metasomatized amblygonite-scorzalite pod which probably occurred in close association with triphylite crystals. Hydrothermal reaction at intermediate temperature would lead to exchange of cations between the triphylite and amblygonite to form scorzalite followed by augelite, childrenite and siderite. Such products appear brecciated and the mass has a nodular outline distinct from the subhedral outline of the parent phases. Bjarebyite and palermoite occur at the final stages as crystals in open cavities along the contact between the amblygonite-scorzalite remnants and the Fe-Mn oxides. Palermoite specimens show a similar paragenesis suggesting that bjarebyite may occur in close association with this mineral.

PHYSICAL PROPERTIES

The color of bjarebyite is emerald green with a faint bluish tinge, darker than ludlamite and brazilianite which the species closely resembles. It always appears as highly faceted and very complex crystals, usually pitted and etched. The luster is subadamantine, hardness 4^+ on Mohs scale, streak white. Two perfect cleavages, {010} and {100}, distinguish it from ludlamite and brazilianite. In addition, the ludlamite paragenesis is usually confined to a stage directly replacing triphylite, a primary phase which is absent in this sample.

CRYSTAL MORPHOLOGY

Crystals are lustrous, eminently suitable for reflection goniometry and range up to 3mm in greatest dimension. We examined three crystals and constructed an indexed gnomogram consistent with the structure cell derived from X-ray study. The crystals are spear-shaped and steeply terminated.

The crystal class is monoclinic holosymmetric (2/m) with *c* {001}, *a* {100}, *b* {010}, *m* {110}, *d* {120}, *r* {111}, *f* {121}, *e* {131}, *h* {141}, *w* {411}, *l* {211}, *t* {021}, *q* {011}, and *v* {031}. Of the 14 distinct forms 11 occur among the 23 entries of descending *d*-spacings. Six forms of the longest *d*-spacings are present but further down the list, all negative forms are missing, although the reticular hypothesis would predict their presence. This contradiction may have resulted from our selection of crystals all of which were attached to matrix and had to be broken, fortuitously destroying negative forms. Accordingly, missing negative forms (such as $\{\bar{1}01\}$, $\{\bar{1}11\}$, $\{\bar{1}21\}$, $\{\bar{2}11\}$, $\{\bar{2}21\}$ and $\{\bar{1}31\}$ may actually prove to be present as other crystals are discovered, suggesting that bjarebyite crystals may be very complex indeed.

A plan and clinographic projection of the bjarebyite

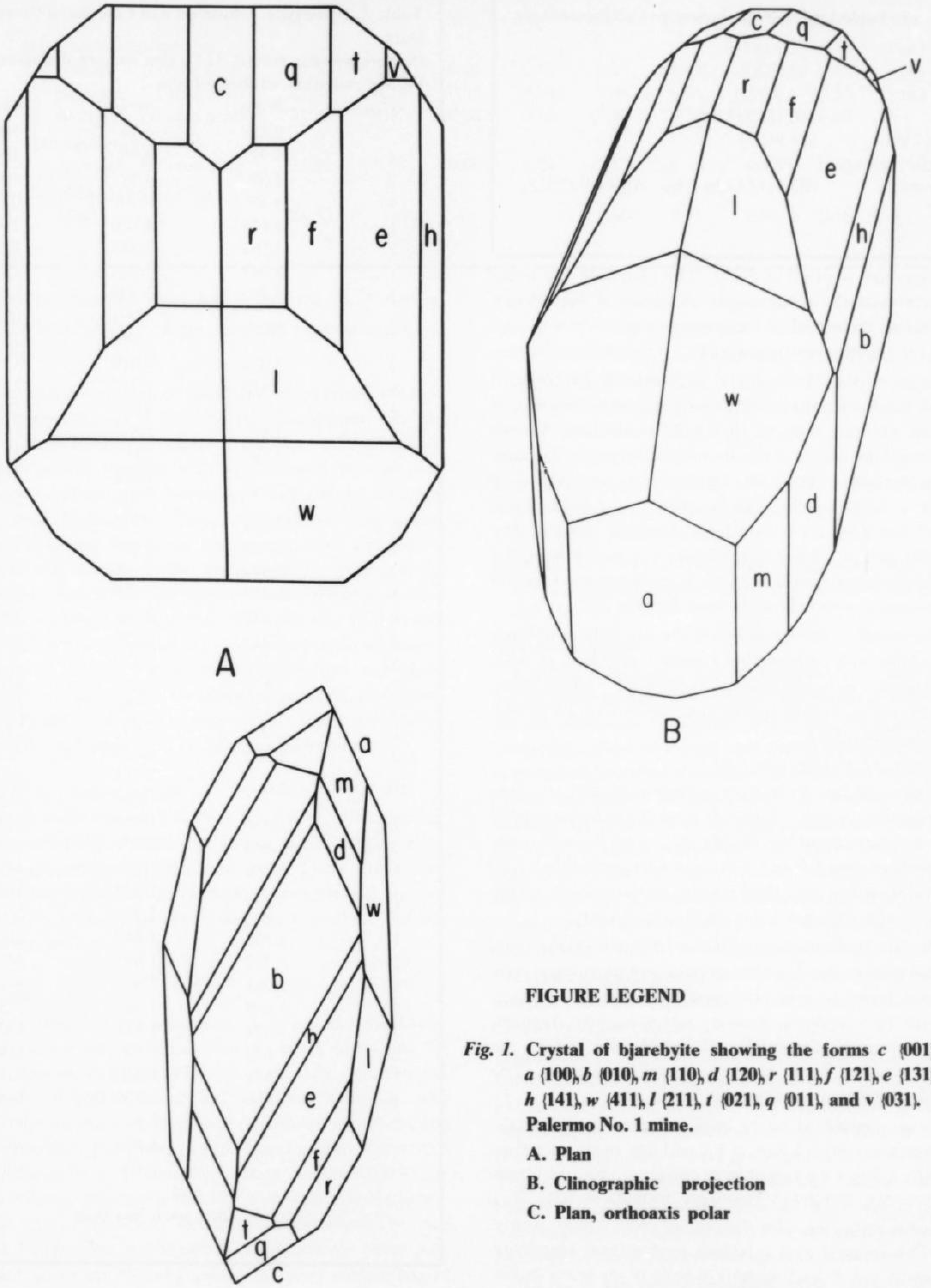

FIGURE LEGEND

Fig. 1. **Crystal of bjarebyite showing the forms *c* {001}, *a* {100}, *b* {010}, *m* {110}, *d* {120}, *r* {111}, *f* {121}, *e* {131}, *h* {141}, *w* {411}, *l* {211}, *t* {021}, *q* {011}, and v {031}. Palermo No. 1 mine.**

A. Plan

B. Clinographic projection

C. Plan, orthoaxis polar

Table 1. Bjarebyite. Structure Cell Parameters

a (Å)	8.930(14)
b (Å)	12.073(24)
c (Å)	4.917(9)
β	100.15°(0.13°)
V (Å³)	521.8(1.5)
space group	$P2_1/m$
formula	$(Ba,Sr)(Mn,Fe,Mg)^{2}_2\ Al_2(OH)_3[PO_4]_3$
Z	2

development appears in Fig. 1. The plan with the *b*-axis polar reveals the spear-shaped character of the crystals and shows the extent of their complexity.

X-RAY CRYSTALLOGRAPHY

Single crystal Weissenberg and rotation photographs about the *b*- and *c*-axes and a thorough three-dimensional crystal structure analysis ($R = 0.06$) established the cell shape and the details of the atomic arrangement, the latter to be published elsewhere. The cell data are offered in Table 1. A few small crystal fragments were crushed and rolled into a sphere of powder with rubber cement. The powder data in Table 2 were obtained by matching strong single crystal intensities with the interplanar spacings and these results were refined by least squares fitting.

The atomic structure of bjarebyite not only establishes its formula with certainty but reveals a new kind of AlO_6 octahedral polymerization: octahedral edge-sharing dimers further link via opposite corners to form an infinite $[Al_2O_6(OH)_3]$ chain.

CHEMICAL COMPOSITION

Crystals of bjarebyite were submitted to ARL electron microprobe analysis.[1] Elements from Na to U were qualitatively scanned and Mg, Fe, Mn, Al, Ca, Sr, Ba were quantitatively analyzed. P and $(OH)^-$ were determined from the crystal structure analysis. Likewise, valence states of the cations were obtained from the structure study.

The homogeneous crystal was a fragment of the same crystal used in the structure analysis and its average composition based on a 60 area scan is accepted as the type analysis for bjarebyite. Another rather massive fragment gave a range of compositions in Fe, Mn, Ba and Sr, the other elements being rather constant throughout. The details of the analyses appear in Table 3.

We are committed, on the basis of the structure analysis, to accept a solid solution of Fe and Mn over equivalent positions. Since the sum of large cations = 5 for one formula unit, the computed bjarebyite formula is $(Ba_{1.1}Sr_{0.1})(Mn^{2+}_{0.9}Fe^{2+}_{0.9}Mg_{0.2})Al_{1.8}$ for the cations, with Mn:Fe nearly 1:1. This suggests that a ferrous predominant bjarebyite also exists and, indeed, appears in some of the scans on the massive fragment. Based on the probe and crystal structure analyses, the bjarebyite formula is $(Ba,Sr)(Mn,Fe,Mg)^{2+}_2\ Al_2(OH)_3[PO_4]_3$ and the name applies to the ideal end-member composition $BaMn_2\ Al_2(OH)_3[PO_4]_3$ and all compositions with Ba > Sr and Mn > Fe. Compositionally and structurally, bjarebyite is unique, but is remotely related to the eosphorite-childrenite group and it is suggested the

Table 2. Bjarebyite. Observed and Calculated Powder Data
(Sphere powder mount, 114.6 mm camera diameter, Fe/Mn radiation, calibrated film)

I/Io	*d*(obs)	*d*(calc)	*hkl*
7	8.81	8.79	100
4	4.97	4.98	120
2	4.59	4.59	$\bar{1}01$
4	4.47	4.49	011
1	4.124	4.130	210
2	3.562	3.553	220
1	3.447	3.435	$\bar{2}11$
1	3.295	3.308	121
2	3.090	3.094 3.081	031 221
3	3.024	3.028	$\bar{1}31$
4	2.910	2.912	211
2	2.852	2.847	310
2	2.811	2.821	131
7	2.681	2.687	221
3	2.643	2.662 2.636	311 320
1	2.514	2.523	141
2	2.495	2.487	$\bar{3}21$
2	2.444	2.446	$\bar{1}02$
1	2.413	2.420	002
1	2.377	2.369	330
1	2.310	2.298	202
2	2.261	2.257	$\bar{2}12$
2	2.177	2.162	410
3	2.137	2.138	$\bar{1}51$
1	2.090	2.095	122
2	2.039	2.023	$\bar{3}12$
10	2.010	2.012 1.996	060 $\bar{2}32$
2	1.956	1.954	132
2	1.880	1.879	222
1	1.786	1.792	$\bar{4}02$
1	1.759	1.772 1.758	$\bar{4}12$ 500
1	1.733	1.740	510
1	1.702	1.697	$\bar{3}42$
1	1.681	1.677	351
1	1.659	1.665	$\bar{2}52$
2	1.624	1.611	530
2	1.600	1.596	441
2	1.578	1.566	501
3	1.556	1.554	$\bar{1}62$
3	1.528	1.517	$\bar{5}41$
5	1.495	1.497 1.476	033 $\bar{6}01$

and
about 30 lines, each less than 2

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[1] Performed by Mr. G. R. Zechman of this laboratory.

Table 3. Bjarebyite. Electron Microprobe Analyses

		Ba	Sr	Ca	Mg	Mn	Fe	Al	Mn/Fe +Mn
Heterogeneous massive									
Low Ba	10 area scan	19.70	2.53	0.06	0.71	6.25	8.65	7.00	0.42
High Ba	10 area scan	22.93	0.25	0.08	0.78	7.44	6.08	7.06	0.55
Average	60 area scan	21.22	1.33	0.08	0.76	7.40	6.74	7.11	0.53
Homogeneous crystal									
Average	60 area scan	21.81	0.79	0.06	0.84	7.15	6.95	7.01	0.51
$BaFeMnAl_2(OH)_3[PO_4]_3$									
Ideal		21.53	-	-	-	8.60	8.75	8.46	0.50

species be classified near that group. We also mention that the $Fe^{3+} > Al^{3+}$ analogue may also exist on structural grounds.

The specific gravity of bjarebyite, determined by Berman microbalance, is 3.95 ± 0.02. The sample was obtained from a recently collected specimen and afforded a powder pattern identical with type material. We compute $\rho(calc) = 4.02$ gm/cm^3 from the unit cell and the composition $BaMnFeAl_2(OH)_3[PO_4]_3$. A Gladstone-Dale calculation based on the oxide specific refractive energies in Larsen and Berman (1934) gives $\rho(calc) = 3.86$ gm/cm^3 which is within 4% of the structure cell computation. The specific gravity is much greater than ludlamite (3.2), brazilianite (3.0) and arrojadite (3.6) and serves as an additional diagnostic tool for identification by sink-float techniques in Clerici solution. Its composition suggests that bjarebyite should occur in specimens which contain palermoite, goyazite, and associated eosphorite-childrenite.

OPTICAL PROPERTIES

Bjarebyite is biaxial (+), $2V \sim 35°$, $r \gg v$, birefringence low with α 1.692, β 1.695, γ 1.710 all ± 0.003, weakly pleochroic greyish tan to pale yellow-green. These values vary somewhat depending on the sample composition and we selected a crystal adjacent to the type crystal for this optical study.

NAME

The beauty of the crystals, the location and the source of the specimen provide us with the honor of naming the new species BJAREBYITE after the late Mr. Gunnar Bjareby of Boston, a talented artist and naturalist, who assembled a magnificent collection of hand specimens and micromounts, particularly of the New England pegmatites. He amassed a micromount collection of over 1,000 exquisite Palermo specimens and was a phosphate mineral student with extraordinary insight and knowledge. The care and detail of his investigations, unfortunately never published, place Mr. Bjareby among the most outstanding of 20th Century amateur mineralogists.

The species and its name have been approved by the International Commission of New Minerals and New Mineral Names, International Mineralogical Association. The type specimen shall be preserved in the United States Natural History Museum (Smithsonian Institution).

ACKNOWLEDGMENTS

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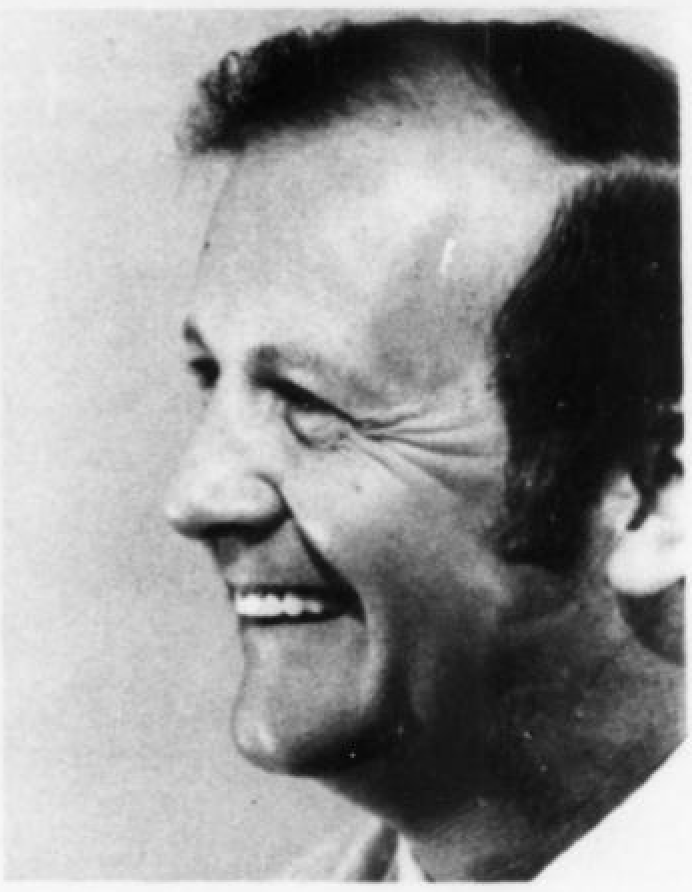
Note added in proof:

A recent visit (June 23) to the Palermo No. 1 pegmatite by the senior author afforded good specimens of abundant porous whitlockite-carbonate apatite-siderite masses uncovered by resumed mining operations. Bjarebyite occurs in moderate abundance, with colorless striated palermoite prisms and brown lath-like childrenite crystals, as deep bluish green masses of fibrous appearance up to an inch across. Upon closer examination, the masses are seen to be composed of etched highly faceted complex crystals in parallel growth. Masses of scorzalite and amblygonite also occur locally in lustrous green glassy fragments unlike green rockbridgeite which it superficially resembles. About twenty hand specimens of the mineral were culled and we anticipate that more specimens of this species will be found, especially in association with the whitlockite.

In addition, Mr. Curt Segeler recently sent the senior author a micromount specimen of excellent pseudo-rhombohedral crystals of an unknown green mineral. It occurs implanted upon scalenohedral siderite crystals in vuggy pockets and proved by X-ray investigation to be bjarebyite. The crystal development is unusual and bears no simple relationship with our crystal drawings of the type material. Siderite masses in close association with whitlockite should be carefully examined for this magnificent species.

We thank Mr. Peter Samuelson, mine operator, for the opportunity to collect these specimens and Mr. Segeler for his continued assistance in carefully selecting specimens for further study.

The Museum Record



by Paul E. Desautels

If there is one expression which best describes almost all museums in the United States — and abroad for that matter — it is the term "genteel poverty". No matter how curators and administrators fight the battle, and no matter the lengths to which they go to cover it up, they know and the public knows that their museums are bankrupt. Bankrupt is the correct word because it fits any operation which must continually spend more than it receives just to keep operating.

It seems impossible that some museums with superb collections worth millions of dollars could be destitute. And yet, any move to liquidate parts of these collections to meet operating expenses is normally met with outcries from all quarters about the squandering of holdings and the violation of a donor's trust, etc. Sometimes there is even strong criticism of a museum exchanging excess treasures for objects it needs for the collection. So the typical museum finds itself without the means to hire guards, pay the light bills, prepare exhibits or even to care for its treasures. Ultimately, in the worst cases, relying on volunteer curators working in totally inadequate storage areas — or, perhaps even worse, just locking the doors — the collections slowly deteriorate and are lost anyway. The difference is that the loss by attrition never makes the newspapers while an attempt to convert some object into needed cash is almost sure news.

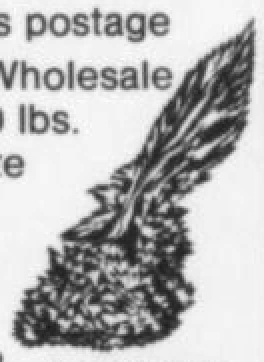
Often, too, the resistance to this conversion-of-objects approach meets strong internal resistance. No curator wants to see his collection used to pay the janitor or the telephone bill. If he even considers such a course of action his priorities are in the wrong place. As a curator his primary loyalty is to the collection. It is the administrator's concern, not his, as to how daily expenses will be met.

Where does a museum turn for operating and construction money? There are too few sources and no direction is easy. At one time the wealthy patron could always be trusted to provide a new building, to purchase new objects, or to cover the annual deficit. Changes in tax laws and a switch of patron loyalties to other activities have made it difficult for some museums and fatal for others. It is so much more fashionable these days for private and foundation philanthropy to be directed toward social causes and social experimentation, medical and other research, and experimental education. There is hardly a handful of foundations or major philanthropists in the world interested in supporting Natural History Museums, let along Mineral Museums, except for research projects. Long term public relations efforts by such museums could possibly turn the tide in the long run but the need is urgent and the long run may be too late.

Admission charges to museums, until the idea is seriously studied, seem a reasonable answer. Putting aside any question of whether this is a paying proposition, there are philosophical difficulties to be faced. An admission charge is a kind of barrier to the free flow of attendance traffic through the doors. Most museums want people to come in and experience an exposure to real objects for one purpose or another. Institution of an admission charge operates against this, especially for those people who need it most and are the most difficult to entice inside. As suggested above, there is strong doubt about whether it is a paying proposition anyway since the costs of collection may eat up most of the profits. In recent weeks all the National Museums in England have been required by law to begin collecting admission fees. Although the English and U.S. philosophies of approach to the public differ, it will be interesting to see an evaluation of the results after a trial year. Meanwhile, be prepared to pay an admission charge to the British Museum of Natural History next time you visit — a very worthwhile expenditure to say the least.

Many museum directors have ultimately concluded that the only salvation lies in obtaining increasing amounts of tax money. This may be true but such money might not solve the problems. Anyone who has toured a number of National Museums around the world will soon discover that a closer relationship to a Federal treasury does not solve the problems. Federal budget appropriations are, at best, made on the basis of demonstrated need. Even then, because of other budget pressures, only some variable portion of the need is forthcoming. At the same time, because it has Federal support, its duties, chores and responsibilities are likely to be excessively burdensome. Although they look better than most others, even the great National Mineral Museums, with few exceptions, are living in poverty. The fact that they do look so good is a sad commentary on how badly off the others are. Every Mineral Museum curator I've talked to about the subject is amazed to find that the Smithsonian, as guardian of the National Collection of Gems and Minerals, receives no appropriated funds at all for the purchase of new specimens. This shouldn't be so shocking a revelation because I know of only one active mineral collection in the world in a National Museum that does receive such funds.

Answers to the financial problems of Mineral Museums are not in sight. However, the first steps toward a solution are to realize that the problem exists and to decide that it's worth some effort to seek a resolution. Considering the size of the professional and hobby groups, at least in the United States, there already exists a sizeable lobby which could accomplish much. Whether it can or will may be a matter of life and death for the few viable Mineral Museums still struggling along.


COLEMANITE

Yedlin on Micromounting, continued from page 263.

icut. Letters from Dr. Peter Leavens, of the Univeristy of Delaware, and from others indicate that work done by them at Yale, at the Smithsonian, and elsewhere in the past indicate that the material in reference had been found to be wurtzite, indeed. So two further specimens were sent to Pete Dunn in Washington, D.C. These were collected at the site in different years, from different locations. Dunn's report to us, dated 28 September, 1973: "The two 'wurtzite' specimens you recently sent have been checked and both are paramorphs of sphalerite after wurtzite. This is consistent with my prior observations."

2. Microscope light: From de Haas, Optical Engineering, 2734 Midvale Avenue, Los Angeles, California 90064: ".......our lamps now cost $60 instead of the original $54. Cost of materials have so gone up that we can no longer distribute the light at the old price." (Ed. note: Still a terrific bargain.)

3. Rapid City, South Dakota: The public library in this progressive community has acquired a collection of micromounts through the good graces of the local club there. A stereo-binocular microscope has been made available by the South Dakota School of Mines. The specimens are viewable at the reference desk in the library, and Milo Olmstead and cohorts attend viewing sessions to explain and instruct. What a fine thing!

4. San Benito, California: Chalcocite has long been reported in the natrolite associated with benitoite and neptunite from this area. Some years ago a specimen was soaked in acid and resulting gel rinsed to expose joaquinite crystals on the contact between matrix and natrolite. Exposed, too, were several micro crystals of a hexagonal appearing metallic mineral (actually orthorhombic), whose morphology approached that of the drawing in **Dana's System**, Volume I, 7th edition, page 188, from Joachimstal. Well, one of the crystals was removed, X-rayed, and proved to be digenite, pseudomorphic after chalcocite. And here's another first for California. **Dana**, page 180, indicates that digenite has been found altered to native copper, chalcopyrite, bornite, covellite, malachite, and azurite. No mention of chalcocite. At page 186 under chalcocite: "Pseudomorphous after bornite, chalcopyrite, galena, millerite, pyrite and enargite." No mention of digenite. A good project for those with a surplus of the material and an availability of X-ray and other testing techniques. Please let us know.

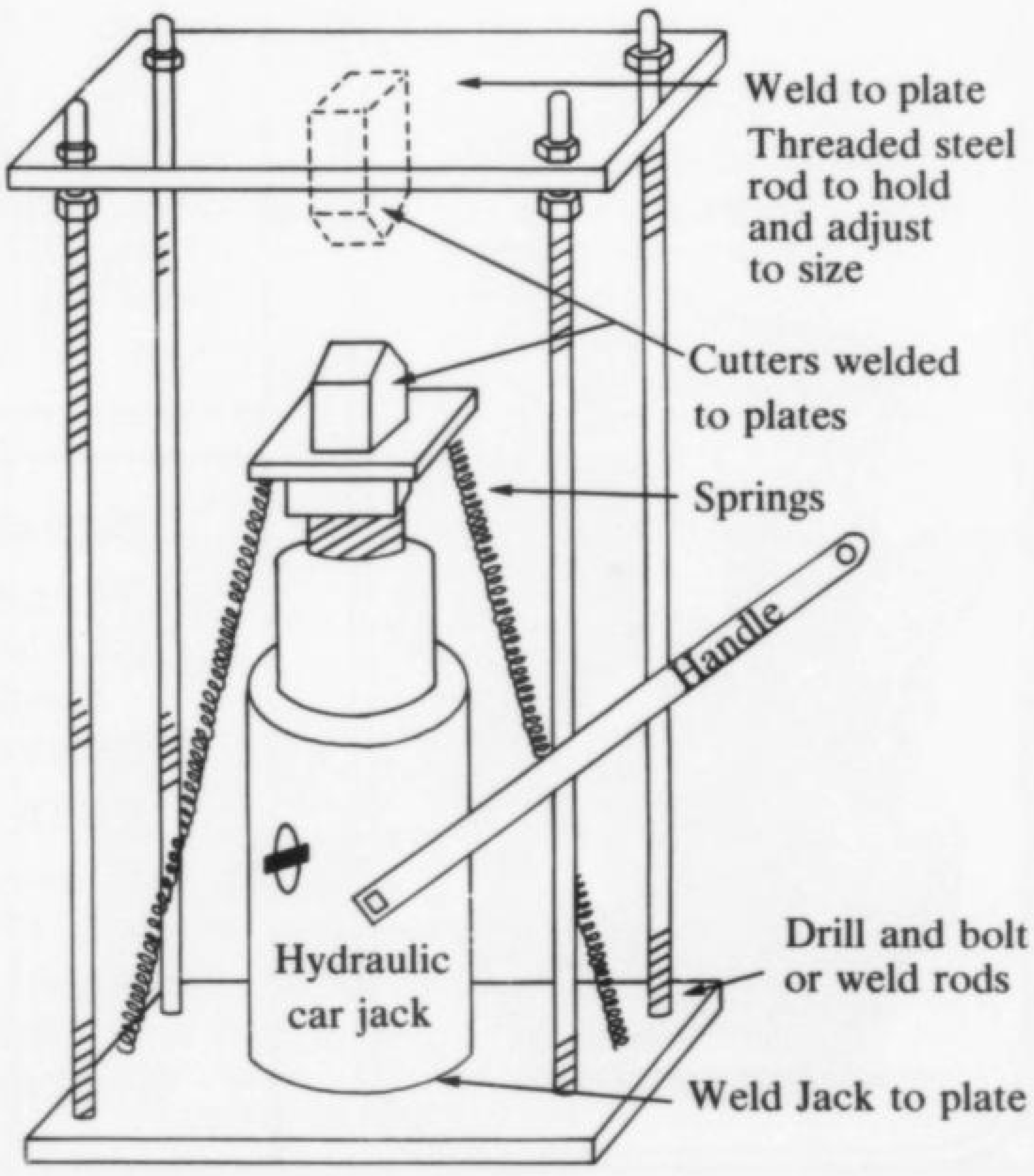
Henry H. Fisher, of Columbus, Ohio, on reading of our description of several mineral trimmers and breakers (**M. R.**, Vol. IV, No. 3) remonstrates, and says, "Why would anyone want to operate a screw-type crusher... rather than a hydraulic crusher that can easily be built and operated with less effort and expense out of an auto jack and scrap and welding... "? He sent a sketch of such a contrivence, and authorized our use of the drawing and our letter of response. This, in part, states: "I have seen and used your type of crusher, lately at the Smithsonian, where it has been in use for many years. There, too, is one similar to the 'Yost' screw type instrument, and thereby a distinction is made. You refer to the hydraulic tool as a crusher. Nowhere in my article have I used the word, but referred to the instruments as breakers, or trimmers, bearing in mind that we're dealing in micromount material, and sometimes it is necessary to remove but a quarter or half inch of waste material from the matrix. I would not dare use the hydraulic tool for this purpose - it is just too large and indelicate. Of course, for getting large rough material down to size there is nothing like it." Fisher responds: "The tool can be made in several sizes. The important thing is the size of the jaws, which canbe threaded and interchangeable. It is really an adaptation of a soil test earth compactor for a laboratory."

This discussion reminded us of a trimming technique where the specimen occurs on a reasonably flat matrix, much too large to go into a collection without shaping up. Usually crystals form in vugs, open seams and interstices, where space permits unobstructed growth. These portions are usually weaker than the rock surrounding and are most subject to destruction. Where such matrix is to be trimmed away to size the specimen properly, do not take large bites with the cutting tool - pliers, trimmer, etc. Nibble. And begin working on the rock farthest from the part to be preserved. A rough sketch is here included to detail a progressive procedure. We've had reasonable success with this technique.

Dermid Maclean, Huntsville, Alabama, sent to us some manganese ores from Chile, and requested identification. He adds - "I do not remember ever having seen manganite crystals in any show or dealers' shelves. Is it so unusual?"

Part of our answers may be of interest. "Years ago I

Hydraulic Rock Breaker



knew the late J. C. Boyle, perhaps the best sight identification man I'd ever met. He was curator of minerals at the Brooklyn, New York, Children's Museum. He had some key ideas about minerals and they usually worked out - like pyrolusite was almost always earthy and soiled the fingers when handled. That if it occurred in crystals and still soiled the hand it was still pyrolusite, perhaps psudomorphic after manganite. If it was in botryoidal form and had a 1 to 2 hardness, it was the same. If it was hard, and left no black mark on paper, then it was apt to be psilomelane. If in fine black prismatic crystals, striated, hardness about 4, orthorhombic, then it was apt to be manganite. This is a very rough rule-of-thumb identification. Much pyrolusite has come from the Lake Superior area - masses, with black prismatic crystals in the vugs, very soft. Usually pyrolusite after manganite. But then a few other things enter into consideration. Pyrolusite is tetragonal. Ramsdellite, a dimorph, is orthorhombic. Both are MnO_2. Manganite and groutite have the same chemical composition. So you must observe their morphology. Regarding manganite at dealers, most shy away from black minerals. They don't sell. Except for splendent superb manganites from Ilfeld, Harz, Germany, which are in great demand. There are very few of them around save for those in museums and old collections, and when one becomes available it commands a fabulous price. I've seen a couple here and there, at Tucson and Washington shows. Curiously, perhaps 35 years ago there was a collection of minerals at the public library in New York City, at Fifth and Forty-second. The collection, I believe, is now in the storage area of the Museum of the City of New York. As I recall, there were at least half a dozen of these manganites in it, ranging in size from 3 by 4 inches to slabs 6 x 8 inches. Today they'd wipe out New York City's deficit!

Buy and use a good mineral book, and clean and "police up" your microscope.

Neal Yedlin
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Braunite and Sursassite from Los Angeles County, California

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Recently braunite, $Mn_7O_8SiO_4$, and sursassite, Mn_2-$Al_2(OH)Si_2O_7SiO_4 \bullet H_2O$ (?), have been found in Palos Verdes Hills, Los Angeles County, California. Although braunite has been reported previously in northern California (Humboldt, Plumas, Santa Clara, Stanislaus, and Trinity Counties) (Murdock and Webb, 1966), it has not been observed in southern California until now. The only other occurrence of sursassite known in North America is in New Brunswick, not far from Houlton, Maine (Heinrich, 1962). Small quantities of todorokite, a manganese oxide, also occur in the area. In addition to reporting a new occurrence for these minerals, another purpose of this paper is to update the morphological and x-ray diffraction powder data for braunite, so they will conform to the space group and unit cell recently determined by de Villiers and Herbstein (1967).

The braunite occurs as submetallic steel-gray euhedral to subhedral crystals embedded in quartzite. The individual crystals are usually less than 0.5 mm across. A goniometric study of several of the larger crystals (1 mm) showed a rather constant habit, in which equidimensional tetragonal crystals are bounded by *e* {112}, *x* {211} (Fig. 1), and very rarely *n* {102} and *c* {001}. The orientation and morphology are based on a cell in which $a:c = 1:1.98_7$, $I4_1/acd$ (de Villiers and Herbstein, 1967). The morphology given by Dana (1892) was based on the same orientation with a different axial ratio, and the morphological data given by Palache *et al.* (1944) were based on a different orientation. The transformation formula to convert the Palache *et al.* (1944) indices to the values used here is: $\bar{1}10/110/002$.

Initially the braunite was identified by the x-ray powder method. The powder data for the Californian mineral compare well with those previously published by Smitheringale (1929), Berry and Thompson (1962), and others. The data given in Table 1 are the averaged values derived from four nearly identical films made in two powder cameras (11.46 cm diameter. CuKα radiation). In order to index the reflections, all possible reflections allowed by a cell in which $a = 9.44$, $c = 18.76$ Å, $I4_1/acd$ (de Villiers and Herbstein, 1967) were calculated through 1.87 Å. X-ray powder data have been indexed previously (Berry and Thompson, 1962; ASTM data card #8-78), but the indexing was based on space group $\bar{I}4ca$, now considered incorrect. The unit cell parameters for the Californian material, determined from data in Table 1, are $a = 9.43 \pm 0.04$, $c = 18.76 \pm 0.04$ Å, $a:c = 1:1.98_9$, which are close to the values reported by de Villiers and Herbstein (1967). Our x-ray data also usually show the strongest quartz lines at 3.34 A (10•1) and 4.25 A (10•0). X-ray rotation and Weissenberg films (5 levels) were also obtained in order to verify the space group and to show that this braunite is the common polymorph rather than the rarer braunite-II of de Villiers and Herbstein (1967).

In the quartzite rock we also found sursassite closely associated with braunite. This mineral is copper-red, and occurs as small tufts and radial fibrous masses in which the fibers may be up to 5 mm long. Some of the sursassite is concentrated in quartz-rich zones and veins in the quartzite braunite rock. A cursory study of pleochroism and other optical data in thin section showed they compare well with data for the mineral given by Heinrich (1962). The final identification was based on x-ray powder data. Our data are averaged values from three nearly identical films made in powder cameras (11.46 cm diameter. CuKα radiation). and are compared (Table 2) with data for the type locality at Oberhalbstein, Switzerland, given by Heinrich (1962). Quartz interference might possibly affect the accuracy of some of the reflections. Desiring to index our x-ray data, we calculated interplanar spacings using the cell data of Freed (1964), $a = 8.82$, $b = 5.84$, $c = 9.71$ Å, $\beta = 108.4°$, $P2_1/m$ or $P2_1$. Our calculated results agree with those reported by Freed (1964). However, since there are an excessively large number of possible calculated values in the range of observed values, the indexing of many of the observed lines may be fortuitous. In the range of the first ten lines observed for California sursassite in Table 2 there

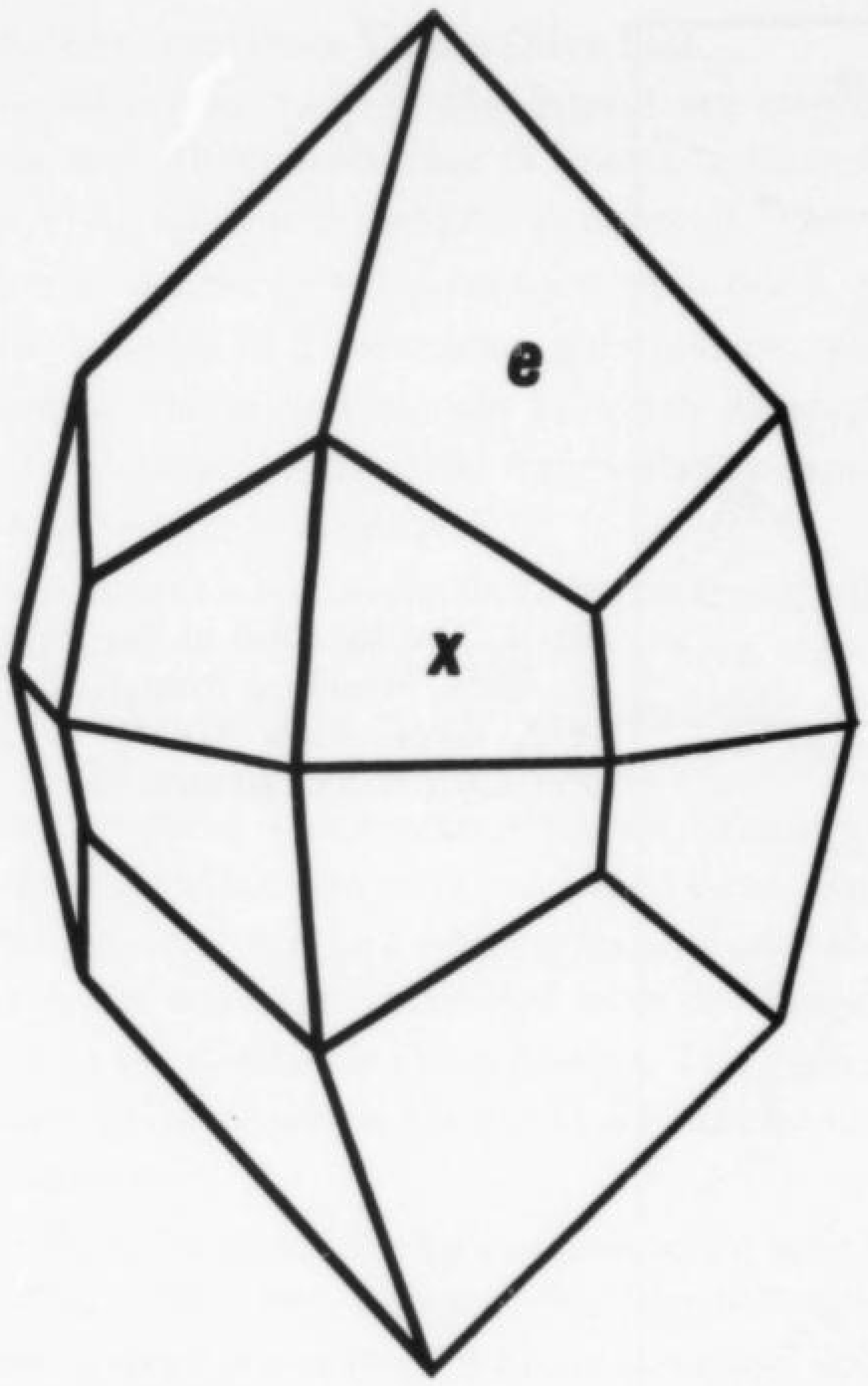

Fig. 1. **The common habit of braunite from Los Angeles County, California.**

are fifty-four calculated values ranging from 9.21 Å (001) through 2.29 Å $(\bar{3}13)$. Because of numerous ambiguities we decided to omit Miller indices from our data.

A black manganese mineral, on porous gray quartzite pebbles from the same area, gave x-ray diffraction data identical to that for todorokite reported by Frondel *et al.* (1960) and Straczek *et al.* (1960). The todorokite occurs as metallic black reflective cleavage planes (over 1 cm across) and as dull smooth brownish-black coatings on the pebbles. This specific quartzite does not contain braunite or sursassite. Other quartzite pebbles are coated with common pyrolusite and goethite.

The minerals described in this paper were collected by one of us (ASC) in the Palos Verdes Hills (Fig. 2) during many field trips to that area with physical geology classes from Pasadena City College. The Palos Verdes Hills constitute a rolling upland on the southwestern edge of the Los Angeles Basin, with a high point about 1480 feet above sea level. The collection locality is George F Canyon in the northeastern portion of the Palos Verdes Hills, near the intersection of Palos Verdes Drive East and Palos Verdes Drive North. The manganese minerals occur in widely scattered pebbles, cobbles, and boulders on the floor of the usually dry stream channel. These fragments are derived from an outcrop of metamorphic rock which occurs in the upper part of George F Canyon. This outcrop has not been studied by us because of its inaccessibility due to steep slopes covered with thick brush, including poison oak. The lower canyon is accessible by a trail which follows the banks of the incised stream channel,

Table 1. X-ray Powder Diffraction Data for Braunite from California. Nickel-filtered copper radiation.

hkl	d(calc.) Å	d(meas.) Å	I(obs.)[a]
112	5.44	5.41	vvw-
200	4.72	4.71	vw-
004	4.69		
202	4.22		
211	4.12		
213	3.50	3.48	vw
220	3.34		
204	3.32		
312	2.85		
116	2.83		
215	2.80	2.80	vvw-
224	2.72	2.71	s
206	2.61		
321	2.59		
314	2.52		
323	2.42		
400	2.36		
008	2.35	2.35	w+
402	2.29		
411	2.27	2.27	vvwB
217	2.26		
332	2.17		
316	2.16		
413,325	2.15	2.15	w
420,404	2.11		
208	2.10		
422	2.06		
415	1.95		
424	1.93		
228	1.92	1.92	vvw-
406,431	1.88		
327,219	1.87	1.87	vw
		1.81	vw
		1.74	vw
		1.66	ms
		1.57	vvw-
		1.54	vw
		1.50	vvw
		1.46	vvw
		1.42	mw
		1.41	w

[a] Scale of decreasing intensities from visual estimation: s, ms, m, mw, w, vw, vvw.

Fig. 2. **The location of the Palos Verdes Hills. Modified from R. P. Sharp, 1972, *Geol. Field Guide to Southern Calif.*, Wm C. Brown, 181 p.**

Table 2. X-ray Powder Diffraction Data for Sursassite. Nickel-filtered copper radiation.

California		Switzerland (Heinrich, 1962)	
d (Å)	I^{a}	d (Å)	I
4.59	ms	4.6	m
		4.3	w
		4.1	w
3.75	m	3.74	s
2.91	mw	2.9	ms
2.84	s	2.84	vs
2.71	m		
2.68	mw	2.67	ms
2.60	mw	2.59	m
2.46*	mw-	2.46	vw
2.39	mw-	2.38	w
2.29*	w	2.28	w
2.16	mw-	2.16	s
2.12*	vw	2.13	vvw
2.08	vvw	2.06	vvw
		2.03	vvw
1.96	vw	1.97	vw
1.88	vvw		
1.81*	vw		
1.66*	w		
1.62	vvw	1.63	vvw
1.61	vvw		
1.57	w	1.57	w
1.54*	vw	1.54	vvw
1.52	vvw		
1.49	vvw-		
1.46	vw	1.46	w
1.45*	vw		
1.42	vvw		

[a] **Scale of decreasing intensities from visual estimation: vvs, vs, s, ms, m, mw, w, vw, vvw.**

***Possible interference from quartz.**

extending west from Palos Verdes Drive East.

The metamorphic rocks at the deposit are principally quartzites and schists consisting of quartz, glaucophane, chlorite, white mica, and manganese minerals. There are white, green, and brown schistose quartzites: black quartzite with braunite and sursassite; glaucophane, glaucophane-quartz schists; and breccia in which glaucophane quartzite and glaucophane schist fragments are cemented with quartz, calcite, and goethite.

The metamorphic rocks constitute the basement rock of the Palos Verdes Hills and surrounding area, and have tentatively been assigned to the Catalina schist (Yerkes *et al.*, 1965). The Catalina schist of the Palos Verdes Hills has been correlated with similar schist on Santa Catalina Island, some 20 miles west of the mainland coast. Because of similar lithologic features (glaucophane important) the Catalina schist has been correlated with the Franciscan formation in the California Coast Ranges. The Franciscan has yielded fossils ranging in age from Late Jurassic to early Late Cretaceous.

In the Palos Verdes Hills the Catalina schist is overlain by 3000 feet of Miocene, Pliocene, and Pleistocene rocks. The general structure of the Hills is an anticline, trending roughly east-west, with the axis paralleling the crest of the Hills. During recent uplifts, 13 marine terrace levels were formed, which have been partially modified by stream canyons, such as George F Canyon.

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What's New in Minerals? continued from page 276.

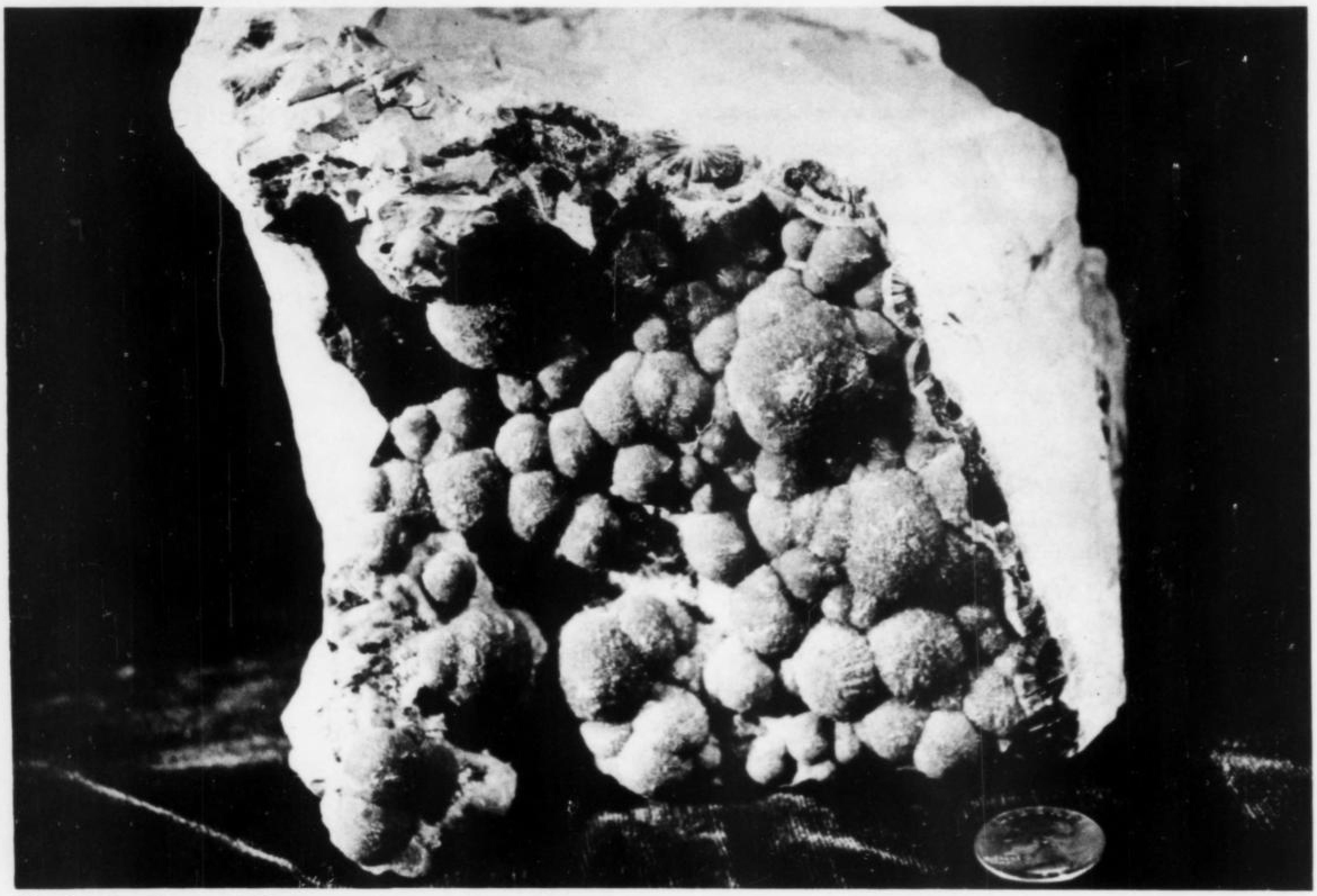

***Fig. 3.* Wavellite — Arkansas**

WAVELLITE — Arkansas

Every once in awhile an old locality makes a dramatic comeback. Often the resurgence tends to be shortlived but it is not unusual that some exceptional specimens appear. In the dramatic comeback department we are forced to include the famous Dug Hill, Arkansas, wavellite locality. This locality, 1.5 miles north of Avant and 19 miles from Hot Springs, Garland County, has produced more and better wavellite than any other locality in the world. The Smithsonian just acquired the recently dug specimen shown in Figure 3. This immense specimen is not only exceptional is size, but is virtually unique in that the wavellite "balls" are practically without damage. The largest measures just over one inch in diameter and a minor bruise is the only visible flaw, except for the disrupted clusters along the edges of the specimen. The wavellite is concentrated on one surface of a massive block of grey limestone 6x5-1/2x3-1/2 inches. The balls are medium green in color on the surface. The crystal growth is spokelike, which is typical of Dug Hill wavellite. Broken spheres reveal a lovely concentric color zoning beginning with cores that are green, but so dark they almost appear black.

The wavellite from this locality was the subject of a paper in the *American Mineralogist* (Vol. 51, p. 422, 1966) by M. D. Foster and W. T. Schaller, "Cause of colors in the wavellite from Dug Hill, Arkansas." The authors attributed the colors to vanadium, the various shades being related to both the amount and oxidation state.

PHOTO CONTEST

See "Shutterbugs Take Note" on p. 231 of last issue for details.

THERE IS STILL TIME TO ENTER — BUT NOT MUCH!

INDEX - VOLUME IV

Friends of Mineralogy, continued from page 254.

Society of Southern California, and many FM members belong to the Society. A regional meeting is held in conjunction with the widely attended show of this Society in November of each year at Pasadena City College. Visitors from other regions and interested persons are welcome to attend these regional FM meetings.

A very fine exhibit on the minerals and history of the famous Crestmore quarry in Riverside, California, was prepared by one of our members, David Burgess. The exhibit has been donated, through FM, to the Los Angeles County Museum of Natural History and will be displayed in the rotunda of the Museum. The exhibit will be moved into specially-built display cases in the new mineral hall of the Museum when it is completed.

The region has published a newsletter, at regular intervals, since April 1972, to keep members abreast of what's happening within their region, as well as reporting on activities of other regions around the country. The newsletter editor is Janet Hammond.

One of the region's members, H. Stanton Hill, was recently honored by the National Association of Geology Teachers and given the coveted Neil Miner Award of the Association in 1971. Stan Hill has also been selected by the American Federation of Mineralogical Societies to receive one of their scholarship awards. Another member, C. D. Woodhouse, has recently been honored through the dedication of the Charles Douglas Woodhouse Laboratory at the University of California, Santa Barbara. This new science building, devoted to the study of geology and mineralogy, was dedicated in January 1973.

A new and exciting project has been initiated by Region 14. Members are planning to set up an x-ray diffraction laboratory for mineral identification. Wayne Leicht will instruct and assist members on operation of the equipment. Currently, activity is centering on locating a suitable place in which to house the laboratory, and also in securing good second-hand equipment. The plan has the full support of national FM, through its executive committee, and funding will come from Region 14 fund-raising events and from a low-interest, long-term loan by FM to Region 14. The region will also raise funds to support and maintain the laboratory. Two generators and two powder cameras have been located and hopefully will be made available to us, as well as numerous film "standards", which are now in our possession. The region received a big "boost" for the project when Philco-Ford Corporation, Newport Beach, California, donated enough equipment, reagents, etc., for a fully-operational chemistry lab!! We take this as a very good omen for the future of FM, since we have succeeded in establishing a good working relationship with some of the major scientifically-oriented companies in the community! The region is seeking assistance, both locally and country-wide, from anyone knowing of the location of equipment that can be donated, loaned, rented or purchased for this laboratory. It is hoped that additional equipment, including a petrographic microscope for optical determination of minerals, can be added in time.

We are, of course, very proud of our accomplishments for FM in this region. We will welcome correspondence with other regions and any person interested to write to us. Our mailing address is P.O. Box 2514, Costa Mesa, California 92626, or by 'phone at (714) 545-1315.

We clearly see a new kind of "mineral happening" within FM—don't you agree??

All news and material relating to FM, for Record *publication, should be sent to Dr. Arthur Montgomery at: Dept. of Geology, Lafayette College, Easton, Penna. 18042.*

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Pyromorphite — Poullaouen, Brittany, France. Yellowish-tan cluster of spindle-like crystals. 11/2" x 1" x 1" **$32.00**

Vanadinite — Mibladen, Morocco. Group of medium red crystals in perfect condition. 11/2" x 11/8" x 1" **$75.00**

Inesite — Hale Creek mine, near Ruth, Trinity County, California. Small sharp delicate pink crystals on brecciated rock. 11/2" x 2" x 3/4" **$42.00**

Wolframite — Panasqueira, Portugal. Dark black single in a steplike pattern. 27/8" x 2" x 3/4" **$60.00**

Meta-autunite — Daybreak mine, Spokane County, Washington. Greenish-yellow aggregate of divergent fanlike growth. 2" x 11/4" x 1/2" **$14.00**

Cinnabar — Almaden, Ciudad Real, Spain. Exceptional lustrous intense red, perfect crystals on grey calcite. 15/8" x 11/8" x 5/8" **$395.00**

Descloizite — Berg Aukas, South West Africa. Cluster of black sharp fine crystals. 1" x 11/2" x 1" **$12.00**

Gold on Milky Quartz — Sixteen to One mine, near Allegheny, Sierra County, California. Brilliant yellow colored gold embedded in cream colored quartz. 2" x 1" x 1/4" **$30.00**

Pyrolusite — Iron Baron, South Australia. Mass of platy steel-grey to dull black crystals. 21/8" x 11/2" x 3/4" **$27.00**

Hessonite, variety of Grossular garnet — Jeffrey mine, Asbestos, Quebec, Canada. Amber colored group with diamondlike patterns on the crystal faces. 3/8" x 11/2" x 2" **$42.00**

Malachite — Copper Queen mine, Bisbee, Arizona. Botryoidal velvet green group, no matrix attached, with U.S. National Museum Label. 27/8" x 21/8" x 1" **$75.00**

Aquamarine, variety of Beryl — near Kabul, Afghanistan. Single pale blue hexagonal crystal with sharp faces. 5/8" x 3/8" x 3/8" **$12.00**

Kunzite, variety of Spodumene — near Kabul, Afghanistan. Striated translucent white to lilac pink single with excellent termination. 41/2" x 11/8" x 1/4" **$160.00**

Pyrrhotite — Santa Eulalia, Chihuahua, Mexico. Bronze to dark brown group of four crystals. 13/4" x 11/2" x 11/8" **$24.00**

Smithsonite — Tsumeb, South West Africa. Cluster of pinkish grey crystals. 2" x 21/4" x 1" **$38.00**

Scheelite — Tong Wha, Korea. Amber colored single with one good face. 11/2" x 11/2" x 1" **$38.00**

Cassiterite — Oruro, Bolivia. Group of several stubby dark brown crystals. 11/4" x 1" x 3/4" **$32.00**

Neptunite — Dallas Gem mine, San Benito County, California. Superb single black crystal on a base of cream colored natrolite. 11/4" x 11/8" x 3/4" **$50.00**

Hematite — Elba, Italy. Beautiful iridescent cluster of crystals. 2" x 11/2" x 11/2" **$15.00**

Scepter Quartz — Denny Mountain, King County, Washington. Very showy, fine single amethyst crystal containing red inclusions resting on a cluster of white to transparent quartz crystals. 1 transparent quartz crystals. 15/8" x 1/2" x 1/2 **$32.00**

Azurite — Tsumeb, South West Africa. Very sharp dark blue group of crystals with minor malachite. 17/8" x 1" x 11/4" **$55.00**

Idocrase (Vesuvianite) — Sierra Nevada Range, California. Group of dark brown crystals. 11/4" x 1" x 3/4" **$17.00**

Huebnerite on Quartz — Trujillo, Peru. Large single transparent to milky quartz crystal with partial reddish brown huebnerite crystal near the quartz base with smaller quartz crystals radiating from the huebnerite. 3" x 11/2" x 1" **$75.00**

Please include a money order or check with your order. California residents please add 5% sales tax (San Francisco, Alameda and Contra Costa Counties 5-1/2%) to all items. All specimens are well packed, insured and shipped postpaid. Your purchase may be returned for cash or credit within two weeks if you are not completely satisfied.

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