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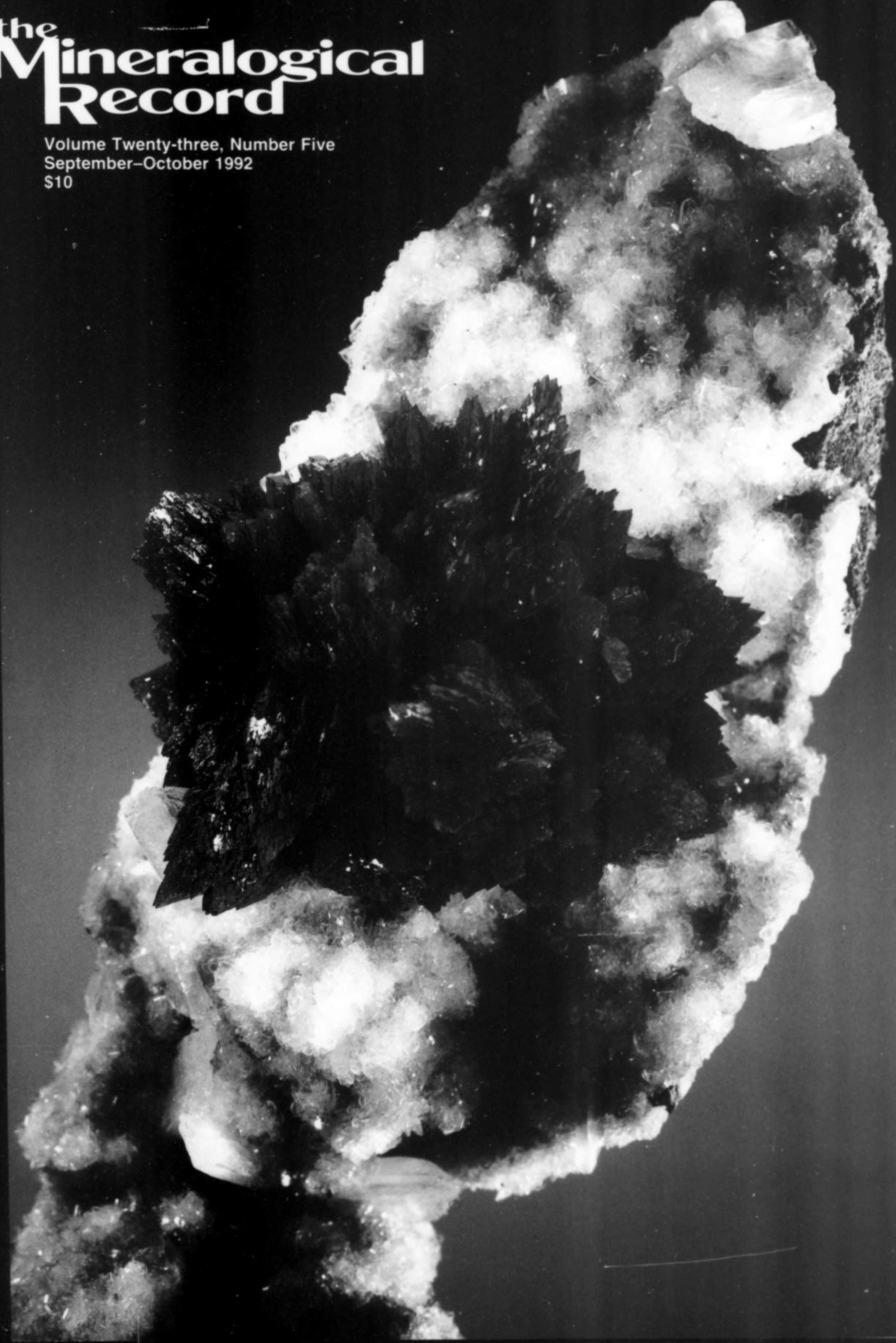

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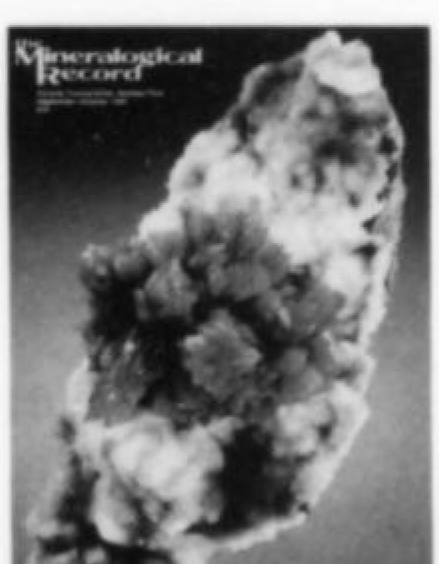
Articles

Columns



COVER: CAVANSITE from the Wagholi quarry near Poona, India. The crystal cluster measures 4.1 cm across. See the article in vol. 22, no. 6, p. 415–420, on this unique occurrence. Houston Museum of Natural Science collection; photo by Harold and Erica Van Pelt.

What is to be done?

Bill Smith

I had to steal this title from V. I. Lenin because it so clearly expresses the question that should be in front of the mineral collecting community. The question is: what are we going to do about the progressive closure of public lands to mineral collecting, and the progressive narrowing of allowed collecting techniques on such lands as remain open to us. (These concerns undoubtedly are shared by fossil hunters and lapidarists, but I must confine my arguments to the field that I understand.)

I am not going to spend much space attempting to persuade the unconcerned that we have a real problem here. If what has been happening in Arkansas, Idaho, Southern California, or New Mexico has not sensitized you to this issue, you need more exposure to the collecting community. The proximate cause of my essay is the "Policy Statement" by John Simmons of the U.S. Forest Service in the July/August 1991 issue of *Rocks and Minerals;* this was the shove that pushed me from verbal commiseration, to this call-to-arms. Simmons' title is "Collecting in Washington's Wenatchee National Forest," but he also refers to National Forests in "Washington and Oregon," so the policy he enunciates may soon also apply to all 21 National Forests in those states, if it does not already.

Another effort I will not make here is to try to persuade Simmons of the error of his ways (though I would be willing to do this in a different venue). This article is directed to the mineral community: collectors and their supporters. Among their supporters should be curators, professional mineralogists, and dealers. It will be asked: why do I not go directly to the source of my grief (Simmons) and attempt to correct his policy? My answer is the main thrust of this article: policy will not be changed to the benefit of our community until we *act* like a community, and express our voice to the right people (of whom Mr. Simmons is unlikely to be one). It is my primary contention that one mineral individual here or there arguing that this or that low-echelon employee of the Forest Service ("FS," henceforth), or the Bureau of Land Management (BLM), or sundry other Federal, State, and local entities will have no, or very little, effect on the policies that concern us. I know that a number of respected members of our community have indeed spoken up to the bureaucracy, and, judging by what results I can see, they probably have already concluded that only serious group action is going to produce serious policy changes in our favor.

It is much easier to identify the problem than it is to construct a solution, but you have to start with the former, so let us see what is wrong with what we are doing now. The first thing we (as a mineral community) are doing wrong is: **doing nothing.** Mostly what we are doing is bewailing the trends to closures and restrictions; other than that, we are **doing nothing.** If we stay sunk in lethargy, we will have only ourselves to thank when, after a winter of idleness in the field, we find that our hammers cannot be used in the summer, either. I frequently hear epithets hurled at "those damned bureaucrats" by some field collectors, but other than elevating their blood pressure to dangerous levels, what are they doing about the problem?

This leads to my second point: blaming the FS, or the BLM, or whatever land administrating agency it is that offends you, is not only futile but misdirected. All such government agencies bow in the direction that the current wind is blowing, and individual officials generally respond to the climate in which they live and work. When our society respected the extractive industries (the logger and the miner) these industries called the tune for our land agencies. As Paul Bunyan has shrunk, the environmentalists have moved into a position of greater prominence, so we hear the land agencies begin to pick up their lingo; the more powerful the local environmental movement, the more their buzzwords emanate from the local rangers. All policy pronouncements from government offices sound like timeless truths being handed down from Mount Sinai, but the truths from Green Mountain National Forest (Vermont) generally differ from those of Talladega National Forest (Alabama); this may have something to do with the size of the nearby chapters of the Sierra Club and the local production of plywood. Propinquity, too, matters; field officials know when they live in communities of ranching and logging families; there are precious few communities of mineral collectors. Much pretense is devoted to "uniform" policies, and "evenhandedness," but it doesn't work that way: when a land district has only six snowmobiles in the whole area, the snowmobiles are likely to find that regulations require them to drive no faster than 2 mph on slopes of no more than 5°; when every hardware store in a radius of 100 miles derives 30% of its winter revenue from snowmobiles, you can be certain that the local agency will apply other rules. When land agencies are confronted with their deviations from their supposed uniformity, their answer will be that they are being "responsive to public opinion." Exactly! We mineral collectors don't have any "public opinion." This is why Simmons can lecture us collectors about our environmental impact, when the area disturbed by all mineral and fossil collecting in the whole U.S. since the retreat of the Wisconsin ice sheet would not cover one section of land, whereas the forest products industry has left much of the Wenatchee National Forest as fringes of virgin timber along the highways surrounding hundreds of square miles of clear cut slash. It is not only that the logging industry employs many people, what really matters is that logging has industry associations and unions. The hikers and backpackers do far more ecological damage (yes, I, too, hike, and my boots have Vibram soles) to the Western outdoors (including the Wenatchee National Forest) than the mineral collectors do, but the "outdoors enthusiasts" have highly effective organizations; we, on the other hand, have organizations that spend so much energy on items like the Uniform Rules, that they are too exhausted to truly defend our essential interests.

At the price of redundancy, I must hammer the second point home: don't blame the agency for behaving like a government agency, and don't blame the government employee for behaving as such. Government entities that are close to the great American public (like the FS and the BLM) oil the squeaking wheel, and the louder the squeak, the more oil. The role of "natural law" may be of concern to the candidates for the Supreme Court, but it is of no interest in the local Ranger's office. This is the way our government operates,[1] and though

I am here to rouse us all to action, I do not propose that we attempt to change habits that our government has had since 1789. What I propose is that we adopt the techniques that other effective communities use, so that we get a little oil on our squeaks. My words may sound harsh toward the government and its employees, but I intend only realism and candor, not opprobrium.

How do we get government agencies to pay attention to what we feel are our legitimate concerns? Well, the way *not* to do this is for three of us to go, hats in hands, to the local GS9, and attempt to wheedle our way into a pocket of amazonstone and smoky quartz. If you can go collecting without this ridiculous charade, by all means, do so; if not you will probably get a gratis lecture on man's place in the universe. Nor is the solution to your concerns to be found by your club president asking the local district ranger for a "policy statement" on mineral collecting. The flaws in this approach (which has the right idea of going to a higher level than the nearest spear-carrier) are twofold. First, if the ranger refers your request to his agency's legal staff, he will get what I always got when I went to my agency's counsel: an engraved slip that always began "it's probably not a good idea to . . . ." If, on the other hand, policy is to be made without the lawyers, what you will get is what we have seen in Simmons' response, various Ouchita National Forest pronouncements, earlier utterances by Sawtooth National Forest, etc. You will get a mineral collecting policy made by someone who has yet to hold an Estwing in his hand, who has never seen a book on minerals, nor attended a mineral show, and who may have seen his first mineral specimen in the hands of his petitioner. That he is a mineralogical cherub, however, will not deter the local satrap from issuing his mineralogical pronouncement; he is paid to "make policy," and by gum, so he shall.

Thus we get these asinine strictures like "for personal use only" (if you put a piece on the swap table at Flatirons Show, you have now violated the U.S. Code); "only on the surface of the ground" (this definitely rules out mesolite); fussy little equipment stipulations (spoons okay, forks not okay), etc. These "policy statements" invariably show a total lack of understanding of what collecting is all about, especially the joy of discovery. But, of course, this is so because no collector had a hand in writing the policy! Furthermore, it is not sufficient to issue draft policy statements for public comment; how would you revise the Wenatchee absurdity? The only thing that can be done is to rewrite it entirely. (Even if review were sufficient, what mineralogical body will do this?) The time for the mineral community to get in on the regulatory policy is *before* the draft, and the best way is to offer up a draft that we have written. Who do you think writes the strawman drafts for legislation regulating private aviation, or duck hunting, or the drug industry, or the National Science Foundation grant process?

But it is not enough for us to be proactive in the regulatory process. Why should the district ranger (or anyone else) pay any attention to our draft? Why indeed, if we have no political power? The three most important things to any government agency are (I bet you know the answers!) appropriations, appropriations, and appropriations, or, for the novice: money, money, money. If we have a detectable effect, however small that effect may be, on an agency's proposed budget, I guarantee that we will have captured that agency's attention.

So there it is: if we wish to see that the future bodes well, as opposed to ill, for mineral collecting on public lands, we must develop organizations that will be proactive on public policy, and we must exert political pressure, *budgetary* pressure, to ensure that we are heard. Take heart: doctors do it, gun enthusiasts do it, petroleum companies, llama breeders and timber companies do it, the Wilderness Society does it, tropical fish collectors do it.

If I can sell you on this, I have done the job I set out to do. Once we decide that we will go this route, we have many paths that we can follow. Probably the easiest way to get an agency's attention (money, again) is have one of the senior officials get a call from Congress. You can be *certain* that even the most polite inquiry from a congressperson's lowliest staffer will be responded to with alacrity. If the congressperson is on the right committee, the agency will be that much more obliging. There are other ways to get the agency's attention (does any of us know the Deputy Assistant Secretary of Agriculture?), but by going to Congress as opposed to, say, the courts, we move from something we don't have much of (money) to something we have a good deal more of (votes). (An example of the reverse situation is that of the metal mining industry today, which has a goodly amount of money, but not many votes.)

I have sensed a lot of skepticism among my collector friends that the political process might be useful to us. This skepticism seems to derive from a general repugnance toward the political process. But the skepticism is unfounded; if just ten collectors in your congressperson's district call up, *as a group*, that congressperson's office will hear you out. Congress people can count; they know these ten collectors have family, coworkers, friends, and neighbors; they also know that people who make the effort to go directly to Congress are serious candidates for becoming single-issue voters. There is no reason why at least some of us could not suppress our repugnance and pick up the political tools that are available to us. It is also true that the mineral collecting community has a high percentage of rugged individualists, idiosyncratic loners, and other character types not noticeably suitable for group action. Gun owners hardly seem to be models of conformity, yet in spite of the Brady Bill, no one doubts the political effectiveness of the NRA. The Sierra Club, in spite of violent upheavals within its membership, to the point of exiling their founder, nevertheless strikes fear and terror in many a bureaucratic heart. Just because we try to work to one common goal doesn't mean that we must all abandon our individuality and start collecting only Arizona wulfenites.

It is not my intent here to offer a program, because I am not qualified to do so, of how mineral collectors can make their needs felt. We already have in existence two institutions that perhaps could be turned in this direction: the AFMS and the FM. Perhaps they, or others, could develop a spinoff group to address the field collectors' concerns only. My concern is to start by divesting ourselves of illusions, and to encourage a "can do" attitude among us. Let us not be dissuaded by minor or illusory obstacles. For instance it has been said that this or that organization cannot lobby because it might lose its non-profit status. My guess is that the AMA is non-profit, but who would suggest that Congress does not listen to the medical community? [Ed. note: According to the Mineralogical Record's corporate attorney, there will likely be no risk to an organization's non-profit status as long as political activities account for a relatively insignificant proportion of its financial budget and its activities in general.] Another argument has been that many of the mineral specimens that enter our markets come from collecting of dubious legality, so what use is it to enter the regulatory process? This argument is analogous to maintaining that Ducks Unlimited should not enter the political scene, because there is poaching on the Eastern Shore of the Chesapeake Bay. We should not ignore the concerns just mentioned, but let us not let them dissuade us from taking the important actions that we know are necessary. We live in a democracy, so we can either help decide land use policy, or let others do it for us. Rest assured, our fate will be decided by someone.

Bill Smith
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[1]Editor's note: The author is no stranger to the workings of government bureaucracy; though now retired, he formerly served as Deputy Chief of the Office of Program and Budget, National Security Agency, Washington, D.C.

NOTES ON THE HISTORY OF PHOSGENITE AND MATLOCKITE FROM MATLOCK, ENGLAND

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Phosgenite and matlockite have a rich history, touching on many important mineral collectors, dealers and scientists of the 18th and 19th centuries. A study of the surviving documents points to the junction of two veins in the Bage mine as the probable type locality for both species.

CHARLES GREVILLE

Charles Francis Greville was born on 12 May 1749, the second son of Lord Brooke, later Earl of Warwick. His first passion in life, at least in his younger years, was the "fairer sex," and he is perhaps best known for his association with Emy Lyon, one of the "beauties" of eighteenth-century England. Emy was Greville's mistress, but as a second son his financial situation was always precarious and after some years he decided to transfer her and her daughter to his uncle Sir William Hamilton! Emy later married the uncle, became Emma Lady Hamilton, and led a brilliantly successful life in Naples. Subsequently she had a famous romance with Admiral Lord Nelson and bore him a daughter, Horatia (Fraser, 1986).

Greville's second passion in life was mineral collecting, an interest which he perhaps acquired from Sir Joseph Banks (1743–1820), with whom he was well acquainted. He was not rich, but by dealing in works of art and penny-pinching, Greville was able, in the 30 years prior to his death in 1809, to build up one of the finest collections of British minerals then in existence. In 1810, the year following his death, his 20,000 British and foreign specimens (which included a collection made by Baron Ignaz von Born (1742–1791) of Prague) were purchased by the British Government for £13,727 to add to the collections of Sir Hans Sloane, Charles Hatchett and the Rev. Clayton Mordaunt Cracherode, and so form the foundation of the mineral collection of the British Museum (Bruce, 1814; Anon., 1904; Smith, 1978).

PHOSGENITE

Discovery and Description

About 1785, Charles Greville purchased some specimens of an unusual carbonate of lead in a shop in Matlock, Derbyshire (Chenevix, 1801). His collection was growing rapidly at this time, and between 1794 and 1806 he engaged the Count Jacques Louis de Bournon (1751–1825), who was a political refugee in England, to arrange it. During this work, probably in 1799, the Count de Bournon recognized that the specimens of lead carbonate purchased by Greville were quite distinct from any lead carbonate then known.

Greville dispatched some specimens to the famous German chemist Martin Heinrich Klaproth (1743–1817) for analysis, and Klaproth, in turn, forwarded specimens to the German mineralogist Dietrich Ludwig Gustav Karsten (1768–1810) (Klaproth, 1802). Karsten was at that time the "Councillor of Mines" of the Prussian "Ministerium für Bergwerksangelegenheiten" (Ministry of Mining Matters) in Berlin where Klaproth also lived (Dunker and Humblot, 1977).

At the same time the Count de Bournon was also engaged with the Irish chemist Richard Chenevix (1774–1830) in the analysis of copper arsenates from Wheal Gorland in Cornwall. The Count de Bournon gave some specimens of the unusual lead carbonate to Chenevix, and he analyzed these in his presence (Chenevix, 1801).

The first publication and description of the mineral would seem to be that of Karsten, who published the physical properties in his *Mineralogische Tabellen* in 1800. These tables were an extended version

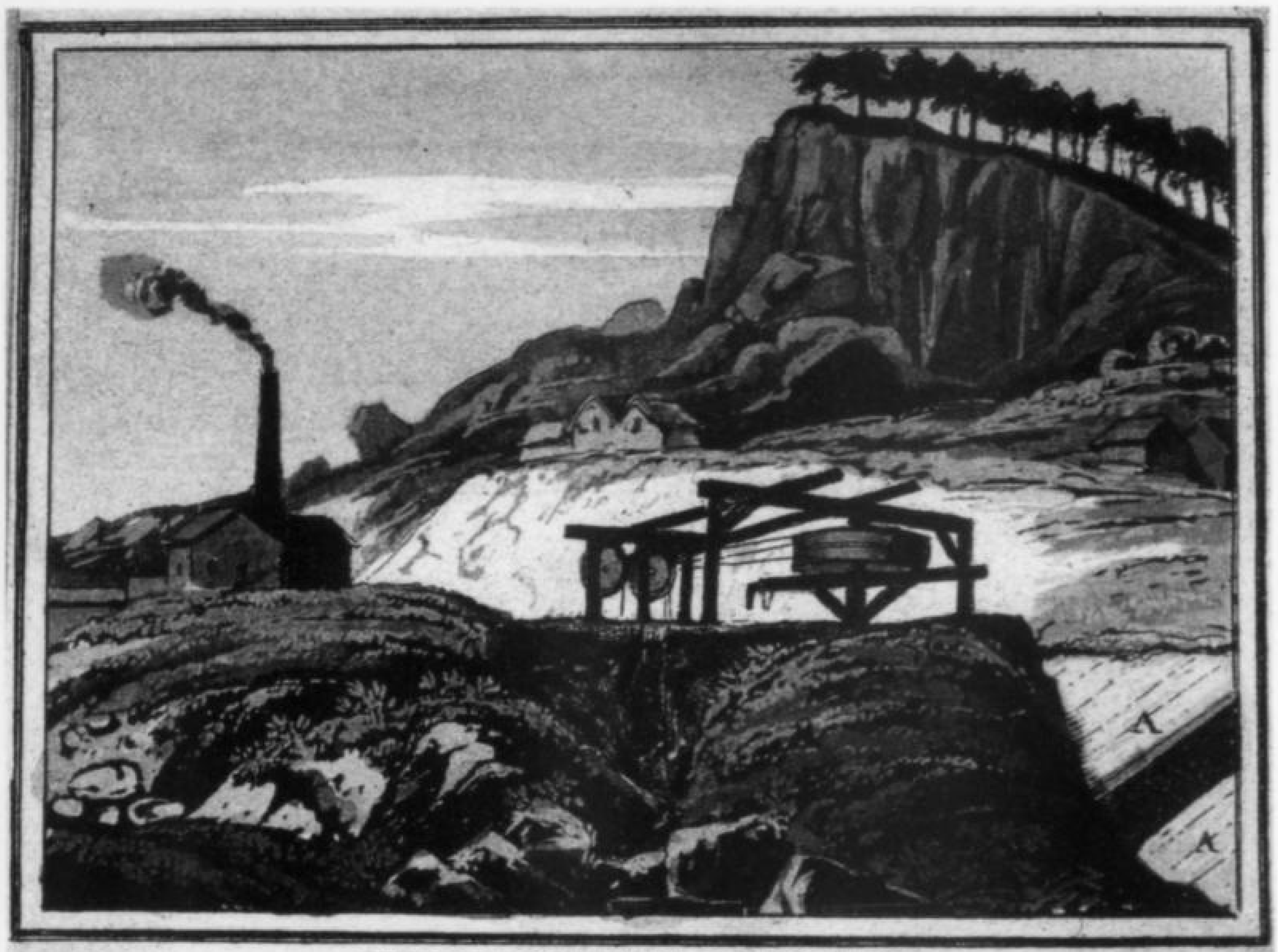


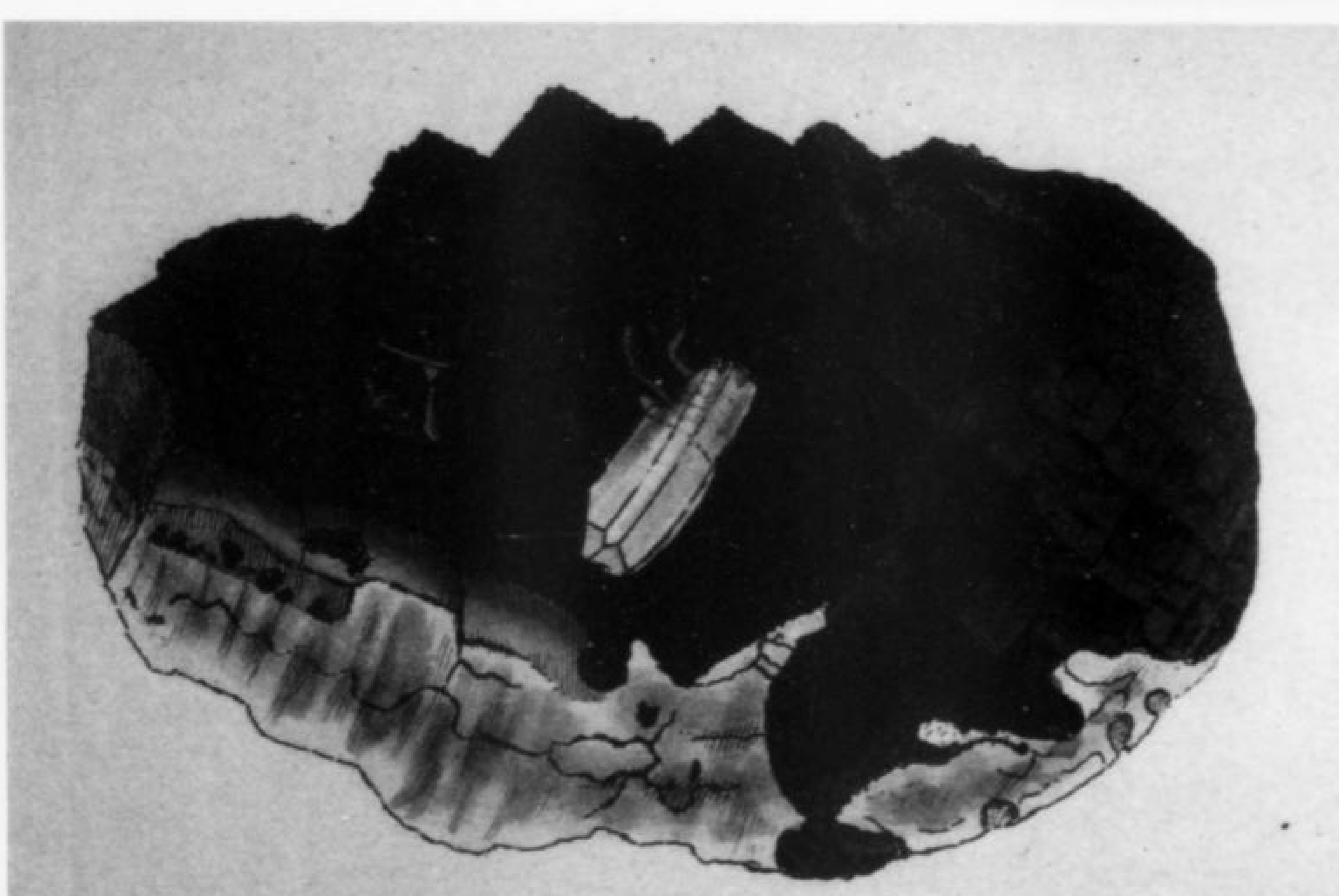
Figure 1. The Cromford Moor mine near Matlock, Derbyshire, England (from John Mawe's _Familiar Lessons on Mineralogy and Geology_, 1822). (MRL)

Figure 2. Phosgenite crystal, 2.5 cm, with fluorite, from the Wallclose mine, Cromford, Derbyshire. It was sold to Charles Greville by Tom Pearson of Matlock, and is now in the Natural History Museum, London (BM59296). Photo courtesy of the Department of Mineralogy.

of his *Tabellarische Übersicht der mineralogisch einfachen Fossilien* first published in 1791. As a result of Klaproth's analysis, Karsten referred to the mineral as "Hornblei" (i.e., chloride of lead), but gave no details of the chemical composition. The first publication of a chemical analysis was by Chenevix in 1801. Klaproth published his analysis in 1802 in the third volume of his *Beiträge zur Chemischen Kenntniss der Mineralkörper*.

Although both Chenevix and Klaproth determined correctly that the mineral was a lead chloro-carbonate (now called phosgenite), they did not arrive at the correct formula. This was due to imperfect analytical procedures and the use of inaccurate equivalent weights. It should be remembered that chemistry was in its infancy at this time. During the next few years chemistry advanced at a phenomenal rate, so that in 1815 the Swedish chemist Jöns Jacob Berzelius (1779–1848) was able to correct Klaproth's analyses. He performed no new analyses, but using the older, carefully recorded, results, calculated the presently accepted formula (Berzelius, 1815; Berzelius, 1824).

The discovery of phosgenite near Matlock was probably the first known (proven) natural occurrence of a lead chloride (with the possible exception of pyromorphite). Chenevix wrote:



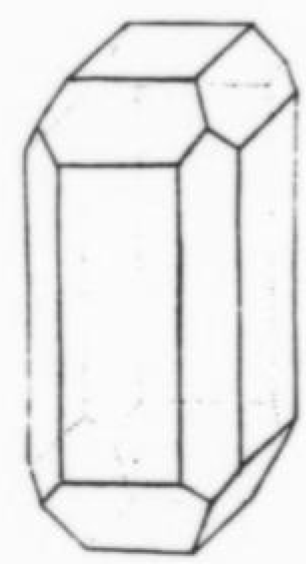


Figure 3. The phosgenite shown in Figure 2, as it appeared in James Sowerby's _British Mineralogy_ (1811, plate 399), along with its accompanying crystal drawing. (MRL)

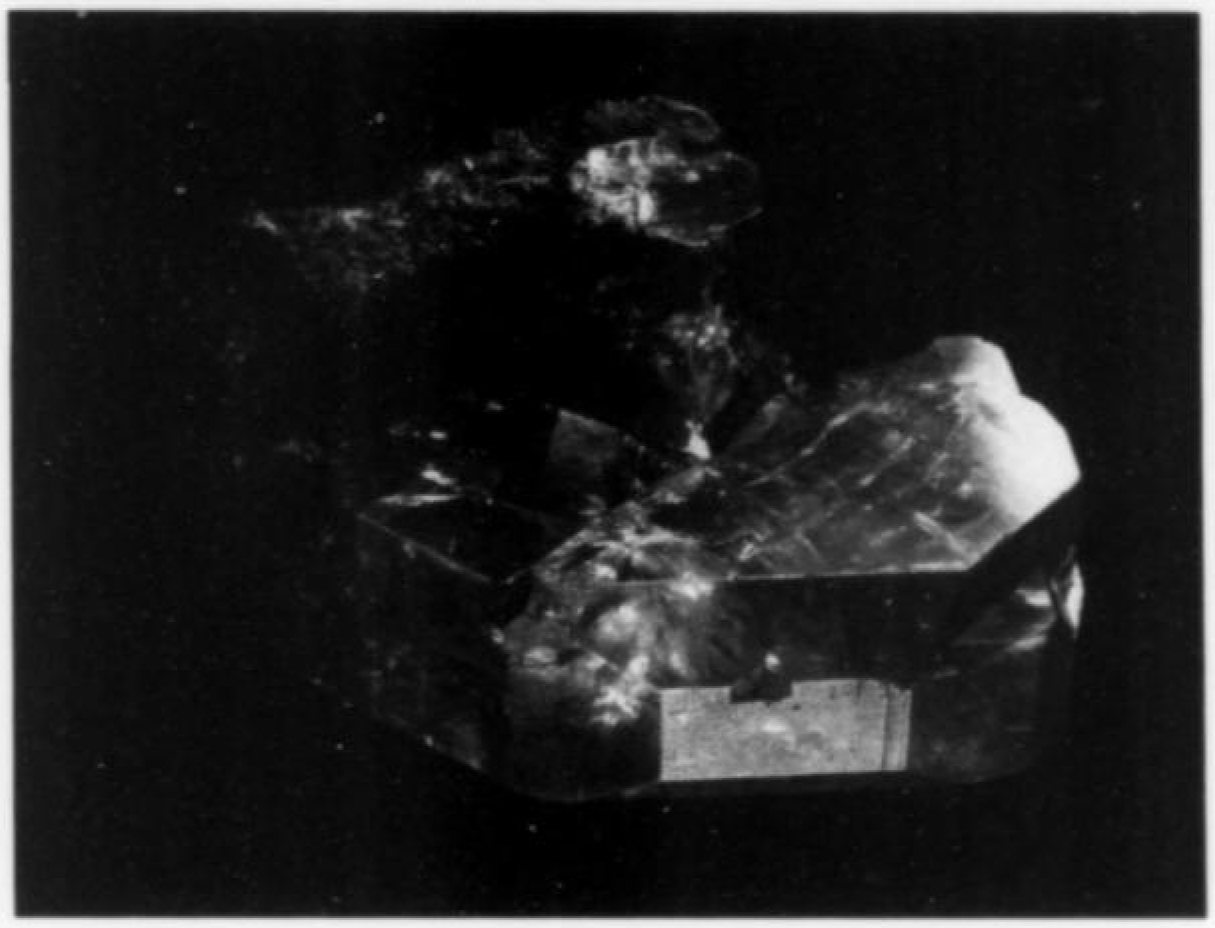


Figure 4. **Phosgenite crystal, 1.2 x 2.5 x 4 cm, from the Wallclose mine, Cromford, Derbyshire. Greville collection, now in the Natural History Museum, London (BM59295). Photo courtesy of the Mineralogy Department.**

> The existence of a natural muriate of lead has been suspected more than once. Ferber examined a specimen found at Meis and Bleystadt, in Bohemia, which he imagined to contain muriatic acid; but the Baron de Born assures, that Klaproth, upon an accurate analysis, had determined those same grey hexaedral [sic] crystals, which Ferber had procured, to be merely phosphate of lead, a variety then well known. Mons. Sage had likewise asserted as much; but the specimens which he had tried, being further submitted to investigation by Mr. [sic] Laborie, and by some members of the Royal Academy of Paris, were found to be totally void of muriatic acid, and are now universally acknowledged as pure carbonated leads.

The Swedish chemist Torbern Olof Bergman (1735–1784) stated in a paper published in German just prior to his death that no naturally occurring "Hornblei" was known of at that time. Although he worked in Uppsala, Bergman was well connected with the scientific communities in England and other countries. The chemical identity of mendipite (a lead oxy-chloride) was first determined by Berzelius (1824), although the species was known at least a hundred years earlier than this. The simple chloride, cotunnite, was first reported in 1825 from the ash of Vesuvius (Monticelli and Covelli, 1825). It should be noted that references to cotunnite occurring in Derbyshire (Ford and Sarjeant, 1964) have undoubtedly arisen through too literal a translation of the term "Hornblei."

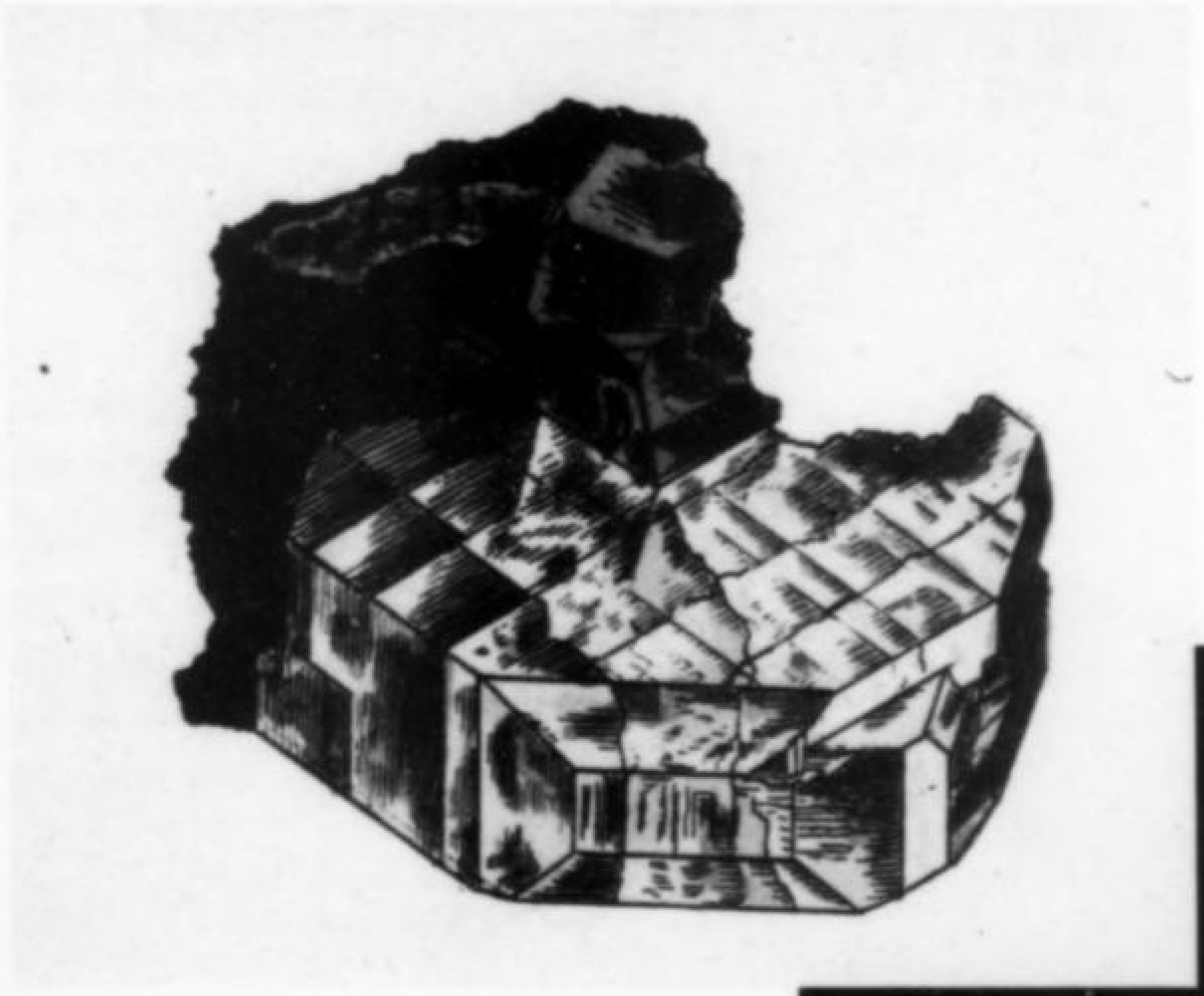


Figure 5. **The phosgenite crystal shown in Figure 4, as it appeared in James Sowerby's *British Mineralogy* (1811, plate 400). (MRL)**

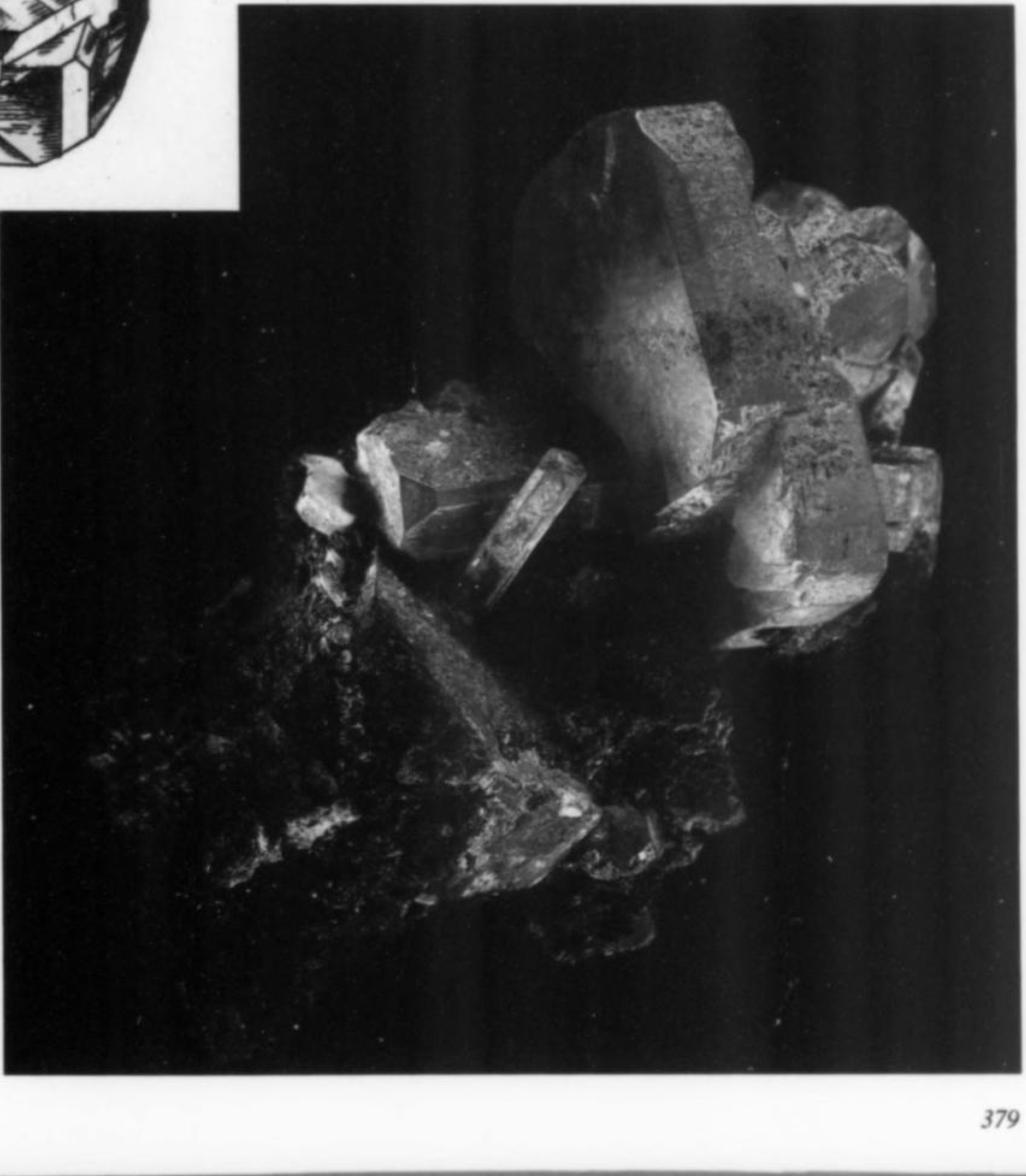


Figure 6. **Phosgenite crystals to 2.5 cm, with galena and barite, from the Bage mine, Bole Hill. Collected by Bryce M. Wright, later in the Alfred Russell collection and now in the Natural History Museum, London (BM1964, R7204). Photo courtesy of the Mineralogy Department.**

Location

The exact location where phosgenite was first discovered is difficult to determine. Charles Greville made the following comments:

> I purchased a piece of this mineral at Matlock, in Derbyshire; the shopkeeper not knowing from what mine it came, or unwilling to inform me, I left a commission for him to send me all he could procure, and repeated my order for several years successively: I traced some specimens, which had been sold, and recovered them. The largest crystal, Dr. Darwin, of Derby, gave up to me. I supposed from my enquiries, that it came from the district of mines intended to be unwatered by the Cromford level, as I was assured of my having no chance of any more till that level was completed; and since that period the water has continued in a degree, that many mines which were then open, are now drowned.

Cromford Sough (or drainage level) was started as a southward drive from Cromford village about 1673. Driving continued for more than a hundred years, and resulted in a very complex system of branch levels. The Rantor (Raven Torr) branch was begun about 1770, and the Shore Vein branch before 1769. A sub-branch of the Shore Vein branch had been cut along Wallclose Vein by 1770, and had reached Butler Vein in the Bage title by 1798. The Rantor branch had been driven along Fletchers and Ranter Vein by 1770. The northern portion of the Rantor branch, driven through altered (and evidently unstable) lavas and tuffs, had collapsed before 1790, and this undoubtedly caused a general increase in water levels (Rieuwerts, 1987).

The Dr. Darwin referred to was certainly Dr. Erasmus Darwin (1731–1802), the grandfather of Charles Darwin. He had moved from Lichfield to Radbourne Hall near Derby upon his second marriage in 1781. In 1783 he moved to Derby itself, and founded the Philosophical Society there in the same year. Earlier (about 1766) he had been a founding member of the famous Lunar Society of Birmingham. Darwin was greatly interested in geology, and evidently had a wide knowledge gained from his own observations, and from discussions with others interested in the subject such as the watchmaker (and barometer-maker), engineer, and geologist John Whitehurst (1713–1788) (who was reputedly also a "Lunatic"), the mine agent Anthony Tissington, and the parish clerk and "fossil philosopher" R. Brown of Derby. Whitehurst is well known for his *Inquiry into the Original State and Formation of the Earth* (1778). In 1787 Darwin supplied Thomas Beddoes (1760–1808) with a box of "fossils" from R. Brown for £1-1s-6d (£1.07) (King-Hele, 1963; King-Hele, 1981).

The famous Scottish geologist James Hutton (1726–1797) visited Darwin at Lichfield about 1775, and many of Hutton's ideas are included in Darwin's *The Botanic Garden* (published in 1791 or 1792). The first part of this work, entitled "The Economy of Vegetation," contains many notes on mines and minerals, but does not seem to include any reference to phosgenite (Darwin, 1791).

Darwin also kept a diary-notebook or "commonplace book" which is kept at the Darwin Museum at Down House, near Sevenoaks, south of London. This contains many notes on his daily life and medical cases, together with notes on other matters that interested him, and sketches of his inventions. It does not seem to include any reference to phosgenite either (Darwin, 1785; King-Hele, 1981).

Greville was an acquaintance of Darwin, and he proposed Darwin's son Robert as a Fellow of the Royal Society in 1787.

Specimens

The large crystal of phosgenite which Greville says he received from Darwin may be the larger of the two specimens illustrated by James Sowerby in his *British Mineralogy* (1811), which according to him came from the Greville collection, and which are now on display in the Natural History Museum, London (specimens 59295 and 59296).

The whereabouts of the other specimens obtained by Greville (apparently all that were found) are uncertain. Some information is given by the Count de Bournon in the catalog to his collection (Bournon, 1813). According to Bournon the two or three specimens in Greville's collection did indeed go to the British Museum. The three specimens in Bournon's own collection (one fine and two very small) came originally from Greville, and were given to Bournon by the mineral dealer Jacob Adolarius Forster (1739–1806). Bournon's collection is now at the College de France. Bournon also records a single specimen in the collection of Sir Abraham Hume (1749–1838), whose collection was also cataloged by Bournon, and is now in the Sedgewick Museum, Cambridge. It is probable that this specimen also came from Greville. Jacob Forster's private collection, which also contained specimens of phosgenite, was sold to Charles Hampton Turner by the dealer John Henry Heuland (1778–1856) (who was a nephew of Forster) in 1820. Armand Levy's catalog of this collection lists two specimens of phosgenite (Levy, 1837). Turner's collection was later purchased by Henry Ludlam (1822–1880). The Ludlam collection, now in the Natural History Museum, London, contains four specimens of phosgenite (Rudler, 1905), and it is probable that some of these came originally from Greville although the yellow-orange specimen listed by Levy does not seem to be present. The fate of the specimens that went to Chenevix, Klaproth and Karsten has yet to be uncovered.

Unfortunately, no catalog of Greville's collection was made, and Svedenstierna's account of Greville's collection as it was in 1802/3 contains little information (Svedenstierna, 1804). Furthermore, the specimen labels to the Greville collection that were produced by the Count de Bournon were mislaid during the transfer of the collection (in 1810) from Greville's house at Paddington Green (which he had purchased for Emy Lyon) to the British Museum. This transfer was supervised (apparently much to the annoyance of the Count de Bournon) by Charles Konig who had shortly before been appointed "Assistant Librarian" and keeper of minerals.

In 1862, Thomas Davies, assistant to Nevil Story-Maskelyne, the first "Keeper of Minerals," found an old label among some papers of the late Charles Konig (died 1851) which he supposed may have belonged to one of the (two or three) Greville specimens. The label read as follows:

> The muriocarbonate of lead was sold to Col. Greville by Tom Pearson of Matlock and was obtained from the Wallclose Mine on Cromford Moor. Pearson told me that it had been found likewise in the Raven Torr mine near Middleton by Wirksworth.

The label was signed "J.C." which, in 1870, Thomas Davies believed to be the initials of a Dr. Cantrill.

I have located no definite reference to Dr. J. Cantrill. A Dr. Cantrell of Wirksworth, Derbyshire, exchanged a very fine anglesite specimen from Derbyshire with the British Museum in 1862 (British Museum Catalog). However, this was probably Dr. William Cantrell, surgeon of Wirksworth, who is recorded in the 1835 edition of *Pigot's Commercial Directory* for Derbyshire, and in various other directories from 1827 to 1867. Cantrell was the proprietor of a large mineral business in the area and also ran a medical practice in Wirksworth. In 1855 he was joined by Dr. William Webb (Foxon, 1990). They would certainly have had many lead miners as patients, and these may have sometimes paid with mineral specimens. Webb published an article on "The lead miners of Derbyshire and their diseases" in the *British Medical Journal* (1857), and also published papers on the early history of the lead mines of the area. The specimen of anglesite is illustrated in Bancroft's *The World's Finest Minerals and Crystals* (1973), and on the front cover of the October 1990 edition of *Lapis* magazine. Perhaps "J.C." was William's father.

A reference to Thomas Pearson is found in the diary of Charles Konig. During a month's vacation in 1819 Charles Konig visited Matlock. On August 20 he "took a ride on horseback to Cromford Moor mine," and reported: "neither there nor at Brassington anything to be had." The next day he "took a ride to Mr. Mills at Ashover," and also "called on Thomas Pearson, the guide who got the muriate of lead for Mr. Greville" (Konig, 1819).

The Cromford Moor mine was worked beneath the level of Cromford Sough in the early 19th century by means of pumps installed in the sough (Rieuwerts, 1987). There is an illustration of the Cromford Moor engine house in John Mawe's *Familiar Lessons on Mineralogy and Geology* (1818).

It is not clear if Thomas Pearson really obtained the phosgenite about 1785, or if the label actually belonged to the Greville specimens. The label must have been written after 1802 since it refers to "muriocarbonate of lead." It was perhaps known to Konig prior to his visit in 1819. The label may have belonged to specimens of phosgenite obtained from Dr. Cantrill (Cantrell) although there is no record of this in the British Museum catalog. It is certainly inaccurate in one respect: "Col. Greville" was Charles's illustrious elder brother, Colonel "Wellbred" Robert Fulke Greville.

The early crystals, apparently quite scarce, were generally cubic in form, modified by edge faces, but "very frequently lengthened, or flattened." Some crystals had almost pyramidal terminations with only very small basal planes. One of the "Greville" specimens mentioned above has such a termination, and is also elongated and twisted about the *c* axis. The crystals were commonly from 1.3 to 2.5 cm long. Klaproth described his specimens as "crystallized in regular cubes with edge faces, 3/8 to 1/2 (Prussian) inch (0.98 to 1.30 cm) on the edge."

The crystals were generally "of a light straw color, though sometimes of a perfectly colorless and clear transparent white." Some of the specimens were exceptionally fine. The largest crystal found was apparently 3.8 cm long, 2.5 cm broad and 1.3 cm thick, "of the finest transparent yellow." This may be the second "Greville" specimen mentioned above. The crystals were found deposited upon "a large facetted galena."

Other References

Other early references to the mineral phosgenite are practically nonexistent. The sculptor, marble-worker and mineral dealer White Watson (1760–1835) (Cleevely, 1983) was active in Bakewell in 1788 and sold comprehensive collections of Derbyshire minerals for from five to ten guineas (£5.25 to £10.50) (Gadolin, 1788). He and the drawing master and fossil collector William Martin (1767–1810) produced lists of Derbyshire minerals about this time (Watson and Martin, 1790; Watson, 1799; Watson, 1803), but these only refer to "spicular" and "laminar" "white carbonate of lead." However, Watson's catalog of a collection of his to be sold by auction at Bakewell in 1805 (Watson, 1805) contains the following entry: "No. 1012: Carbonate of Lead in straw-yellow crystals with crystals of Ruby Lead-ore in cavities of Galena." This may just possibly have referred to phosgenite, although it is not clear what was meant by "Ruby Lead-ore" (perhaps it was a misplaced foreign specimen of crocoite).

The mineral dealer John Mawe (1764–1829) referred to the mineral (incorrectly) as "muriate of lead" in his *The Mineralogy of Derbyshire* (1802), but provided no additional information. Mawe also referred to "glass lead," but this is an old term for anglesite.

Greg and Lettsom, in their *Mineralogy of Great Britain and Ireland* (1858), state that the early specimens were found "in an air shaft to a level at a mine between Cromford and Wirksworth in Derbyshire," but I have found no other reference to this, and it seems open to doubt.

The crystallography of phosgenite was investigated by Brooke in 1837. However, he used a specimen from Wheal "Confidence," Newquay, Cornwall (Brooke, 1837; Greg and Lettsom, 1858). I have been unable to locate any information on this mine, and there is some reason to doubt the locality because Brooke also referred to "native muriate of lead" in "very thin and irregularly curved translucent . . . yellowish white . . . crystals, without any well defined lateral or terminal planes" on the same specimen as the phosgenite. This description (and the association with phosgenite) matches matlockite rather well, so that the specimen may actually have been from Derbyshire and not from Cornwall (even though Greg and Lettsom state that the phosgenite was in "gossan," the normal interpretation of which would be a non-typical matrix). If the specimen was indeed from Derbyshire, this would be the first published description of the mineral matlockite, albeit as lead chloride. Nevertheless, phosgenite (with laurionite and paralaurionite) has been recorded from Wheal Rose, Porthleven, Cornwall, where seawater enters the lead lodes (Russell, 1944; Dines, 1956), and recently good crystals of phosgenite have been found in the seashore outcrops of a number of lead veins in Cornwall.

Although Greg and Lettsom referred to Brooke's phosgenite specimen from Cornwall as "unique," Brooke stated that there were a few single phosgenite crystals from Cornwall in the collection of William Phillips (1775–1828). This collection was destroyed by bombing in 1941. Brooke's collection was presented to the University of Cambridge by his son in 1857, but it is not known whether the phosgenite specimen still exists.

MATLOCKITE

Discovery and Description

In 1851, the well-known mineral dealer Bryce (Brice) Wright of Caldbeck (1814–1874; and not to be confused with his son of the same name, 1850–1895), who was at that time living in Liverpool, discovered some specimens of phosgenite, and another, unknown, mineral in the debris of an old shaft belonging to the old Bage mine and Cromford level workings (Greg, 1851; Allan-Greg Catalog). These specimens came into the possession of Greg and Lettsom. Greg sent some to the Scottish chemist Robert Angus Smith (one of the first environmentalists and originator of the expression "acid rain") who was at that time living in Manchester, having just returned from Germany, and Lettsom forwarded specimens to the German chemist Karl Friedrich Rammelsberg (1813–1899) for analysis (Greg, 1851; Rammelsberg, 1852).

The physical properties of the new mineral were investigated at this time by William Hallowes Miller (1801–1880) (Greg, 1851).

Both Smith and Rammelsberg determined the new mineral to be a lead oxychloride. The mineral *matlockite* is now known to be a lead fluoride-chloride. The analysts made the error because of the similar blowpipe reactions of the two compounds, and because they determined only the lead and chloride present. It is, of course, very difficult to distinguish between the two substances on the basis of a gravimetric determination of the lead and chloride present. The error was to remain undetected for more than 80 years (and has even been perpetuated in some recent publications)! Its discovery by W. Nieuwenkamp in Holland in 1933 was almost by chance (Nieuwenkamp, 1933). Nieuwenkamp discovered the error while making X-ray powder diffraction pictures of various lead salts, and subsequently verified the presence of fluorine in matlockite by wet chemical means.

Following Nieuwenkamp's discovery, the mineral was investigated at some length by Bannister and Hey (Bannister, 1934). They also checked to make sure that mendipite was indeed what *it* was supposed to be!

Although the name matlockite was used for the mineral by Greg in 1851, the name was perhaps originally proposed by Rammelsberg (see Rammelsberg, 1852). It should be noted that the name matlockite had been previously used by Chapman as a synonym for phosgenite (Chapman, 1843). Incidentally, phosgenite has also been known by the following German, Swedish, Latin and English names: *salzsaures Blei, salzsaures Bleierz, saltsyradt bly, Chlorblei, Chlorbleierz, Hornblei, plumbum corneum, corneous lead, hornbley, Bleihornerz, cromfordite* and, by mistake, *Kerasin* (an old synonym for mendipite). The name *Phosgenit* (*phosgenites plumbosus*) was proposed by Breithaupt in 1841, following his use of the name *Phosgenspath* in 1820.

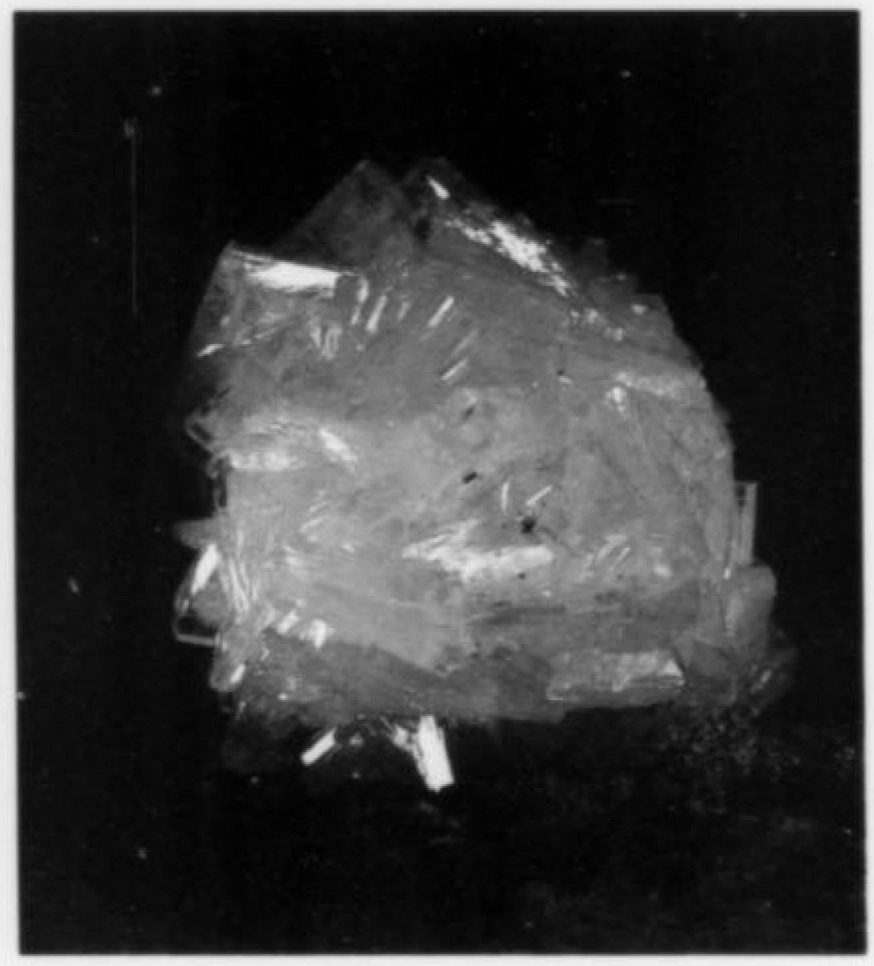


Figure 7. **Matlockite crystal group, 1.5 cm, from Derbyshire. Ludlam collection, now in the Natural History Museum, London (16073). Photo courtesy of the Mineralogy Department.**

Figure 8. **Matlockite crystal, 3.5 cm, from the Bage mine, Bole Hill, Wirksworth, Derbyshire. Collected by the mineral dealer Bryce M. Wright in 1851, sold to the Williams family, then to Arthur Russell; now in the Natural History Museum, London (BM1964, R2009). Photo courtesy of the Mineralogy Department.**

Location

No doubt encouraged by the discovery of a new mineral, and by the fact that the water level in the Bage mine had been reduced by the construction of the Meerbrook Sough, Bryce Wright determined to discover specimens of phosgenite and matlockite underground.

The Meerbrook Sough was started as a westward drive from the Derwent valley in 1772 with the intention of draining the Cromford/Wirksworth mines to a lower level than the Cromford Sough. Initially about 30 meters were hoped for, but in practice only about 21 meters were achieved. Driving on the main level ceased in 1813, but was resumed in 1841. The main level was driven west just to the south of the Bage mine between 1841 and 1855. During this period, no doubt due to the intersection of northerly trending faults, water levels were lowered in a large area to the north of the sough, and a report to the proprietors of the Meerbrook Sough Company, dated October 1848, states that, although little water had been tapped in recent work, it was hoped to be able to start working the Wallclose vein in the spring of 1849 (Taylor, 1848). However, the water level in the Wallclose-Bage mine area was not significantly lowered until the northerly trending Bolehill branch, begun in 1855, reached that area. This branch was completed on reaching the Gang vein to the north of the Bage mine in 1864 (Rieuwerts, 1987).

In 1851, after a few weeks search and excavating, Wright succeeded in locating some more specimens "in one of the old shafts" of the Bage mine. According to Greg and Lettsom, he had succeeded in locating the exact air-shaft that had produced specimens around 1785, but as mentioned above, this seems open to doubt. However, it does seem likely that Wright obtained his specimens from workings associated with the Wallclose vein, which is also the most likely source of the specimens that were obtained about 1785. In common with most dealers of the time, he could be expected to give inaccurate details of his locations. The truth of the matter is probably that specimens came to light during the normal (re-)working of the Wallclose vein, and Wright was quick to take advantage of this. Certainly the number (perhaps a hundred or more) and quality of the specimens still extant indicates working on a fairly large scale.

The Bage mine ceased to work some time before 1858 (Greg and Lettsom, 1858), but was later restarted and, due to completion of the Bolehill branch of the Meerbrook Sough, became one of the main lead producers in the area in the period around 1870 (Rieuwerts, 1987). It is possible that additional specimens came to light during this later period of working, considering that some of the known specimens are larger than the maximum sizes given by Greg and Lettsom.

The workings of the Bage mine were reentered by R. Webb and G. Batey in October 1980 (Batey, 1983). The present entrance to the mine is a 92-meter shaft situated in the village of Bole Hill on the western edge of Cromford Moor, 1.6 km south of Cromford and 1.6 km southeast of Middleton-by-Wirksworth. The mine consists of workings on three main levels: the 58, 72 and 92-meter levels. The presently accessible workings trend in a generally north-south direction, extending about a kilometer towards Cromford. The workings

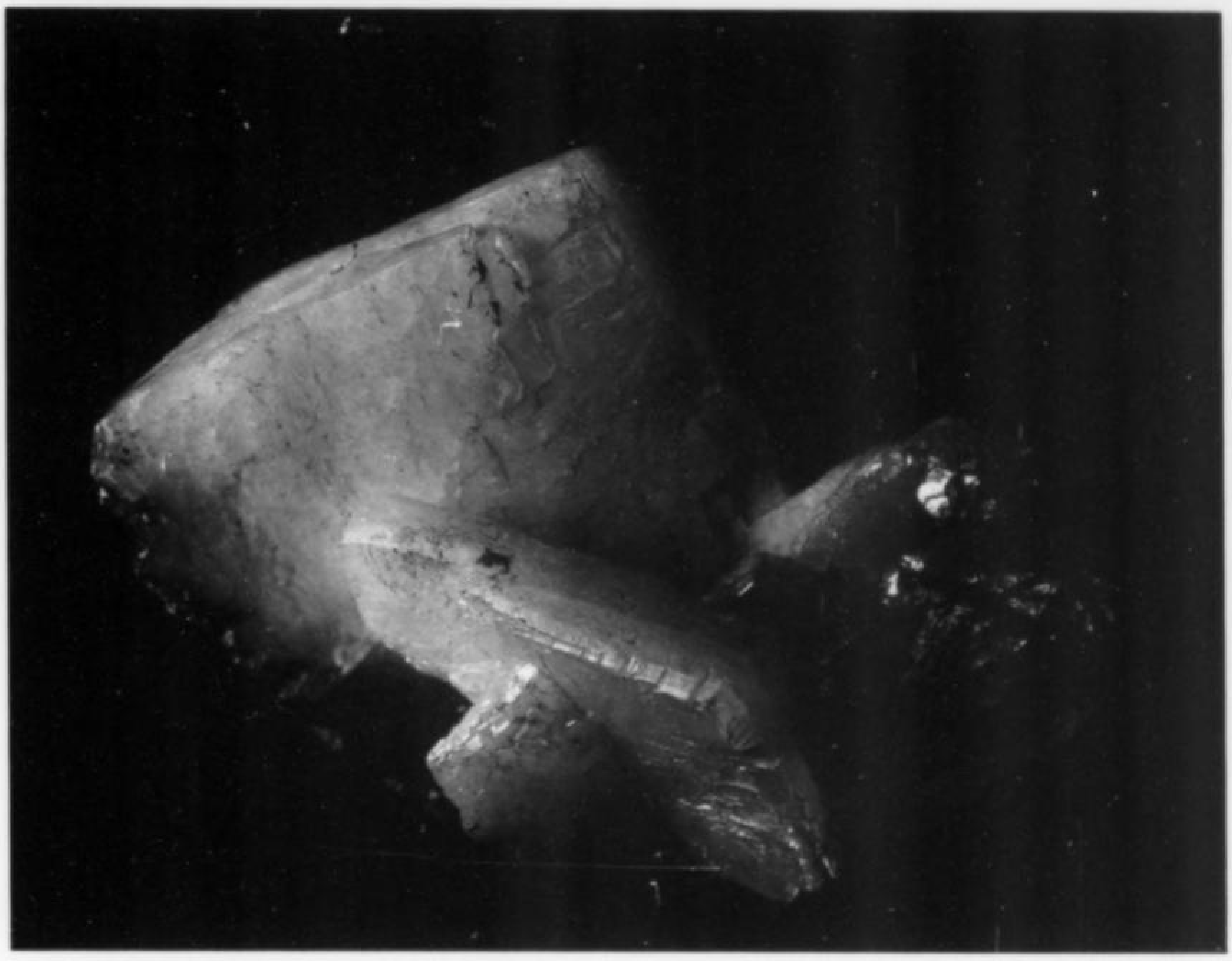


Figure 9. Matlockite crystals to 3.8 cm, from Cromford, Matlock, Derbyshire. Ludlam collection, now in the Natural History Museum, London (16075). Photo courtesy of the Mineralogy Department, Natural History Museum.

associated with the 58-meter level were apparently active as early as 1752. The 92-meter level is at about the same level as the Cromford Sough.

Specimens

Bryce Wright succeeded in obtaining some very fine specimens of phosgenite and matlockite. The Natural History Museum, London, also contains numerous crystals of anglesite which were obtained during the working of the "matlockite vein." The "shaft" in the Bage mine was apparently the only locality where Wright obtained specimens of phosgenite and matlockite underground, although he "examined every mine in the neighborhood." Bannister mentions matlockite also from the Arkwright and Rutland (Rutland Cave?) mines. According to Braithwaite the reference to the Rutland mine is incorrect (Braithwaite, 1983). The Arkwright mine undoubtedly refers to workings connected with the Cromford Sough which has its portal about a kilometer from the Arkwright cotton mill at Cromford.

Phosgenite has also been recorded by Stokes from Meer Brook Sough mine, Wirksworth (Stokes, 1879). According to Braithwaite this could be the Meerbrooksough mine 600 meters from the Bage mine, or the Meerbrook Sough itself (Braithwaite, 1983).

According to Greg and Lettsom, the specimens of phosgenite obtained by Wright were "highly modified, transparent, and, in a few instances, 6.4 cm long." However, the largest crystal I have seen is around 2 by 5 by 10 cm in size. This is in the Natural History Museum, London. In general the specimens in that institution and other collections that I have seen are transparent, colorless or pale straw-yellow, and of either tabular or short to long prismatic habit, crystals of tabular and prismatic habits often occurring together. The white surface coating (cerussite) of many of the phosgenite specimens from Monte Poni, Iglesias, Sardinia, is absent.

According to Greg and Lettsom, the specimens of matlockite found by Wright were always tabular, "generally thin, frequently aggregated, or superimposed on each other, and occasionally slightly curved," up to nearly 5 cm across. Greg and Lettsom also refer to there already having been a specimen of matlockite in the British Museum many years prior to the discoveries of Wright. This may have originally come from Greville (as may the specimen investigated by Brooke). The largest crystal known is a detached tabular crystal about 5 by 6.5 cm in size, at present in the Derby Museum. There is a composite crystal on matrix, 4 by 5 cm in size, in the Royal Scottish Museum, Edinburgh. It is illustrated in *Mineralien Museen in Westeuropa* (Bode and Burchard, 1985). The Ludlam collection in the Natural History Museum, London, contains a detached crystal group incorporating a simple crystal of similar size.

Bannister (1934) mentions the following forms for matlockite:

(1) Single crystals, mostly square, tabular, transparent and colorless or pale yellow to pale amber, varying in size up to 2.5 cm square and nearly 0.6 cm thick.

(2) Flat aggregates of platy crystals in sub-parallel growth, rarely quite colorless and generally translucent to opaque.

(3) Hemispherical rosette-like aggregates of platy crystals resembling similar crystallizations of barite and reaching 1.9 cm in diameter.

(4) Stumpy, bipyramidal crystals with small prism faces, generally revealing composite growth on the pyramid faces. These measure about 1.3 cm across and are less common than the other three types. A crystal of this type is illustrated in the October 1990 edition of *Lapis* magazine (Wilke, 1990).

The minerals occurred in cavities of decomposed galena, associated with anglesite. Rammelsberg also described his specimens as being accompanied by "earthy" galena. Decomposed galena associated with anglesite and native sulphur occurs in the Dene quarry at Cromford (Braithwaite, 1983). The association of matlockite with anglesite is also characteristic of specimens from the Mammoth-St. Anthony mine, Tiger, Arizona (Abdul-Samad, 1982).

Many of the finest specimens obtained by Charles Greville and Bryce Wright are now on display in the Natural History Museum, London. Several are associated with barite. Bannister (1934) records the matlockite mentioned above as occurring in cavities in galena and compact barite ("cawk"), both sometimes altered. Chenevix also determined 1% barite in his analysis of phosgenite. Other associated minerals seen on specimens include cerussite, sphalerite, marcasite and/or pyrite, and (colorless, non-fluorescent) fluorite. The Arthur Russell collection in the Natural History Museum, London, apparently contains crystals of matlockite enclosing small colorless cubes of fluorite, and specimens in my own collection show both matlockite and phosgenite partially enclosing fluorite. There seem to be few specimens with phosgenite and matlockite in association; there are two in the Natural History Museum, London, and one in my collection.

In addition, I know of two or three examples in other collections.

Even today, dealers tend to hide their sources of specimens, and this often leads to the loss of valuable information. It may be of use to record that some of the (very few) specimens of phosgenite and matlockite that have been on the market in recent years came from the collection of the Rev. Dr. Thomas Wiltshire (1826–1902), Professor of Geology and Mineralogy at Kings College, London, and bear his characteristic small round labels with the initials "T.W." and a number. The catalog to this collection is in the Sedgwick Museum, Cambridge.

Another old specimen in my collection, labeled as from "Matlock," consists of massive galena and "cawk" with small colorless cubes of fluorite, and small twinned crystals of cerussite. A cavity contains a pale brown anglesite crystal. Some of the cerussite crystals are lead gray, apparently due to galena included in the surface skin of the crystals. Such crystals have been noted on Bage mine specimens.

Two Bage mine specimens (of phosgenite and of matlockite) have matrixes of galena which exhibit smooth water-worn faces coated with thin layers of gray-white cerussite. Such water-worn galena occurs commonly in Derbyshire, where lead veins are cut by karst passages in the limestone. The 58 and 72-meter levels of the Bage mine were partly driven along natural watercourses, and there is also evidence in these levels of the solution of vein minerals after their deposition (Jones, 1982).

The most characteristic associates of phosgenite and matlockite from the Bage mine area are galena, barite and fluorite. It should be noted that the Bage mine lies roughly on the limestone/shale boundary and also on the boundary between the barite and fluorite "zones" of this part of the Derbyshire orefield (Dunham, 1952), although these zones are, of course, not so well defined as those of the Alston area of the northern Pennines orefield. In contrast to the non-fluorescent fluorite, the anglesite, matlockite and phosgenite from the Bage mine area fluoresce strongly yellow under shortwave ultraviolet radiation.

In a recent paper on the geology of the Bage mine, Jones (1982) has described the widespread occurrence of hemimorphite in the presently accessible workings (and also the finding of a single small specimen of phosgenite in an old "kibble," or tub, high up in a stope above the 58-meter level), but this mineral does not seem to have been found with any specimens of phosgenite or matlockite, despite their association with sphalerite. This, together with the presence of unoxidized marcasite and/or pyrite, may indicate that the original specimens were obtained lower down in the (presumably) less oxidized sections of the mine.

CONCLUSION

In conclusion, it may be speculated that the type locality for both phosgenite and matlockite is in the Bage mine, in a part of the Wallclose vein (or an associated sub-parallel or cross vein), probably near its junction with the Butler vein and just below the level of Cromford Sough. Although this general area of the mine is now accessible (Jones, 1982), all the workings below the level of Cromford Sough are flooded. Diligent searches of the workings above the present water level have so far failed to locate any phosgenite or matlockite except for a single specimen of phosgenite mentioned above. The only active mine in the area is the enormous Middleton limestone mine approximately 1.6 km to the west.

NOTES ON SPECIMEN CONSERVATION

Due to the presence of small amounts of marcasite and/or pyrite, the matrixes of many of the Bage mine specimens (which often consist of decomposed galena and barite) are very liable to decay. This may be immediately noticed by smelling the specimens. Specimens must be kept very dry to avoid disintegration. Some of the best specimens in the Natural History Museum, London, have fallen to pieces due to storage (at some time) under excessive relative humidity.

Specimens of matlockite in thin, tabular crystals are extremely brittle; virtually all of the specimens I have seen of this type are damaged. Anglesite is also very brittle. Care should be taken to avoid mechanical or thermal shock. Phosgenite is rather soft, and has a very good cleavage, so that specimens of this mineral are also easily damaged. Repaired specimens of all three minerals are not uncommon.

Do not illuminate the specimens with bright (hot) lamps. Do not clean the specimens ultrasonically. Do not use water to clean specimens associated with marcasite/pyrite. If possible, avoid cleaning the specimens at all!

ACKNOWLEDGMENTS

A large number of institutions and individual persons have assisted me in the research needed for this publication. In particular, I would like to thank the following: the Deutsches Museum Library, Munich; the Kungl. Vetenskapsakademiens Library, Stockholm; the British Library, London; the Natural History Museum Library, London; the Natural History Museum Department of Mineralogy, London; the Geological Museum, London; the Mineralogical Record Library, Tucson; the Derbyshire Record Office, Matlock; the Darwin Museum, Down House, Downe; Mr. D. G. King-Hele, for information on Erasmus Darwin; Mr. P. Titheradge, for checking Darwin's "commonplace book"; Mr. P. Naylor, for information on Dr. Cantrell, and for local knowledge on Cromford; and Mr. J. Jones, for information on the Bage mine.

I would be pleased to hear from any readers who have additional information.

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[One of the two specimens analyzed by Berzelius apparently consisted of mendipite with hydrocerussite and/or cerussite, wulfenite, and at least one copper mineral. The specimen came from "Mendiff [sic] at Churchhill [sic] in Sommersetshire [sic], where it was found about 1730." The other specimen he analyzed was a bismuth telluride from Riddarhyttan. The results were also published in German; in the following reference:]

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[It is of interest to note that Berzelius must actually have visited Churchill in the Mendip Hills. He spent several days of August or early September 1812 on the farm of Smithson Tennant (the discoverer of osmium and iridium, and not to be confused with James Tennant) at Shipham (where smithsonite mines were then active!) 2.4 km south of Churchill (Anon., 1912).

Although I have spent many years looking for the type-locality for mendipite, I have been unable to locate it, but I suppose it must be Dinghurst Camp, a small area of intense mining activity very close to Churchill. Recent excavations there have exposed veins of iron oxides and barite, but no manganese oxides or mendipite. Dolebury Hill, an area of lead and iron mining just to the east, has also been suggested as the type-locality for mendipite.]

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[On page 94 Darwin refers to lead ore in Derbyshire and the "transmutation" of galena into "lapis calaminaris" (usually smithsonite).]

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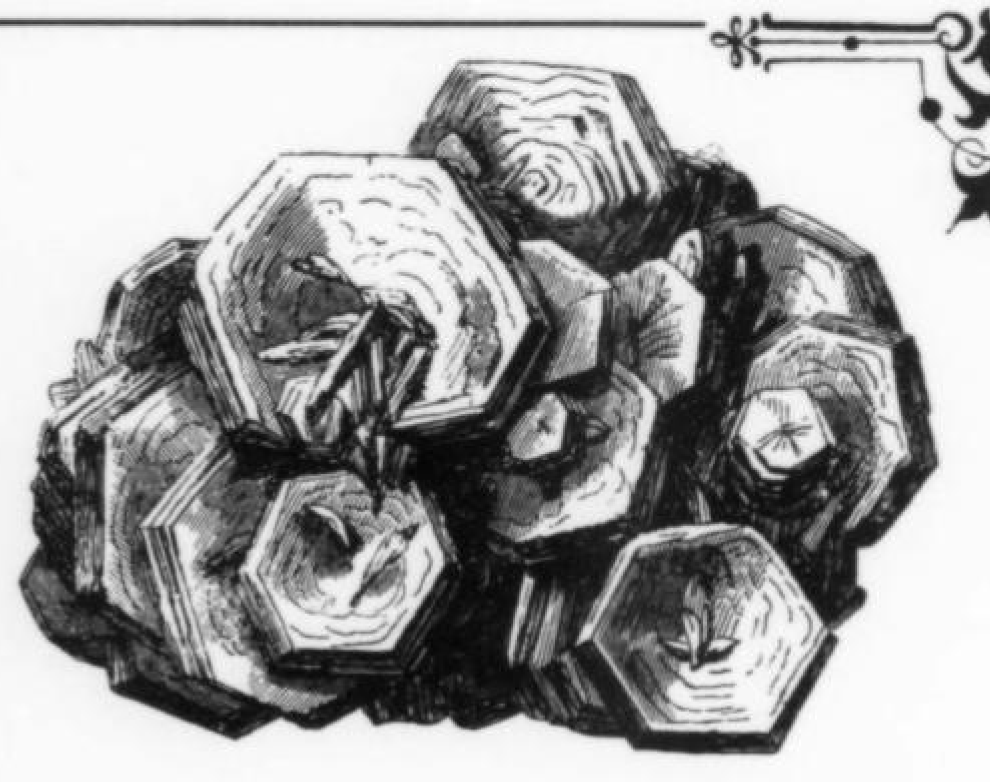

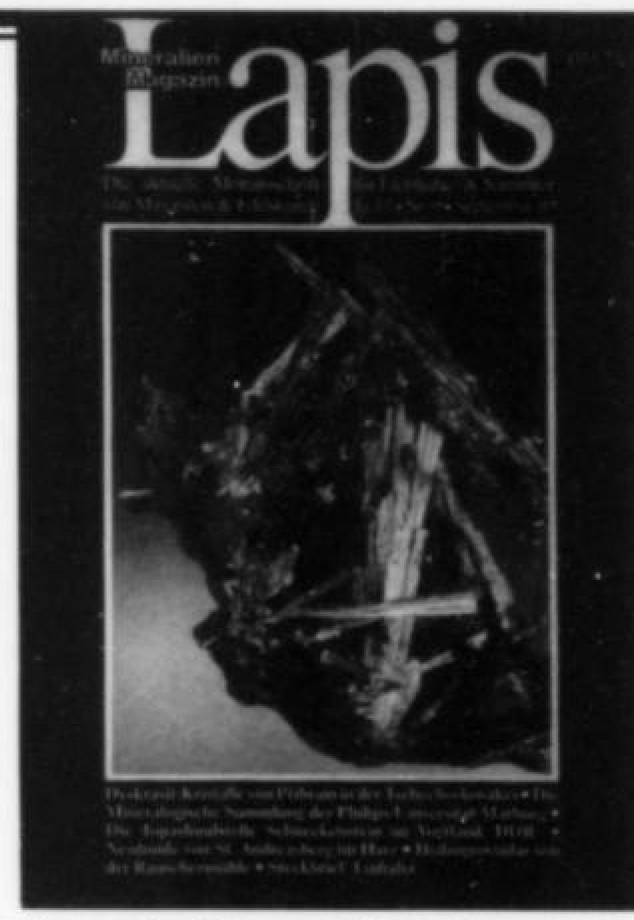

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Prenteg is among the most famous of British localities. It has been an important source of fine brookite crystal specimens for well over a century, and is thought to be one of the two type localities for the species. Examples of Prenteg brookite may be seen in museums and private collections all over the world.

INTRODUCTION

The locality described here has been variously referred to as "Tremadog," "Fronolen" or simply as "near Snowdon." More correctly, specimens should be labeled "Twll maen grisial" (cave of the crystals), Fron Oleu, Prenteg, Tremadog, Gwynedd, Wales. Fron Oleu, incorrectly called "Fronolen" by Greg and Lettsom (1858), is a small farm half a kilometer west of the brookite locality. The name "Tremadoc," seen on many specimen labels, is an alternative spelling of the Welsh, Tremadog. The occurrence itself is a crag exposure on a steep, wooded hillside on the north side of the A498 road from Porthmadog to Beddgelert, approximately 4 km from Porthmadog, and 24 km south-southeast of Caernarfon. The crag, situated approximately 30 m above the road, is relatively inaccessible with adjacent outcrops being thickly overgrown or precipitous. The collecting area is on private property, and permission to visit must be obtained in advance from the Head Warden, Snowdonia National Park Office, Penrhyndeudraeth, Gwynedd, Wales LL48 6LS.

Specimens from Prenteg have been illustrated in many publications. James Sowerby, for example, included a specimen of "oxide of titanium" as plate 299 in his famous treatise, *British Mineralogy* (vol. 3, 1809). Perhaps the best known specimen, however, is a fine, single, 2.5 x 3-cm brookite crystal sitting on a transparent, colorless quartz crystal, and suggested by Bancroft (1973) to be one of the world's finest mineral specimens (Fig. 8). The specimen was collected circa 1840, and sold in 1856 by the British dealer Mr. Bryce Wright to the British Museum (Natural History), London (now The Natural History Museum) where it can still be seen (April, 1990) on public display in the Mineral Gallery.

HISTORY

The earliest reference to brookite from Prenteg appears to be that of Sowerby (1809), who records a specimen of "oxide of titanium" collected by his friend, Wilson Lowry (1762–1824), "who brought it from near Snowdon last summer." The specimen described bears several large crystals of an intense semi-transparent red color, with occasionally brilliant reflections, sitting on well-crystallized, colorless quartz. This early figured specimen is about 6 x 9 cm, and has been preserved in the collections of the Natural History Museum (NHM), London, as specimen number BM-31715 (Fig. 7). The museum acquired the specimen from J. W. Lowry (1803–1879).

Sowerby also records that since writing his original manuscript, he had "been presented with a superb specimen of quartz, on which are two or three crystals of this oxide of titanium," by his kind patron, the Right Hon. the Earl of Dartmouth, from the same place. The specimen is also noted as bearing crystals of adularia, which is probably a misidentification of albite. As far as we are aware, no orthoclase has been observed on any specimens from Prenteg.

Levy (1825) provided the first systematic description of brookite, including detailed crystal drawings, based on specimens (supplied by James Sowerby and John G. Children) from Snowdon, in addition to others from Dauphiné, Isère, France. The specimen from Snowdon was later confirmed as having come from Prenteg (Sowerby, 1838). Whether or not this is the first description of the mineral species, however, is uncertain. Palache *et al.* (1944) note that "Haidinger stated in 1825 that the name *jurinite* was given to this species [brookite] by Soret in 1822 and that the original locality was Dauphiné. All record of the original publication (if any) appears to be lost."

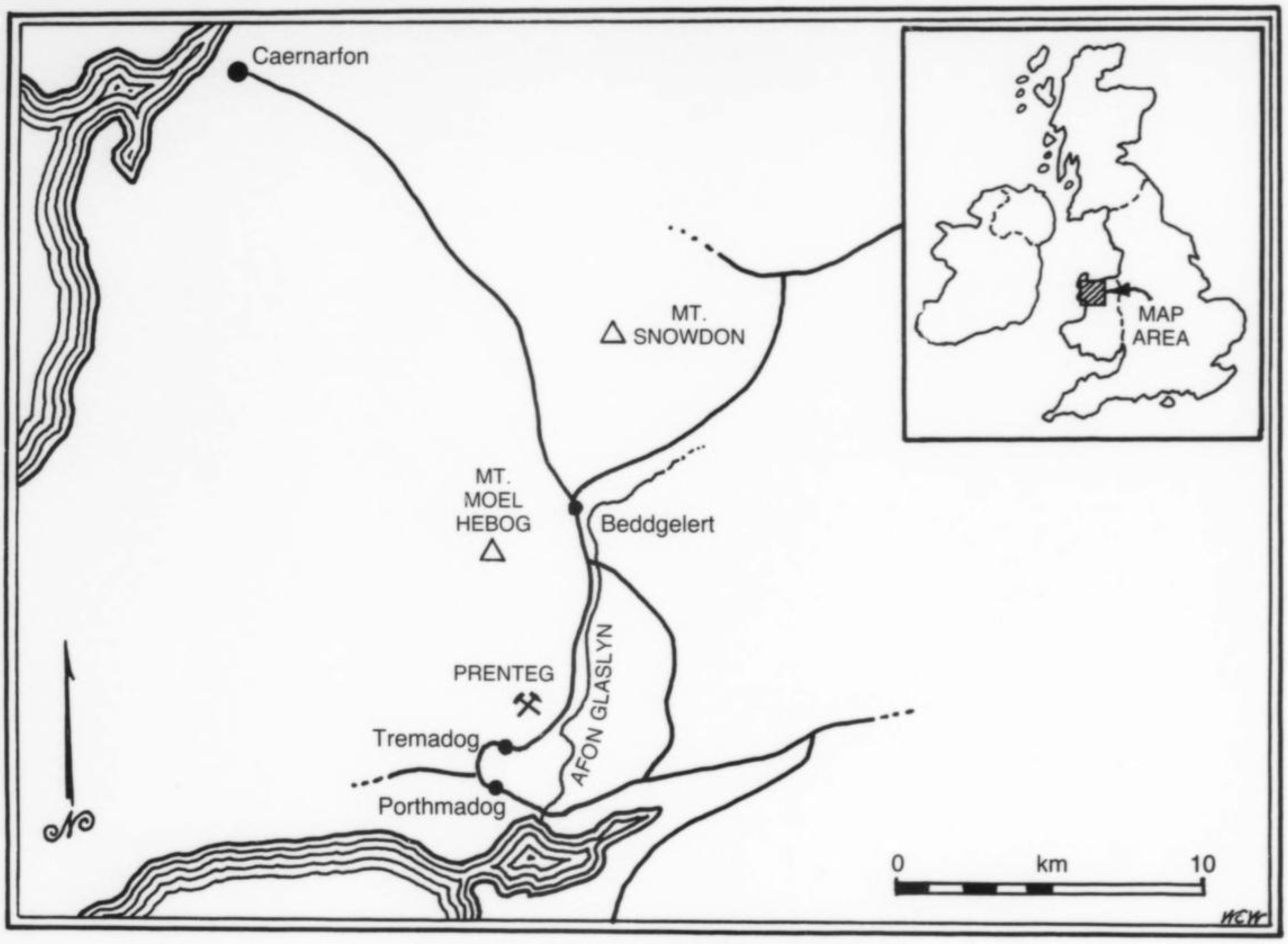


Figure 1. **Location map of "Twll maen grisial," Fron Oleu, Prenteg, Tremadog, Gwynedd, Wales.**

Figure 2. **Northwest view of the hillside at Prenteg, showing location of "Twll maen grisial." R. Starkey photo.**

Figure 3. **The main collecting area at "Twll maen grisial" as it appears today. R. Starkey photo.**

Based on the above information, it appears that since brookite is in fact the generally accepted name for the species, based on Levy's characterization of specimens from both France and Wales, the specimens he described would by today's standards be considered as cotypes (and perhaps even neotypes relative to Soret's work), and that both Dauphiné and Prenteg are "type" localities for the species (Dunn and Mandarino, 1988).

The famous British mineralogist, Sir Arthur Russell (1878–1964), visited Prenteg in August of 1905, and obtained with considerable effort many fine specimens of both brookite and anatase. His field notes, now at the NHM, provide an interesting insight into the ways of a gentleman collector at the turn of the century:

> No specimens of the mineral [brookite] having been obtained from Prenteg for many years, in 1905 I decided to do a considerable amount of blasting on the face of the quarry. This was difficult owing to the fact that previous blasting had undercut the face in the form of a shallow cave. I was rewarded however by a fine series of specimens.

Russell concluded that the locality was temporarily exhausted, and suggested that it would be necessary to resort to further blasting in order to secure additional specimens. Much of the material which Russell collected is now preserved in the NHM. In modern-day Britain, the use of explosives by collectors is illegal, and the very position of the outcrop above a busy highway in a popular tourist area precludes future blasting.

Russell's collection, now in the NHM, contains other noteworthy specimens from Prenteg. Two of these, bought by Russell in 1912 from the dealer Samuel Henson (1848–1930), were earlier in the collection of Isaac Walker (1794–1853) at Arnos Grove, Southgate, London (Spencer, 1912). Walker himself had bought them from the dealer Henry Heuland, at his sale in 1838. One specimen (Russell no. 3247) shows ten slender brookite crystals on albite (Fig. 9), and cost Walker the sum of 30 shillings. The other specimen (Russell no. 3246) is roughly 6 x 8 cm, and shows several large brookite crystals on a quartz matrix; Walker paid £6 for it, a (then) not inconsiderable sum.

Fearnsides (1912) describes a field excursion made by the Geologists' Association in April of 1912, during which a visit was made to Prenteg. This interesting contemporary account of the locality includes mention of the fact that the dolerite was being worked by local road men due to its weathered and altered state. During the visit a few large specimens containing brookite broken out by the workmen were distributed among the party, and large blocks of the carbonate-covered quartz were carried away to be treated at leisure in a bath of hydrochloric acid.

It is still possible to collect specimens of all the minerals described in this article, but truly fine brookite crystals are never easy to collect, and are certainly the exception nowadays. Nonetheless, Prenteg is a beautiful spot to spend a pleasant day studying the mineralization, and admiring the breathtaking views across the Glaslyn estuary. There is always the possibility of turning up a really good brookite crystal!

GEOLOGY

The country rocks at Prenteg consist of slaty mudstones of Ordovician age, and contain Trinucleid trilobites together with a few brachiopods. These sediments have been intruded by a sill of pale gray, fine-colored dolerite, quite similar to those of Moel-y-Gest, Tremadog

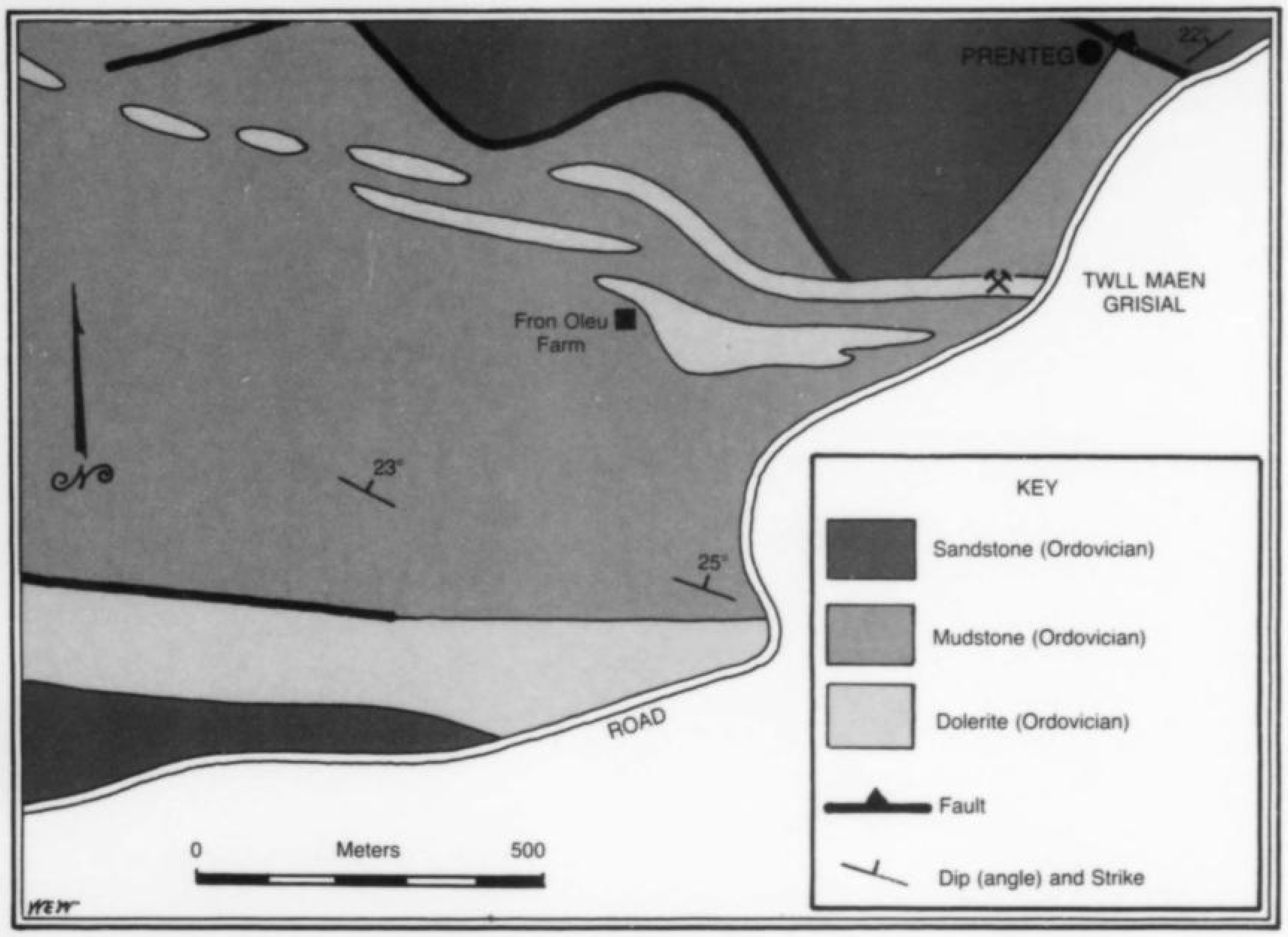


***Figure 4.* Simplified geological map of the area around Prenteg (modified from B.G.S. Special Sheet, Central Snowdonia, by Dunham, 1972).**

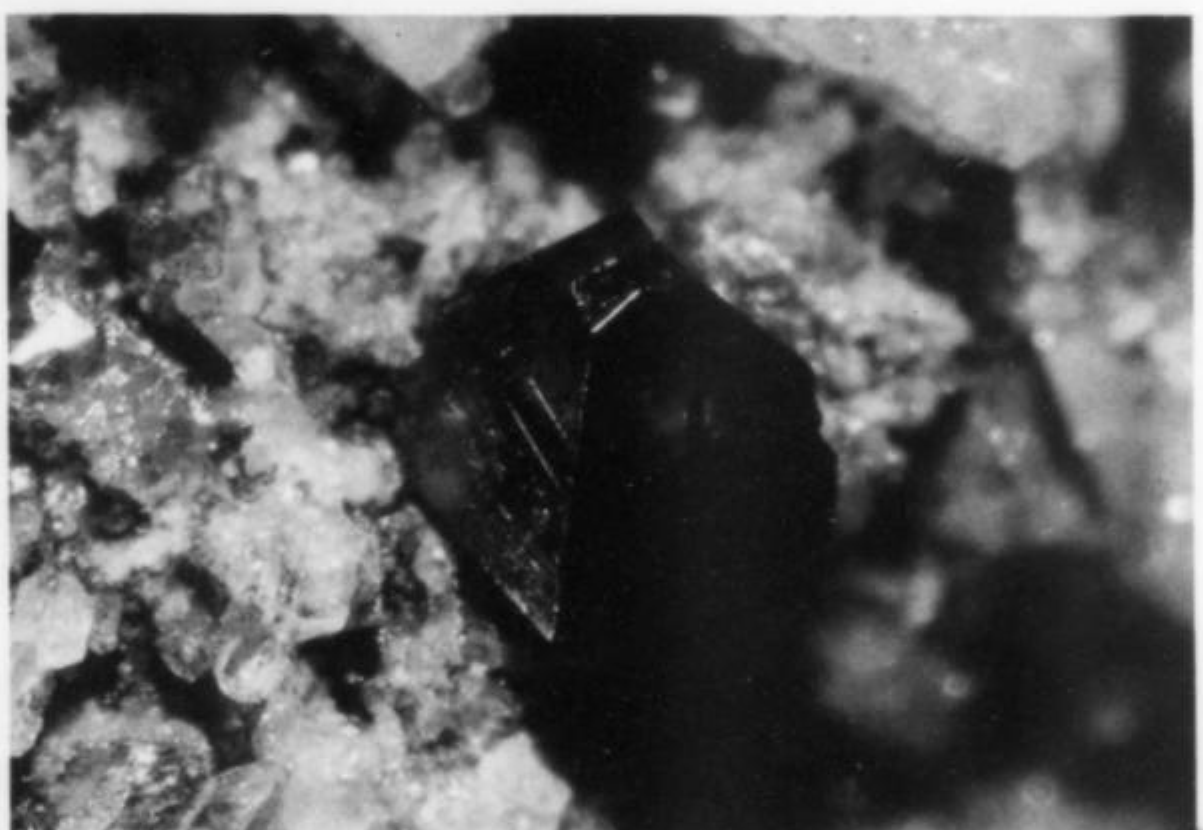


***Figure 5.* A brown, 0.7-mm anatase crystal on dolerite showing the typical forms {112} and {017}. Canadian Museum of Nature specimen, catalog no. MOC-3471; G. Robinson photo.**

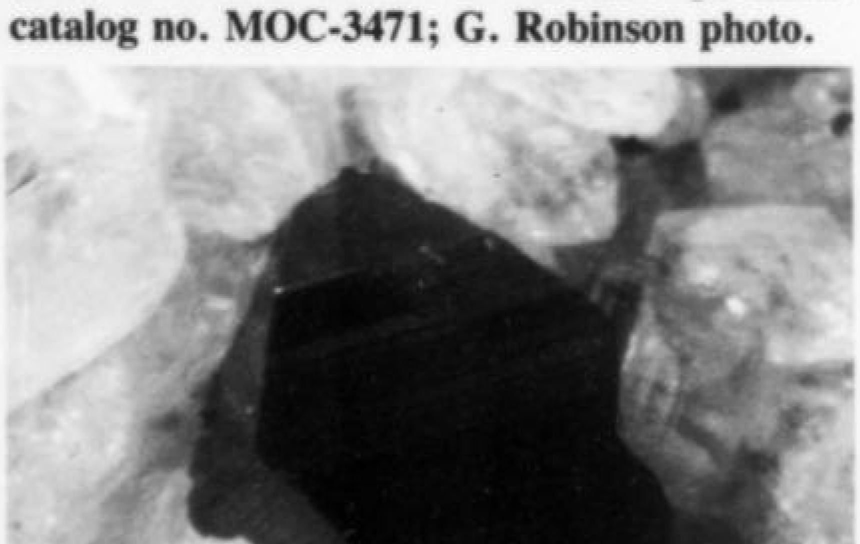


***Figure 6.* A blue-black, 4 mm anatase crystal on albite. Canadian Museum of Nature specimen, catalog no. 52322; G. Robinson photo.**

and Pant Ifan. The dolerite forms a body striking roughly east-west and is exposed in steep cliffs 30 to 50 meters high (see Fig. 2). Much of its original igneous texture is masked by subsequent alteration. A simplified geological map of the area immediately adjacent to the brookite locality is shown in Figure 4.

At the "Twll maen grisial," the exposed face is transected by numerous anastomosing quartz veins, which appear to follow no distinct pattern, and emanate as branching, discontinuous stringers from equally irregular, but wider quartz-filled cracks or fissures. Many of the wider fissures are incompletely filled, and contain free-standing crystals of quartz. The remaining voids may or may not be filled by later carbonate mineralization and organic material. The brookite and anatase crystals occur most commonly with the colorless crystals of

***Figure 7.* "Oxide of titanium" from Prenteg, plate 299, Sowerby's *British Mineralogy*, 1809.**

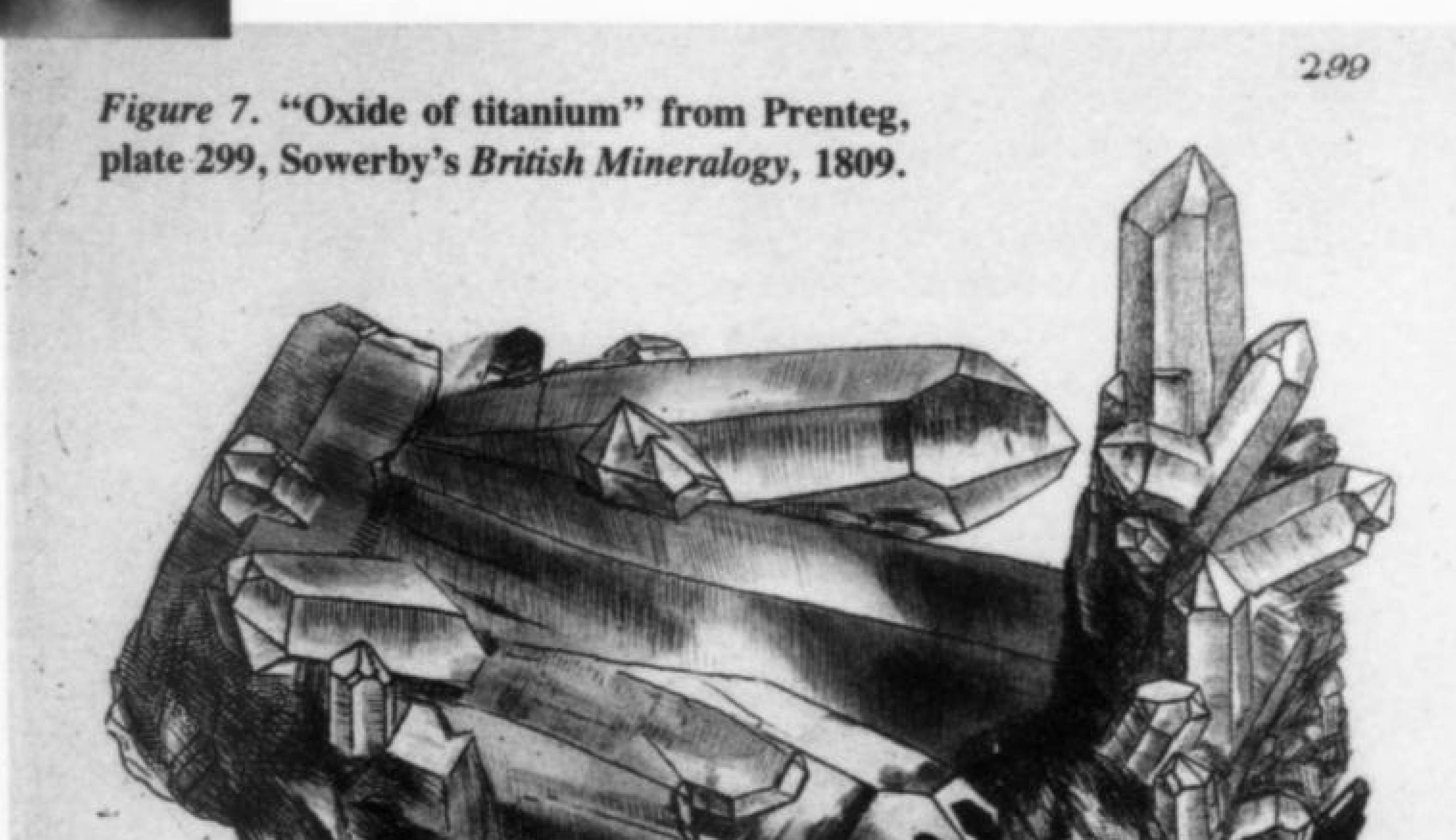
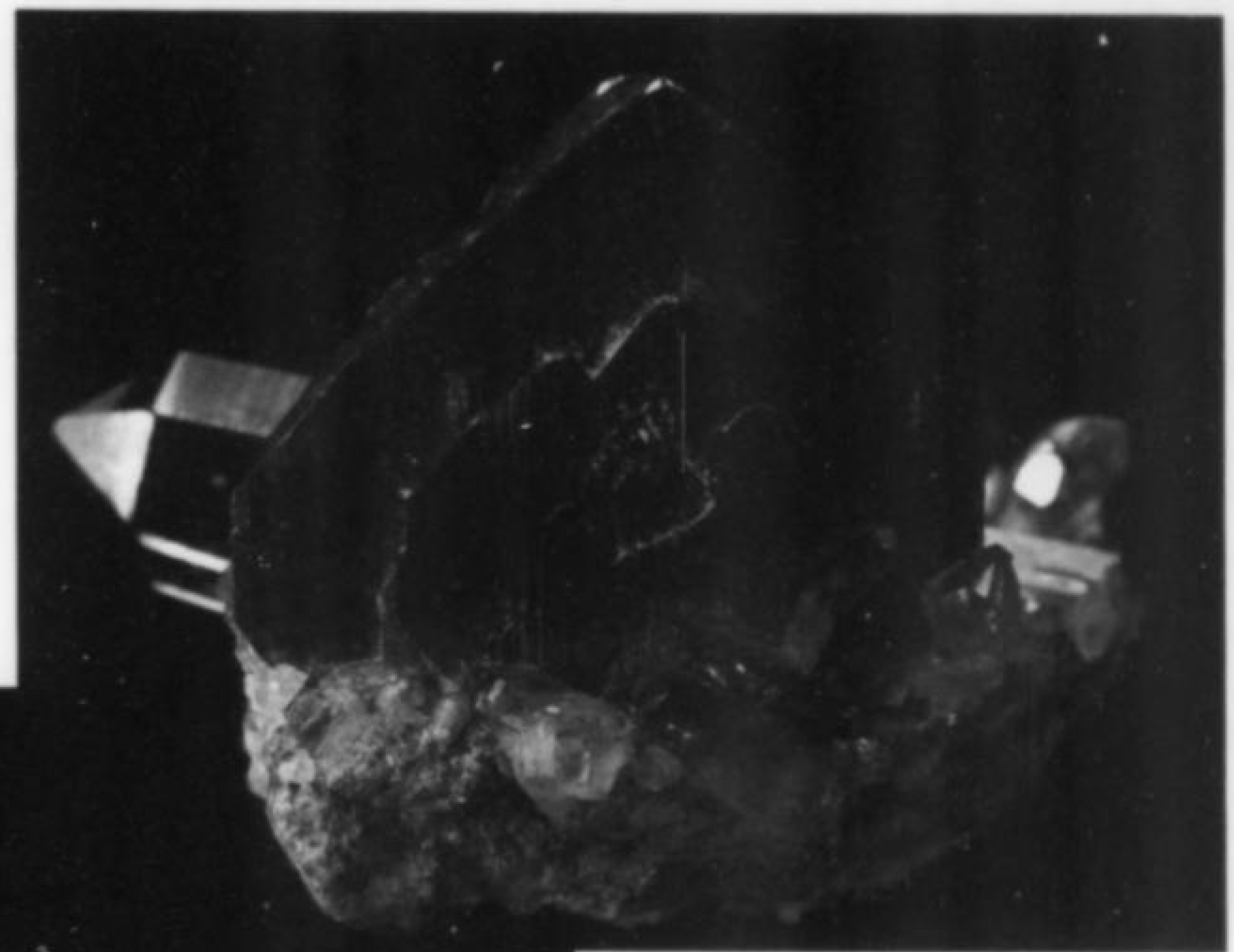


Figure 8. A 2.5 x 3-cm brookite crystal on quartz. Natural History Museum (London) specimen, catalog no. 26967; F. Greenaway photo, courtesy of Department of Mineralogy, NHM.



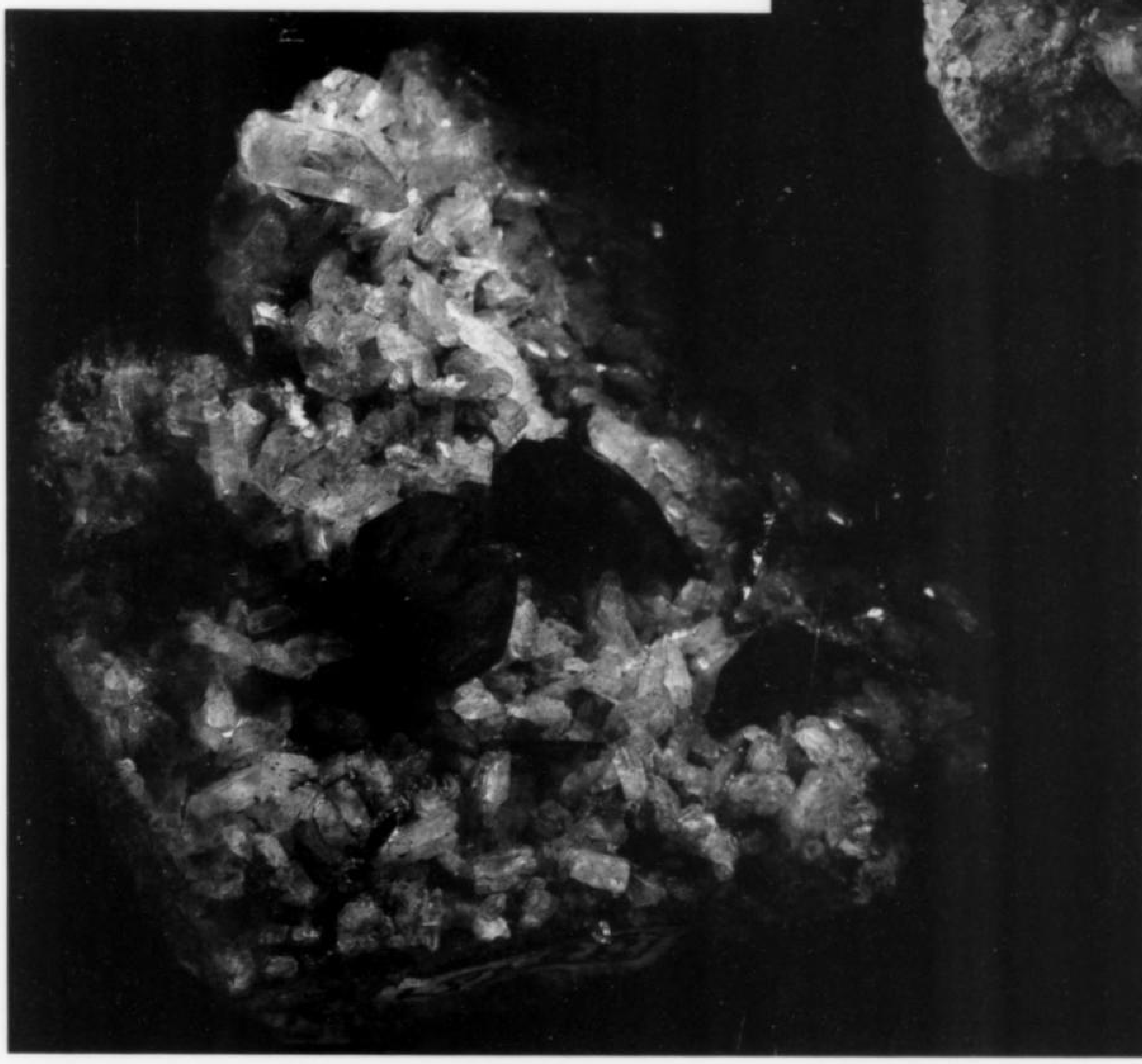


Figure 9. **A 4 x 5-cm specimen of brookite on albite. Natural History Museum (London) specimen; Russell collection, catalog no. 3247; F. Greenaway photo, courtesy of Department of Mineralogy, NHM.**

Figure 11. **Brookite crystals with albite. The largest crystal is 1.2 cm long. Canadian Museum of Nature specimen, Pinch collection, catalog no. 57815; G. Robinson photo.**

Figure 10. **A 1.1-cm brookite crystal with quartz. Canadian Museum of Nature specimen, catalog no. 54022; G. Robinson photo.**

quartz as part of the vein filling, or projecting from the walls of the fissures in the altered dolerite itself, where they are commonly associated with brilliant, twinned crystals of albite. These minerals are frequently masked by over-growing calcite, and many of the finest specimens have in fact been freed by leaching away the calcite in hydrochloric acid.

MINERALOGY

Albite $NaAlSi_3O_8$

Tabular, colorless to white crystals of albite occur abundantly with quartz, or alone on altered dolerite at Prenteg. The crystals are virtually always twinned by the albite law, and may reach nearly a centimeter in maximum dimension. They are typically lustrous and free of inclusions.

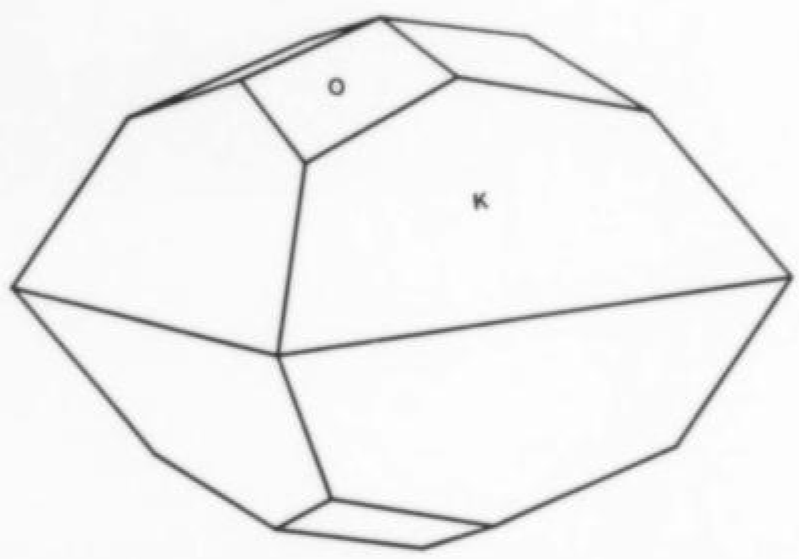


Figure 12. **Crystal drawing of anatase showing dominant forms *k*{112} and *o*{017}.**

Anatase TiO_2

While not generally well known for its anatase specimens, Prenteg has produced some very fine crystals of this species. Crystal drawings reproduced by Goldschmidt (1913) show a typically simple habit consisting of two sets of tetragonal bipyramids {017} and {112}, as illustrated in Figure 12. Colors range from steel-gray to rich, golden brown. The crystals are extremely sharp and lustrous, with pronounced horizontal striations on the pyramid faces, and generally range in size from 0.5 to 3.0 mm. According to Russell (manuscript notes), the largest British crystal measures 4 mm on the vertical axis. A specimen collected in 1980 by one of us (RES, specimen 0095-05) bears three dark brown bipyramidal crystals up to 4 mm. Parallel and *en echelon* growths are common, and individual crystals frequently appear distorted relative to their orthogonal axes.

Brookite TiO_2

Brookite is the mineral that made the locality famous, and brookite crystals from Prenteg are considered by many to be among the world's finest. Considering their transparency, richness of color, large size, high luster, perfection of form and complex morphologies, they are remarkably spectacular examples of the species! Brookite was named in honor of the English mineralogist Henry James Brooke (1771–1857) by Levy (1825). Since then, brookite crystals from Prenteg have been described by numerous investigators—as a quick perusal of Goldschmidt (1913) will verify—though three of the entries (from Schrauf) are wrongly ascribed to Tavistock, Wales.

Brookite occurs as transparent, pale golden brown to deep red-brown, thin, tabular, orthorhombic crystals of exceptional beauty associated with quartz and/or albite. Free-standing crystals are difficult to collect undamaged owing to their brittle nature. The finest large crystals attain a maximum dimension of perhaps 3 cm, and many fine specimens have been recovered by dissolution of enclosing calcite with hydrochloric acid.

Because several different unit cells and crystallographic settings have been used for brookite in the literature, the indices for the crystal forms given by the various investigators are not always in agreement;

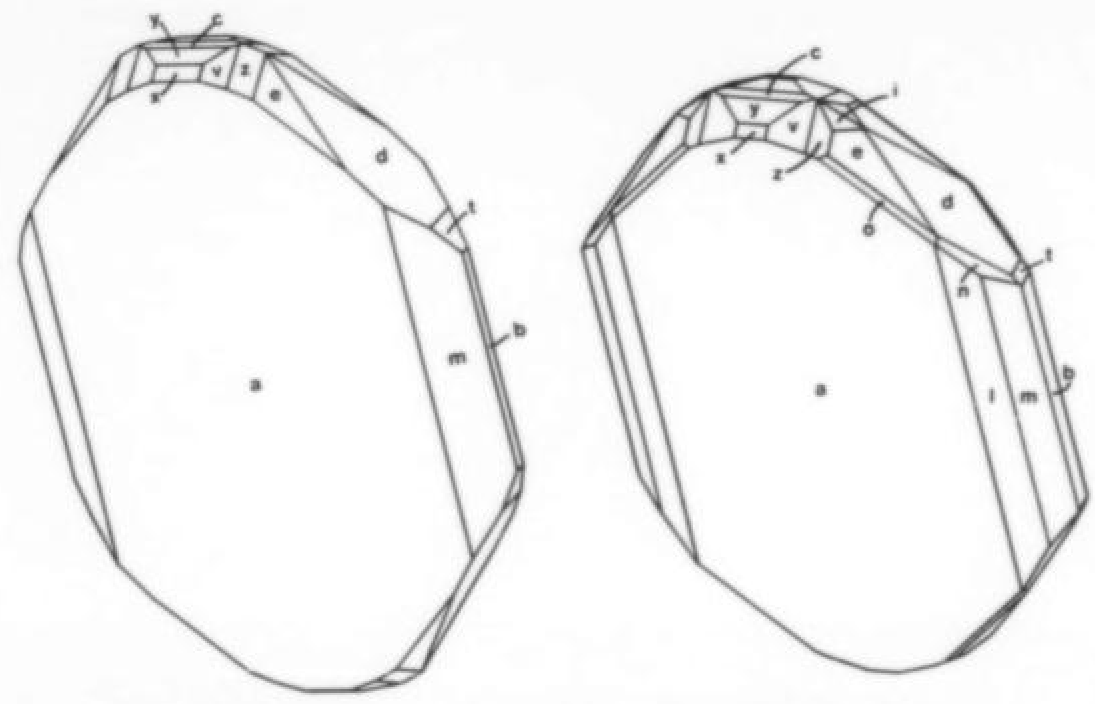


Figure 13. **Crystal drawings of brookite showing commonly observed forms *a*{100}, *b*{010}, *c*{001}, *l*{410}, *m*{210}, *x*{101}, *y*{102}, *t*{021}, *d*{043}, *e*{111}, *n*{221}, *o*{211}, *z*{212}, *v*{313} and *i*{579}.**

for this study, single crystal X-ray precession photographs were used to determine the orientation of crystallographic axes to correspond with the latest brookite structure as determined by Meagher and Lager (1979). Figure 13 shows some of the more commonly encountered crystal forms, indexed accordingly. Tabulations by Goldschmidt (1913) list additional forms as having been reported, but these are, for the most part, far less common and in some cases suspected of being in error.

Calcite $CaCO_3$

Most of the larger veins contain calcite as a late-stage filling. Large cleavable masses several centimeters across are common, and often show well developed lamellar twinning on {0001}. Opaque, white, rhombohedral crystals up to 3 cm occur in some of the veins, but these are commonly etched and are of little interest to collectors.

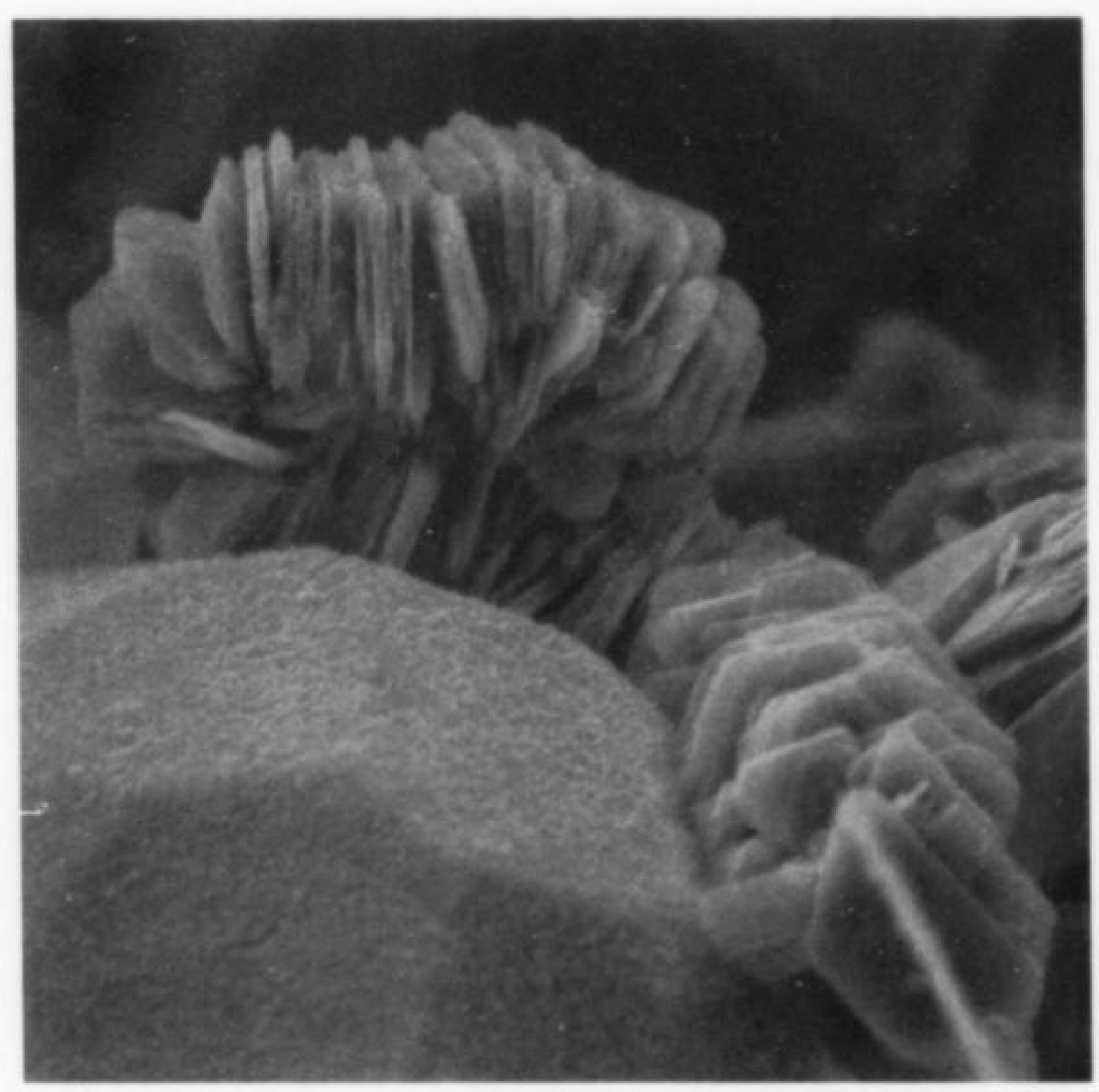


Figure 14. **SEM photomicrograph of chamosite crystals on fluorapatite. The largest crystal is approximately 40 microns. Canadian Museum of Nature specimen, catalog no. MOC-3476; G. Robinson photo.**

Chamosite $(Fe^{+2},Mg,Fe^{+3})_5Al(Si_3Al)O_{10}(OH,O)_8$

Microscopic vermiform pseudohexagonal crystals of a silvery-white chlorite group mineral occur on and in much of the quartz and albite. Microprobe analyses of this material show it to be an aluminian chamosite with a formula close to $(Fe^{+2}_{2.45}Mg_{1.93}Al_{0.54}Mn_{0.07})Al_{1.00}(Si_{2.48}Al_{1.52})O_{10}(OH,O)_8$.

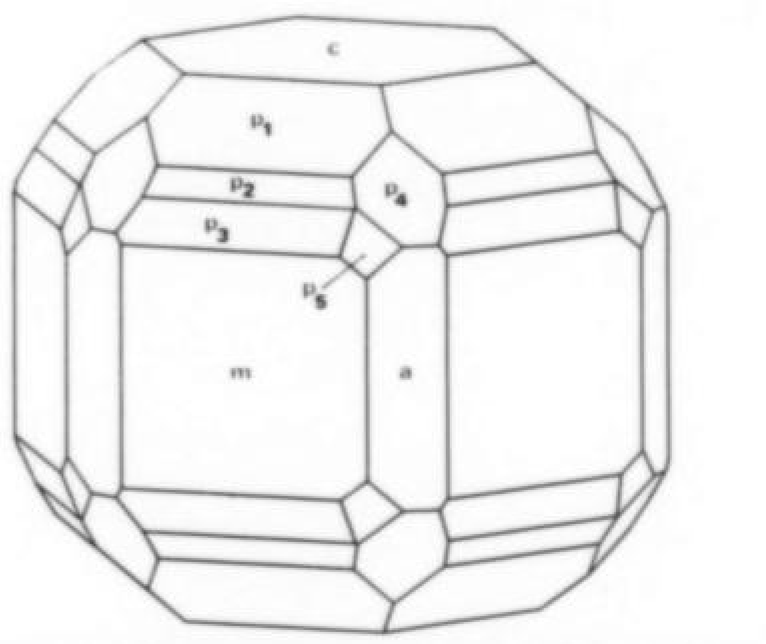


***Figure 15.* Composite crystal drawing of fluorapatite showing commonly observed forms *c*{0001}, *m*{$10\bar{1}0$} and *a*{$11\bar{2}0$} with {$ho\bar{h}l$} dipyramids *p_1*, *p_2*, *p_3*, {$hh\overline{2h}l$} dipyramid *p_4*, and {$hk\bar{i}l$} dipyramid *p_4*.**

Fluorapatite $Ca_5(PO_4)_3F$

Transparent, colorless crystals of fluorapatite are associated with albite in some of the veins. The crystals have characteristically brilliant faces, and often appear nearly spherical in shape due to their unusually complex morphology; squat and platy habits and crystal aggregates also occur. The crystals generally range in size from 0.5 to 1.0 mm, with an occasional individual attaining a maximum dimension of 1.5 mm. Fluorapatite commonly occurs growing directly from the surface of the dolerite, sometimes with inclusions of acicular, metallic rutile, and overgrown here and there by chamosite or albite.

The crystals are highly complex, with at least three sets of {$h0\bar{h}l$} bipyramids, an {$hh\overline{2h}l$} bipyramid and an {$hk\bar{i}l$} bipyramid. The idealized composite crystal drawing shown in Figure 15 was possible only by aid of SEM examination, because individual faces on the specimens available were too small to be accurately measured by optical goniometry. The crystal morphology is similar to that illustrated by Greg and Lettsom (1858) on page 76 (their Fig. 4) for apatite from St. Michael's Mount, Cornwall, England; and to that shown by Goldschmidt (vol. 1, Fig. 56) for apatite from an unspecified locality. The stereopair SEM photomicrographs in Figure 16 show well the highly complex morphology of these crystals.

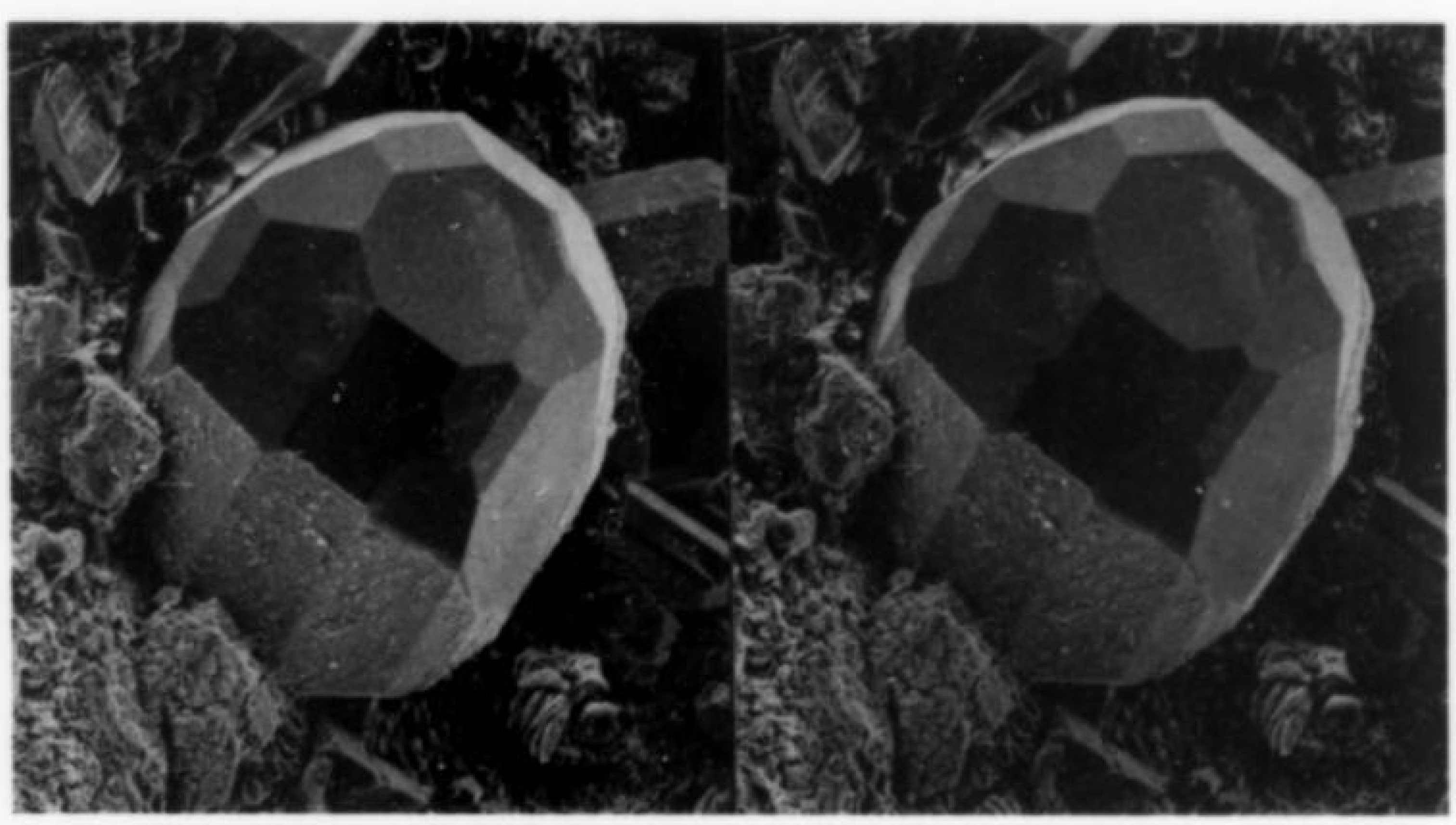


***Figure 16.* Stereopair SEM photomicrographs illustrating the complex morphology of the fluorapatite crystals from Prenteg. University of Leicester specimens; photographs by J. Faithfull.**

Galena PbS

Galena appears not to have been recorded previously from Prenteg, but during the course of this study it was noted as a rare accessory mineral associated with brookite in some of the quartz-calcite vein fillings.

Halloysite $Al_2Si_2O_5(OH)_4$

One sample of the white, pasty, late-stage clay mineral common in many of the veins of Prenteg was analyzed by X-ray powder diffraction and found to be halloysite.

Ilmenite $FeTiO_3$

Ilmenite has been noted on a single specimen as small, black grains associated with titanite (q.v.) in white quartz. Its identity has been confirmed by energy dispersive X-ray microanalysis.

Monazite-(Ce) $(Ce,La,Nd,Th)PO_4$

This mineral, previously undescribed from Prenteg, occurs sparingly as transparent, honey-colored, rhombic crystals up to 1.5 mm across, somewhat resembling siderite (Fig. 17). Monazite-(Ce) was collected *in situ* from the metasediments at the western side of the upper outcrop, and is associated with albite, goethite pseudomorphs after pyrite, fluorapatite and a pearly white clay-like mineral that may be cookeite. The monazite was identified by X-ray powder diffraction and confirmed as Ce-dominant by qualitative EDS microprobe analysis.

Pyrite FeS_2

Pyrite occurs sporadically throughout the mineralized area, both as an overgrowth on albite and quartz crystals, and directly on dolerite matrix. The mineral has been extensively altered to brown goethite. The crystals typically form microscopic cubes, generally less than 1.0 mm in dimension.

Quartz SiO_2

Quartz is one of the most abundant minerals at Prenteg, and is the dominant constituent of the fissure-filling veins. The crystals are typically prismatic, and form milky to transparent individuals up to 5 cm, but exceptionally may attain lengths of 7–8 cm. The crystals are frequently laden with inclusions of chamosite, and have also been noted to contain all three TiO_2 polymorphs. In some of the veins quartz crystallization appears to have been interrupted periodically by the presence of an unknown bladed phase, resulting in bizarre growth phenomena evident on some specimens.

Rutile TiO_2

Rutile is probably the least abundant of the TiO_2 polymorphs present at Prenteg. It occurs sparingly in some of the veins as microscopic, acicular, silvery yellow crystals commonly associated with quartz and

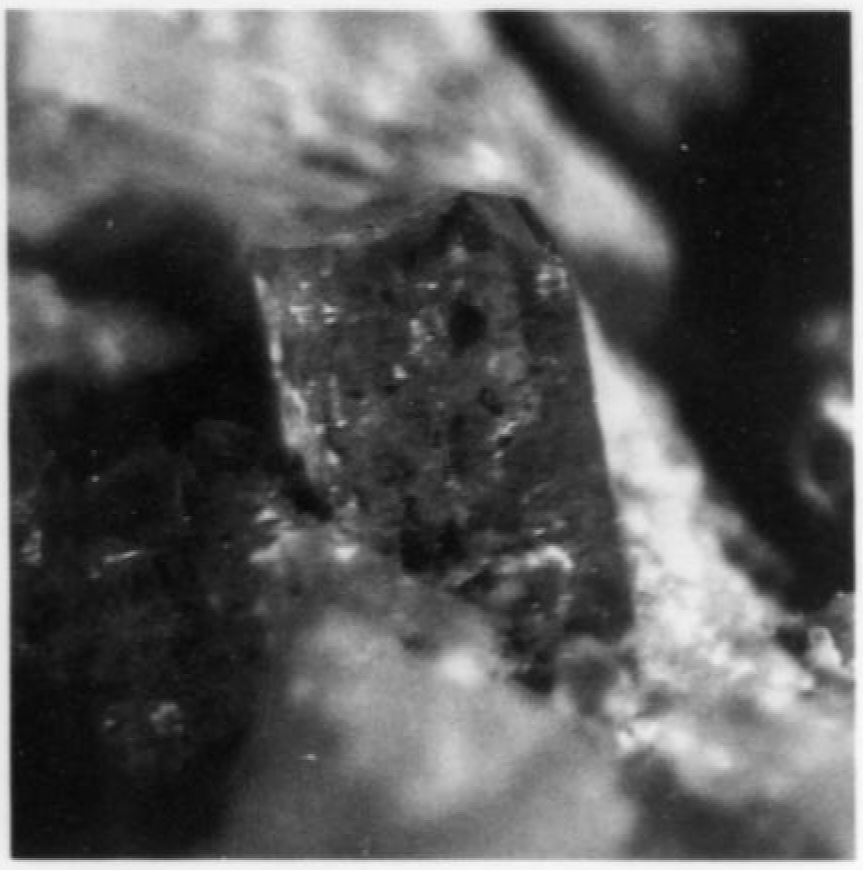


***Figure 17.* A 2.5-mm crystal of monazite-(Ce) on albite. Dave Middleton specimen; R. Starkey photo.**

chamosite. It has been observed as inclusions in the quartz, albite and fluorapatite, and has also been noted "piercing" free-standing brookite crystals. Generally, it appears to be an early-formed mineral, though sagenitic replacement of brookite by rutile has also been observed on some specimens.

Titanite $CaTiSiO_5$

Greg and Lettsom (1858) report sphene from Prenteg, though no specimens are preserved in the collections of the NHM, British Geological Museum or National Museum of Wales. During the course of this project, a single specimen collected by Mr. David Hardman was submitted to one of us (RES) for examination. The specimen contains a crude, 6-mm, pinkish brown crystal that has been shown by X-ray powder diffraction to be titanite. Additional titanite occurs on the same specimen as small, irregular grains, associated with small grains of black ilmenite in white quartz. As far as we know, this is the only verified record of titanite from Prenteg.

PARAGENESIS and ORIGIN

Absolute conclusions concerning the complete paragenesis of the occurrence cannot be drawn from the present study, considering the relatively small number of specimens of some of the early-formed species which were available. Many of these species do not coexist on the specimens studied, thus precluding the determination of their relative placement in the crystallization sequence. The problem is further aggravated by the microscopic size of some of these minerals, which require an SEM to be easily viewed. With these considerations in mind, the following paragenesis is suggested.

The first minerals to crystallize appear to have been fluorapatite, rutile, anatase and perhaps monazite-(Ce), followed by chamosite. Whether or not these were contemporaneous, and exactly when chamosite precipitation began cannot be ascertained for the reasons given above. At SEM magnification, chamosite crystals may be seen on the surfaces of rutile and fluorapatite, indicating that it formed after these species crystallized. There may well have been an overlap in time when any or all of these minerals were forming, but without the capability of examining the crystals internally to determine presence or absence of individual phases, it is impossible to tell.

Probably the next species to have formed is quartz, followed by brookite and albite. Chamosite is observed in and on all of these species, particularly near the base of the crystals, suggesting it was present before and during the early stages of their growth. Both quartz and albite continued to crystallize after brookite had formed, and the quartz crystallization appears to have continued beyond that of albite on most of the specimens examined. Acicular crystals of rutile may be seen penetrating both quartz and albite, suggesting that these minerals crystallized around it. In one instance rutile was noted growing into quartz, apparently from the surface of a large brookite crystal where the two joined. Albite is the only species in contact with the brookite on the opposite side of the crystal. This suggests that either the precipitation time for rutile should be extended, a second stage of rutile crystallization exists, or that very local conditions caused rutile to become the stable TiO_2 polymorph. Since it has been shown that the presence of alkalis or calcium stabilizes the brookite structure (Bach, 1964; Lerz, 1968; Mitsuhashi and Watanabe, 1978), it is interesting to speculate that the latter possibility may hold. While the pressure and temperature ranges of stability for the three TiO_2 polymorphs are not well understood, it is generally agreed that brookite is probably a metastable phase and that both anatase and brookite exist metastably at atmospheric pressure (Dachille *et al.*, 1968, 1969; Jamieson and Olinger, 1969). Thus it may be more than just coincidence that albite and brookite occur together both here and at other localities, as the former may be essential to stabilize the latter.

Microscopic crystals of pyrite occur on the surfaces of some of the albite and quartz, indicating that it formed after these minerals, but before halloysite or calcite, either of which may cover all the other minerals or completely fill some of the veins.

In order to establish the temperature of formation of the quartz veins, three crystals of quartz from Prenteg were sectioned and examined for fluid inclusions. All three were found to contain numerous secondary aqueous fluid inclusions with homogenization temperatures ranging from 125° to 150° C. One crystal had four isolated inclusions with constant liquid-vapor ratios which were presumed to be primary. All four homogenized between 159° and 165° C, and froze at −3.5° to −3.7° C. A single, isolated fluid inclusion occupying a negative crystal cavity was also observed in one brookite specimen. Also thought to be primary, this inclusion homogenized at 170° C and froze at −2.1° C. The relatively low freezing point depressions are indicative of moderately low salinity. The lack of a suitable geobarometer such as an equilibrium assemblage of metamorphic indicator minerals in the host rocks precludes a pressure correction to these data. Thus, the 160–170° C range of homogenization temperatures reported here for the quartz and brookite represents the minimum temperature of formation for these minerals.

The actual temperature of entrapment, however, was probably not significantly higher. X-ray powder diffractometer analysis of the slate adjacent to the quartz vein exposure shows it is composed chiefly of quartz, chlorite and illite. The dependency of illite crystallinity on temperature has been discussed in detail by Weaver (1960), Kubler (1967, 1968), Weber (1972) and others. The illite in the slate at Prenteg has a Kubler crystallinity index of 5.0 (or an Hb_{rel} of 1.54, by Weber's method), indicating a temperature of formation in the neighborhood of 165° C, similar to the homogenization temperatures given above.

Polished sections of the host dolerite examined by SEM backscattered-electron imagery show pervasive chloritization. No original ferromagnesian silicates were found in the samples studied, but small domains of unaltered albite and euhedral fluorapatite and rutile (X-ray verified) were observed. Microprobe analyses of the "chlorite" show it is very similar to the aluminian chamosite that occurs in the albite-quartz-brookite veins, with an average composition of $(Fe^{+2}_{2.37}Mg_{2.01}Al_{0.52}Mn_{0.06})Al_{1.00}(Si_{2.50}Al_{1.50})O_{10}(OH,O)_8$. This, together with the fluid inclusion, illite crystallinity data and field observations, suggests that the origin of the brookite-bearing veins is probably related to a very low grade regional metamorphic event that altered the dolerite and provided the essential components for the alpine-type mineralization observed in the veins.

ACKNOWLEDGMENTS

Our thanks are given to Dr. R. F. Symes for permitting access to the collections of both the NHM and the Geological Museum, and for providing photographs of the NHM specimens illustrated. We also thank Dr. R. E. Bevins for access to the collection of the National Museum of Wales, Cardiff. Dr. J. Faithfull of Leicester University provided the stereopair photomicrographs of fluorapatite, and identified the titanite and ilmenite. David Middleton of Wolverhampton provided many specimens for study, and Neil Hubbard of Leicester provided helpful discussion and assistance in the field. Dr. R. J. King, formerly with the National Museum of Wales, provided help with the references. Dr. Wendell E. Wilson drafted the maps and made available the illustration of brookite from Sowerby's *British Mineralogy* in the Mineralogical Record library. Peter Embrey, Douglas Bassett, Pierre Bariand and Henri Schubnel provided much help researching the type specimens of brookite.

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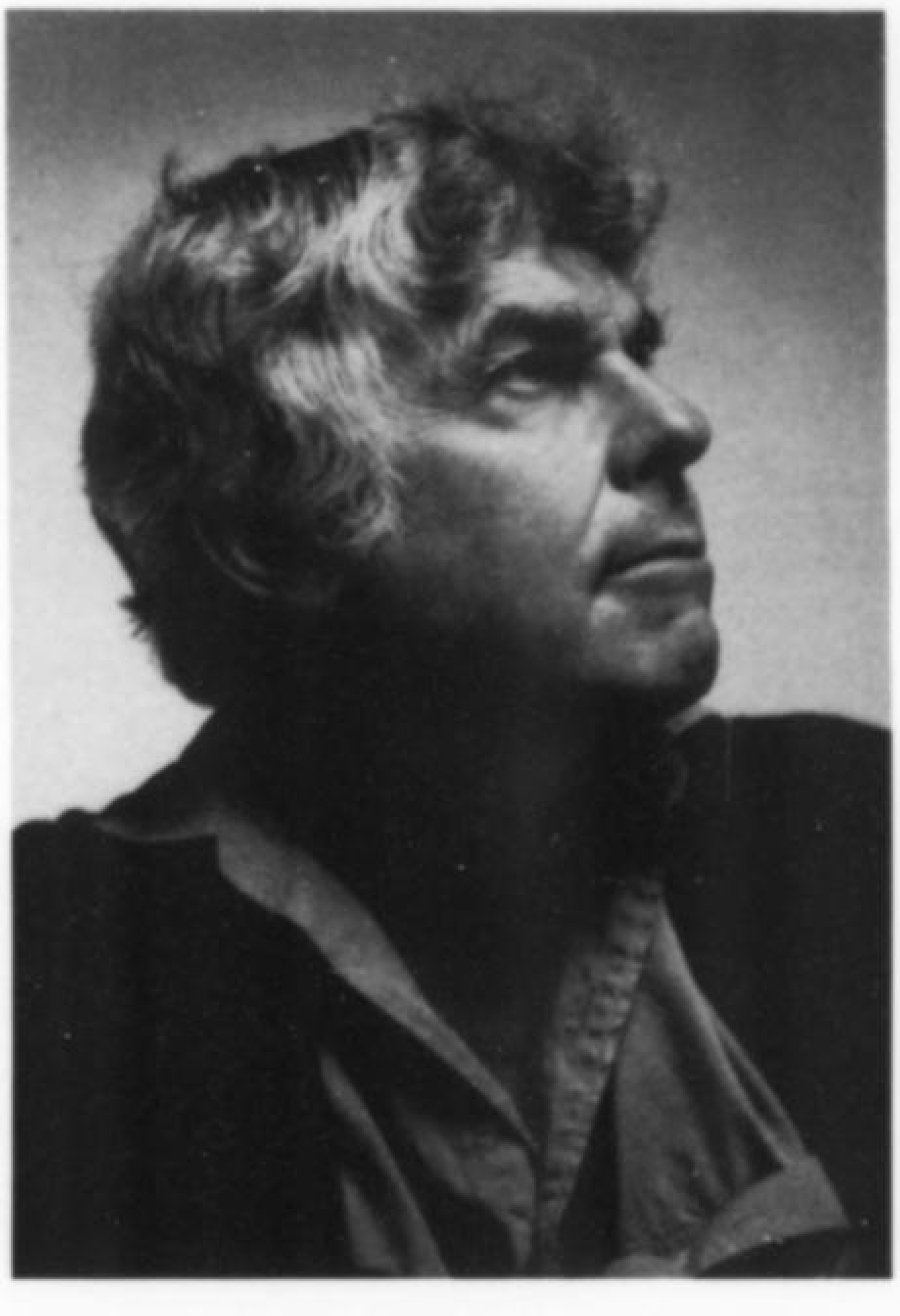
Prominent mathematician, world traveler, political activist, boating enthusiast, accomplished mineral photographer and collector of aesthetic mineral specimens, Steve Smale is respected among amateurs and academicians alike.

You've probably seen him at mineral shows: a tanned, casual browser with somewhat long, salt-and-pepper hair, wearing a comfortable sweater. Like many prominent people in the mineral world, his unassuming appearance gives no clue to his unusual expertise and accomplishments. Among his friends who have at least a remote understanding of his lofty status and endeavors as a mathematician he is held somewhat in awe. Others know him simply for his superb mineral collection and perhaps also for his skill as a mineral photographer.

Stephen Smale was born on July 15, 1930, in Flint, Michigan. His family lived on a small ten-acre farm outside of town, and he attended a one-room school with but one teacher. She taught all nine grades (30 students), took care of the library, cooked the school lunches and did the janitorial work besides. She had never finished college but, Steve says, "she had a lot of energy." Although these circumstances were not conducive to a top-flight education, Steve's fellow students always did well in the country-wide test at the end of the eighth grade. And when Steve's turn came, he scored the highest of all 1000 students taking the examination.

Steve's father, Lawrence, had attended college but had not completed a degree program. He was a white-collar worker, employed in a ceramics laboratory of the AC Sparkplug company, and he allowed Steve to convert the loft of their large chicken coop into a chemical laboratory. Steve's primary interest in high school was chemistry—no hint as yet that he would devote his professional life to mathematics. His father taught him to play chess, and he eventually became a tournament player (coming in fiftieth out of about 130 entrants in the National Open). And his father also built him a telescope, nurturing an interest in amateur astronomy. However, no one ever accused Steve of being a child prodigy, and in fact one of his high school teachers was not especially encouraging about his idea of attending college at the University of Michigan in Ann Arbor.

Nevertheless, he made the big jump to college, financed by a small inheritance from his grandfather and a four-year tuition scholarship. During his first three years he was a physics major and, although his grades were satisfactory, he switched in his senior year to mathematics because it seemed easier. He played a lot of chess and Go, and became involved in political activism. Like his father, he was at that time a Marxist, and he joined the Communist Party, becoming heavily involved in left-wing politics and opposing the Korean War. "It was a question of avoiding the draft," he says, "which kept me studying at all." As a junior in college he had visited Eastern Europe, attending a Communist "Youth Festival" in Berlin around 1951, and back at home he organized a "Society for Peaceful Alternatives" on campus. Because of these political activities (his grades were never in question) he was put on probation during his senior year.



Although still somewhat casual in his attitude toward academic studies, he applied to attend graduate school at Ann Arbor and was accepted. During his first year, however, this attitude finally caught up with him, and he was warned by the chairman of the department that if his mathematics grades did not improve he would be jettisoned from the graduate program. Heeding the warning, Steve devoted him-

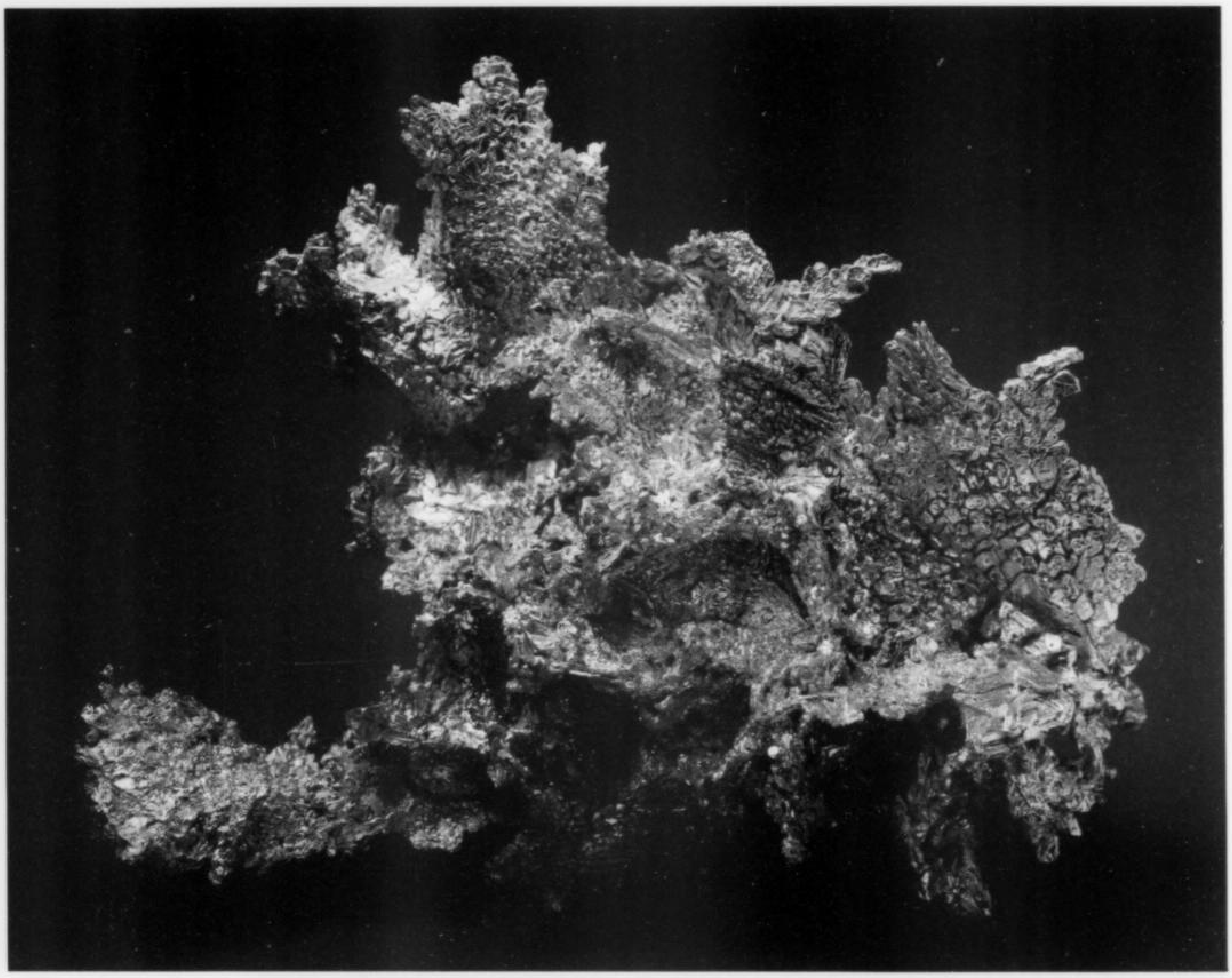


Figure 1. **Gold crystal group, 10 cm, from the Eagle's Nest mine, Michigan Bluff area, Placer County, California. Smale collection and photo.**

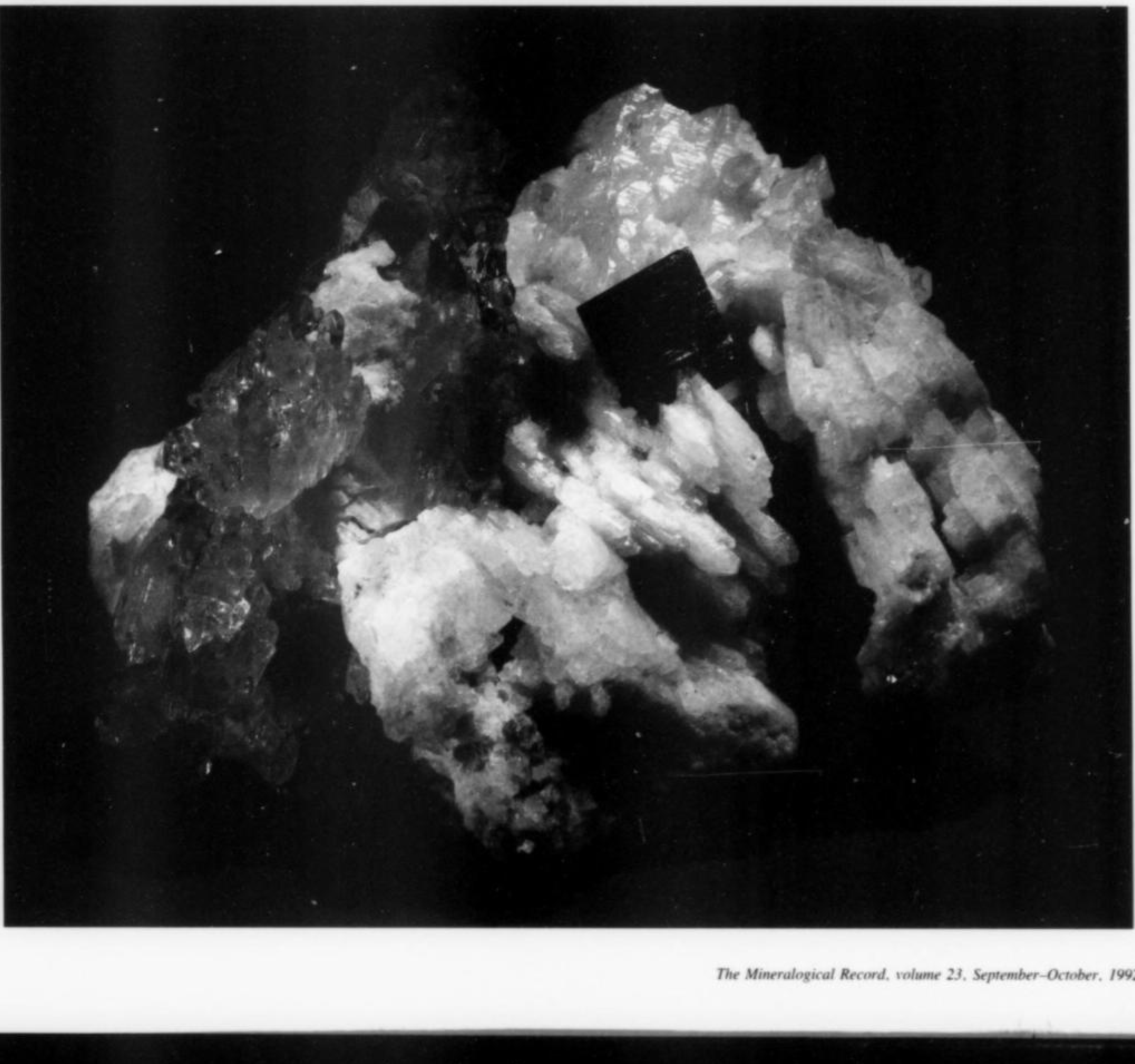


Figure 2. **Black columbite-tantalite crystal, 1.2 cm, with rose quartz from the Pitora mine, Minas Gerais, Brazil. Smale collection and photo.**

Figure 3. **Aragonite crystal group, 8 cm tall, from Cumberland, England. Smale collection and photo.**

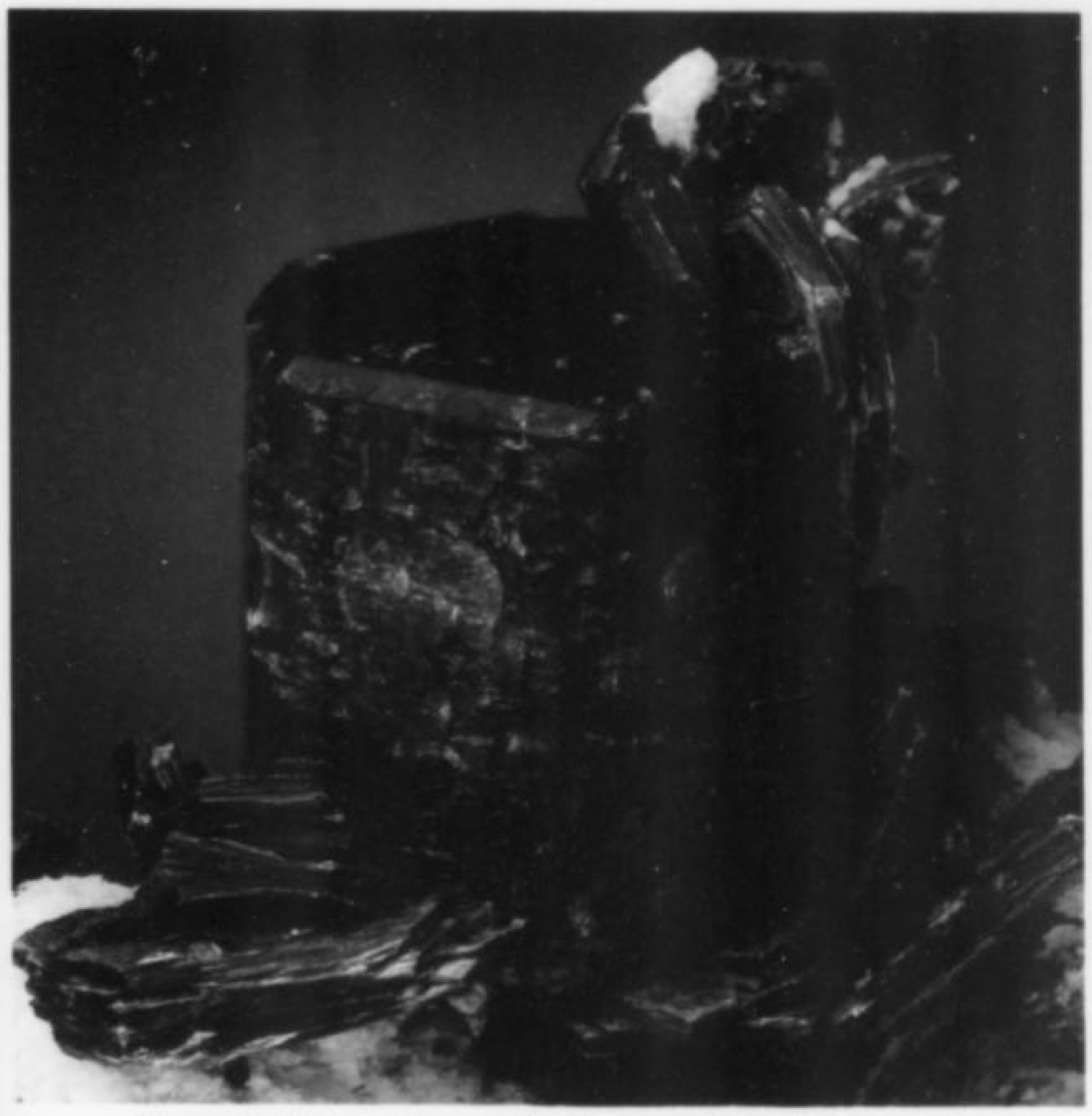


Figure 4. **Muscovite on a dark green, 4-cm fluorapatite crystal from the Jose Pinto mine, Minas Gerais, Brazil. Smale collection and photo.**

Figure 5. **Amethystine quartz crystal group, 15 cm, from Guerrero, Mexico. Smale collection and photo.**

self seriously to mathematics and dropped out of the Communist Party. In later years he maintained some degree of activism, taking part in a controversial press conference at the International Congress in Moscow in 1966, and playing a central role in the early Vietnam protests (he was co-chairman, with Jerry Rubin, of the Vietnam Day Committee). But gradually his political views changed and broadened to the extent that today he considers himself anti-communist, and even right-wing on a few issues, although still decidedly left-leaning on others. Upset first by the Soviet invasion of Hungary in 1956, and then by Communist activities in Southeast Asia and the Soviet invasion of Afghanistan, he concluded that the pure Communist/Socialist system is essentially destructive, and this view was also reinforced by visits to the Soviet Union itself in 1961 and 1966.

During the fall of 1954, in his third graduate year, Steve met Clara Davis, who was then the student in charge of a Co-op. She was a very stable person, an anchor perfectly suited to Steve's temperament, and they were married two months later. They are still married today, and are the parents of two PhDs.

In 1957 he was awarded a PhD in mathematics at Ann Arbor, and took the position of instructor at the University of Chicago. He was a member of the Institute for Advanced Study at Princeton from 1958 to 1960, became an Associate Professor of Mathematics at the University of California, Berkeley in 1960, and was a Visiting Professor at the College de France, Paris, in 1962. From 1961 to 1964 he was Professor of Mathematics at Columbia University, and from 1964 to the present day has been Professor of Mathematics at Berkeley. During his early professional years he ascended to the academic stratosphere of mathematics as a result of his work in the field of topology; he was awarded the Veblin Prize for Geometry by the American Mathematical Society in 1965, and the Fields Medal by the International Union of Mathematics in 1966, among other distinctions. His advancements in topology are difficult to describe to non-mathematicians but it should suffice to say that he became one of the world's leading lights on this esoteric subject.

With his laurels still fresh and his professional niche secure, Steve nevertheless dropped the study of topology in 1961, much to the chagrin of his professional colleagues who felt abandoned and rejected by his sudden disinterest. But, in an interview with *More Mathematical People* (1990) (from which most of the information in this profile was drawn), Steve said:

> I think that there was some truth in the statement that the main problems in topology I'd solved. Dimensions 3 and 4 were left open . . . [but] it was more interesting to me to go on to other things. . . . The problems of the discrete dynamical system in the 2-sphere were ever so much more exciting and mysterious than anything left in topology.

So he changed boats in professional mid-stream and took up the study of dynamical systems, which involves the passage of physical states in time. A colleague in Brazil was especially encouraging, and Steve has since made many trips to Brazil for mathematical as well as mineralogical purposes. His interest in dynamical systems persisted into 1963, when he shifted his investigations to the calculus of variations and infinite dimensional manifolds, two subjects which he succeeded in unifying. In 1966 he was back to dynamical systems, and remembers the time fondly as a period of much growth during which he had some of his best students.

Since 1970 he has become involved in various subjects including the mathematical aspects of electrical circuitry, applications of global analysis, and especially mathematical economics. A 1976 paper in the *Journal of Mathematical Economics* even deals with a mathematical model applicable to specimen pricing at mineral shows! His involvement in economic theory has also led to a better understanding of the conflicts between capitalism and socialism. "Probably the solution," he says, "is to have some kind of balance between the two. This is the position I've evolved to."

These days Steve is careful about where he spends his energies, and is working on a global perspective about science, and a world perspective about mathematics. Computer science he sees as a kind of revolutionary influence in mathematics because of its emphasis on algorithms and recursive function theory, which could ultimately make the foundations of mathematics more continuous rather than discrete. Looking at numerical analysis from a topological perspective, or the systematic study of algorithms, is the focus of his work in recent years.

Steve was also very much involved in the early development of a new field in mathematics called "chaos theory." His influence has been pervasive, as a reading of James Gleick's 1987 bestseller *Chaos* will show.

New interests have always been actively cultivated by Steve, who considers a "comfortable niche" to be more or less synonymous with a "rut." This is true in his private as well as his professional life. In 1987 he sailed a ketch (16 tons, 43 feet, with three private staterooms, living room and galley) from Berkeley to the Marquesas Islands in the South Seas. His crew consisted of two mathematician friends. The trip out from Berkeley was 25 days with no sight of land, but on the way back he anchored in Hilo, Hawaii to see Clara, make repairs and visit the Lyman House mineral museum.

And then there is his mineral collection, roughly 700 superb, aesthetic specimens. The original influence is traced once again to his father, who gave him a mineral in 1968. At about the same time several beautiful "coffee table" books on aesthetic specimens came out, further stimulating his interest. He came to the sudden realization that a private person could actually compete with museums for the finer specimens! Within a month or two he was "driving all over the state to every mineral shop, trying to buy minerals. I was pretty naive," he says, "but I put a huge amount of energy into it." Since then, he and Clara have put most of their disposable income into mineral specimens, and he has developed into a first-rate connoisseur. The love of beauty, and a sense of competitiveness are the driving factors. Freedom from damage, and an aesthetically crystallized, properly sized matrix are among their important criteria in selecting specimens.

> If you can get some mineral that no museum or collector had, there's something . . . that makes it more beautiful. Beauty is very integrated with rarity [and] is connected so much with innovation and priority.

Traveling to foreign mineral-producing areas has proved to be one of their most successful ways of acquiring new specimens. Trips to Pakistan, Morocco, China, Colombia, Peru, and Brazil (seven times!) have yielded many superb crystal groups for their collection.

Collecting minerals is one of the few outside endeavors Steve has actually taken time off from mathematics to do. Another is mineral photography—his skill was developed at the expense of an intense six-month hiatus in his professional work. Much of his inspiration during this developmental process came from great photographers such as Ansel Adams, Edward Weston, Eliot Porter, Robert Mapplethorpe, and Harold and Erica Van Pelt. The results are on these pages, clearly showing that his time was productively spent. (He uses a Sinar 8 x 10-inch view camera.) Prints of his mineral photos, usually 16 x 20 inches, are available through Ziba Gallery, 64 Shattuck Square, Berkeley, California.

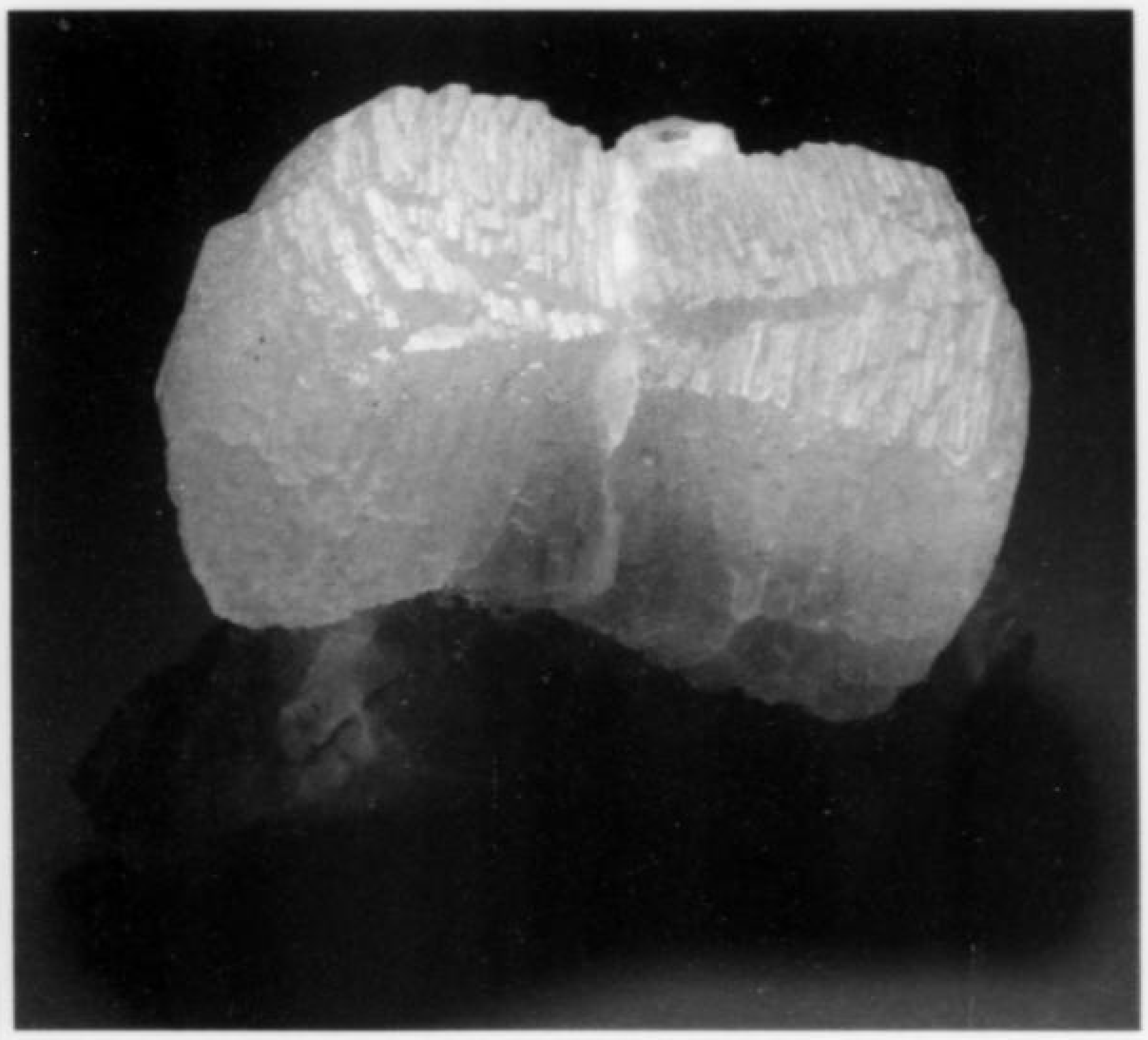
Over the years Steve has developed one of those enviable life-styles peculiar to very successful academics whose profession has bestowed upon them the maximum in elbow room. How does he do his mathematical work? "Naturally." Does he have a schedule? "No." He rises at 5 a.m. by choice, spends some time organizing his day, and perhaps puts some time in on his mineral photography. He is often colloquium chairman for his department at Berkeley, and teaches half-time (= one course). If he's grappling with a particular mathematical problem he may sit back and think about it for a half hour before

Figure 6. Large 16-cm hematite crystal group from Brumado, Bahia, Brazil. Smale collection and photo.

Figure 7. Polybasite crystal group, 7 cm across, from Arizpe, Sonora, Mexico. Smale collection and photo.

Figure 8. Manganite crystal group, 17 cm, from Ilfeld, Harz Mountains, Germany. Smale collection and photo.

Figure 9. **Witherite crystal, 7 cm, from the Minerva mine, Cave-in-Rock, Illinois. Smale collection and photo.**



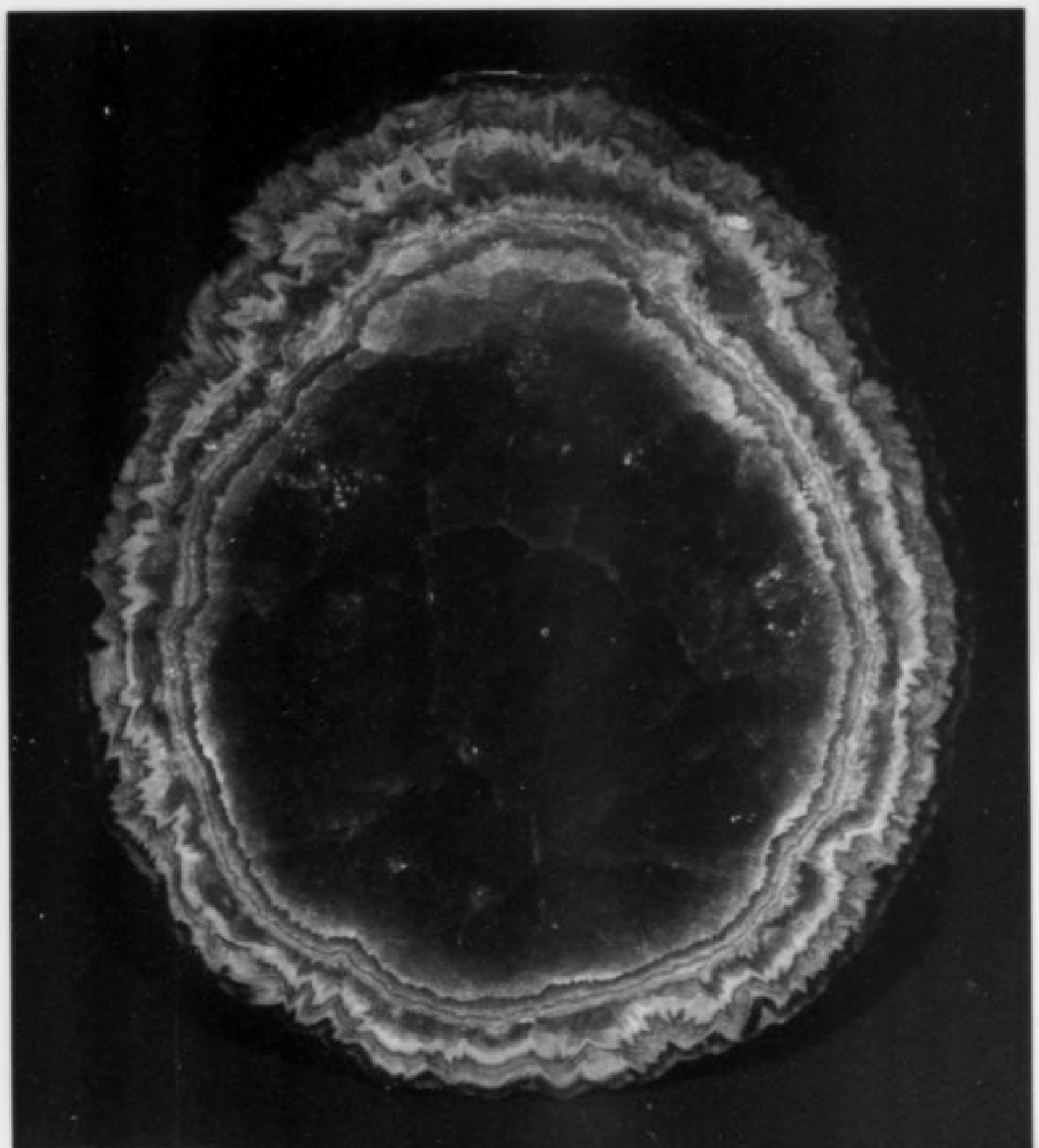


Figure 10. **Rhodochrosite (slabbed and polished), 9 cm, from Catamarca, Argentina. Smale collection and photo.**

Figure 11. **Green fluorapophyllite with white mesolite and heulandite, 15 cm across, from Poona, India. Smale collection and photo.**

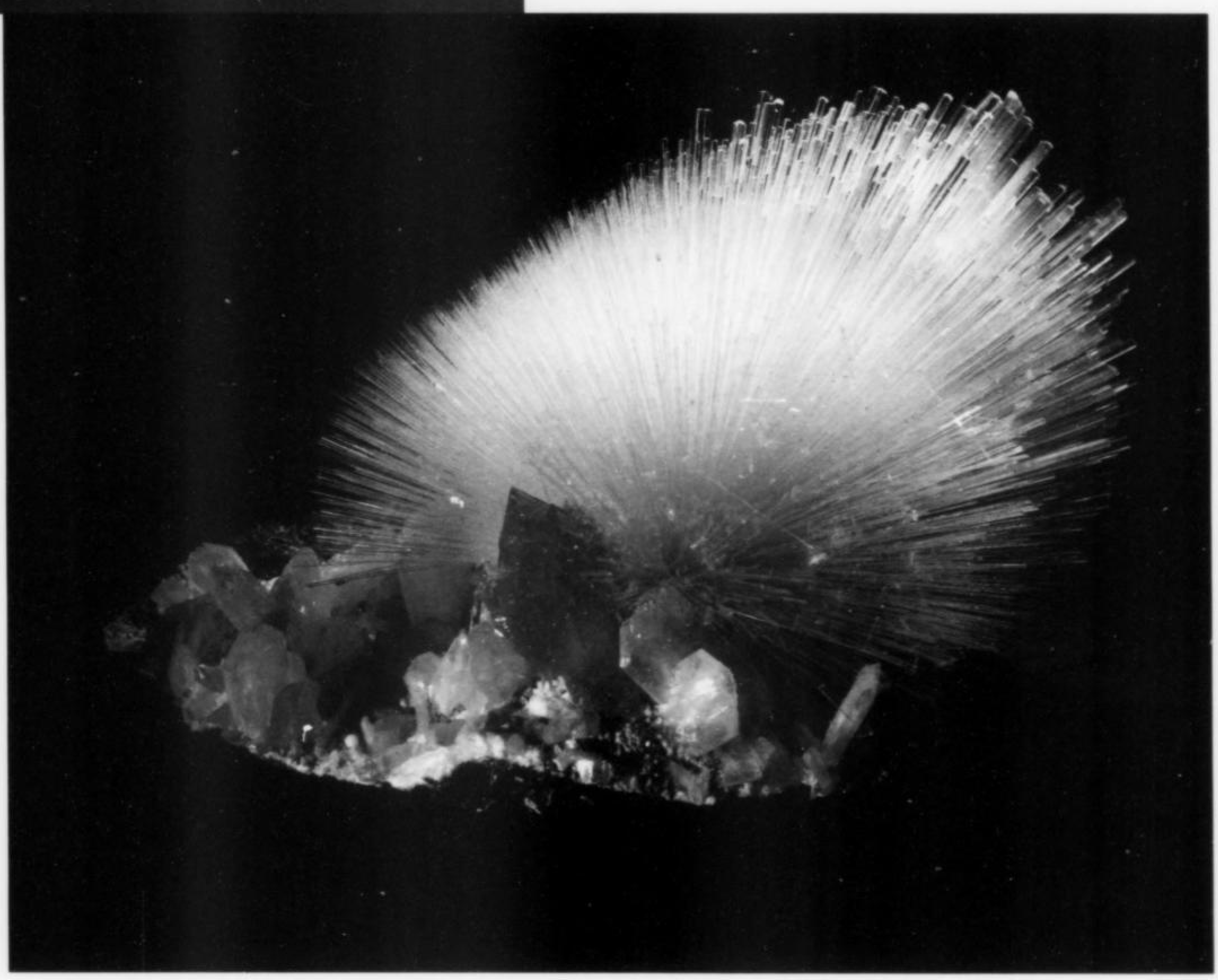


Figure 12. **Barite crystal, 17 cm, with yellow calcite from Elk Creek, South Dakota. Smale collection and photo.**

Figure 13. **Elbaite with lepidolite, 10 cm across, from the Himalaya mine, San Diego County, California. Smale collection and photo.**

dinner or after dinner. Then he'll spend a few minutes (!) preparing the next day's lecture. "And," he says, "our mineral collection takes a lot of time too—organizing it and doing things connected with it."

With this kind of freedom, it is not unusual for him to attend the major mineral shows. If you are fortunate, you may even see an occasional exhibit of some of his specimens (he won the coveted McDole trophy at the Tucson Show in 1976). In the meantime, the selection of photos presented here will give some idea of the Smale Collection.

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Book Reviews

Zeolites of the World

by Rudy W. Tschernich. Published (1992) by Geoscience Press, 12629 N. Tatum Boulevard, Suite #201, Phoenix, Arizona 85032, (602) 953-2330. Hardcover without dustcover, 18 x 26 cm, 563 pages including many hundreds of photographs and crystal drawings, ISBN 0-945005-07-5, $84.95 prepaid and $2.00 shipping charge.

The publication of *Zeolites of the World* has been anticipated by the collector community for some time; its arrival will benefit the collector in many direct ways.

The volume is of good size; it fits the hand well and is durable. It has good balance, adequate margins, neat layout, and non-glossy paper of more than adequate opacity; print-through is negligible. The abuse of wasted abundant white-space, an all too common current practice, is delightfully missing here; the available space is very well-used, spacing is neat, and there is adequate room for marginalia. This volume is very well published.

The introductory sections are well written and of appropriate length. These are: *Zeolites defined* (9 pages), *Origins of Zeolites* (17 pages), *Cleaning Zeolites* (6 pages), *Industrial Uses of Zeolites* (3 pages), and then the author gets right to the heart of the subject . . . *species!* Pages 39 through 526 are devoted to mineral descriptions and prodigious amounts of information on localities, the great strengths of this work . . . its great core cause. These are followed by a list of zeolite synonyms, and by a 30-page reference list, both of which appear to have been very carefully prepared, and both of which have significant value for the serious reader.

However, Mr. Tschernich errs grievously in a number of cases where he puts his judgments on nomenclature ahead of those of the I.M.A. Commission on New Minerals and Mineral Names, and makes nomenclature recommendations best left to professionals. Over 30 years of effort have been expended by scientists worldwide in an attempt to create and codify a uniform nomenclature for mineral species and the criteria for their status. Such great efforts should not be trivialized by careless shoot-from-the-hip actions by a member of the collector community. The relegation of a valid mineral species to varietal status is not an action to be treated cavalierly, qualifying remarks notwithstanding. In his treatment of several minerals (clinoptilolite, herschelite, tetranatrolite, wellsite, and willhendersonite) he admits his presentation of the species status of these minerals is at variance with that of the I.M.A., but it should be strongly emphasized that his open admission of such arbitrary actions does not excuse his egregious errors in judgment and his apparent disrespect for the procedures of the science.

Mr. Tschernich publishes what he calls guidelines, intended, he says, "as an aid to systematizing the nomenclature in the zeolite group of minerals." He indicates these are "under consideration" by the I.M.A. but offers no verification, reference, or permission to publish. Without addressing here the substance of what he proposes in the book (or discussing the facts of *any* proposal to the I.M.A., all of which must be kept confidential) and which may or may not be before the Commission on New Minerals and Mineral Names (CNMMN), I.M.A., I must strongly condemn Mr. Tschernich's irresponsible use and abuse of such information. There has been no CNMMN approval of the nomenclature he proposes and his actions are wholly inconsistent with established practice in the science of mineralogy. [This paragraph and the preceeding paragraph were read and approved by the Chairman, Vice-Chairman, and Secretary of the Commission on New Minerals and Mineral Names, I.M.A.]

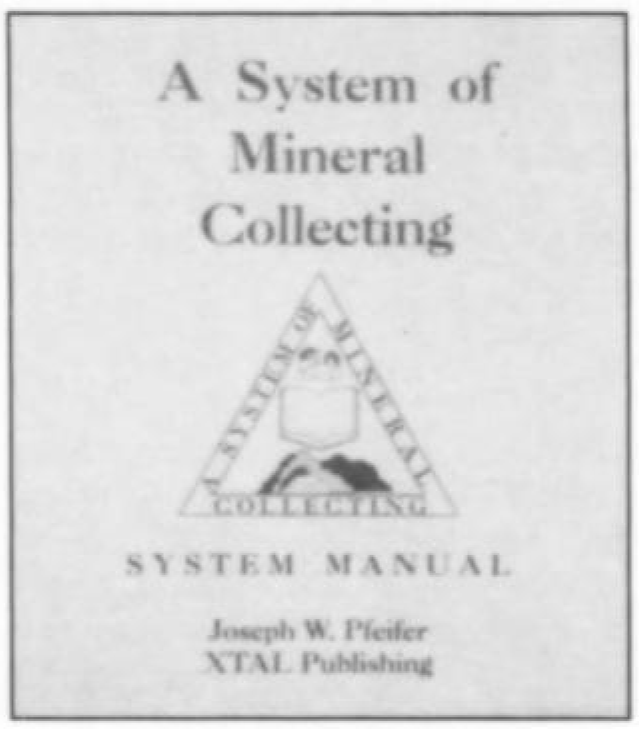
The zeolite minerals are presented alphabetically in the work and this is not inconvenient inasmuch as there are not very many. Each mineral section contains a heading with information on formula, history, type locality and nomenclature. Major headings are for structure, physical properties, optical properties, morphology, chemical composition, identification, cleaning, origin and occurrences.

This volume is very well illustrated with abundant crystal drawings, sketches where appropriate, and a great number of black-and-white photographs (taken with both visible-light and SEM techniques, and intermixed very well). There are 56 color photographs; the aspect which caught my attention is that, although beautiful, they appear to have been chosen with their educative value as a prime criterion, an admirable decision. One *learns* a lot looking at the photographs Tschernich has chosen; they are very much more than window-dressing. Crystal drawings and sketches are used generously to illustrate forms, common habits, zoning, overgrowths, twinning and many other details, all shown with great care. Having long grown used to the parsimonious use of good illustrative material, and the excessive use of spectacular (but often irrelevant) color photographs, it is indeed a pleasure to use a book that uses the graphic arts very well and educates one in detail.

The compilation and writing of this volume was an act of love, coupled with a very deep respect for the subject matter. All books should be written by as intense an enthusiast. Aside from the very serious problems with species nomenclature, species status, and respect for established scientific procedure noted above, this book is a volume worthy of its moderately steep price.*

Pete J. Dunn
Smithsonian Institution,
U.S. Member, Commission on New Minerals and Mineral Names, I.M.A.

*The views expressed are those of the author and do not necessarily represent opinions of the Smithsonian Institution.



A System of Mineral Collecting

by Joseph W. Pfeifer; 350+ pages, 5.5" x 8.5", looseleaf, $34.95; ***The Collector's Catalog****, 242 pages, 8.5" x 11", comb binding, $29.95; published (1991) by Xtal Publishing, P.O. Box 253, Sandy, UT 84091-0253.*

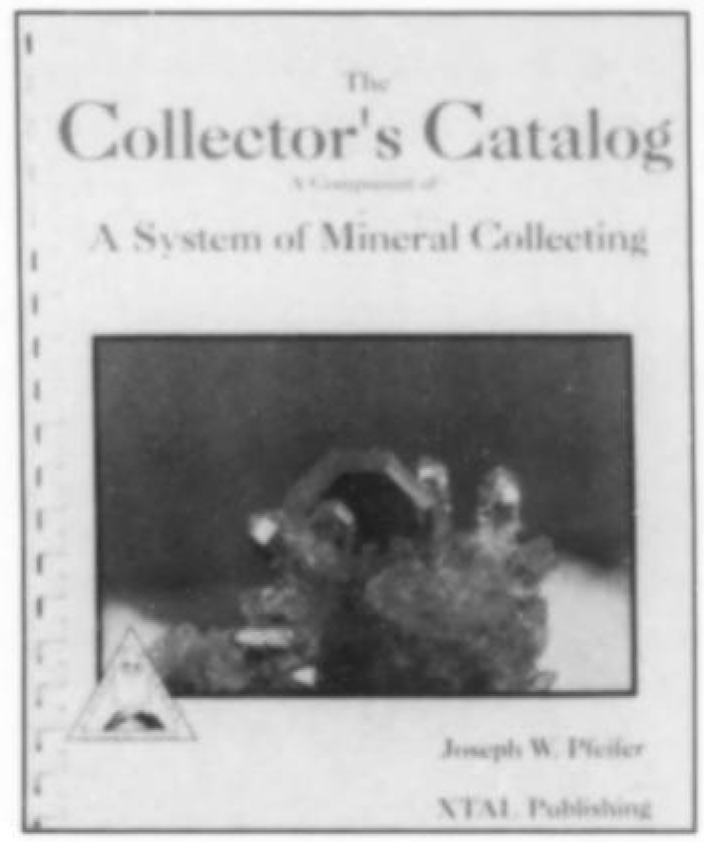
Acquiring unusual or beautiful specimens of minerals and their gem varieties has occupied people since before the dawn of the written word. Over time formalization of this activity has taken place as advances in chemistry and physics have provided a convenient and logical basis for studying and organizing minerals. This trend towards organization on a scientific basis had led to elaborate systems designed to transform accumulations of interesting material into collections within which individual items can be readily identified by their characteristics. Today all mineralogical collections are arranged on the basis of some sort of formal system, from those arranged alphabetically by the mineral name or locality to those based on a detailed chemical or structural classification. Not only does this provide a basis for gaining more personal enjoyment from a collection, but it provides a basis for study of the relationships of minerals to each other and to their occurrences.

The basis for classification of mineral species is information. The initial source of this data must be the person who picks up the mineral specimen in the field. By doing so, the field collector and all subsequent owners assume an obligation and responsibility to provide accurate, useful and usable information about the specimen and where it was found. There are several reasons for this: First, the mineral specimen may be reduced to little more than a pretty object if it loses its name and location. Second, the more information one has for a specimen, the more knowledge and enjoyment one can get from it.

Incomplete or erroneous locality information is a problem all researchers and collectors have to deal with at one time or another. More often than not the fault is an imperfect memory on the part of the field collector. That some effort should be expended to rectify this situation is the subject of a commentary by Pete Dunn on "Suggestions for more accurate locality notations" which appeared in the *Mineralogical Record* (September-October, 1991). It may be pertinent to note that a specimen is only as valuable as its label is complete!

To help collectors retain and complement their locality information and to compile accounts of specimen acquisition and localities for future investigation, Joseph Pfeifer has provided *A System of Mineral Collecting*. This unique new manual is best described as a complete set of forms and booklets organized into various aspects of the hobby to keep records on field trips, planning and organizing equipment, storing key information, setting goals, and keeping track of people, places and experiences, etc. When consistently used, this provides a "history" of the collector's activities. For the benefit of species collectors, the companion volume, *The Collector's Catalog*, provides a means to compile locality and other information in a single, easily transportable volume.

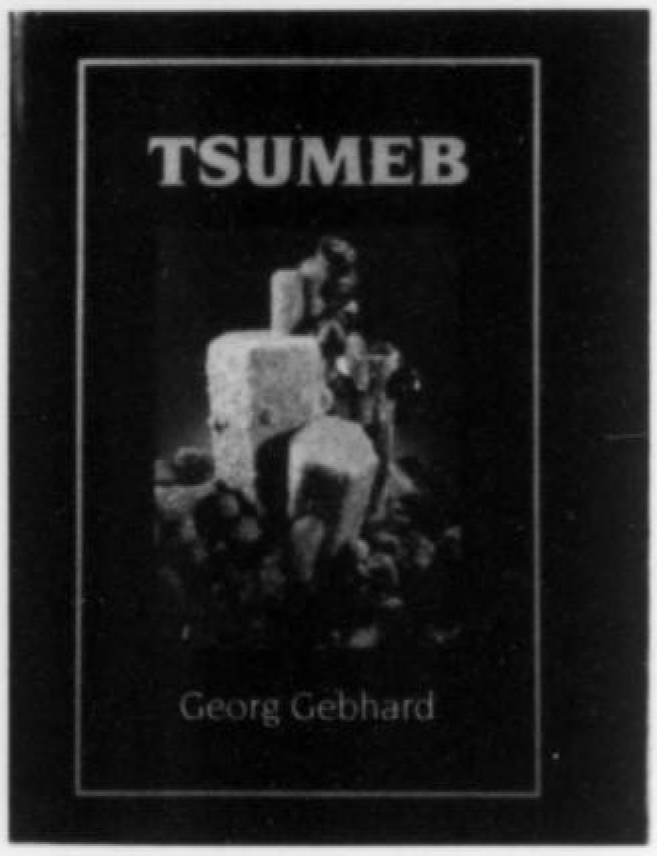
A System of Mineral Collecting is composed of six sections separated by index tabs, plus an introduction and brief explanation of the contents of each section and the companion volume, *The Collector's Catalog*. Section One concerns the Field Trip and contains five subsections with forms covering the various aspects of field collecting, including Field Trip Log, Field Trip Report, Field Trip Organizer, Field Trip Supplies and Field Notes (subsection 1-5), a small pocket notebook measuring 4 x 5.5 inches. Section Two addresses localities and contains three subsections with forms for Potential Collecting Areas, Location "Tip" Sheets and Locality Maps. Section Three is titled "Your Collection" and in four subsections contains forms for Collection Journal Notes, Collection Wish List, Trade/Swap/Lending Record and Specimen Documentation Notes wherein locality and acquisition information can be compiled and reviewed. Section Four deals with Show Visits and contains five subsections, Mineral Show Diary, Show Preparation Checklist Symposium Record, Museum Visits and Show Buyers Guide (4-5), another second small pocket notebook measuring 4 x 5.5 inches. Section Five concerns People and contains two subsections, Personal Contacts and U.S. Mineral Collectors Atlas wherein information on localities, museums, collectors, and so forth can be compiled on state/county outline maps. Section Six on Data Collecting has five subsections, U.S.G.S. Research Record, State Geo-lit Research Record, Library Reference Record, Literature Filing Organizer and Magazine Checklist.



The Collector's Catalog is a separate manual that is a database-style collection of forms, listing alphabetically over 3,300 mineral species. Each mineral name listing has space to help the collector list important information on each specimen such as size, locality, value, where it was obtained, where it is stored, and catalog number. This manual will be of value to those wishing to document, catalog and evaluate their collection. Even those who have utilized a personal computer to catalog their specimens can use this manual as a portable extension of their database for use away from home at mineral shows and symposia.

The comprehensive coverage has resulted in useful and usable forms for every collector regardless of the size or sophistication of their collection. Consequently, every mineral collector who is serious about building a worthwhile collection will find much of value in these two manuals. Pfeifer has provided collectors with the means to vastly improve their collections and, at the same time, to gain more pleasure therefrom. In the final analysis a mineral collection with detailed documentation on the provenance and acquisition of its contents also has greater monetary value. I believe that these manuals are an excellent buy, and I recommend that every mineral collector purchase one or both for their own sake and that of their collection.

Richard W. Thomssen

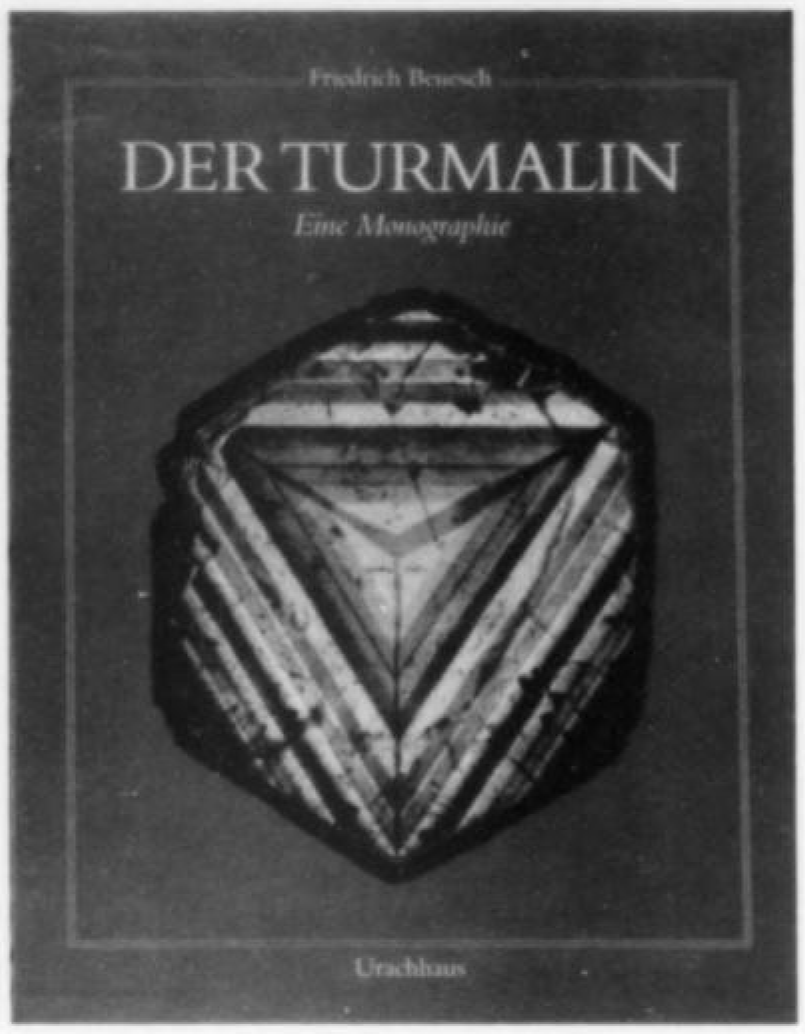


Tsumeb, eine deutsches-afrikanische Geschichte

["Tsumeb, a German-African History"] by Georg Gebhard. Published (1991) by Verlag Christel Gebhard-Giesen, Oberwehnrath, D-5226 Reichshof 1, German. Hardcover, 23 x 30 cm, 239 pages, ISBN 3-925322-02-7, price: DM 149 plus postage, prepaid orders only.

German involvement in geology and mining in former South-West Africa is a prominent feature of the recorded history of the country now independent and named Namibia. Diamonds apart, the great mineralogical prospecting effort centered on the Tsumeb area where, at the time of writing and according to the author of this book, 31 species unrecorded elsewhere occur. The first chapter outlines the early settlement of the territory in the first years of this century and is accompanied by interesting photographs of the original state of the mines. An account of life in the Tsumeb area follows and itself precedes a description of the orebody which is clearly depicted in a colored map. The next short chapter mentions the major collectors and collections of Tsumeb minerals—particular attention is given to Samuel Gordon whose adventures in the area are amusingly told in an early issue of the *Mineralogical Record.* A short chapter relates how the first new mineral (otavite) was discovered, and describes the first papers on the area. The next section is the longest in the book (113 pages) and it is to this section, in which the species are arranged in rough order of importance, that most *Record* readers will first turn. Particular rarities are treated separately so readers will need to turn to the alphabetical index of species at the back of the book. The index also gives chemical compositions. There is a useful bibliography. The standard of production and of photography is high, with many beautiful specimen photos by Olaf Medenbach. Labels are plentifully reproduced in the text, and altogether this is a very desirable book. It is reminiscent in quality and treatment to Embrey and Symes' excellent *Minerals of Cornwall and Devon*. [Ed. note: According to the author, an English-language edition is in production.]

Michael O'Donoghue



Der Turmaline: eine Monographie

["The Tourmaline: a Monograph"] by Friedrich Benesch. Published (1990) by Verlag Urachhaus, Johannes M. Mayer, Stuttgart. Hardcover with dust jacket and slipcase, 31 x 50 cm (4 pounds), 380 pages, ISBN 3-87838-650-8, price: DM 296.

Although this is in every way a superbly produced book and a feast for the eye, the text varies a good deal, with considerable digression (for the mineralogist) into anthropological and magical byways. Nonetheless, there is considerable mineralogical detail here, and the two sections of colored plates are magnificent, especially with the large page size.

The book opens with notes on references to tourmaline in early literature, some of which is reproduced in the text, and then continues with sections on species nomenclature and on crystal coloration. Then come 151 pages, each depicting, in beautiful color, one, two, three or four examples of tourmaline crystals. I have never seen so fine a group of color pictures, and the book, however heavy and expensive, is worth trying to obtain for these alone. Captions on the pages themselves are limited to the country of origin of the crystals shown but the captions are expanded in the text following. Next come discussions of tourmaline geochemistry, paragenesis, crystallography and another section of colored plates, this time showing 15 examples, hand-painted, of multi-coloured tourmaline crystals.

From there the book turns to the place of tourmaline in religious and magical symbolism, on which I cannot comment, but it goes on to discuss tourmaline occurrence and then concludes with a large bibliography. By the time you read this review the second short print-run will have been exhausted but the book is worth trying to get somehow, as the plates are unequalled.

M. O'D.

Mineralny Dolnego Śląska

["Minerals of Poland"] by Józef Lis and Hubert Sylwestrak. Published (1986) by Instytut Geologiczny, Warszawa, Poland. Hardcover, 17 x 25 cm, 791 pages (no illustrations), ISBN 83-220-0257-2, price: 800 zlotys.

This is the new standard mineralogy of Poland in which the lengthy descriptive section (707 pages) gives mineral species in alphabetical order. The book begins with a brief history of Polish mineralogies and gives a small-scale map of the country as it is today. Next comes a glossary of terms and abbreviations used. After the descriptive section is a fine bibliography of 35 pages: this gives a very large number of invaluable references to Polish and other literature, much of which will not be included in the main abstracting services, certainly not in English-language ones. The entries in the descriptive section give mineral name, chemical formula, chemical analysis in many cases, and locations in Poland with references to the literature giving author, title, journal name and date of paper. Other details, such as physical and optical properties, are not given. No doubt the inclusion of this data would have increased the size of the book to an unacceptable extent and since the information is easily obtained elsewhere the omission is not a serious loss. The lack of detailed geological information may be more regretted but, since the manuscript was delivered as long ago as 1980, we should be pleased that the book has appeared at all. Some entries give Miller indices and some give space groups. This is a most welcome addition to the often dated literature of Eastern European mineralogical deposits, and readers should try to get copies without delay.

M. O'D.

Die Edlen Steine Sachsens

["The Gemstones of Saxony"] by Werner Quellmalz, with photos by Jürgen Karpinski. Published (1990) by Deutscher Verlag für Grundstoffindustrie, Leipzig. Hardcover, 20.5 x 22.5 cm, 200 pages, ISBN 3-342-00510-6, price: DM 49.80.

This book not only gives an account of gem and ornamental minerals found in Saxony but concentrates upon the history of mining for gems in the area. In this connection early works on mining are described and illustrated with a high standard of reproduction. The text occupies about one-fifth of the book, and there is also a very useful bibliography in which many early works are included. Captions to the colored illustrations, grouped together, are also very informative. Among the minerals found in Saxony are tourmaline, topaz, amethyst and other varieties of crystalline and cryptocrystalline quartz, beryl (aquamarine) and turquoise. Among the colored pictures are reproductions from eighteenth-century mineral and gem books.

M. O'D.

Südtirol: Bergwerke, Höhlen, Heilquellen

["South Tirol: Mines, Caves and Springs"] by Herbert Kuntscher. Published (1990) by Steiger-Verlag, A-6622 Berwang/Tirol, Austria. Hardcover, 15 x 22 cm, 247 pages, ISBN: 3-85423-073-7, price: 358 Austrian Schillings.

Perhaps not many countries would understand the publication of a guidebook devoted to old mine workings, caves and springs, but this is a particular Austrian and German tradition. The production standards and color reproduction are of customarily high quality. Among the mines featured are the fluorite mine at Rabenstein and the silver-lead mines between Rosskopf and Telfer Weissen. General remarks on the mineralization of each area are prefaced by a brief geological summary. There is also a very useful bibliography.

M. O'D.

Mineralfundstellen Atlas Deutschland West

["Atlas of West German Mineral Localities"] by Stefan Weiss. Published (1990) by Christian Weise Verlag, Oberanger 6, D-8000 München, Germany. Hardcover, 16 x 22 cm, 320 pages, ISBN: 3-921656-16-8, price: DM 48.

Over 1,000 western German mineral localities are described in this book. The only colored feature, however, is a set of maps. Sites are described in order of region, thus keeping all the Harz Mountains localities (for example) grouped together. Map references are given for each site, and the minerals known to have been found there are listed alphabetically. There is a place name index at the back. The only drawback is the rather small print on the maps.

M. O'D.

Contributo alla Mineralogia del Vicentino

["Contributions to the Mineralogy of Vicenza"] by M. Boscardin and S. Sovilla. Published as Quaderno no. 2 of the Museo Civico "G. Zannato" di Montecchio Maggiore (IV). Softcover, 40 pages, no ISBN.

Minerals of the Italian province of Vicenza are described and illustrated in color, with particular reference to celestine. All minerals are described with up-to-date references where available, and with crystal diagrams of some species. Precise localities are referred to map references in most cases.

M. O'D.

Mineralfundstellen Ostharz und Lausitz

["Mineral occurrences in East Harz and Lausitz"] by H. Vollstädt, I Siemroth and S. Weiss. Published (1991) by Christian Weise Verlag, Oberanger 6, D-8000 München 2, Germany. Hardcover, 15 x 21.5 cm, 128 pages, ISBN 3-921656-19-2, price: DM 34.80.

This is a short field guide to the minerals of the German Ostharz and of the Lausitz area, with maps, mineral lists and plentiful illustrations of major species encountered. Several well-known locations are covered, including the fluorite deposits of Rottleberode and an occurrence of green gypsum at Sangerhausen, both in the Ostharz. Saalhausen in Lausitz provides some attractive agate specimens. The book includes a bibliography.

M. O'D.

Mineralfundstellen Sächsisches Erzgebirge

["Mineral Occurrences in the Saxon Erzgebirge"] by H. Vollstädt and S. Weiss. Published (1991) by Christian Weise Verlag, Oberanger 6, D-8000 München 2, German. Hardcover, 15 x 21.5 cm, 128 pages, ISBN 3-921656-21-4, price: DM 34.80.

The German Erzgebirge in Saxony has always been a celebrated area for mineral deposits, most of which are described in this short field guide with maps and a bibliography. Among the better-known deposits are Ehrenfriedersdorf and the Schneeberg district, with its superb proustites.

M. O'D.

Mineralfundorte in Europe

["Mineral Localities in Europe"] by G. Strübel and S. H. Zimmer. Published (1990) by Ferdinand Enke Verlag, Stuttgart. Softcover with pull-out charts, 243 pages, ISBN 3-432-98611-4, price: DM 72.

Mineral locations in Europe are listed alphabetically by country (including the former East Germany). The entries for the two Germanys are by far the most complete, some of the major mines being listed under "Grube"—a useful feature. Each entry gives map reference and height above sea level, together with the names of minerals found. Introductory material for each country section describes the available maps and, where applicable, the main bibliographical sources. The principal national mineral collections are also listed. This is a useful book for those unfamiliar with European locations and, although the brief entries make one wish for more, there is no other quick guide of this kind.

M. O'D.

Mineralfundstellen Thüringen und Vogtland

["Mineral Occurrences in Thuringia and Vogtland"] by H. Vollstädt, R. Schmidt and S. Weiss. Published (1991) by Christian Weise Verlag, Oberanger 6, D-8000 München 2, Germany. Hardcover, 15 x 21.5 cm, 128 pages, ISBN 3-921656-20-6, price: DM 34.80.

This short field guide to the minerals of Thuringia and Vogtland in Germany is well supplied with detailed maps, lists of minerals by location, illustrations, and a useful bibliography. The area is in the eastern part of united Germany and includes such well-known deposits as Schneckenstein, famous for its yellow topaz crystals, and the Ronneburg uranium ore deposits.

M. O'D.

Bergbaugeschichte, Geologie und Mineralien von Ehrenfriedersdorf/Sa, mit 30 Exkursionszielen

["Mining History, Geology and Minerals of Ehrenfriedersdorf, Saxony, with 30 Field Trip Plans"] by S. Flach, F. Hofmann, B. Lahl, M. Mann and G. Urban. Published (1991) by Doris Bode Verlag, Dürnberg 2, D-4358 Haltern 4, Germany. Softcover, 15 x 21 cm, 64 pages: Emser Hefte no. 2, 1991, price: DM 19.80.

The Ehrenfriedersdorf district, Saxony, Germany has been mined for more than 700 years and is the oldest worked German source of tin. The papers in this short book deal first with the mining history, then with the geology and finally with the minerals which are described in chemical order. A final chapter lists 30 excursions in the area, each with a mineralogical or geological basis. Each paper has its own list of references.

Emser Hefte is a quarterly publication specializing in German localities; a 1-year subscription is DM 66 including postage. Many back issues are also available, including Schneeberg (1982 no. 1, DM 18.00), Bad Ems (1983 no. 2, DM 12.50), and Rammelsberg (1987 no. 4, DM 19.80).

M. O'D.

friends of mineralogy

With the Chapters: Pennsylvania

The distribution of Friends of Mineralogy membership at the end of 1991 was: National members, 86; Chapters: Colorado, 85; Great Basin, 19; Indiana, 45; Pacific Northwest, 84; Pennsylvania, 110; and Southern California, 68.

The Pennsylvania Chapter evolved from the FM Region 3 organization, which met in the spring of 1971 as the Conference on Preservation of Pennsylvania Mineral and Fossil Localities. A symposium was sponsored November 2–4, 1973, and had 115 people in attendance. This actually pre-dated the first FM symposium in Tucson by several months. The Pennsylvania Chapter's 14th symposium will be held in West Chester, September 25–27, 1992, on "Eastern Mineralogy, Maine to Florida."

Symposia bring interested people together to gain and share knowledge. Newsletters send information to the individual. The secretary of Friends of Mineralogy issues a newsletter to all members three or four times a year. Each Chapter keeps in touch with its members by means of a newsletter, many of which contain mineralogical and/or historical information which might be of interest to other collectors. The Pennsylvania Chapter has had such a newsletter for almost 20 years. It is currently a quarterly, and the present editor is Juliet C. Reed, Associate Curator, Department of Geology, Bryn Mawr College. A faithful contributor of articles of a technical nature is Allen V. Heyl, an Allentown, Pennsylvania, native who is a retired geologist formerly with the U.S. Geological Survey in Denver. Aheylite was named for him.

In the vol. 18, no. 3, Fall 1990 issue of the newsletter the editor listed proposed referenced changes in the Pennsylvania Mineral Species List, 1976–1989, followed by 4½ pages of selected references.

Newsletter vol. 18, no. 4, Winter 1990, carried a report by Allen V. Heyl on "Arsenian pyrite from the Ecton mine, Audubon, Montgomery County, Pennsylvania." A specimen collected between 1950 and 1955 from the west side of the 80-foot stope in the southwesternmost workings of the Ecton mine was submitted to him by F. Harold Evans about 1980. The pyrite was originally a fist-sized, partly crystallized mass with some highly modified cuboctahedral faces and coarse, massive, pale-yellow grains, each grain between 1 and 2 cm across. Chalcopyrite partially coats the surface of the pyrite and there is a little sphalerite.

The pyrite, analyzed by Ross Youman, U.S. Geological Survey Laboratories, Denver, September 1988, showed Fe 48.1700, As 0.7400, Ti 0.0002, Mn 0.0014, Mn 0.0014, Ag 0.0020, Cu 0.0120, Co 0.0051, Cr 0.0042, Ni 0.0084, Nb 0.0016, Pb 0.0120, Sb 0.0240, V 0.00064, Y 0.00026 and Zn 0.0027 weight %.

The least altered part of the specimen was made into a polished section, which was carefully examined by "one of the very best metallographers in the United States," who wrote a memorandum to Heyl in December 1988:

> I examined the section last spring (1988), could not find a discrete arsenic mineral in it, and set the section aside for some months. On re-examining it this week, I still could not find any discrete mineral. I conclude from the microscopic examination and the X-ray dispersive analysis that As is in the structure of the pyrite; the pyrite is an arsenian pyrite.

Nickelian, cuprian and cobaltian pyrites have been well documented at the Cornwall mine (Gordon, 1922), and this added a fourth main trace element pyrite variety to Pennsylvania's list of minerals.

In the same newsletter, Heyl reported that, checking over a specimen of pink cobaltian calcite from Phoenixville, Pennsylvania (Rand Collection, Bryn Mawr College), he found a good-sized crystal of linnaeite, the cobalt sulfide—a new mineral for Pennsylvania.

Other articles in recent years include "The infrared spectra of minerals," Arnold H. Fainberg; "A new study of the turquoise group" (abstract), Eugene E. Foord and Joseph E. Taggart; a reprint from *Catalogue of Minerals for Sale*, George L. English and Company, June 1890, "Pyrite crystals from French Creek, Pennsylvania"; "Pennsylvania meteorites," Richard Souza; "Aheylite and planerite," Heyl and Foord; minerals from the "Whim shaft, Audubon, Pennsylvania," and descriptions of minerals from "Sugar Grove, West Virginia," both by Larry Eisenberger; to name a few.

The president of the Pennsylvania Chapter is Arnold Mogel, R.D. 1, Box 151 M, Mohrsville, PA 19541.

Best Article Award

The panel of judges selected "The Kalahari manganese field: an update" as the best article published by the *Mineralogical Record* in 1991. The authors are K. L. Von Bezing, Roger D. Dixon, Demetrius Pohl and Greg Cavalla. Mr. Von Bezing was present to receive his certificate of award, presented by Arlene Handley, President, on Saturday evening during the Tucson Show; $200.00 was contributed to the *Mineralogical Record* in the names of the authors.

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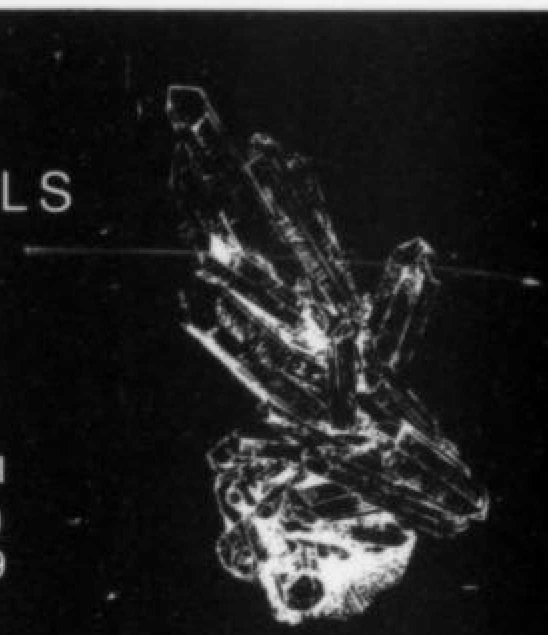

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Microminerals

by **Bill Henderson**

Some Techniques

In the Microminerals column in the January-February 1991 issue of the *Mineralogical Record,* I asked readers to write me with information as to their likes and dislikes, their interests, and how to improve this column. I also asked for news of noteworthy micromineral material for inclusion in columns. I received precisely six letters in response, and can only hope that far more people read the column than took the trouble to support it. At any rate, four of the six writers asked for information on collection management techniques and micromount preparation methods used by other collectors. I'll try to answer some of these questions without rehashing the basics.

First, as to bookkeeping and paperwork, my own inclination is to minimize it. To this end, unlike many micromounters, I keep no card file or database for every micromount I make. It is perfectly possible to put all the pertinent information on the label of the micromount in 99% of the cases. I list the identity of the most important mineral on the specimen first, followed by any other significant minerals. Next, the locality with the mine, town or city, county and state is listed. If a stope or level is known, that is included too. Foreign specimens are treated similarly. If one or more of the important minerals is difficult to spot, I mark it with an arrow (about which more later), and add a short description of it immediately following its name on the label. After the above, I add the collector or source and, where known, the date collected. I still have room for a literature reference if needed, the method of identification and by whom, whether I have photographed the mineral and whether the photo has appeared in print, etc. Also entered are notations as to type locality specimens, unusual crystal form, twinning, epitaxial growth, phantoms, inclusions and other features of interest. For the modest number of specimens on which I or others have done extended identification tests by optical or other methods, I record on the label a number such as U186 (U for unknown), which keys the specimen to a half-inch-thick letter-size file. I have not yet reached the number 300. Brief acid testing or cleavage testing can again be recorded on the label.

In some cases, a micromount may have on it two or more minerals of importance. In others, a specimen should obviously not be broken down to fit the standard 1 x 1-inch micromount box. These I mount in 2 x 2-inch boxes or in thumbnail boxes too large to fit in the 1-inch-deep rows in my cabinet. What to do so as to find these oversize specimens? Why, instead of maintaining a file, I simply add an empty standard box with a label, such as these:

Barite
Cap Garonne Mine
France
see Pharmacosiderite

Leucosphenite
Mt St-Hilaire
Quebec
see Thumbnail box

Of course, the barite/pharmacosiderite specimen is mounted in a box labeled with pharmacosiderite as the primary mineral and barite second.

Many readers will think it impossible to put all this information on a micromount label, but it can be done. To begin with, it is never necessary to make all the above entries for a single specimen. Second, I don't write the labels by hand. I type them, sixty at a time, in rows on large sheets of paper. Then I photocopy them twice, each time with a 30–35% reduction in size, cut the labels out, and attach them to the micromount box tops using a liberal application of rubber cement. I say box tops because I hate to turn a box over to read what's inside it. Many collectors put the bulk of the label on the bottom of the box, and only a single mineral name on the top, for fear of mixing tops and boxes. All I can say to this is that it is extra labor, the labels on the bottom get scuffed and marred; and that, in 36 years of looking at some 10,000 micromounts in my collection, I have never even wondered whether I have put the wrong top on a micromount box. Of course, the above technique requires saving up some 50–70 specimens unlabeled, or with temporary labels. I find this no hardship, and store them in a pencil box marked, "To Label."

Two reasonably wordy labels from my collection are shown below. The second was attached to the top and one side of the box.

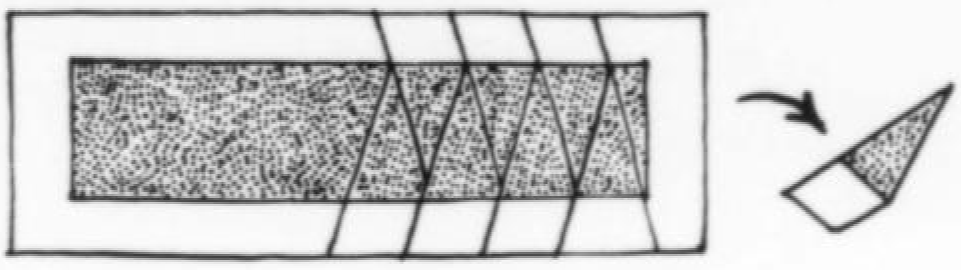
Calciohilairite
chalky white
Washington Pass
Okanogan Co., Wash.
Coll by Bob Boggs
From first discovery
Am Min, 73,1191(88)

Armangite
red-blk cleaves
Hematolite
red-brown
Dump at Finngruvan-Gröngruvan
Nordmark, Sweden
Coll. Per Nysten
Stockholm Förhandlingar 109,110(87)

Anent boxes and boxing ("anent" was one of Neal Yedlin's favorite words), I buy plastic boxes in both black and white by the thousand. Then, I swap tops and bottoms. These days, I mount about half my micro specimens on the shallow box *tops* instead of the deep-sided bottoms so that one or more sides of the specimen are visible, in addition to the top. This provides a black bottom no matter which way I want to mount the specimen. Since black polystyrene is distractingly reflective, I spray-paint the black halves of each box type with flat black stencil paint. This I do to some hundred tops or bottoms at a time.

Alas, a trick Neal Yedlin used on occasion is no longer available to users of plastic boxes. Occasionally, he wanted to view the top and *bottom* of prepared micromounts. Easily done with paper boxes. He simply cut off the box bottom and gave it two tops! The specimen, of course, was glued to the *side* of the box.

Earlier in this column, I mentioned tiny arrows used to pinpoint significant crystals or other features on micromounts. I use them for another reason, as well. That is to mark valuable or important areas on specimens I am almost ready to cut up on my diamond saw. For example, it is possible to inspect a large piece of matrix under the microscope, and mark five or so valuable, tiny cavities for preservation, while ignoring a dozen or more worthless vugs. Then, when the specimen is flooded with water or oil during cutting, it is still possible to see the arrows marking the goodies. For a long time, I have made my own arrows from Mystik® colored cloth tape. It comes in a variety of colors, and has a sticky backing. I made the arrows by first cutting a half-inch-wide strip of tape and applying it to a wider strip of the release paper backing from a page of self-sticking labels. Then, I make a series of cuts with scissors (see Figure), each one of which gives me a single arrow. Each is left with a little tab of release paper. Thus, the labels do not stick to each other, but can be easily

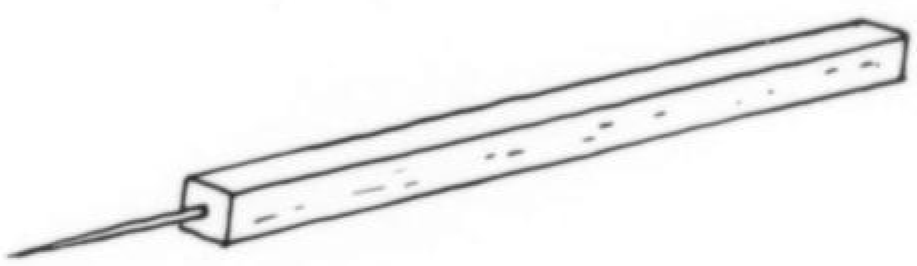


separated for use by means of the tab. I keep four colors of such arrows on hand, and make up new supplies 50–100 at a time.

Very good commercial arrows are now available at a nominal price. These come in a variety of colors, four different sizes, in rolls or on sheets on release paper. The smallest, which I use, are only 3/16 inch long and 1/8 inch wide. They are available from some stationers and from the manufacturer: Shercon, Inc., 1823 San Fernando Road, Los Angeles, CA 90065.

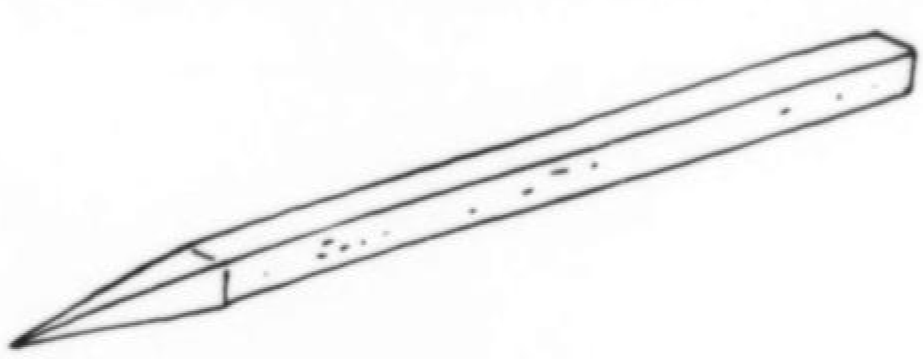
As for trimming micromounts to size, I do most of that these days using a diamond saw with water as coolant. Immediately after cutting, I wash the specimens with detergent in an ultrasonic cleaner, and then rinse them with water, followed by distilled water (from my dehumidifier). Less often, I use a small rock splitter for trimming. Once in a while, I have a trimmed specimen which is too rounded for the splitter to grip, and yet misses fitting its box by a millimeter or less. These are usually amenable to further size reduction using nothing but sandpaper or emery paper. The technique is a bit slow, but surprisingly gentle and effective.

While an ultrasonic cleaner used as above will leave most specimens as clean as they will ever be, it is sometimes necessary to remove broken or poorly formed crystals or the odd bit of matrix in order to expose the best crystals properly. Dental picks are useful for this purpose. However, for really fine work I employ common sewing needles of various sizes. I use pliers to push the eye end of the needles into 1/4-inch-square balsa wood sticks about three inches long, thus



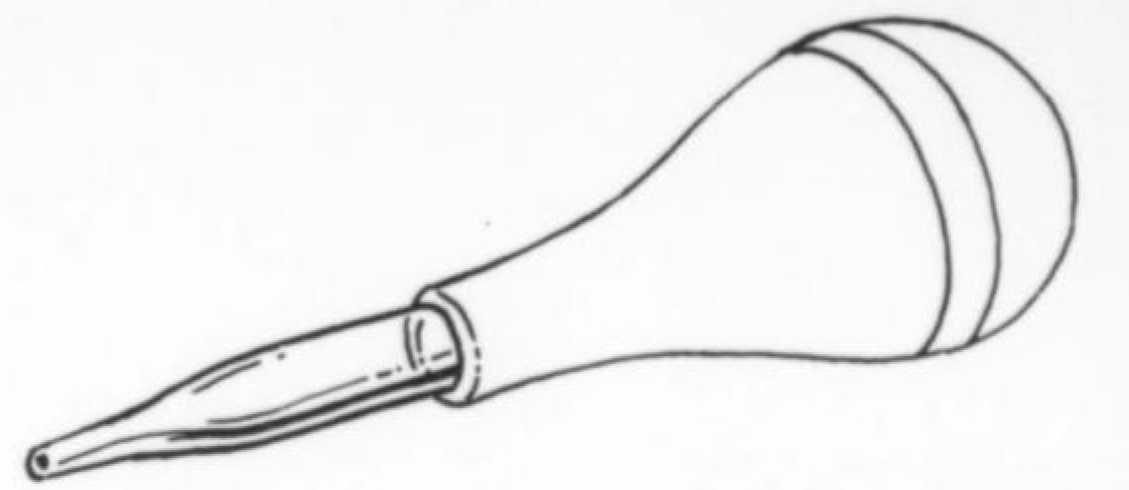
providing handles for the business end of the needles. Inserting the needles in pin vises provides a better but somewhat more expensive tool.

Fairly often, a thin skin of iron oxides, silicate gel or other material remains on a specimen even after cleaning in the ultrasonic. Small brushes or needles don't remove such material readily. Surprisingly, crystals on many such specimens can be cleaned using a single-edge razor blade. Another very effective cleaning tool is a 1/16-inch balsa wood stick, the end of which has been formed using two diagonal cuts. In use, the fibers at the cut end separate and spread to give, in



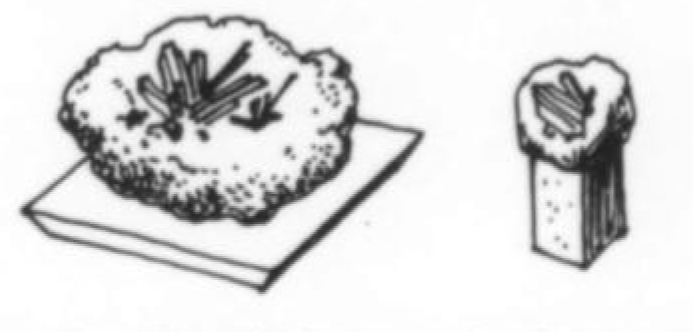
effect, a quite stiff but very small brush. The end is easily renewed by recutting.

For blowing dust and loose scrapings off of microcrystals, I use a rubber bulb into which I have inserted the glass tip of an old medicine dropper. The air blast is sufficient to blow away any dust and chips when the instrument is held close to the specimen, and will even move the specimen too! Scientific and photographic supply houses sell

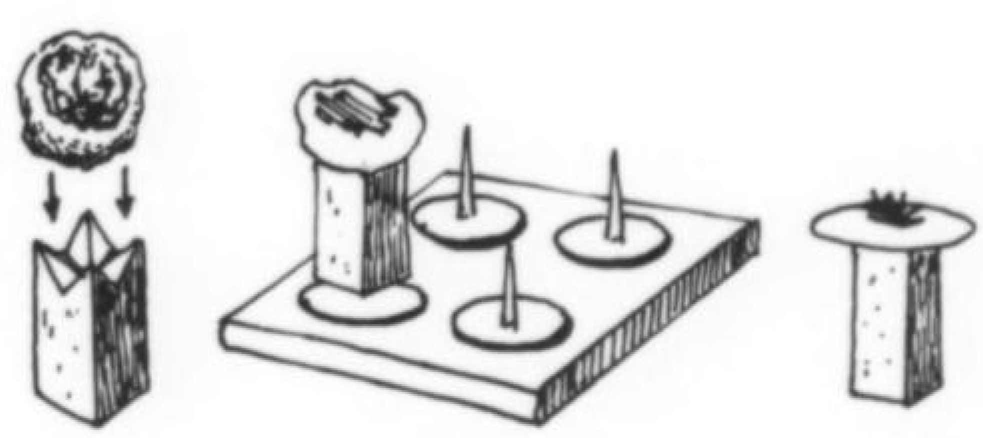


Freons or compressed air in cans, together with a valving arrangement. These work very well, but the better ones are expensive.

There are as many ways of mounting micromounts in their boxes as there are collectors, it seems. More and more, people are mounting them on sticky plastic such as Mortite or Blue-Tack. That's okay, but I prefer to mount specimens in conventional boxes (that is, ones in the deep half of the box rather than on the cover) on balsa wood. I paint a variety of sizes and shapes of balsa wood strips with flat black paint. Later, when the strips have been cut to length, I blacken any visible cut surfaces with a black marking pen. Larger specimens may require only a thin piece of balsa to bring the top of the specimen just below the box top. Smaller ones, on the order of 1/3 inch in size, I mount on 1/4-inch balsa set vertically. Even smaller ones require



thinner balsa strips. Rounded ones are hard to mount since they tend to sag to one side or another while the glue is drying. For these, four diagonal cuts on the end of the balsa support provide a stable footing for the mount. For very tiny crystals, many collectors use thin fibers



of Nylon or other plastic removed from an old hairbrush or whatever. Lately, I have seen superb micromounts of tiny crystals perched on blackened cactus needles and porcupine quills. I asked about the latter, and was informed that they are obtained from road kills. Lucky are those who live where porcupines abound! While the glue for such balsa mounts is drying, I support the mounts on thumbtacks glued to a small box.

Since I photograph quite a few of my mounted specimens for talks and columns, I hesitate these days to mount such tiny crystals on pedestals which will show in the final photo. Rather, I mount potential photo subjects on small circles of paper. These I cut from the back side of black and white print paper, or from very smooth but matte-finish art paper, using a paper punch. The circle is big enough not to show in the final photograph, and can be mounted in turn on a balsa peg to bring it near the box top.

I hope some of these techniques will be useful to readers. Please send along any helpful hints of your own, and I will see that they get published.

Wm. A. Henderson, Jr.
47 Robin Ridge Drive
Madison, CT 06443

What's New in Minerals?

ANNUAL WORLD SUMMARY OF MINERAL DISCOVERIES Covering April 1991 through April 1992

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Canadian Museum of Nature
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Vandall T. King
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3012 Australia

As always, this compendium would not be possible without the dedicated support of numerous individuals who provided information, specimens and photographs. In addition to those cited herein, we would like to extend special thanks to Dudley Blauwet, Wilfred Bokman, Steven Chamberlain, Walter Gibbins, Robert Gait, Robert Gault, Torgeir Garmo, Gilles Haineault, Kenneth Hollmann, Neil Hubbard, David Joyce, Markku Lehtinen, John Medici, Frank Melanson, William Pinch, Jeffrey Scoville, Rod and Helen Tyson, Quintin Wight and Wendell Wilson.

Part I: United States

ARIZONA

There has been a new find of sceptered quartz crystals in Santa Cruz County, approximately 110 km south of Tucson (*Mineral News*, vol. 7, no. 12, p. 1). The crystals occur in mud-filled pockets along fractures in altered rhyolite, and have been collected in quantity by Bill Hefferon (8145 N. Wanda Rd., Tucson, AZ 85704).

Jeffrey Scovill (734 E. Coronado Rd., Phoenix, AZ 85006) reports that metatorbernite has been found as sharp, green, tabular to bipyramidal crystals at an unidentified, abandoned mine approximately 5 km south of Crown King, Yavapai County. Most of the crystals are less than 2 mm across, though a few reach 1 cm. These occur in fissures in monzonite, and are sometimes associated with a black, reniform mineral intermediate between cryptomelane and hollandite in composition. Some of the bipyramidal crystals appear rather transparent, which makes them very desirable as micromounts. The deposit is not extensive, but should continue to produce good microspecimens for some time to come. Positive identification of the metatorbernite was made by Dr. Peter Modreski (USGS) and Josef Vajdek (Paqua Minerals).

Jimmy Vacek (1903 N. 74th St., Scottsdale, AZ 85257) recently acquired three fabulous crystallized azurite stalactites from Morenci. These consist of brilliant drusy 3-mm midnight-blue crystals forming slender, delicate stalactites to 20 cm with interesting pinch and swell diameters. Additionally he has found some lapidary-grade milky orange cuprite with medium blue chrysocolla from Bisbee, which has been cut and carved into some extraordinary shapes. Some slabs up to 10 x 10 cm with many imaginative patterns have been produced.

During the Tucson show, the Magma Mining Company provided a field trip to the Mammoth open pit near Tiger, which was hosted by mine geologist Gary Alexander. Good microcrystals of gold in quartz, acicular clear willemite, orange vanadinite, and larger specimens of wulfenite, amethyst and other minerals were collected. The trip was much appreciated by all who attended, and the Magma Mining Company deserves a vote of thanks from the mineralogical fraternity for making the trip possible.

Lastly, Peter Megaw (3771 E. Guthrie Mt. Pl., Tucson, AZ 85718) had some fine rare minerals at the Tucson show from the Tombstone district. These included khinite, parakhinite, duhamelite and the exceedingly rare species, yafsoanite.

CALIFORNIA

This seems to be the year for garnet. Good specimens of orange-red grossular have been found at Coyote Front Range, near Bishop, Inyo County. The crystals average 1 to 2 cm and are predominantly dodecahedral or trapezohedral in habit. Crystal groups to 10 cm are available from John Seibel (P.O. Box 95, Tehachapi, CA 93561). David Leicht of Laguna Beach had some interesting andradite from the "Perovskite Hill" locality in San Benito County. The 2–3 mm dodecahedral crystals form phantoms with dark brown cores and golden brown rims. Earl Kelly (4921 W. Mountain View Drive, San Diego, CA 92116), on the other hand, has found pockets containing gem-grade orange spessartine as well as centimeter-sized dodecahedral crystals with pagoda-like striations at the Little Three mine, near Ramona. A few crystals with small hexoctahedral faces were also found.

For the rare species collectors, Eugene and Sharon Cisneros (*Mineralogical Research Company*, 15840 E. Alta Vista Way, San Jose, CA 95127) have available a small supply of the new rare mercury mineral, wattersite, from Clear Creek, San Benito County. (See the description of this new species in vol. 22, no. 4, of the *Mineralogical Record*.)

COLORADO

Once in a while we are fortunate to be able to turn back the pages of time and acquire specimens from localities long gone by. Such was the case at Don Knowles' room (*Golden Minerals*, 13030 West 6th Place, Golden, CO 80401) at last year's Denver show. Just before the show Don was fortunate to obtain two flats of old-time jackstraw cerussite crystals from Carbonate Hill, Leadville. The thickly intergrown prismatic crystals resemble those from the Flux mine in Patagonia, Arizona, but have been generally unavailable for a number of years.

In addition to the "old find," Don also had a new one: a lot of very sharp calcite pseudomorphs after twinned aragonite crystals from Owl Canyon, Larimer County. These consist of groups of intergrown, stubby, pseudohexagonal prisms that apparently occur in a brick-red clay. While not particularly beautiful, they are, nonetheless, very well-formed pseudomorphs, and interesting mineral specimens.

Also at the Denver show, Bryan Lees (*Collectors Edge*, 402 Gladiola St., Golden, CO 80401) offered a lot of newly mined rhodochrosite specimens from the famous Sweet Home mine at Alma. Attractive specimens of rhodochrosite associated with fluorite, quartz, pyrite, etc. were available in all sizes. At the Tucson show, Bryan had additional new things from some interesting ground he has been working near Silverton. The early indications look promising and consist of transparent to frosted acicular quartz crystals to 6 cm and clear blue fluorite crystals (to 1 cm) with internal color zones. Sulfosalts and sulfides have also been found as skeletal tetrahedrite-tennantite crystals to several cm, rounded bornite crystals to several mm, and a number of yet-to-be-identified metallic minerals.

Steve Green (*Rough and Ready Gems*, P.O. Box 10404, Denver, CO 80210) displayed an interesting case of schorl crystals at last year's Denver show. The crystals, which form somewhat equant doubly terminated individuals up to about 10 cm, had a rather short journey to the show, having been found only 10 km west of Golden, in Golden Gate Canyon. Sometimes it pays to look in your own back yard!

CONNECTICUT

Tony Albini (86 Hillcrest Ave., Waterbury, CT 06705) reports that the White Rocks quarry at Middletown has now ceased operations due to the general economic slump. More importantly, though, the Strickland quarry at Portland has been landscaped for a golf course. The owner, Joe Kelly, did, however, permit collecting in the bulldozer slash, and should be commended for his generous actions permitting at least a few final specimens to be preserved. Collectors attended several trips, and many minerals were found, including actinolite, albite, almandine, bavenite, beryl, biotite, calcite, cassiterite, columbite, cookeite, diopside, elbaite, ferroaxinite, fluorapatite, fluorite, ilmenite, kyanite, lepidolite, lithiophilite, microcline, microlite, montebrasite, montmorillonite, muscovite, petalite, pyrite, pyrrhotite, quartz, schorl, sillimanite, spessartine, sphalerite, spodumene, wodginite, zinnwaldite, zircon and zoisite.

Russell Behnke (161 Sherman Ave., Meriden, CT 06450) had some newly collected spessartine-almandine crystals at this year's Rochester Mineralogical Symposium. These consist of sharp, dark red-brown, trapezohedral crystals up to nearly 7 cm in a pegmatite matrix. Russ explained they were collected last summer from a pegmatite exposed while blasting for a parking lot near Middletown. A number of specimens were recovered, including about a dozen exceptional ones. Overall, they resemble the classic Russell, Massachusetts, specimens, and are probably among the best garnets collected in Connecticut in several decades.

IDAHO

Lanny Ream (*Mineral News*, vol. 7, no. 10, pp. 6–7) reports that good micromounts of chabazite, levyne, phillipsite, thomsonite and other minerals may be collected from the vicinity of the Lucky Peak Dam site, east of Boise.

KENTUCKY

In a recent update on the Muldraugh geode locality (*Mineral News*, vol. 7, no. 5, p. 1), Alan Goldstein reports that excellent specimens of calcite, celestine, strontianite and sulfur continue to be found. Some are described as the best ever found in the state of Kentucky. Unfortunately, in a more recent update (*Mineral News*, vol. 8, no. 1, p. 7) it is reported that the locality has subsequently been closed due to misuse by collectors. Such incidents are all too frequent in our hobby, and are obviously self-defeating. In aviation there is an old adage to "learn from the mistakes of others, because you won't live long enough to make them all yourself." Maybe we could all benefit from mandatory CRM-PDM (Cockpit Resource Management and Pilot Decision Making) training, too. We could call it "*Collecting* Resource Management and *Proper* Decision Making." Unlike aviation, we could easily outlive our hobby if we don't wake up!

MAINE

The Plumbago Mining Company of Rumford and its consortium (*Third Mount Mica Company*) have continued to develop the Mount Mica quarry at Paris, with modest success. The company has already moved three times as much earth as all previous operators combined, and is following a plan which will ultimately expose the entire deposit. A number of tourmaline pockets have been encountered which have produced both specimens and facet rough. Most of the better crystals have been relatively small, averaging around 3 cm, and have been mostly green or blue-green in color. A few watermelon crystals have been recovered, as have blue-green crystals with transparent indicolite caps. A few of the famous tourmaline "nodules" were also encountered, and are indeed remarkable. Their color, clarity and natural brilliance is fabulous. The working face has progressed from the so-called Dagenais pocket area on the west, up to the edge of the 1904 Merrill workings, which will be of considerable interest in 1992. The locality will remain closed to collectors, but specimens will continue to be available through Plumbago Mining Company at the major shows. Unrelated to the current activity, two new phosphate species have been discovered from Mount Mica; one is a pale blue pseudocubic mineral (~1 mm) and the other is a milky white, steeply bipyramidal mineral (~2 mm). Both occur in a siderite matrix.

Ray Sprague and Tony Wielkiewicz (*Mongort Minerals*, 93 Main St. #9, Andover, MA 01810) have collected a large quantity of some very interesting muscovite crystals from the Emmons quarry, Uncle Tom Mountain, near Greenwood. These occurred in a large 1 x 3-meter pocket and were associated with quartz, albite, and minor amounts of beryl, bertrandite and other minerals. The crystals appear to show different episodes of growth and form sharp pseudohexagonal individuals up to 2 cm in groups many times that size. The color of this muscovite is grayish green with a bright silver sheen. Ray and Tony also have a good supply of pseudocubic quartz crystals from the Tamminen quarry nearby, in addition to hydroxylherderite and perhamite from the Ski Pike quarry, near West Paris. The latter form coarsely crystallized cream-colored balls up to 6 or 7 mm, and are excellent for the species.

Collecting in Maine will be poor in 1992 for the visitor unfamiliar with the lesser-known localities, since most of the famous ones will be mined commercially. Among these are the Mount Mica quarry in Paris, the Bennett quarry in Buckfield, the Emmons, Harvard, Tamminen (intermittently) and Gross quarries in Greenwood, all quarries at Newry, the Black Mountain quarry at Rumford, the Fisher quarry in Topsham, the Lobikis quarry near Peru, the Tryon Mountain quarries near Pownal, and some of the Mount Apatite quarries near Auburn.

MONTANA

The Yellowstone mine near Cameron, has recently produced some good rhombohedral crystals of gray dolomite up to 5 cm on smoky quartz, in addition to some black dendrites in talc. The latter is of carving quality, and makes quite attractive specimens when slabbed and polished. X-ray powder diffraction patterns of the dendritic mineral showed only talc lines, but qualitative SEM EDS analysis showed major Mn with minor Ba, Fe and K, suggesting they may be a Mn-oxide mineral, such as romanechite or hollandite. Specimens are available from Duane Johnson (*D.J. Minerals*, P.O. Box 761, Butte, MT 59703-0761).

Lanny Ream of Coeur d'Alene, Idaho, has found some interesting specimens of the unusual mica mineral clintonite at the Dry Gulch skarn locality near Helena. The clintonite forms milky white cleavages to 1 cm+ in the typical gray-tan skarn matrix, associated with the better-known blue spinel crystals for which the locality is famous. Also found were some acicular blue sprays of tourmaline crystals to several mm in vugs.

NEVADA

David Shannon (6649 E. Rustic Dr., Mesa, AZ 85205) has obtained a lot of the rare silver-gold sulfide mineral uytenbogaardtite from the New Bullfrog mine in Nye County. The uytenbogaardtite occurs as rich grains in a siliceous matrix associated with electrum.

There is now a new U.S. locality for crystallized turquoise! The crystals, like those from the famous Lynch Station, Virginia, locality, are generally microscopic in size, but equally as beautiful. They tend to form spheroidal aggregates of dark blue to blue-green crystals up to 2 or 3 mm across and are associated with microcrystals of wavellite, wardite, crandallite and other species in a brecciated, silicified sediment. The locality is given as near Valmey, Humboldt County. Specimens are available from Jim McGlasson (*The Collector's Stope*, 7387 South Flower St., Littleton, CO 80123). Jim has also recently come up with another significant find in Nevada: scholzite crystals from near Battle Mountain, in Lander County. These, while perhaps not quite as large as those from Australia, are certainly every bit as good, and form radiating sprays of transparent to white acicular crystals up to approximately 1 cm, richly covering a gossan-like matrix. The occurrence is in breccia veins in Ordovician sediments.

Harvey Gordon (1002 S. Wells Ave., Reno, NV 89502) also currently has a good selection of Nevada microminerals, including good pharmacosiderite, arthurite, clinoclase and cornwallite from Majuba Hill, Pershing County, in addition to some larger specimens of velvety white acicular hemimorphite lining cavities in limonite from the Richmond mine, near Eureka. For those who prefer larger specimens, Harvey also had a number of good amazonite and topaz specimens available at the Tucson show from his Zapot claim in Mineral County.

Dennis P. Flynn (P.O. Box 722, Lovelock, NV 89419) reports a rumor that a 150-kg (!) cinnabar "crystal" was recently carved into a Buddha (7 cm, ~340 g) and the remainder sent for refining. The crystal was rumored to have been found in the late 1960's or early 1970's, but the mine of origin and owner were not revealed. The crystal, however, no matter how crude, would certainly have to qualify as the world's largest, if its prior existence could be substantiated.

NEW HAMPSHIRE

Peter Samuelson of North Conway collected a quantity of colorless to light brown topaz crystals from South Percy Peak, in Stratford last summer. These occur in miarolitic cavities in the Conway Granite, associated with smoky quartz and microcline crystals. Details are given by Ken Hollmann in *Mineral News* (vol. 7, no. 10, pp. 1–2). Ken also reports that Peter Samuelson made a second interesting find last summer on Bald Mountain Ridge, near Ossippe. This consisted of a 3-meter deep pocket in the Conway Granite which yielded about 15 kg of sandy blue beryl crystals up to 9 cm. These appear to be partially replaced by albite, which is responsible for their sandy texture. Over 200 specimens of curved, dark brown siderite crystals in groups up to 7 cm were also recovered.

NEW JERSEY

Specimen mining at the famous Sterling Hill mine at Ogdensburg has been sporadic this past year due to a cave-in and rising water. Nevertheless some excellent specimens of franklinite, willemite, mcgovernite, stilbite and other minerals were recovered.

NEW MEXICO

There have been a number of new discoveries made in the state of New Mexico over the past year. These are discussed in detail by Ray De Mark (*Mineral News*, vol. 8, no. 1, p. 5) and include: gahnite from near the Harding mine, pucherite and mottramite from the Harding mine, scheelite from the Wichita mine, otavite from the Blanchard mine, and libethenite, crandallite and turquoise crystals from the Mex-Tex mine.

NEW YORK

The Balmat district in St. Lawrence County has long been a producer of interesting mineral specimens. Last fall there was a rather intriguing find of magnetite crystals at the Zinc Corporation of America's Number 4 mine, north of Balmat. The crystals are most unusual, as they form perfect, lustrous cubes that resemble bixbyite more than magnetite, and occur in a matrix of anhydrite, calcite and halite! Some crystals are modified by the tetrahexahedron {015}. Most crystals average 4 to 8 mm, but a few approaching 2 cm are known. Further to the north, at the new Z. C. A.'s Pierrepont mine, good pyrite and sphalerite specimens have been found. Some of the pyrite crystals occur in spherical aggregates resembling cannonballs, which make rather unusual and attractive specimens. Specimens of these minerals are available from Ken Hollmann (P.O. Box 134, Center Rutland, VT 05736), Charles Bowman (P.O. Box 374, Gouverneur, NY 13642) and Vernon Phillips (R.D. 5, Box 185, Gouverneur, NY 13642).

A number of very fine dravite-uvite crystals were collected last summer at the green tremolite occurrence south of Selleck Road, near West Pierrepont, St. Lawrence County. The best of these consist of highly modified, lustrous, dark brown, doubly terminated crystals rivaling the best from the more famous uvite locality at Pierrepont, approximately 10 km to the north. Terry Holmes of Edwards, N.Y. made the original find, which was followed shortly thereafter by several others.

NORTH CAROLINA

Beau Gordon (P.O. Box 6214, Rome, GA 30162-6214) has re-opened the muscovite locality at Latimore, Cleaveland County, and has had exceptional success. The muscovite is extremely pleochroic in colorless to emerald-green, and forms clusters of crystals to 10 x 10 cm, occasionally with tan to orange rutile crystals associated.

OHIO

John Medici (7272 Macbeth Dr., Dublin, OH 43017) reports collecting some very fine specimens of celestine last summer at Clay Center. The crystals form transparent blue individuals up to about 7 cm, associated with calcite. Some show chisel-shaped phantoms. The quarry is presently closed due to changing ownership, so future production is uncertain.

PENNSYLVANIA

Bryon Brookmyer (502 North 40th St., Harrisburg, PA 17111) collected some very good crystallized prehnite last summer at the Silver Hill quarry, near Bowmansville, Lancaster County. The pure white crystals occur in pockets several centimeters across, and form free-standing aggregates of subparallel rectangular crystals 5 to 10 mm high that somewhat resemble thomsonite. Bryon also made a second important find only a few days before the Rochester Symposium. This consisted of a lot of green sphalerite crystals from Thomasville, York County. Most specimens consist of thumbnail-sized single and spinel-law twinned crystals typically with a small amount of matrix. A few parallel growths up to 4 cm were recovered, though most are in the 1 to 1.5-cm range. All are extremely sharp and lightly frosted. Overall, these are probably among the better sphalerites known from the state of Pennsylvania. Specimens are available from Chris and Neal Pfaff (*M. Phantom Minerals*, P.O. Box 12011, Columbus, OH 43212).

SOUTH DAKOTA

Faheyite has been identified on a specimen from the Roosevelt mine near Custer. The specimen was collected by Stephen and Janet Cares in 1981, and recently submitted to the Canadian Museum of Nature for identification. The faheyite occurs as radiating aggregates of white needles approximately 1 mm in length, associated with strengite. As far as we can determine, this is only the third reported occurrence for the species worldwide.

UTAH

A rare ammonium-bearing mica, tobelite, has recently been iden-

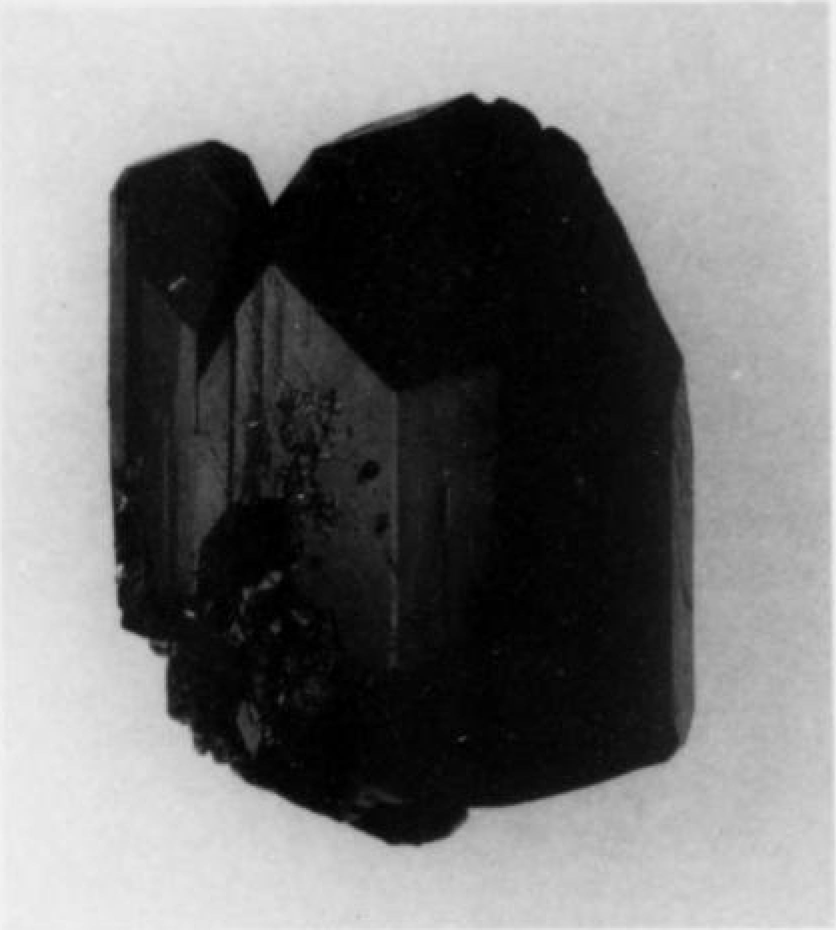


Figure 1. Uvite, 6 cm, from an exposure south of Selleck Road, West Pierrepont, New York. Steven Chamberlain collection and photo.

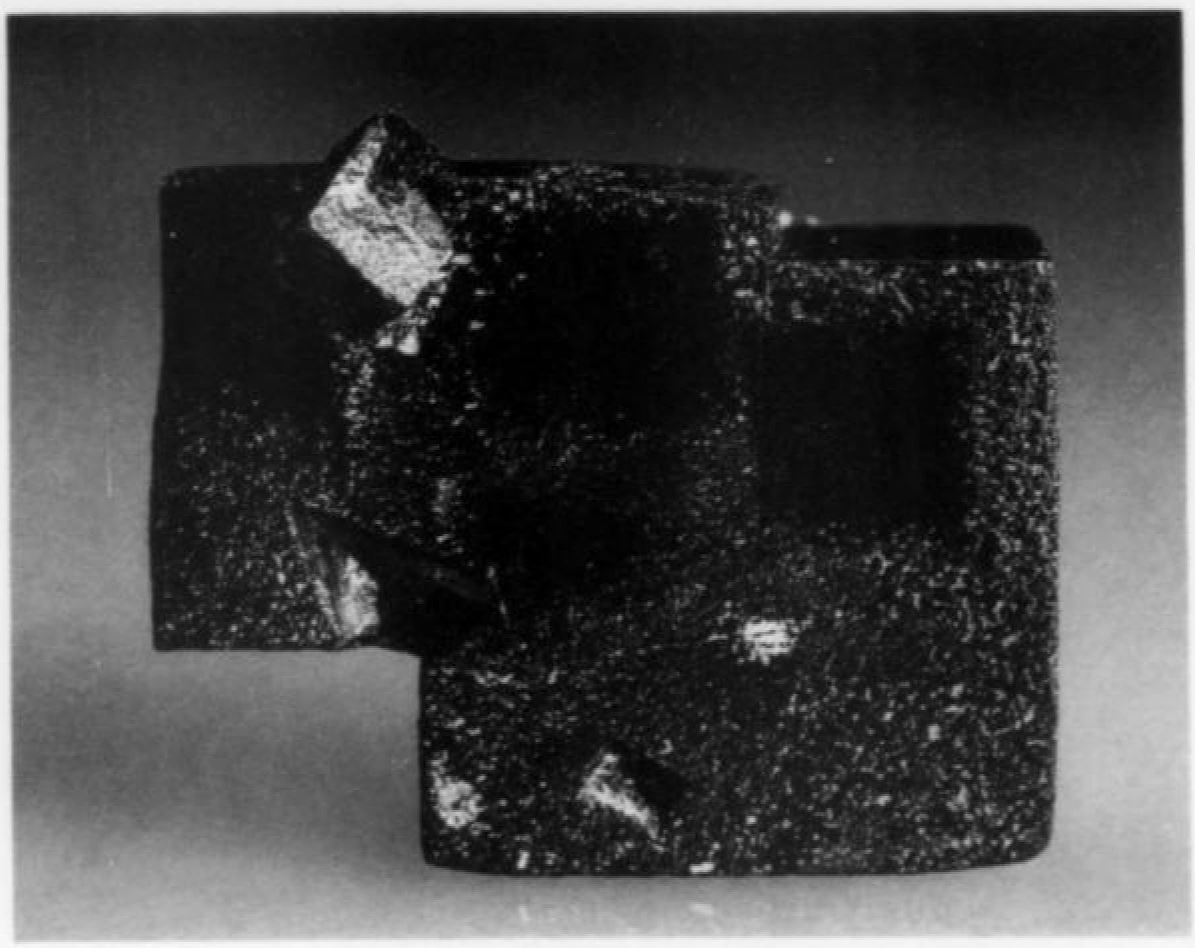


Figure 2. Magnetite, 2.4 cm, in cubic habit from the 2300-foot level of the Zinc Corporation of America's #4 mine at Balmat, New York. Steven Chamberlain collection and photo.

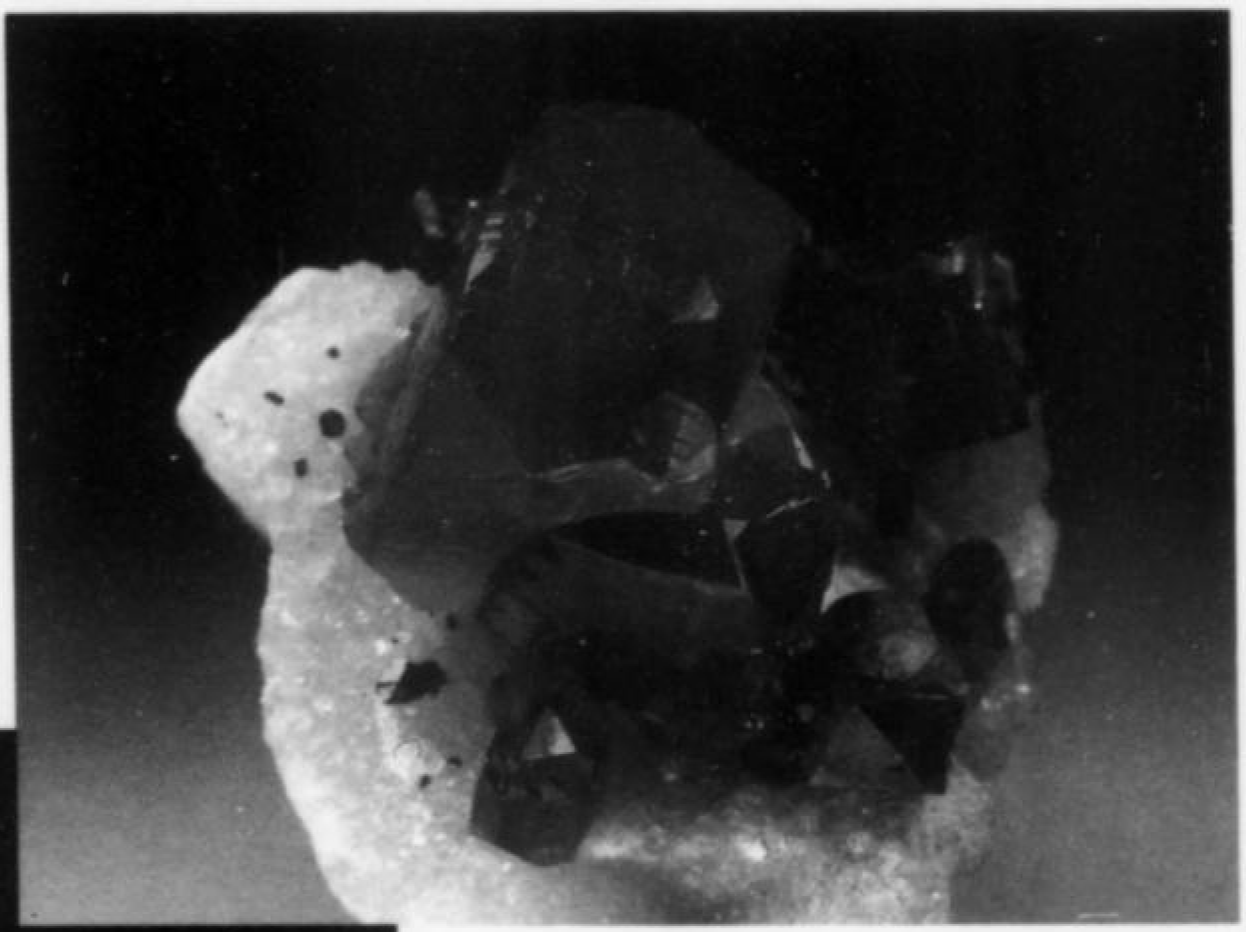


Figure 3. Sphalerite, 1.5 cm, on white dolomite matrix from the Thomasville quarry, York County, Pennsylvania. Bryon Brookmyer collection.

Figure 4. Millerite on matrix, 10 cm, from Thompson, Manitoba. Canadian Museum of Nature specimen; photo by George Robinson.

Figure 5. Shortite, 2 cm, from Mont Saint-Hilaire, Quebec. Gilles Haineault collection; photo by W. Bokman.

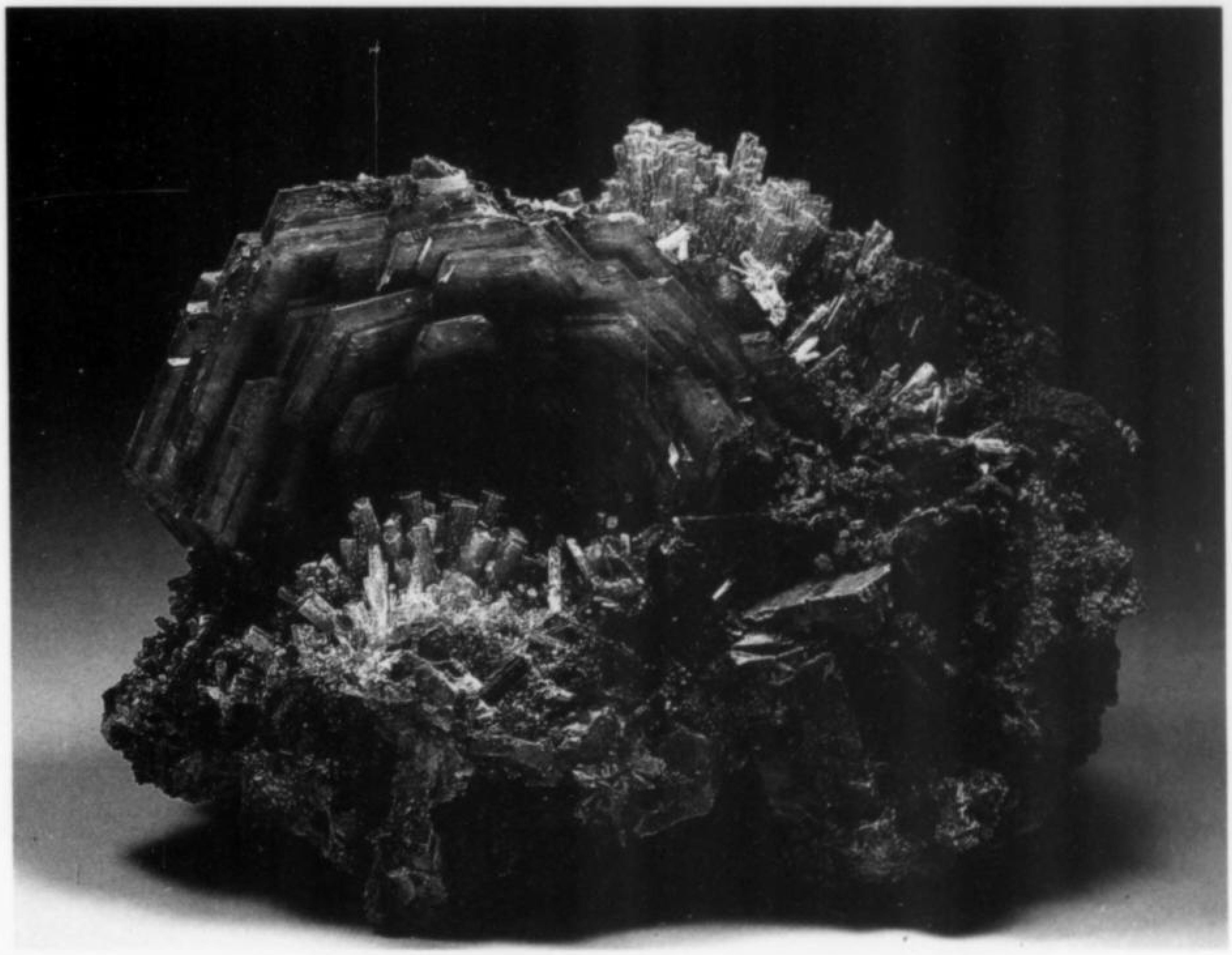


Figure 6. **Catapleiite, 20 cm, a recently collected specimen from Mont Saint-Hilaire, Quebec. Gilles Haineault collection; photo by George Robinson.**

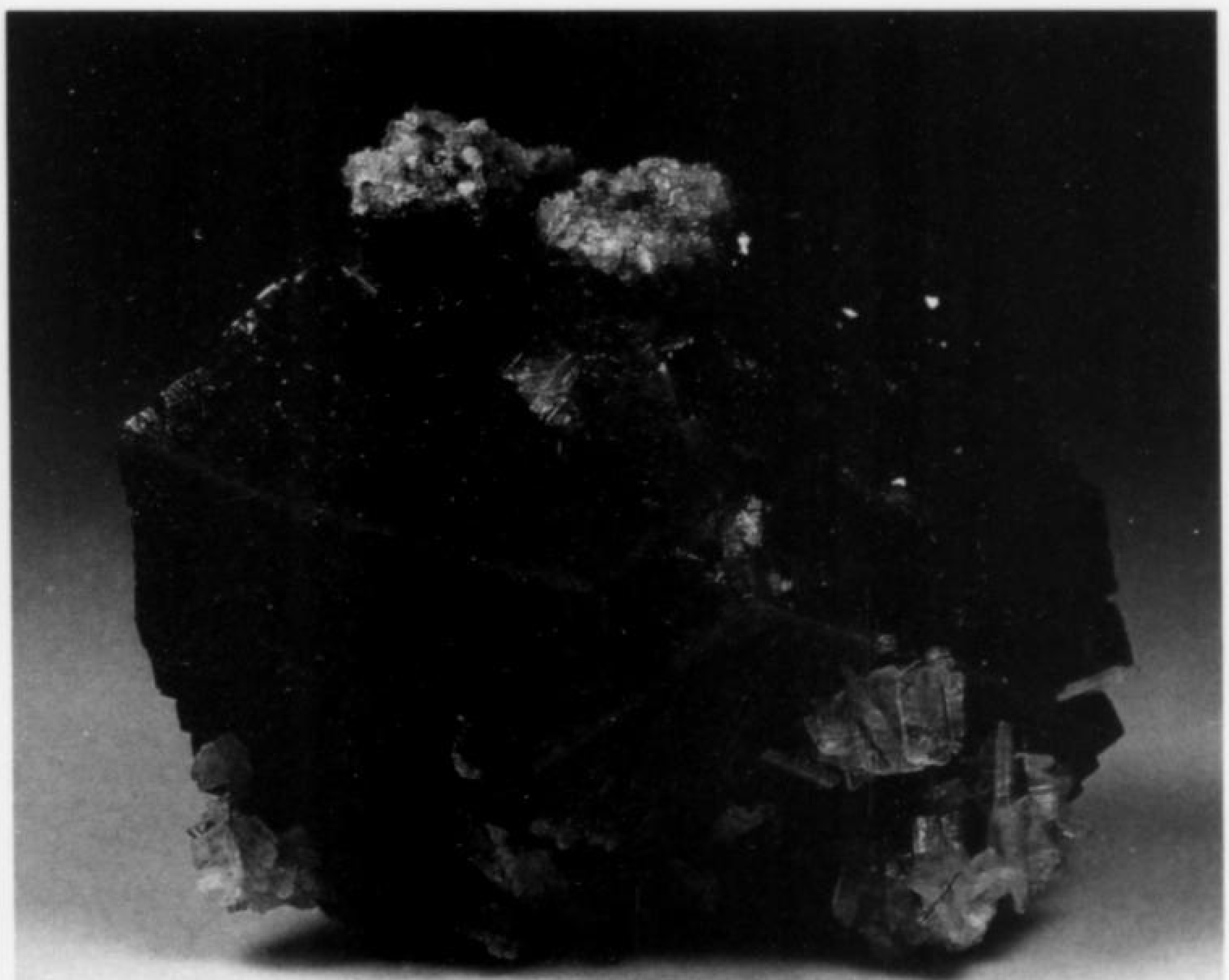


Figure 7. **Rhodochrosite, 6.5 cm, from Mont Saint-Hilaire, Quebec. Gilles Haineault collection; photo by George Robinson.**

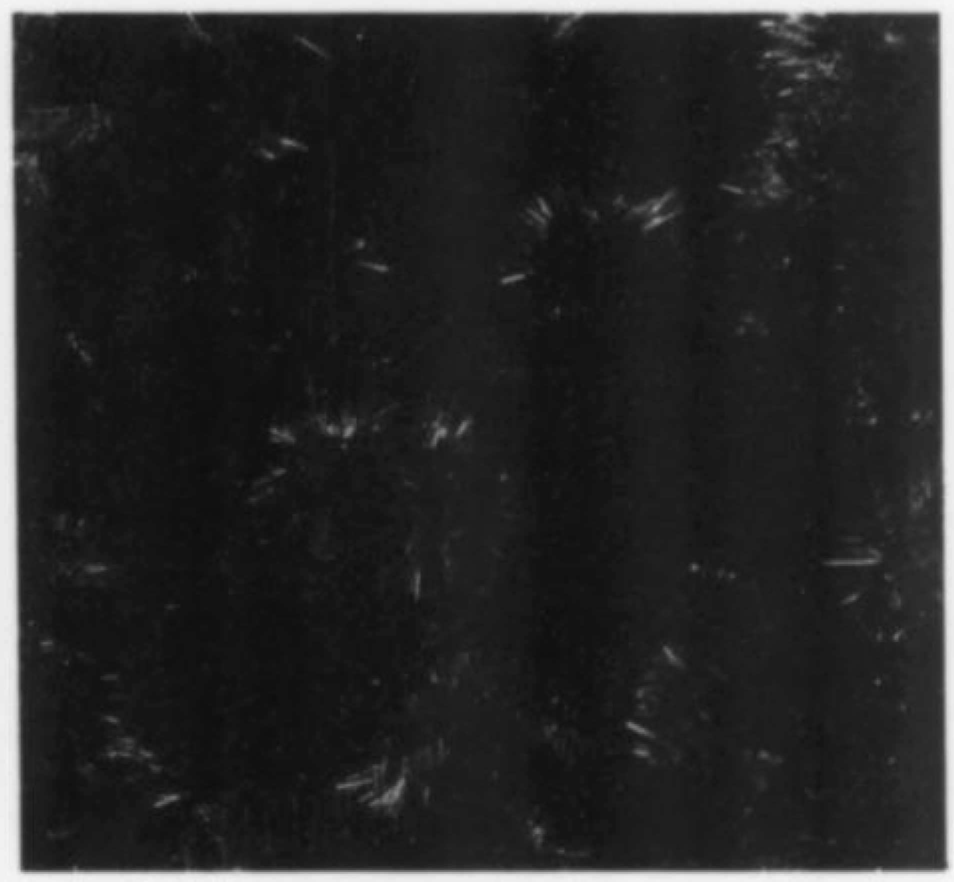


Figure 8. **Erythrite from Mt. Cobalt, Queensland, Australia; 2 x 2 cm; Canadian Museum of Nature specimen; photo by George Robinson.**

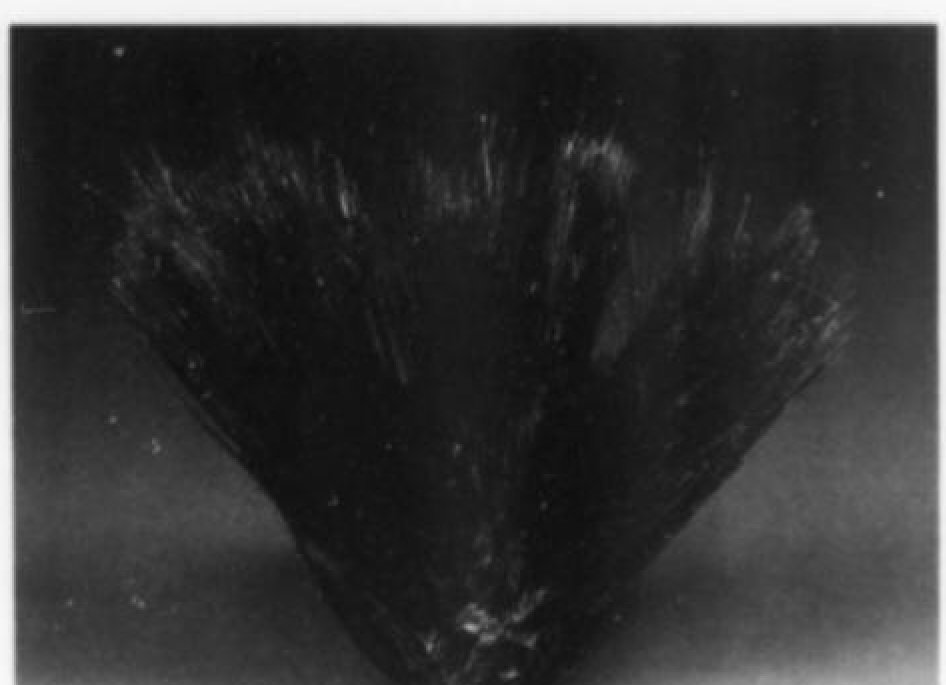


Figure 9. **Astrophyllite, 4 cm, from Mont Saint-Hilaire, Quebec. Canadian Museum of Nature specimen; photo by George Robinson.**

tified from Five Mile Pass, Toole County. Specimens were available from Phil Richardson of Salt Lake City at the Denver show last September.

John Holfert (109 W. 2700 S., Bountiful, UT 84010) and Steve Allred (3888 Marshall Rd., Erda, UT 84074) have been mining their claim, the Holfert-Allred property, near the so-called "tin mine" in the Thomas Range, and have been finding numerous exceptionally fine sherry-brown topaz crystals. Some are of faceting quality and are up to 5 cm long. Additionally, many smaller specimen-grade red beryl crystals have been recovered, along with some enormous milky white tridymite crystals (to 1 cm!) in twinned rosettes and botryoidal clusters to several cm on rhyolite.

VIRGINIA

Dr. Lance Kearns of James Madison University in Harrisonburg reports there were several new and exciting finds made in Virginia last year. First, an unusual assemblage of fluoride minerals consisting of cryolite, chiolite, prosopite and elpasolite was encountered last summer at the 45-foot level in a new shaft at the Morefield mine near Amelia. These occurred in colorless to pale purple masses up to 20 cm in the pegmatite. Large (half-meter!) crystals of amazonite of superb color were also found. Not to be outdone, on the morning of September 1, the Rutherford mine nearby boasted its find of the year (decade?): a large, etched 2,800-carat dodecahedral crystal of gem-quality spessartine! Elsewhere, at the Willis Mountain kyanite mine in Buckingham County, an unusual assemblage of phosphate minerals was found, including good specimens of trolleite, lazulite, goyazite, variscite, apatite and other species.

WASHINGTON

Probably few people know that the original locality for okanoganite at Washington Pass consists of a single, huge boulder known locally as the "Okanoganite Boulder." Randy Becker, the redoubtable excavator of the Northwest, has made many trips to this and other boulders in the slide area, and has found a large suite of interesting minerals. In addition to some rather peculiar tan, tetrahedral twins of okanoganite to 2 mm, he has found pink prismatic crystals of kainosite-(Y) in albite vugs associated with euhedral arfvedsonite crystals to 3 mm, fibrous blue crocidolite, allanite (to several mm), gemmy tan-to-pink, color-zoned hexagonal crystals of bastnaesite-(Y) to 2 mm, and flat, rhombic, brown titanite crystals to 6 mm. Randy has also collected some unusual talc pseudomorphs after anthophyllite to 2 cm from the Rainy mine in King County. The pseudomorphs have a cross-section resembling a maple leaf, and occur in coarse pyrite.

Part II: Canada

ALBERTA

Rod and Helen Tyson (*Tyson's Minerals*, 10549 133rd St., Edmonton, Alberta T5N 2A4) have recently collected a quantity of good calcite specimens from a bridge construction site near Athabasca. The calcite occurs as bright yellow crystals lining cavities in septarian nodules up to 2 meters in diameter. A large number of specimens have been recovered.

BRITISH COLUMBIA

There have been a number of good specimens of lapidary-quality rhodonite from British Columbia available over the past year. The material varies in color from bright red to pale pink and exhibits a number of attractive patterns, making it suitable for both lapidaries and specimen collectors. Kirk Makepeace (*Jade West Resources, Ltd.*, 577 194th St., South Surrey, BC V3S 5J9) operates the River's Inlet mine at River's Inlet, and has a good supply of material available. Similar material from a prospect north of Johnson's Crossing is available from *Osiris Enterprises* (3345 Mason Ave., Port Coquitlam, BC V3C 3V4). Other good specimens, seen in Tucson, are available from *Anooraq Resources* (5219 Timberfoil Rd., West Vancouver, BC V7W 2Y5).

Further inland, Bob Jackson (P.O. Box 2652, Renton, WA 96056) continued to do development work at the Rock Candy mine near Grand Forks. A number of quartz, fluorite and barite specimens were collected. Some of the quartz specimens are quite large and unusually good for the locality. While the pockets are relatively abundant, and there is good potential for future collecting, no one said it would be easy! Underground mining is difficult, dangerous and expensive, and we wish Bob the best of luck!

Washington collector Randy Becker recently found some very interesting scalenohedral calcite crystals with nail-head scepters to 1 cm near Monte Lake, and Rod and Helen Tyson collected a quantity of very sharp, flesh-colored sanidine crystals near Beaverdell. These occur as porphyroblasts in an igneous matrix and consist of both single crystals and Carlsbad-law twins up to 5 cm in length.

MANITOBA

Toronto collector David Joyce was fortunate to notice an unusual specimen on a geologist's desk during a recent visit to the Thompson open pit mine at Thompson. The specimen consists of a thick, rich vein of what appeared to be massive millerite in contact with calcite. Speculating what might be hiding beneath the calcite, he asked to visit the area where the specimen was found to see if more was available. While not abundant, about a dozen additional pieces were collected. After leaching the calcite in dilute HCl, some of the finest millerite ever found in Canada was revealed! The specimens, which range up to 8 x 10 cm, are a rich, golden, metallic brown color, and are covered with velvety acicular crystals. Overall, they somewhat resemble the millerite from the Gap mine in Lancaster County, Pennsylvania, but are much better crystallized. Some interesting micro-crystals of pyrite showing right-angle bends associated with quartz and calcite were also collected at Inco's T-3 mine nearby.

NORTHWEST TERRITORIES

Rod and Helen Tyson recently acquired a lot of approximately 250 specimens of native silver and acanthite from the El Bonanza mine, near Port Radium. Most are in the thumbnail to miniature size range, and consist of finely crystallized dendritic silver, with a few larger pieces (2 kg) of leaf silver.

Department of Indian and Northern Affairs geologist, Walter Gibbins, reports that there is currently a diamond rush on in the Northwest Territories! In November of last year, Dia Met Minerals, Ltd. recovered 81 small diamonds (less than 2 mm diameter, but some of gem quality) from a 59-kg sample of kimberlite from near a small, unnamed lake north of Pointe de Misère, approximately 300 km northeast of Yellowknife. Already more than 10,000 square km have been staked, suggesting this may be the most important diamond discovery in North America to date. Details are given by Gibbins and Atkinson (EGS 1992-1 Diamond Exploration in Northwest Territories, NWT Geology Division, DIAND, Yellowknife, NWT X1A 2R3).

NOVA SCOTIA

Doug Boddy (RR 1, Monastary, N.S. B0H 1W0) has been working a claim for clear quartz crystals near Boylston. The crystals occur in pockets in quartz veins cutting slate, and generally resemble those from Arkansas. Some of the specimens have a bright orange color due to iron oxide inclusions, which makes them particularly attractive. Good calcite, pyrite and dolomite specimens have been found in adjacent veins, and Mr. Boddy hopes to continue to recover more specimens in the coming year.

ONTARIO

Last spring, Ottawa mineral collector Judith Bainbridge submitted a bright blue unknown mineral to the Canadian Museum of Nature for identification. Its identity was quickly confirmed as gem-quality lazurite ("lapis lazuli"). What is most unusual, however, is the specimen's locality: a flower bed by the parking lot of the Ottawa General Hospital! A call to the hospital confirmed that a local landscaping firm had recently completed the project, and subsequent calls eventually confirmed the source of the cobblestones they used as a local gravel pit. A field trip was made to the gravel pits, which quarry Pleistocene tills, but no additional specimens were found. Similar material has been found in the Balmat district of northern New York, and somewhere in the thousands of square kilometers of Grenville metasediments north of Ottawa there is probably a gem lapis occurrence awaiting discovery. It would seem that like gold, lapis lazuli is where you find it!

Not all of what's new in Canada's mineral world involves new discoveries. On March 10, the Canadian Museum of Nature in Ottawa opened the first half of its new Viola MacMillan Mineral Gallery. In addition to a number of its finest display specimens, the exhibit also features a reconstruction of the famous basalt cliffs of the Bay of Fundy, along with a display of zeolites and other basalt-hosted minerals, an underground gold mine with crystal pockets and an exhibit of economic minerals, and a multimedia journey through geologic time in a time machine! There is also a temporary exhibit of minerals from the famous William Pinch collection, recently acquired by the museum. The second half of the gallery is scheduled to open in 1993, and will feature many more specimens of particular interest to collectors in two areas dedicated to teaching the fundamental concepts of crystal chemistry and mineral paragenesis. There will also be a common services area with plenty of hands-on activities designed to teach children basic geology and mineralogy, and even a walk-through reconstruction of a submarine geothermal environment, complete with black smokers!

If that's not enough to make you consider a northerly excursion in the not too distant future, how about a second great exhibit? The Royal Ontario Museum in Toronto is currently committed to two new exciting projects. One is a display of about 250 spectacular minerals showing how the ROM mineral collection was built through gifts, purchases, collecting and exchanges. It is being put together by Darko Sturman and Bev Mikell, together with an "in-house" design team, and is scheduled to open at the end of February, 1992. The other project is the S. R. Perren Gem and Gold Room, expected to open in mid-1993. It will be a stunning display of the ROM's magnificent gem and gold collections and the first part of the McLaughlin Earth Sciences Gallery. The completion of the Early Sciences Gallery is dependent upon a current fund-raising campaign, with a goal of $5 million. Further information may be obtained by telephoning (416) 586-5856.

QUEBEC

As usual, the most exciting finds from *la belle province* have been made at Mont Saint-Hilaire. Without doubt the most exciting of all was made by René Lalonde on July 19, 1991, when he collected what has to be the world's finest catapleiite. The specimen, which has since been acquired by Gilles Haineault (*Collection Haineault*, 2266 St-Alexandre, Longueuil, Québec J4J 3T9), consists of a perfect 15-cm crystal perched on a matrix of crystallized natrolite! When viewed for the first time, the specimen tends to invoke a sense of awe; sort of like seeing the Grand Canyon for the first time. It is certainly one of the finest specimens Mont Saint-Hilaire has ever produced.

While not as large or as spectacular as the catapleiite, there have been a number of other noteworthy finds over the past year, beginning in April 1991, when some very fine crystals of remondite-(Ce) were found in miarolitic cavities in the nepheline syenite. Some of these are quite gemmy, and of a rich amber-yellow color. One crystal section nearly 5 cm in diameter was collected. These crystals were originally thought to be burbankite, but microprobe analyses done at the Canadian Museum of Nature have shown they are in fact remondite-(Ce). Other species occurring in the cavities include good crystals of ilmenite, wöhlerite, barite and analcime. Good microcrystals of thalcusite and vitusite were also found in sodalite syenite xenoliths, as was gaidonnayite in a pegmatite vein. Later in the spring and early summer Gilles Haineault collected some very good astrophyllite and some large, but corroded, pseudo-octahedral crystals of cryolite. Rich masses of bright yellow to yellow-green shortite were relatively abundant in a series of marble xenoliths encountered in August. Probably the best of the relatively few euhedral crystals recovered from the find is a 2-cm sulfur-yellow single collected by Gilles Haineault. A few black andradites and large pectolites were also found, as were some extremely fine dawsonite crystals. Near the end of the summer, Gilles encountered a large analcime pipe with unusual, blotchy green analcime crystals, some of which appear to be hollow. Throughout the year, of course, were the usual organized weekend trips which provided countless collectors with a wealth of smaller and microcrystal specimens. On one such trip Ottawa micromounter, Quintin Wight, collected what appears to be the first Japan-law twinned quartz known from Mont Saint-Hilaire. The crystal, which is approximately 1 x 2 mm, appears colorless to pale smoky, and was collected from a fracture zone in hornfels.

The list of species from Mont Saint-Hilaire has continued to grow since April of 1991, too, and now includes its first telluride mineral. A single gray, metallic cube of hessite about 0.5 mm in diameter has been identified in a sodalite xenolith. Other firsts from the sodalite xenoliths include the copper sulfides djurleite and digenite as irregular 0.1-mm black grains along with the copper sulfates langite and posnjakite, both as green-blue efflorescences. The rare species phosinaite has also recently been identified in a sodalite xenolith. The specimen consists of gray-mauve fibers about 6 mm in length with a thin, black, amorphous coating. Associated species include thermonatrite, vuonnemite, ussingite, steenstrupine, fluorite, villiaumite, eudialyte and a lovozerite-group mineral. Lastly from the sodalite xenoliths, a new species has been identified: abenakiite-(Ce). Formerly UK-85, abenakiite-(Ce) occurs as a reddish orange grain resembling eudialyte.

Thenardite and vaterite have both been identified in association with shortite in marble xenoliths. The thenardite occurs as a bright white powder with shortite, kogarkoite, calcite and pectolite, while the vaterite forms vitreous, white, flattened sheets in fissures with shortite. Kellyite has been found as thin colorless plates to 3 mm in diameter associated with aegirine, analcime, calcite, catapleiite, microcline and natrolite. It is normally coated with a fine-grained (possibly amorphous) pinkish brown unknown mineral. Wagnerite occurs as pale orange-brown tabular crystals to 2 mm associated with rhodochrosite, pyrite and siderite in fine-grained albite veins in hornfels. Lastly, saponite and fluorbritholite-(Ce) may be added to the official list of species for Mont Saint-Hilaire. The first of these was actually identified several years ago, but somehow escaped the list. It occurs as coarse, 10-mm, dark brown-green micaceous plates in marble xenoliths associated with pectolite, apophyllite, orange vesuvianite and calcite. As a result of nomenclature changes, the britholite from Mont Saint-Hilaire is more properly called fluorbritholite-(Ce); its description remains the same. Add to this as least a half a dozen new unknowns, and it's easy to see why Mont Saint-Hilaire remains Canada's most famous mineral locality!

Over the past year or two there have been some very fine calcite specimens found at the Marcil quarry near the village of Sainte-Clotilde-de-Chateauguay, south of Montreal. These are found in a number of habits including golden yellow scalenohedral crystals over 10 cm long associated with pink dolomite and quartz. The specimens occur in vugs in Beekmantown dolostone. Montreal area collector Dr. Donald Doell reports that collecting was sporadic over the past year and its now forbidden. Good specimens have been available from Gilles Haineault and Tyson's in the past.

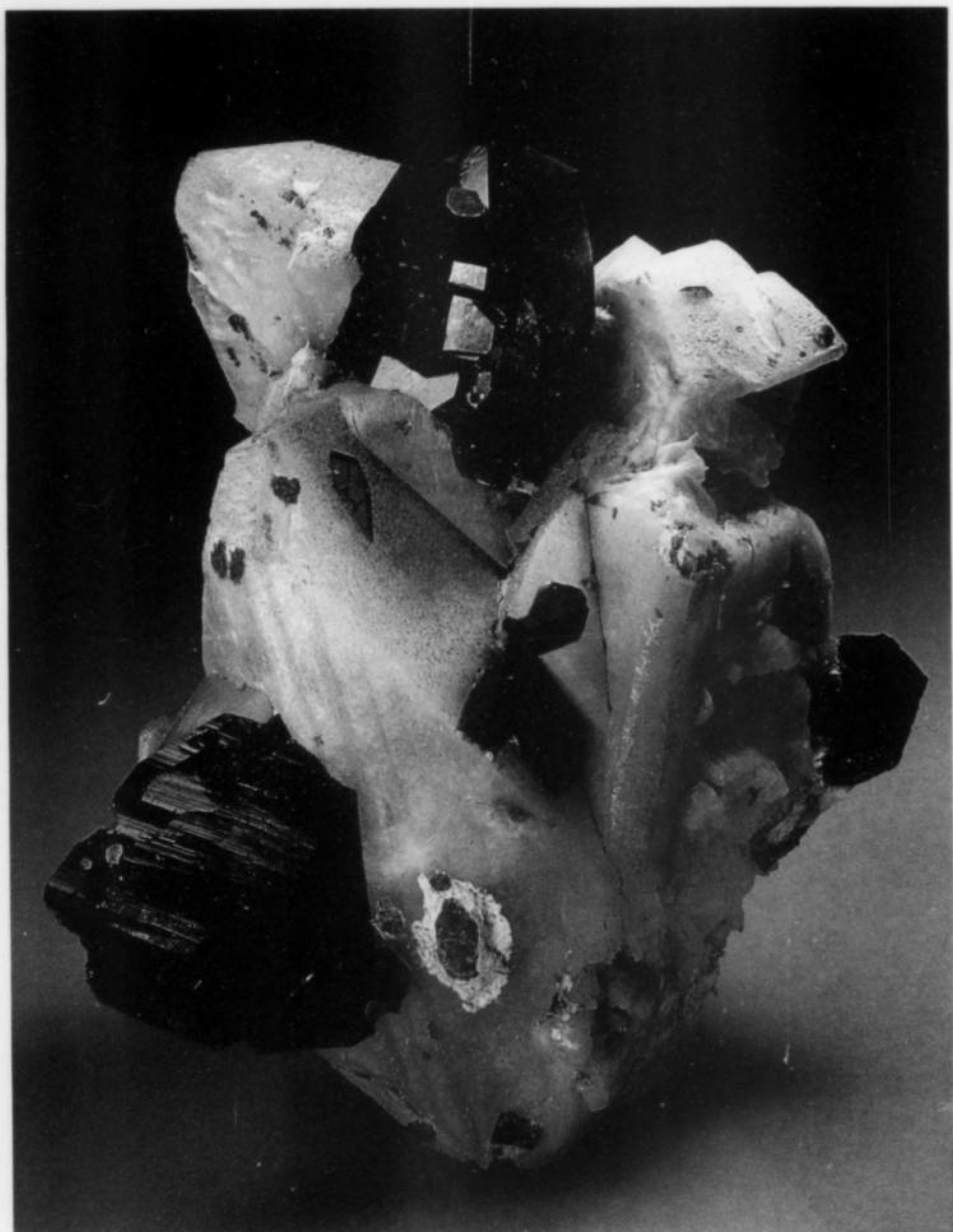
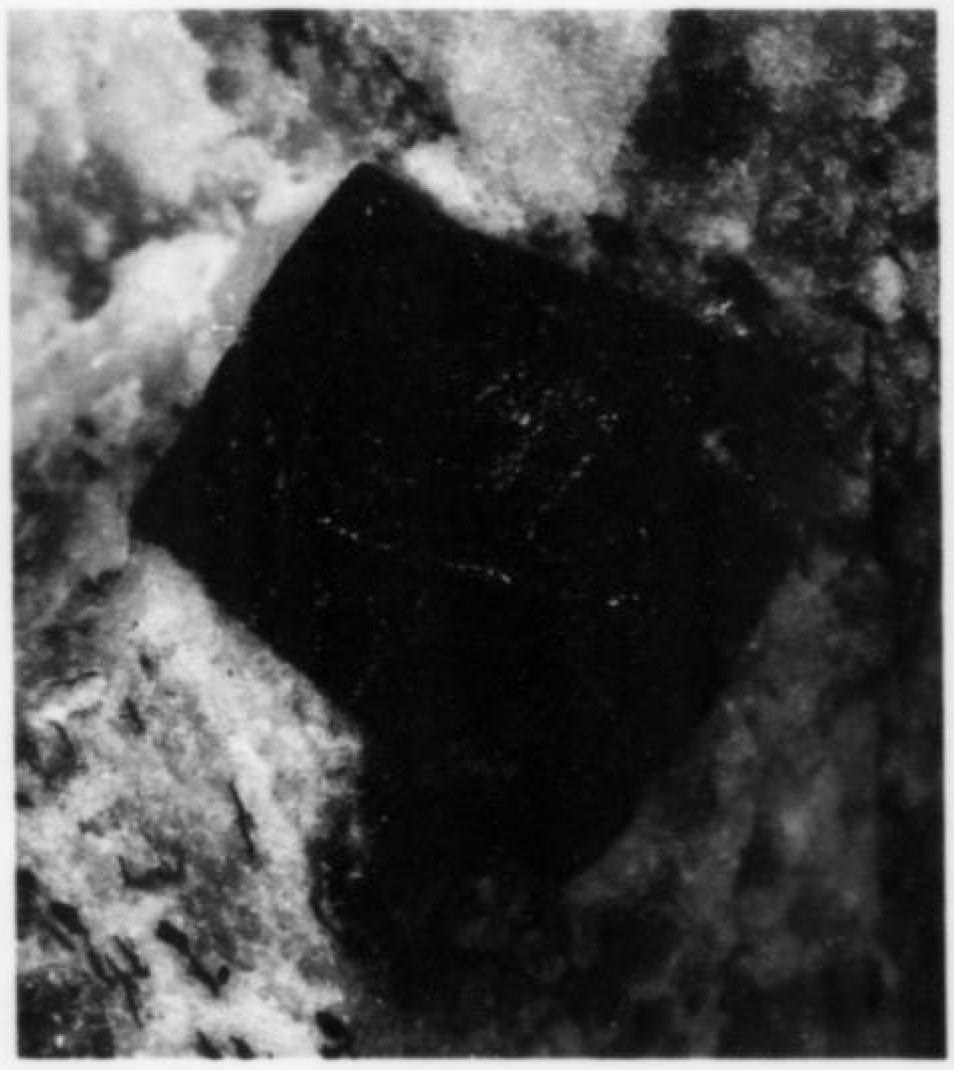


Figure 10. Ferroaxinite crystals to 4 cm on white dolomite crystals from Paiva, Polar Urals, Russia. Ulrich Burchard specimen.

Figure 11. Loparite twin, 6 mm, from the Kola Peninsula, Russia. William Pinch collection; photo by George Robinson.



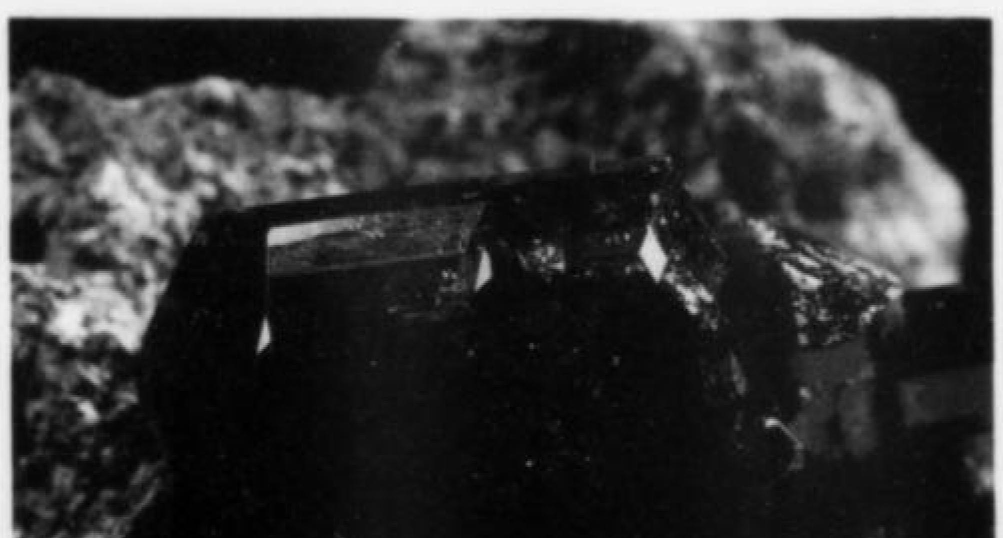


Figure 12. Gemmy, dark amber-colored cassiterite crystal, 1.9 cm, from Merek, Chabarovskij Kraj, Russia. Van Scriver Minerals specimen.

Figure 13. Wire silver on matrix, 4.3 cm, from the Sarbay mine, Kazakhstan. Van Scriver Minerals specimen.

Figure 14. Nickeline, 8 cm, from the Pöhla mine, Saxony, Germany. Canadian Museum of Nature specimen; photo by George Robinson.

Figure 15. Viitaniemiite crystal, 8 mm, perched on brown topaz from near Dassu, Pakistan. William Pinch collection; photo by George Robinson.

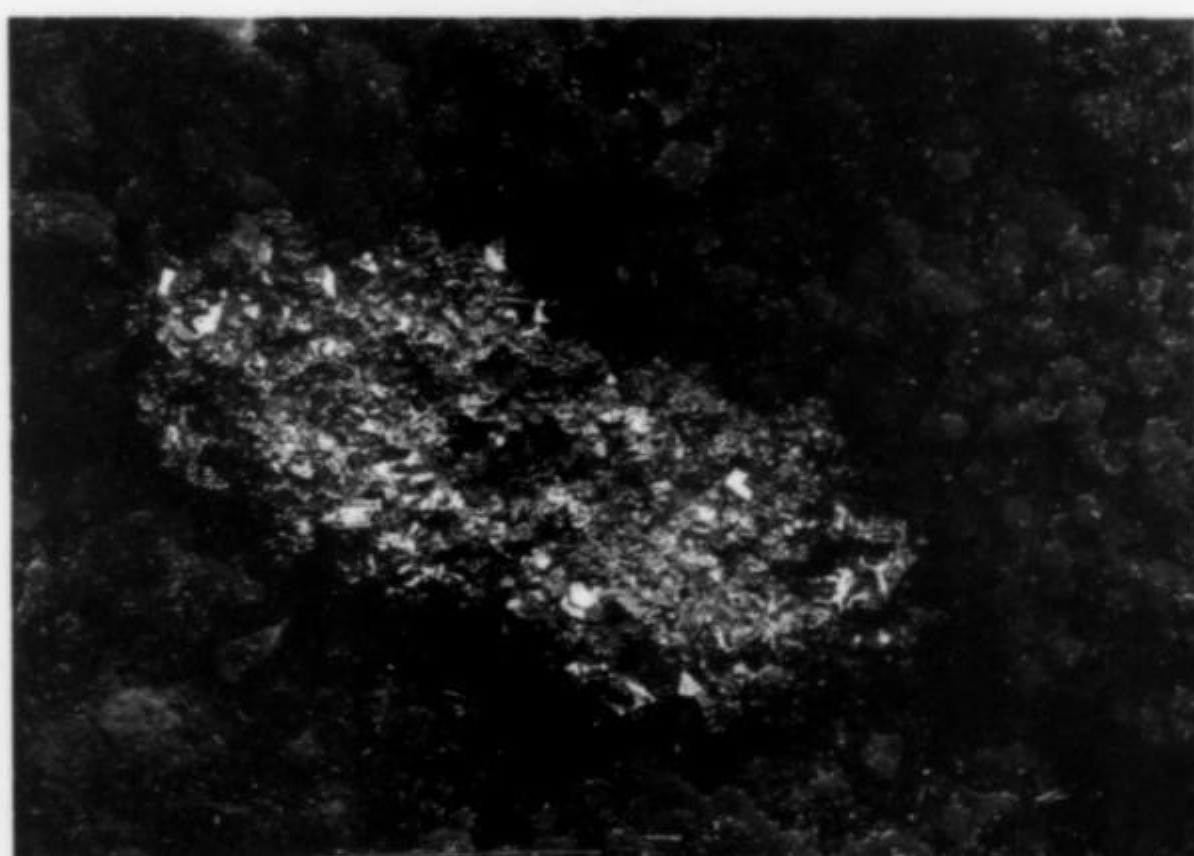


Figure 16. Silver, 1.2 cm across, on conichalcite from the 44 level of the Tsumeb mine, Namibia. Charles Key specimen; photo by George Robinson.

Figure 17. Bournonite crystal group, 15 cm, from St. Laurent de Minier, Gard, France. Canadian Museum of Nature specimen; photo by George Robinson.

Part III: Other World Occurrences

AFGHANISTAN

By now we have probably all become accustomed to what appears to be a nearly endless supply of aquamarine, tourmaline, topaz and kunzite from the Afghanistan and Pakistan pegmatites, superb though they be. However, if one takes the time to look more closely at the tables of aqua, other treasures may slowly emerge. One such treasure did so quite blatantly at last year's Denver show. What at first looked like a rather unusual, striated white tourmaline crystal, but with perfect basal cleavage, turned out to be a 5 x 10-cm crystal of beryllonite! A quick scan around the room found its mate, which fitted perfectly onto the first half producing a doubly terminated crystal 10 x 10 cm! The specimen, which was purchased from Den and Ahmad Minerals (Peshawar, Pakistan), now resides in the collection of the Canadian Museum of Nature in Ottawa. The locality was given as Paprok, Konhar, Nuristan, Afghanistan. By the time of the Tucsòn show, François Lietard (*Minerive,* Au Bois, 42520 Roisey, France) had a number of additional very fine, but smaller crystals along with a few hambergite specimens from the same locality. An additional new item available from Mr. Lietard was tremolite crystals from Korano Mujan, Konhar. These form colorless to white prismatic crystals to 10 cm, which resemble those from the Balmat district in St. Lawrence County, New York.

There was also a noticeable number of ruby specimens at the Denver show. These consist of bright red hexagonal crystals up to 3 cm in white marble, and were available in a wide range of qualities from an equally wide range of dealers, though Cal Graeber (P.O. Box 47, Fallbrook, CA 92028) and Herb Obodda (P.O. Box 51, Short Hills, NJ 07078) had some of the more memorable specimens. The locality was being given as Jegdalek, Sarobi, Afghanistan.

AUSTRALIA

White massive armenite has been found in a fine-grained, gray-tan matrix at Purnamoota, in southwestern Australia. White radial groups of phillipsite crystals up to 1 cm across associated with 8-mm analcime trapezohedra have been available from Doughboys, Tasmania, as have orange stellerite crystals up to 10 cm from the Garrawilla volcanics in New South Wales. Several new and rare minerals from Coppin Pool, Western Australia, were seen at the Tucson show, including danielsite available from Forrest and Barbara Cureton (*Cureton Mineral Company,* P.O. Box 5761, Tucson, AZ 85703-0761), in addition to lusungite and segnitite available from *Ausrox* (42 Hex St., Tottenham, Melbourne, Victoria 3012, Australia).

Charles Key (20 Delano Park, Cape Elizabeth, ME 04107) recently obtained some exceptionally sharp crystals of native gold in quartz from the Meekatharra mine, Meekatharra, Murchison District, Western Australia. The crystals, which are predominantly cuboctahedral or dodecahedral in habit, occur "frozen" in massive gray-white quartz veins. Sizes range from 3 to 8 mm.

Last year we reported that good erythrite had been collected from Carcoare, New South Wales. Since then it has been learned that these specimens were deliberately mislabelled by those who collected them in an apparent attempt to "hide" the locality from others. The correct locality for these specimens is Mount Cobalt, Queensland. In addition to the erythrite, specimens of cobaltite, smolianinovite, heterogenite and mansfieldite have also been collected.

Elsewhere Down Under, the Iron Monarch pit, Iron Knob, South Australia has produced dark olive-green microcrystals of namibite; and a relatively new opal field near Mintabie, South Australia has provided some rather striking specimens of precious white opal in sandstone. The Red Lead mine at Dundas, Tasmania continues to produce sporadic but fine crocoite; sharp, tabular crystals of white beryl have been collected at Tabba Tabba, Western Australia; and a relatively small but new deposit near Widgiemooltha, Western Australia has produced bright apple-green gaspeite in seams up to 10 cm and sufficiently compact to be of lapidary interest.

BRAZIL

There has been a find of some extremely rich blue-green amazonite at Santa Maria do Itabira, Minas Gerais. The crystals, which occur up to about 10 cm long, appear to be encased in quartz which has to be chipped away to expose them. Thus, most specimens are not completely without damage. Nevertheless, their intense color is so overwhelming that it easily compensates for a few unavoidable chips. Specimens were available at the Denver show from *Valadares Minerals* (Rua Capote Valente 513, Ap. 133 CEP 05409 Pinheiros, São Paulo, SP, Brazil).

Frank and Wendy Melanson (*Hawthorneden,* R.R. 1, Eldorado, Ontario, Canada K0K 1Y0) recently obtained some unusual aquamarine crystals from the Mimoso mine in Espirito Santo. The crystals, which range from 4 to 8 cm in length, occur in clusters, and have unusual terminations consisting of very steep, etched, first-order bipyramids (possibly $\{60\bar{6}1\}$) with smaller, lustrous, second-order bipyramids $\{11\bar{2}1\}$ and pinacoids {0001}.

Carlos Barbosa (Rua Cel. Roberto Soares Ferreira 586, Bairro Vila Bretas, 35030 Governador Valadares, Minas Gerais, Brazil) has been one of the great discoverers and exporters of unusual and fine Brazilian minerals, and his reputation continues. Among this year's finds was an excellent selection of minerals from Brumado, Bahia, consisting of Japan-law twinned quartz crystals to 5 cm, clusters of blocky, tan dolomite crystals with basal pinacoids associated with transparent magnesite crystals, acicular, brushy clusters of red-brown uvite-dravite and drusy quartz epimorphs after euhedral talc crystals! The talc consists of colorless, thin, tabular pseudohexagonal crystals to 5 cm, coated by clear to white drusy quartz crystals, sometimes irregularly stained by disseminated red hematite. Sea-green clusters of small (2 mm) "phengite" crystals in and on quartz were also found, as were good crystals of sellaite showing clear outer zones with smoky phantom cores, and milky, tan 2–3 mm rhombohedral svanbergite crystals on quartz. Clear pseudocubic woodhouseite has also been reported from this locality, though a qualitative EDS microprobe analysis of one specimen of this recent material shows it is Sr-dominant, and thus svanbergite. Lastly, Sylvia Roberts of Washington, DC, reports having received a newly found 2-cm crystal of zeunerite-metazeunerite from Brumado.

Carlos also had some exceptional clusters of transparent, bright lilac fluorapatite crystals (to 1 cm) on white cleavelandite with etched microcline from an unspecified pegmatite near Governador Valadares, Minas Gerais. Many of the fluorapatite crystals are color-zoned lilac with pale blue terminations. Additional new items recently offered by Carlos include a 132-gram palladian gold ("porpezite") from the iron mines at Itabira, Minas Gerais (now in the William Pinch collection), superb lustrous brown xenotime crystals to 3 cm from Ibitiara, Bahia, 2-cm pieces of flawless oligoclase from Mantena, Minas Gerais, bermanite with rockbridgeite from Linopolis, Minas Gerais, colorless topaz crystals to 5 cm from Padre Paraiso, Minas Gerais, skeletal amethyst scepters with cavernous terminations (rarely with {0001} faces) from Mimoso, Espirito Santo, and sharp, purplish red crystals of gibbsite to 1 mm from Serro, Minas Gerais. The latter are excellent for the species and occur in cavities in a magnetite/chromite-bearing schist.

The electric copper-blue tourmaline discovered by Heitor Barbosa at Mina da Batalha, Sao Jose da Batalha, Paraiba is now well known. Recently, however, a new prospect a few kilometers away has produced a new supply of these unusually colored tourmalines in crystals to 3 x 10 cm. The crystals are "frozen" in quartz and have a thin exterior zone of blue, occasionally streaked with pink, around cores that are pink to pinkish gray; but these are insufficiently clear to be suitable for gems. It is uncertain if the new locality has produced any facet rough, or if any of the material has slipped into the market mislabeled as "Paraiba."

Since we first reported the new find of almandine from Serrote Redondo, Paraiba, by Dr. Reinhard Wegner of Campina Grande last year, there has been a continuing supply of these novel specimens seen on the market. The dark red-brown trapezohedral crystals occur in quartz "nodules" in a granitic gneiss, which, like geodes, provide no clue of their contents until cracked open. The crystals are well-formed and occur up to 3 cm.

Luiz Menezes (Rua Eng. Agenor Machado 108, São Paulo, S.P. Brazil 04710) has an interesting new selection of tiny, colorless, cube-like edingtonite crystals on natrolite and calcite from the Jacupiranga mine, São Paulo (see *Mineralogical Record,* **15**, 261–270).

BULGARIA

The rare mineral vasilite has been found at Novoseltsi, and is currently available from Cureton Mineral Company.

CHILE

Well-known Rochester, New York, collector, William Pinch recently acquired two unusual specimens from Chile. The first of these consists of a 3 x 4-cm group of 5-mm lustrous, green libethenite crystals from the Mercedes mine, Coquimba. The second is an exceptionally fine specimen of the rare mineral rodalquilarite, with a 2-cm cavity completely lined with brilliant, 1–2 mm olive-green crystals. The locality for this piece is the Wendy pit, El Indio Gold mine.

COMMONWEALTH OF INDEPENDENT STATES

At the Denver show last September, Jim McGlasson (*Collector's Stope*) had a reasonably good supply of two very rare minerals, bismutocolumbite and bismutomicrolite. Both come from pegmatites in the Malchan Range in Central Transbaikalia. The bismutocolumbite is from the Danburitovaya mine and the bismutomicrolite from the Solnetchnaya mine. Both these minerals occur in 1–2 mm crystals associated with lepidolite, albite, elbaite and other species. This is believed to be only the second world occurrence for bismutomicrolite.

Once again, the Fersman Museum was able to send representatives to attend the Denver show and, as usual, they had an excellent selection of Russian minerals. In addition to their normal selection of rare species from the Kola Peninsula (wadeite and shafranovskite from Chibiny, loparite and phosinaite from Mt. Karnasurt, etc.), they also had a number of more common species from widespread occurrences. Among these were some very good pink chabazite crystals from the Sarbai iron mine, Rudnyi, Kazakhstan. Some of these are covered by a thin layer of epitaxially overgrown gmelinite and are associated with yellow stilbite, calcite and chalcopyrite. Radial groups of dark, flat-topped stellerite up to 3 cm were also seen, along with some unusual, pale pink to colorless apophyllite from Norilsk, Siberia, that resembles barite more than apophyllite.

By the time of the Tucson show, good minerals from the Commonwealth appeared in a quantity and diversity virtually unparalleled on the North American market. Certainly the major highlight has to be the superb centimeter-sized crystals of sperrylite from the Talnakh deposit in Norilsk, Siberia. Bryan Lees had an amazing, sharp, 18-mm cuboctahedron in chalcopyrite matrix, and the 3-cm subparallel group of crystals in matrix displayed by William Pinch was (how do we say it these days?) totally awesome! Even the chalcopyrite matrix itself is remarkable, considering the rare species it contains (taimyrite, paolovite, talnakhite, mooihoekite, etc.). Other new material included sharp, lustrous, 8-cm crystals of axinite from Paiva in the Polar Urals, Russia, available from François Lietard (Au Bois, 42520 Roisey, France); centimeter-sized bertrandite crystals that look more like stilbite than bertrandite from Kara-Oba, Kazakhstan; tennantite and quartz from Karabach, Urals; 3-cm cassiterites as good as those from Bolivia from Merek, Chabarovskij Kraj region in eastern Russia; betekhtinite crystals and wire silver specimens from Dzezkazgan, Kazakhstan; and 8-mm shuiskite crystals on uvarovite from Saranovskaya in the Urals. These were but a few of the many treasures to be seen. Stone Flower (B. Kommunisticheskaya 48, Moscow 109004, Russia) brought a fine selection of zeolites from Krasnoyarsky Krai, Yakutia, south-central Siberia. These included excellent pale golden-brown, flat-topped bow ties of stilbite up to 8 cm long; zoned, red-to-colorless heulandite 1 to 7 cm across; and white radial mounds of mordenite 1.5 cm across. Smaller blades of flat-topped stilbite up to 2 cm long are present, some on calcite crystals up to 18 cm across. From the same cavities came large, exceptional specimens of colorless to pink, coarse, bladed thomsonite up to 2 cm long and 3 mm thick, associated with white analcime, heulandite and calcite. Several dealers had white trapezohedral crystals of analcime, commonly up to 8 cm in diameter, with one remarkable crystal 20 cm in diameter, from Tunguska, Tura, central Siberia.

Additional very rare and unusual minerals from the Kola Peninsula and Ural Mountains in Russia were available from Forrest and Barbara Cureton. Among others offered were cancrisilite, hydroxylcancrinite, manaksite, manganotychite, paranatisite, tsaregorodtsevite, tuliokite and vistepite. Many were annotated as "author's studied material" and had been obtained by Forrest during a trip to Russia in early January. *Wilke Mineralien* (Handelstrasse 5, D-6116 Eppertshausen, Germany) also had a number of rarities, mostly from the Kola Peninsula, such as perlialite, kovdorskite, bobierrite, labuntsovite, normandite, phosinaite, carbocernaite, ilimaussite-(Ce), lun'okite, taikanite, and a wealth of others.

FINLAND

Finnish geologist and mineral collector Markku Lehtinen has reported two interesting discoveries made quite some time ago in Finland that seem to have escaped the North American press. The first of these is a large find of amethyst that was made in 1985 in the Luosto area, Sodankylä, in central Lapland. Crystal groups in excess of 200 kg have been recovered, and a large crystal pocket has been reconstructed in the Mineralogical Museum at the Geological Institute of the University of Helsinki. The specimens somewhat resemble the large crystal groups from the Thunder Bay, Ontario, deposits, but are generally of a more pale purple to smoky purple color. The locality is presently under claim.

The second discovery was made in 1982 by a collector from Vantaa at a roadcut near Luumäki. This locality has produced some gemmy beryl crystals of over 2,000 carats. The occurrence is a greisen vein in granite, and it, too, is presently under claim.

FRANCE

Christophe Dubois (31, Avenue Picaud, 06400 Cannes) has recently acquired a large variety of uranium minerals from the Rabéjac and Rivieral mines, Lodeve. From the Rivieral mine there is a new production of tabular, pale yellow abernathyite crystals to 3 mm, whose edges are overgrown with yellow-green heinrichite. The Rabéjac quarry has produced a wondrous suite of minerals. Zeunerite-metazeunerite is found as emerald green platelets to 2 mm, sometimes associated with a drusy coating of umohoite. One specimen labeled umohoite-14Å consists of rounded crystals (<1 mm) and botryoids associated with massive, pale yellow calcurmolite and nearly white rutherfordine. Some of the calcurmolite forms butter-yellow earthy masses. Botryoids of pale yellow rutherfordine to 1 mm are found associated with yellow uranophane on barite. Rutherfordine may also be associated with sklodowskite and beta-uranophane, or occur as 3-mm fibrous bundles of crystals with octagonal plates of zeunerite and schoepite pseudomorphs after "epi-ianthinite." Arsenouranospathite of two types, both associated with zeunerite, has also been noted; one as silky white to pale yellow, fibrous-appearing clusters, the other as pale yellow tetragonal plates. Becquerelite forms transparent and nearby invisible crystals (<1 mm) associated with zeunerite. An odd association of tiny leaves of native silver on chrysocolla associated with cleavages of tyrolite are also found at the mine. Additional species that have been observed include uranospinite, cuprosklodowskite, clinoclase, agardite, cornwallite and lavendulan.

Other uranium minerals seen from Mas d'Alary, Lodeve, Herault, included liebigite as gemmy, bright lemon-yellow, rounded crystals to 4 mm on gypsum. These occur in vugs and are found when the matrix is broken open, suggesting they are not of post-mining origin. Small pale yellow platy crystals of novacekite and apple-green microcrystals of andersonite occur at the same locality. The old surface workings at Mas d'Alary have also produced small spherules of square znucalite crystals (0.1 mm). These are of a clear yellow to amber color, and may possibly be of post-mining origin.

Dubois also had brown synchisite-(Ce) crystals to 1–2 cm from the Trimouns mine, Luzenac, Ariege. Some very nice orange, prismatic to barrel-shaped crystals of parisite-(Ce) to 1.5 cm and brown bladed allanite-(Ce) were also found.

Also worthy of note is an occurrence of reticulated galena from the Les Malines mine, Saint Laurent le Minier, Gard. The galena has a slight bronze tarnish with right-angle spikes interlocking with other reticulated crystals, and forms spongy masses to several centimeters. This locality has also recently produced large specimens of milky white barite rosettes, sometimes on botryoidal pyrite, covered with a thin film of sulfur, topped by clear tabular sulfur crystals to 7 cm. Furthermore, it is the locality for the large cogwheel twins of bournonite (to 10 cm!) recently seen on the market. The bournonite is typically etched, and frequently has a thin crust of galena or covellite and occasionally minor blue serpierite. A huge lot of these was offered at Tucson last February by the French dealer J. Adani.

The Mont Blanc massif, near Chamonix, Haute-Savoie, has produced fewer specimens this year than in the past due to heavy winter snowfall. Though access was limited, a few quartz gwindels and at least one small pocket of pink fluorite were collected. Of some interest were two first-time discoveries of colorless scheelite crystals (to 1 cm+). One crystal was found by Mr. Canova at the Aiguilles des Glaciers on the south side of the massif and another by Armand Comte in the Periades Pics. Kainosite-(Y) crystals (to several mm), a rare alpine cleft mineral, were found by Mr. Loijerot on the south side of the massif. In Savoie, elongated needle-like crystals of anatase to 4 cm were found at the Col de la Madeleine massif, de la Lauzière.

Large, partially gemmy barite crystals to 15 cm have recently been collected at Côte d'abot, Olloix, in Puy de Dôme. In 1990–91, reworking of the old (1930) fluorite veins near Puy Saint Gulmier provided some outstanding specimens of dark, ink-blue cubes of fluorite to 4 cm, some having thin purple rims. Others consist of isolated, dark purple octahedra to 2 cm overgrown by sea-blue cubes to 3 cm, on plates of quartz. Only ten major pieces of the latter type were found. Tabular lozenge-shaped crystals of barite on a granite matrix were also found at Ravin de Sans-Souci, Chantelguyon.

Other interesting finds over the past year in France include carbonate-cyanotrichite with cuprian aluminian hydrotalcite and brochantite (possibly post-mining in origin) from Val Croze, Gard; excellent 1-cm crystals of bertrandite with cassiterite crystals (to 4 cm) on quartz from Carriere Quilly, La Villeder, Morbihan; microcrystalline yellow crusts of betpakdalite on wolframite from the Celtic Age gold mine at Vaulry, Haute-Vienne; clear blue fluorite crystals (to 2 cm) on quartz as well as 4-mm cuprite crystals in vuggy quartz from the Montroc mine in Tarn; barite, pyromorphite and red-tinted fluorite specimens from the Chillac quarry, Vienne; and capgarronite with perroudite from the Cap Garonne mine, Var.

GERMANY

At the Denver show last September, Manfred Schwarz (*Saxonia Minerals*, Bründelasberg 19, 0-9400 Aue, Germany) had a whole roomful of dendritic silver and other minerals from the Pöhla mine, Erzgebirge, Saxony, but one specimen stood out among the rest: a 6 x 8-cm group of superbly crystallized nickeline, with sharp, pinkish, metallic hexagonal crystals up to 1.5 cm across! It was one of three pieces found in 1984 just above the 240-meter level of the no. 24 shaft, and now resides in the collection of the Canadian Museum of Nature in Ottawa.

GREAT BRITAIN

Neil Hubbard (122 Cordery Rd., Evington, Leicester, England LE5 6DF) has continued to find exceptional new microcrystal material from the Britian Isles, including a most unusual occurrence of boracite. The crystals, which occur up to 2 mm, are pale green to colorless, and consist of cubes modified by the tetrahedron, with every other corner appearing truncated. The locality is the Boulby mine, Loftus, Cleaveland. The Penberthy Croft mine, St. Hilary, Cornwall, is still producing bright blue linarite microcrystals; however, the exciting find is balydonite crystals. These occur as 1-mm, emerald-green, pseudorhombohedral crystals in vugs in rusty quartz. Balydonite is generally not seen in well-formed crystals, so any new find of well-crystallized material is always interesting news. The Greystones quarry near Levant, Cornwall, has produced sharp, transparent hemimorphite crystals in cavities in rusty quartz. The type locality for alstonite, the Brownley Hill mine, near Nenthead, Alston Moor, Cumbria, has also recently produced more specimens of that mineral, and excellent transparent barytocalcite crystals have been found in a calcite breccia at the Lunehead mine, Lunedale, Cumbria. Lastly, Loch Scridain on Mull, Scotland, has produced blue corundum crystals to 3 mm which occur in pink masses of mullite.

INDIA

Dudley Blauwet (*Mountain Minerals International*, P.O. Box 302, Louisville, CO 80027-0302) reports that the now well-known quarries near Jalgaon have been very productive over the past year, producing chalcedony stalactites with lustrous apophyllite, stilbite and heulandite, as well as chalcedony pseudomorphs after calcite with stilbite, and some translucent stellerite specimens. Dudley also has a good selection of the rarer zeolites such as goosecreekite, yugawaralite and epistilbite currently available. Dr. Zaveri (*Zeolites India*, D-311 Manji Mahal, 35 Nargis Dutt Road, Bandra (West), Bombay 400 050, India) has excellent colorless radial aggregates of epistilbite and stellerite from the same quarries near Jalgaon, as well as spectacular amethyst geodes with white mounds of mordenite from Sangamner. Rusty Kothavala (511 Van Buren Ave., Oakland, CA 94610) continues to supply the market with more of the now-famous cavansite and stilbite specimens from Wagholi, near Poona, in addition to some beautiful groups of colorless prismatic scolecite crystals up to 15 cm from Junnar, near Narayangaon.

ITALY

One of the alpine rodingite occurrences near Bellecombe, Aosta Valley, has produced some excellent, deep brown, short, prismatic crystals of vesuvianite over the past summer. Mr. Bonisoli of Turin reports finding some excellent grossular crystals (var. hessonite) up to 1 cm associated with good prismatic crystals of green diopside at Laietto, Val di Susa. Additionally, an alpine vein in Val Chisone, off from the Cuneo Valley, produced a large number of albite crystal clusters, with individual tabular, colorless crystals to 5 cm, associated with gemmy, dark green, long prismatic crystals of epidote. Pizzo Cervandone has produced cafarsite crystals up to 1.5 cm this past season, and Nicchioleta has produced transparent gypsum crystals to 20 cm on a pyrite matrix.

Some very interesting microminerals have been found in ejected volcanic blocks from Vetarella, Vico, Latium. Osumilite-Mg, in complex blue, hexagonal crystals, is sometimes associated with olive-green vicanite-(Ce) crystals to 1 mm, non-metamict betafite crystals to 1 mm, lemon-yellow pseudohexagonal tablets of abecasite to 2 mm and red pyrope. The Sacrofano quarry in Latium has produced vitreous, colorless, hexagonal sacrofanite crystals to 1 cm, as well as yellow-green, acicular to tabular crystals of baddeleyite to several millimeters.

Renato Pagano (P.O. Box 37, I-20092 Cinisello B., Milano, Italy) currently has a good selection of rare and unusual micro-minerals from Italy. Among these is cahnite from a new world locality. The pale yellow-brown disphenoidal crystals (<1 mm) are associated with zeolites in cavities in basalt from Vallerano, Strada Luarentina, Roma. Renato also had a very few specimens of the rare species montesommaite from the type locality at Monte Somma, Napoli; fine tuscanite from Valle Biachella, Sacrofano, Roma; excellent klebelsbergite and peretaite from Miniera di Pereta, Scansano, Grosseto; cordierite crystals (to 1 cm) from Roccatederighi, Roccastrada, Grosseto; gadolinite from Arvogno, Val d'Ossola, Novara; afghanite and stillwellite-(Ce) from Vetralla, Viterbo; cetineite, mopungite and senarmontite crystals (in slag) from Miniera Le Cetine, Rosia, Siena; and an excellent selection of Monte Cervandone, Novara, minerals including gasparite, tilasite with asbecasite, cervandonite-(Ce) and chernovite-(Y).

JAPAN

We all know that Japan is famous for its Japan-law twin quartz crystals, but most of us probably don't realize that there is a currently producing locality for them. Sharp, transparent crystals up to about 2 cm may be collected from quartz veins in compact clay on Narushima Island. A good description of the occurrence and collecting conditions is given by Jimmy McNeil (*Mineral News*, vol. 7, no. 9, p. 6–7). For those interested in more unusual minerals from Japan, Cureton Mineral Company currently has petrukite from Asako-Gun, Hyogo, Prefecture, and Hori Minerals (4-13-18, Nerima, Tokyo 176, Japan) has ribbeite from Nagahama, Ehime.

MEXICO

There has been a major find of amethyst at the famous locality of Amatitlán in Guerrero. One of the best lots of specimens we have seen in over a decade made its debut at last year's Denver show. Long, tapered, gemmy royal-purple crystals up to 15 cm in groups three times that size were available from a number of dealers, though some of the best were being offered by Steven Green (Rough and *Ready Gems*), Bill Larson (*Pala International*, 912 S. Live Oak Park Rd., Fallbrook, CA 92028), Enrique Kucera (Comte d'Urgell 171, 08036 Barcelonia, Spain) and *Ikon Mining and Exploration* (P.O. Box 602, Fallbrook, CA 92028).

There has been another small find of the fabulous ludlamite crystals from the 13 level of the San Antonio mine, Santa Eulalia, Chihuahua. Groups of centimeter-sized crystals were available from Peter Megaw at the Tucson show. Peter also has come up with some more very good natanite from the El Potosi mine in Santa Eulalia. The mineral occurs as golden yellow to brown cuboctahedra to 2 mm in a pyrrhotite-galena-rhodochrosite assemblage. In other specimens, helvite tetrahedra (to 2 mm), rounded, black, velvety cuboctahedral crystals of jacobsite (to 2 mm) and colorless cubo-hexoctahedral fluorite crystals (to 3 mm) have been found. Perhaps the most interesting new material Peter had, however, is what is probably the world's largest jarosite crystals. These occur as 1–2 cm (!) murky red-brown individuals in cavities in a limonitic gossan-like matrix. They are from an undisclosed locality in southeastern Chihuahua.

MOROCCO

The Touissit mine has not been much in the news in recent years. Alain Carion of Paris reported that some new specimens of the chemically treated "orange" anglesites to 8 cm appeared at the Saint-Marie-aux-Mines show. A few pale yellow anglesites (to 15 cm) were also seen. A few of the naturally red-orange prismatic anglesite crystals (to 4 cm) also appeared at the Paris show. Azurites were also seen at the Paris show, and were available in crystals to 2 cm, and clusters, sometimes associated with curved, gray-green rhombs of smithsonite to several millimeters. Large, flawless, tabular, colorless barite crystals up to 20 cm, occasionally as scepters, were found at M'hrit, in the Middle Atlas Mountains; and the El Hamman mine, Fez, continues to produce pastel, apple-green to purple cubes of fluorite up to 10 cm on and coated by drusy quartz.

NAMIBIA

Charles Key was fortunate to acquire some very rare minerals in fine crystals from the Tsumeb mine last summer. These were reportedly found on the 4400-level and include crystals of leiteite up to 4 cm and reinerite to 1 cm! Lustrous, golden yellow, prismatic crystals of legrandite up to 3 cm and some unusual milky white adamite were also found. In addition to these minerals some small, but attractive, native silver specimens were also recovered. Clive Queit (Box 1014, Fourways 2055, Sandton, Johannesburg, Republic of South Africa) also had a good selection of unusual Tsumeb material at Tucson, including some very attractive brochantite, beudantite with cuprian adamite, and bright red crystals of cuprite. Don and Gloria Olson (P.O. Box 858, Bonsall, CA 92003) also had a good selection of this material.

The Chouti mine is a relatively new mine near Tsumeb. While it is still in the exploration and development stages it has already produced a few good specimens of duftite and malachite pseudomorphs after azurite up to 3 cm from its oxide zone.

Also new from Namibia are some attractive, curved crystals of lepidolite on albite from the Otjua mine near Karibib. The locality has been famous for the milky green tourmaline with black caps, often in jackstraw clusters (to 30 cm) with individual crystals to 2 x 8 cm, and continued production has been rewarding. Additionally, blue and lilac-purple color-zoned fluorapatite crystals to 4 cm on albite have been found. Bryan Lees is now an agent for specimens from the mine.

NEPAL

Chris Wright (*Wright's Rock Shop*, Rt. 4, Box 462, Hot Springs, AR 71913) had an interesting lot of corundum crystals available at the Denver show. The crystals are typically barrel shaped, pink to red in color, and are associated with reddish brown phlogopite in a marble matrix. The locality is given as the Chumar mine, Ganesh, Himal, Nepal.

NIGERIA

Over the past few years there has been a slow but steady stream of specimens from the pegmatites near Jos. This year's highlight has been the availability of some new emerald crystals from Bauchi. The best of these are of good color with lustrous faces. Crystals to 15 cm have been recovered, though the smaller ones tend to be of better quality. Specimens are available from Frank and Wendy Melanson (*Hawthorneden*) and Hans-Jürgen Henn (Mainzer Str. 60, D-6580 Idar-Oberstein 2, Germany).

NORWAY

Jim McGlasson (*Collector's Stope*) had specimens of a new paramorph of zirconolite, zirconolite-30Å, from Agnes Sandefjord, Vestfold, available at the Tucson show. (As an aside, a number of mineralogists feel we will probably see more paramorphs approved as species as crystallographic work becomes more accurate and routine in the future).

Torgeir Garmo (*Fossheim Steinsenter*, N-2686 Lom, Norway) reports there have been a number of interesting recent finds made in Norway. A number of large calcite vugs have been encountered in a limestone quarry near Kjørholt, Porsgrund, but the quarry owners forbid collecting, so it is difficult to know the potential of the occurrence. This is particularly sad, since it is felt by some that these may be among the best calcites ever found in Norway!

Sharp, lustrous crystals of black hornblende to 3 cm have been collected at Skarregergbukta, on Seiland Island, Alta, in northern Norway. This locality has been known since the turn of the century, and is perhaps most famous for its large peristerite crystals. Other minerals from the location include biotite, apatite, zircon and probably scapolite. On the neighboring island of Sørøya, and belonging to the same alkaline complex, a new layered deposit of sodalite and feldspar has been discovered and may come into production. The collecting potential at this locality is still unknown, but it is rumored that some of the blue sodalite may be of gem grade.

New deposits of thulite, the official gemstone of Norway, are recorded each year. Most are typically small, but last year 4,500-meter long thulite-bearing horizon was found at Nordli, Nord-Trøndelag. Currently, only a few specimens are available, with associated tremolite and piemontite. On the island of Smøla and Hitra outside of Trøndelag, several good localities for analcime have been recorded. The crystals, which occur up to 1 cm, may be associated with reddish stilbite, making attractive specimens.

On another island outside of Kristiansund (the exact locality is presently unknown) a 200-meter long horizon of fuschite was found in a precambrian gneiss. Sharp, blue, partially translucent crystals of kyanite and minor pyrite occur in the fuschite. This material is extremely colorful, and is currently relatively abundant on the Norwegian market. During construction of tunnels and roads to connect Kristiansund with the mainland, a number of mineralized vugs and fissures have been encountered. Good specimens of calcite, pale amethyst-colored quartz showing sceptered growth, smoky quartz and feldspar crystal groups (to 3 kg), excellent apophyllite crystals to 1.5 cm, muscovite and chlorite have been found.

In the Langesund area, rare species continue to be collected in the larvikite quarries. Some of the recent finds include senaite, gaidonnayite, hochelagaite, hingganite-(Y), hambergite, chiavennite and diaspore (see also articles by Werner, *Mineral News*, vol. 7, no. 6, and vol. 8, no. 1). Blue crystals of bazzite (to 2 cm) have been found in small quartz veins in Tørdal, Telemark, sometimes associated with white tufts of bavenite.

Quartz in a wide variety of habits keeps coming from a number of old and new localities. Water-clear Dauphiné-twinned crystals to 14 cm have been collected at a (now closed) locality near Hattfjelldal, Nordland, and some good crystals colored red by hematite on yellow prehnite were found near Namdalen, where another pocket yielded some unusual smoky crystals with unusual striations. A 10-cubic-meter clay-filled pocket (cave?) found in a new roadcut near Tinnoset, Telemark, yielded numerous doubly terminated, dull white crystals of quartz to several kilograms. Vugs are relatively common in the area, and sometimes produce good phantom crystals, occasionally with hematite.

Elsewhere, some very good titanite crystals were found near Fauske. The crystals, which are typically covered with chlorite, occur up to 7.4 cm. Titanite has also recently been collected as brown crystals in orange calcite from Øyna, Froland.

PAKISTAN

While certainly not a rare species, ilmenite in collector-quality crystals is not commonly encountered. Dudley Blauwet (*Mountain Minerals International*) recently obtained some exceptionally fine crystals of ilmenite and titanite from a new find near Tormiq (above Baghicha), along the Gilgit-Skardu road in the Northern Areas, Pakistan. The crystals, which average 1 to 2 cm, are extremely lustrous and have the general appearance of a Swiss *eisenrose*. In early January, Dudley was fortunate to obtain some of the finest fluorite specimens ever to have come out of Pakistan. The specimens occur as both pink and green octahedral and dodecahedal crystals associated with apatite and aquamarine.

William Pinch recently obtained a rather nice topaz specimen from Dassu, north of Skardu, covered with platy white crystals of the rare mineral viitaniemiite over a centimeter in length! It is perhaps the finest viitaniemiite in existence. In addition, Bill also recently acquired a fine 6.5-cm, prismatic, twinned crystal of aragonite from Stak Nala, near Skardu.

PERU

Christophe Dubois has recently acquired some interesting iridescent acicular crystals of aikinite in sub-parallel groups to several cm from Huancavelica. Crude tetrahedrite-tennantite and chalcopyrite crystals are associated.

ROMANIA

The Cavnic mine near Cavnic, Maramures, regularly produces new specimens of interest to collectors. Recently some extraordinary complete balls of white calcite up to 8 cm have been found. Some are covered with curved rhombs of 1-cm calcite crystals that may have included acicular crystals of berthierite, which give rise to black and white combinations of crystals on individual specimens.

SOUTH AFRICA

In the December 1991 issue of *Mineral News*, Bruce Cairncross reports there has been a large find of quartz with ajoite inclusions at the Messina copper mine, in addition to recent finds of very fine hausmannite, caryopilite and inesite at the N'Chwaning mine in the Kuruman district. William Pinch reports that there have also been some very good leucophoenicite and superb afwillite crystals available. The leucophoenicite forms blocky light brown crystals 2–3 mm across in crusts to several centimeters. The afwillite occurs as clear to white, terminated, prismatic crystals to 1 cm. Mike Haritos (*S.T.D. Mineral Company*, 22 Spring Hill Rd., Hyde Park, MA 02136) has continued to obtain excellent xonotlite, charlesite and hematite specimens from the district, and at the Tucson show Clive Queit had good specimens of portlandite (crystals to 3 cm!), jouravskite and gageite from the N'Chwaning mine, and orlymanite with inesite from the Wessels mine, in addition to some interesting colorless barite specimens from Kimberly.

SPAIN

Jose Chaver (Breton de Los Herreros 11, Madrid 3, Spain), one of the principal exporters of Spanish pyrite specimens, has recently come up with crystals of an atypical habit for Spain. The new crystals are cubes with deeply striated, cathedral-like octahedral modifications, and come from La Rioja Mountains, Navajun, near the Ambassaguas area of Muro das Aquas.

There has also been a new find of clear, cubic fluorite crystals to 2 cm with small octahedral faces from Austurias. The Villabona mine near Oviedo, Austurias, continues to produce good cubic crystals of yellow fluorite to 2 cm, with short tabular blue barite crystals to 5 cm. Several stalactites of blue barite crystals (to 15 cm) were found this past collecting season.

SWEDEN

The genesis of an unusual assemblage of phosphate minerals is discussed in a recent paper by Ek and Nysten (*Geologiska Föreningens i Stockholm Förhandlingar*, **112**, Pt. 1, 9-18). Intergrown masses of trolleite, scorzalite, augelite, gatumbaite, berlinite, burangaite, wicksite and other species are believed to have formed in fractures at the Hålsjöberg, Värmland, and Hökensäs, Västergötland, kyanite deposits as the result of tectonically activated hydrothermal processes. Specimens of this material were available in Tucson from Peter Lyckberg (Box 310042, S-40308 Gothenburg, Sweden).

SWITZERLAND

The superb, tabular, lustrous gray-black hematite crystals reportedly found during the fall of 1990 from Val Cavradi, Disentis-Munster, Graubunden, were seen for the first time at the 1991 Münich show. The finest piece consists of a 30-cm matrix of quartz with crystals to 15 cm, nicely covered by a few crystals of hematite to 6 cm.

TANZANIA

It has been a number of years since many notable specimens of the ruby corundum in zoisite from Arusha have appeared on the market, but some of the best ever were to be seen in Alfredo Ferri's room at the Desert Inn in Tucson last February (*I Sassi di Alfredo Ferri*, Via Guido d'Arezzo II, 20145 Milano, Italy). Deep red crystals to 30 cm along with some excellent carvings made for a very impressive and colorful exhibit.

ZAIRE

Gilbert Gauthier (7 Ave. Alexandra III, Maisons-Laffitte 78600, France) and Eddy Musche of Antwerp, Belgium, had a number of large diamond crystals from the Bakwanga district at last year's Tucson show. The selection included relatively sharp, gray cubic crystals to 1.3 cm and "clusters" to 4 cm, rough, orange-brown cubes to 2 cm, and a variety of smaller specimens in assorted colors and crystal habits.

Despite the relatively unsettled political situation in Zaire, and hard economic times, the Mashamba West mine continued operation, and some outstanding reddish black cuprite crystals (to 4 cm) were found on a matrix of chrysocolla, malachite and plancheite. Outstanding blocky, curved crystals of malachite to 8 cm were also found. These were available from Gilbert Gauthier and a few others. A similar find was made about ten years ago, and the specimens have to rank as the world's largest crystals for the species. The malachite is occasionally associated with transparent, amber-colored nail-head calcite crystals to 2 cm. Plancheite was also recently found in a slightly new habit, forming silky blue balls to 1 cm, looking somewhat like "pale blue okenite." A few are associated with cuprite.

ZAMBIA

Sceptered crystals of amethyst have been found in Zambia, approximately 13 km west of Balachardra, Malawi. The crystals average 2 to 3 cm in length and have clear purple tips. Specimens are available from Tom Wolfe Minerals (P.O. Box 9791, Fountain Valley, CA 92728-9791).

Part IV: Extraterrestrial

While not previously covered in this column, the existence of a few meteorite dealers who carry a reasonable assortment should be noted. Don't forget that meteorites carry some of the rarest minerals known, and some species are only found in meteorites, though to locate and identify such minerals is usually exhaustive and expensive. Some of the dealers carrying meteorites at the various Tucson shows last February included *Lang's Fossils and Meteorites* (326 Manor Ave., Crawford, NJ 07016), Jay Buscio (*Dry Creek Minerals*, 9900 E. Charlito Dr., Rancho Cordova, CA 95670) and *Cureton Mineral Company* in the Executive Inn; Robert Haag (P.O. Box 27527, Tucson, AZ 85726) in the Desert Inn; Blaine Reed (907 County Road 207 #17, Durango, CO 81301) in the Pueblo Inn; and *Mineralogical Research Company* in the main show at the Community Center.

Part V: What's New in Gemstones

While it is generally not the primary purpose of this report to focus on gems or lapidary materials, it is difficult not to take note of some of the exceptional and rare gemstones being offered at most of the major mineral shows by Art Grant, John Bradshaw and Mike Gray (Coast to Coast: Art Grant, P.O. Box 188, Martville, NY 13111; John Bradshaw, P.O. Box 7467, Nashua, NH 03060; Michael Gray, P.O. Box 1110, Venice, CA 90294). The combined talent of these faceters is unparalleled, and it is a real eye-opener just to see what can be faceted! Art, especially, has been devoting much of his time to cutting rare stones such as remondite-(Ce), carletonite, pectolite, serandite, leucophanite, cryolite, villiaumite, and shortite from Mont Saint-Hilaire, Québec; hemimorphite from Santa Eulalia, Chihuahua, Mexico; struvite, mellite and kainite from Germany; and gorgeyite from Kazakhstan. Have you ever seen a faceted nahcolite from Colorado, wollastonite from Asbestos, Québec, kröhnkite from Chuquicamata, Chile, virgilite in volcanic glass from Peru, preobrazhenskite, reedmergnerite or stillwellite? How about a faceted kämmererite from Turkey? No? Well stop in Coast to Coast's room the next time you have the opportunity for an instant education in rare gemstones. We guarantee you will not be disappointed!

RECENT SHOWS, etc.

Cincinnati Show 1992

The 1992 Cincinnati Show was held May 2–3 at the Cincinnati Gardens Convention Center. This friendly, enjoyable show is considered by many to be a hold-over from the 1960's and 1970's when high-quality, excellently managed local shows were more common than they are today. The fine facilities, the number of high-quality specimens for sale, the enthusiastic mineral-oriented sponsoring organization and the relaxed atmosphere, as well as the exceptional quality of the competitive and non-competitive displays, all combine to make this show such a pleasure to attend. A number of the thumbnail exhibits were comparable to anything one might see at Tucson or Denver.

Neil and Chris Pfaff (*M. Phantom Minerals*, P.O. Box 12011, Columbus, OH 43212) are the sole retail source for a new find of peridot-green sphalerite crystals from the well-known Thomasville Stone and Lime Company quarry #1 in Thomasville, York County, Pennsylvania. The discovery was made by Bryon Brookmyer and Steve Myers (a quarry employee); they removed approximately 150 specimens from the upper portion of a 15 x 30 x 100-cm pocket in the quarry wall. Most specimens are thumbnail-size loose crystals, but a few thumbnails and miniatures with white dolomite crystal matrix were also recovered. The crystals are complexly twinned and intergrown in groups up to 4 cm, and show fine green color without the necessity of backlighting. The largest euhedral crystal found measures 1.5 cm across, and is on matrix. The thumbnails offered at the Cincinnati Show were mostly in the 6 to 10-mm range and sold briskly for $25 to $100.

Bryan and Kathryn Lees (*Collector's Edge*), had just arrived back from a trip to the former Soviet Union, bringing a substantial quantity of new material including the following: Bertrandite from Kounrad, Kazachstan, was available in thumbnail to small cabinet size specimens associated with rhodochrosite and aquamarine. The best of these is a bright white, 2-cm radiating fan of crystals on rhodochrosite and calcite matrix. Most of the 18 specimens in the lot are larger than miniature size. Ilvaite was also available, in 36 exceptional pieces from Dalnegorsk, Primorskij Kraj, Russia. The lustrous black crystals, measuring up to 3.8 cm, occur with colorless quartz crystals; the best of the lot sold for $150. Stellerite specimens from Sokolovska-Sarbaisk were present in limited numbers, as pale chocolate-brown, lustrous, spherical aggregates to 2.5 cm in diameter. Datolite has also been coming from Dalnegorsk over the last few years. These are found in an open pit quarry, as partially transparent, lustrous green crystals to 10 cm in complexly intergrown groups similar to specimens from Charcas, Mexico. The matrix is andradite. A few dozen specimens were in Bryan's latest lot. Another exciting Russian species being offered was eudialyte, in 1.2 to 2.5-cm crystals from Chibine on the Kola Peninsula. The sharp, opaque, red-brown eudialyte crystals occur on pale tan feldspar with minute acicular aegirine crystals. A dozen good specimens were brought out.

Other noteworthy specimens seen around the show include 15 thumbnails of brilliantly lustrous chalcocite crystals from Cornwall, England (M. Phantom Minerals bought the lot for resale); some brilliant calcite crystals with dark purple fluorite from Cave-in-Rock, Illinois; a superb Brazilian rose quartz thumbnail consisting of a complete 360° fan encircling a smoky quartz crystal; a beautiful group of clear quartz crystals on purple sugilite from Wessel's mine in South Africa; and an exceptional golden calcite miniature with adamantine luster, from the Mashamba West mine in Zaire.

All in all, the show was a fine opportunity to make new acquisitions, see beautiful displays and old friends. Any serious collector within a day's drive should consider the show a must in 1993.

Tom Gressman

Tsumeb News

Julius Zweibel (*Mineral Kingdom*), long-time dealer in Tsumeb minerals, returned recently from Namibia with a copy of the April 11th *Windhoek Advertiser*. Following is a summary of the latest news regarding the Tsumeb mine.

Tony de Beer, the newly appointed General Manager of Tsumeb Corporation Ltd., has confirmed that 1994 will be the final year of operation for the historic Tsumeb mine. Drilling and remote sensing tests conducted on the ore pipe below the lowest working level have revealed the presence of additional ore pockets, however, and these will be mined in 1994.

The Tsumeb Corporation Ltd. also operates the nearby Kombat mine, and has opened a new operation called the Tschudi mine 26 km northwest of Tsumeb. Concentrates are already being produced from the new site. Several other prospects in the area are under investigation.

Costa Mesa Show

The first annual Costa Mesa, California, Show was held on May 15–17, 1992. A new concept in mineral shows, there were no speakers, no special displays, exhibits or demonstrations. It was strictly a dealer show. The only "extras" were a benefit auction held to raise money for the California Mineral and Mining Museum in Mariposa and a post-show lark to Disneyland by about twenty of the dealers, a real treat for them.

The auction was all that was needed for entertainment! It was as rambunctious as the Tucson *Mineralogical Record* auctions of yore. Bidders bid against themselves. Friendly rivals refused to relinquish lots. Lots were bought and offered a second time. Bidding was spirited, sometimes downright silly, but all together fun! The effort raised over $3,000 for the museum.

For the first show, attendance was quite remarkable, exceeding 3,400. The show was held in a new geographic area, and solid advertising proved that a new area can be breached; fully one third of the attendees had never been to a show before! Held in the Holiday Inn at the confluence of Interstates 55 and 405, the show was very accessible to Orange County residents. The Holiday Inn is also next door to the John Wayne Airport.

The show consisted of some 65 dealers in rooms, ten of them retailing in a small ballroom. A second ballroom housed a handful of wholesalers to round out the dealer cadre.

Every good show attracts new minerals and this one was no exception. *Valadares Minerals,* from Brazil, had a very large selection of fine, opaque white calcites from the amethyst geode area of Rio Grande do Sul. The modified scalenohedral crystals are up to 10 cm or more in length, in miniature to cabinet-sized groups, and priced reasonably.

Several dealers had a fine selection of the new flos ferri-like white carbonate offered as calcite but looking very much like aragonite. Twisting, tapering crystalline coralloidal spelotherm growths were offered in small cabinet to large museum-sized specimens. Most show a subdued luster but a few are coated with a sparkling sugar-like druse that makes them more attractive. Perhaps the better pieces are the large, twisting groups on matrix which one dealer described as looking like the head of Medussa! This material is from the Santa Eulalia area, Chihuahua, Mexico.

There was a plethora of Russian specimens in evidence, a continuing sign of better days for collectors. Russian specimens offered by *Collector's Edge* included superb calcites, topazes, bertrandites, ilvaites, analcimes and sulfides.

The Russian calcites are tabular crystals to 25 cm, white and sharp. They are coming from an open pit mine in Dalnegorsk, Primorskij, Russia. (Keep in mind all Russian locality spellings are as difficult to translate as they are to find on a map!)

On the opposite side of the mountain from the calcite open pit locality is the Nicolai shaft of a sulfide deposit which is producing excellent metallic crystals regularly available. Fine 4-cm lustrous ilvaites also come from this locality.

The bertrandites are immense, 2.5-cm creamy white crystals from Conrad (Kounrad), Kazakhstan. These rare and exceptional crystals occur with rhodochrosite.

Collector's Edge also had huge analcimes for sale, the larger crystals measuring to 15 cm! These come from Tunguska, Thura, Siberian Russia. I did not see any of the choice 2.5-cm red eudyalites from the Kola Peninsula this dealer brought out recently. [See Cincinnati Show report above.]

Finally, *Collector's Edge* offered fine topaz crystals with smoky quartz from Scherlowwaja (Scherlovaya), Adun-Chelon (Tschlon), Transbaikal, Russia, a noted pegmatite mineral source.

Most spectacular of the offerings were several cabinet specimen axinites on matrix shown by *Kristalle*. The axinites are transparent, with typical axinite plum-brown color. Crystals are very sharp, most exceeding 2.5 cm on an edge. The crystals are artfully placed on the matrix of the cabinet specimens so each stands freely and distinctly. The axinites are said to be from 60 km south of Narodnaja, Polar Urals, Russia.

John Seibel offered the finest selection of red beryls from the Violet mine, Utah, I've ever seen on one dealer's table. Some two dozen specimens of rich red crystals, loose and on matrix, astounded visitors. Several of the crystals exceeded 2.5 cm in length and the best specimen had a pair of 2.5-cm crystals jutting from it.

Not new but certainly worth noting were several other species. Benny Fenn of Las Cruces, New Mexico, had a fine selection of water-clear exceedingly prismatic danburite crystal groups from San Luis Potosi, Mexico. Their length exceeds their width by a factor of at least ten.

Roberts Minerals had another batch of fine gemmy green uvites from Brumado, Bahia, Brazil. And there was a scattering of fine red cuprites on or coated with chrysocolla from Zaire. Again, these were not new species but new supplies of recent discoveries.

For the lapidary, a good assortment of gems and gem rough was available. Some of the very finest Mexican agates I've ever seen were offered by a couple of dealers.

Collectors of memorabilia and instruments were not forgotten. An excellent selection of paper, books, and brass instruments tempted every collector.

Dealers and visitors were very pleased, for the show was well attended. The promoter, Marty Zinn of Evergreen, Colorado, did a superb job of advertising and signage to assure maximum exposure. Zinn's reputation as a show promoter is well established. He runs the Colorado Mineral and Fossil Show in Denver in September; the East Coast Mineral and Fossil Show in Springfield each August; and the Executive Inn Show in Tucson each February.

The general feeling after the Show was that the Show exceeded expectations and future shows seems assured. The location is attractive, being next to an airport, near the beaches, Disneyland, Knott's Berry Farm, and with good restaurants and fine mall shopping close by. If dealer enthusiasm is any indication the show's future seems assured for over 85% of the dealers signed on for next year immediately after the show closed this year!

Bob Jones

MINERAL STORIES

Lawrence H. Conklin

A Field Trip in China

[Gene Foord, a geologist of our acquaintance, tells this story about a pre-meeting field trip that took place in conjunction with the 1990 general meeting of the International Mineralogical Association in Beijing, China.]

The Altai no. 3 pegmatite which our group of nine people was scheduled to visit is located way up near the borders with Kazakhstan and Mongolia. To get there, we boarded a jet plane in Beijing and flew (4.5 hours) to Urumqui, the capital of Xinjiang-Uygur Autonomous Region. From there it was a 1.5-hour prop plane flight to Koktokai and a final 45-minute drive to the mine area.

We were met there by the mine director, Liu Jia-Ming, and his staff. When we asked about the plans for visiting the mine, which produces lithium and Nb-Ta, he said, "Oh no . . . this is a *secret* mine!"

Since our arrangement with the IMA was that we would be allowed to collect specimens and take pictures at the mine, we informed him that we were declaring the field trip over, and that we expected a refund of our money. One of our party, had been part of the organization committee and knew what arrangements had been agreed upon. Furthermore, several people in our party, who had politely gone through the ceremony of exchanging business cards with Mr. Jia-Ming, elected to politely *return* his cards to him.

Well, it seems that the director had never had any of his cards returned to him like that before, and he was outraged. "That's it!" he said, "You are all under arrest and will be confined to your quarters until we decide what we are going to do with you." We were then returned to our quarters and remained in custody for three days. We were not allowed to radio or telephone Urumqui or Beijing to attempt to settle the misunderstanding. Finally, several of us managed to talk with the mine geologist (we used Russian as a common language), and I impressed upon him the notion that a serious diplomatic incident between our respective governments was brewing because of this detention. He went to Jia-Ming and, after some discussion, the doors finally opened up.

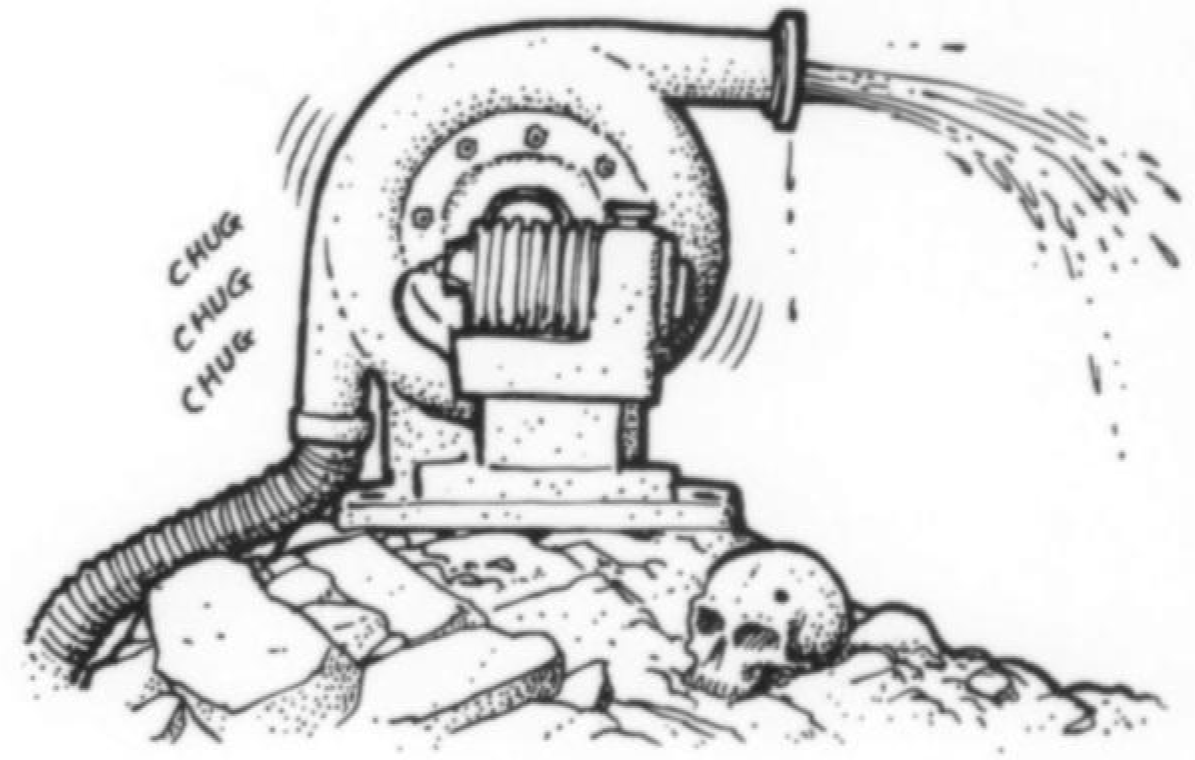
Apparently in an effort to undo some of the damage that had been done, Jia-Ming authorized a quick visit to the mine but we were *still* forbidden to collect any specimens or take long-distance photographs.

So, there I was, standing in the middle of a hundred-meter-long quartz-spodumene zone, with my hand actually *on* a spodumene crystal, and armed guards watching me carefully. I thought to myself, "I came half-way around the world to see this pegmatite and to collect samples, and I am going to take at least a few samples." So, I took the crystal and stuck it in my pocket. If the guards saw me, nothing was said. Several other members of our party also collected some samples.

Before we left, Jia-Ming said that he had a gift that he wanted us to take to the organizing committee in Beijing. He handed us a box and several members of our group started talking amongst themselves quietly. I asked what the problem was and was told that they were worried that it might be a bomb! They were worried that, because Jia-Ming had lost "face," he may have wanted to blow us out of the air over the middle of nowhere and then there would be no traces left or problems to develop. We said to open the package and it turned out that there was no bomb, and that it was a package of mineral specimens.

We boarded a plane and flew back to Urumqui, where the Governor, Liu Lu-Zhong, of Xinjiang-Uygur Autonomous Region expressed his sincere regrets to us over the incident and assured us that the problem would be taken care of. We then continued on to Beijing where our field trip fees were refunded. So, that was my trip to the Altai no. 3 pegmatite!

However, immediately *after* the IMA meeting had concluded, there was a post-meeting field trip by 24 people back to the same mine. The "misunderstanding" had been quickly taken care of. My schedule did not permit me to go, but those 24 people were given the royal treatment. They collected samples to their hearts' content, they took photographs, they had two full days in the pit, they were treated to a banquet, you name it. And all because *we* had "greased the skids" for them.



The Lavra da Ilha Pump

[The following story was provided by Richard A. Kosnar.]

Many years ago I used to travel regularly to Brazil, visiting the gem pegmatites and buying specimens from the garimpieros. Whenever a productive area was discovered, these itinerant miners would descend on the place in droves and work it intensively by primitive hand methods. Living below the poverty level, they could afford nothing more.

The Lavra da Ilha ("mine on the island") pegmatite was discovered around 1970, and was found to contain beautiful crystallized rose quartz, eosphorite and wardite. It also produced some new secondary phosphates including whiteite and zanazziite (first brought to the attention of mineralogists by the writer). Because it is located on a small, shallow island in the middle of the Jequitinhonha River, mining was a constant battle against water, and the workings were always becoming flooded even during the "dry season."

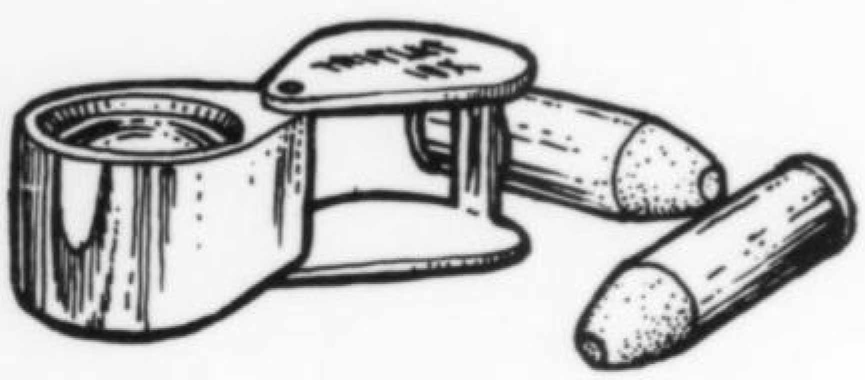
When I first visited the site in 1971 not long after its discovery, it was being worked diligently for specimens by the usual ragtag band of local Brazilian garimpieros. Although they generally wore little more than a diaper-like loin cloth, many also wore sidearms. Human life was sometimes not valued very highly in such remote areas. Arguments over mining rights were often settled with guns rather than lawyers (not unlike the American Wild West of the mid-1800's).

I was surprised to see that there was also an affluent German (he was either a German national or a German-Brazilian from southern Brazil) who had heard about the find and who had staked out a corner of the island to mine using hired labor. Having immediately noticed the water problem and the serious inefficiency it was causing, he had sent off to civilization for a fine, new, gasoline-powered water pump.

It was chugging away steadily, and I saw that his little portion of the diggings was now kept relatively dry, whereas the other pits were still partially flooded and were being laboriously bailed by rather sullen-looking garimpieros.

It was some months before I returned. Arriving at the island once again with my Brazilian partner, I heard the pump still chugging away as before. But it was now draining the other pits, and the German was nowhere to be seen.

"*Onde fica o Alemão?*" I asked ("Where is the German?"). "Dead," was the answer. His body had been found several kilometers down-river, riddled with bullets. Naturally the garimpieros had "inherited" the pump and the pit. I was told that the local officials had cynically dismissed the German's death as suicide . . . presumably the worst case they'd ever seen. Perhaps, in effect, that is what it had been. The German should have guessed that the life of an arrogant outsider would be worth far less than a new, gasoline-powered water pump.



Professional Courtesy

The year was 1956 or 1957, and my partner in the mineral and gem business at that time had just gotten an urgent request from Brazil for some antibiotics. We regularly imported minerals from Brazil, but this was a personal appeal and had nothing to do with our business. He turned to me with the request. One could not simply go out and purchase antibiotics over the counter, but I had many contacts with physician friends. So I got a good assortment together, managed to have it delivered promptly to Brazil, and forgot all about the incident.

Back then my business was located in a small amount of space within a diamond-cutting factory owned by my partner's father. Air-conditioning was scarce in those days, and the front door was left open in the warm months; but for security purposes, an iron cage door that opened only from the inside secured the premises during working hours.

What a shock it was for me, one day, to see someone outside the cage-door, shaking it violently and speaking incoherently (to me at least) in what might have been Brazilian Portuguese! I recall he was saying something like "Meeeeeester Laaaaaary," but I could not be sure. I *was* sure of the fact, however, that he was a menacing figure. He stood only about 5 feet 6 inches tall but seemed to be about that size in girth and looked very strong. His fingers, poking through the vibrating gate, looked to be all thumb-sized. This was a situation that had to be dealt with decisively . . . so I retreated and called my partner (whose Portuguese was fluent). He went to the door, with smiles of recognition for the stranger and amusement over my reaction to him. They spoke for a few seconds, and my partner turned and pointed to me. The next thing I knew, "Meeeeeester Laaaaaary" was in a fierce bear-hug and the visitor proved to be quite powerful as I had suspected.

It turned out that his child was the one who had needed the antibiotics months before, and I was credited with saving her life. Imagine that! My partner, acting as translator, then explained that the grateful father wanted to return the favor to me, many times over if I chose, but of course, within the scope of his field of expertise: a professional courtesy, as it were. I was then told that he was a *professional assassin* and that I could order the elimination of anyone I chose who traveled in Brazil! Within seconds I was out of there and refused to return to my office until I was assured, by telephone, that the man had left the premises permanently. Some professional courtesies are best declined. L.H.C.

Boodle Barrels

[The following note was provided by Patricia A. Barker.]

My favorite Boston Mineral Club meetings in the 1940's were those that concluded with an auction of minerals. Often the specimens to be sold came out of "Boodle Barrels." No one in the Club knew beforehand what minerals the barrels contained, because they were packed with whatever specimens were on hand at the shop of Fred "Boodle" Lane, a dealer in Galena, Kansas, at the time of the shipment.

Usually, we could count on huge dog-tooth calcites, great clusters of galena cubes and plates of chert sprinkled with ruby sphalerite and iridescent chalcopyrite, all from the Tri-State mining district. Often, these wonders would be mixed with glorious fluorite groups from Cave-in-Rock, Illinois, and barite roses from Oklahoma.

I recall, with some smugness even now, the night that my father and I (still neophytes at the game) bid up and won the very first specimen offered after the lid was pried off the first barrel. It was a lovely specimen of lavender fluorite crystals from Rosiclare. After I claimed my prize, several club members commented, condescendingly, that "there'll be plenty more of those fluorite specimens, and toward the end of the auction they'll go very cheap." But we had the last chuckle because our specimen was the only fluorite in the keg that night. The rest were all Tri-State minerals. Even today, admiring that "overpriced" fluorite specimen (the cost was $3.45!) and recalling all those gorgeous golden calcites, the radiant ruby sphalerites and gleaming galenas brings back the excitement and anticipation that was felt as the excelsior packing material was thrown aside and all those wonderful specimens emerged.

Several years later, while I was a geology student at the University of New Hampshire, my parents and I visited Boodle Lane and his pleasant wife Lois. She told us that the mine managers allowed Boodle to collect underground as sort of a consolation for his being stricken with lung and heart problems during his years as a miner.

The area around the Lane's shop was a marvel of mineral specimens laid out on old doors and tables and heaped into great pyramids. Its location on the infamous tourist-trap, Route 66, was superb! Just in case travelers were undecided about stopping at the Lane home or shop, Boodle had laid out "flower beds" of minerals near the highway, and they were certainly traffic-stoppers. Mainly composed of calcite points, but interspersed with galena, fluorite, barite roses and amethyst, those mineral "gardens" were quite a sight.

By prior arrangement accomplished through the mail, Boodle promised to take me down into a mine. They lent me a pair of Lois's boots,

Boodle Lane in a calcite cave in a lead-zinc mine near the Oklahoma-Kansas state line, at a depth of 400 feet (early 1940's).

an ancient jacket, and then they told me to push my hair up under the hard-hat, because women were considered bad luck in mines. It puzzled me, however, how I could possibly bring more poor luck to the Westside Eagle Picher mine at Baxter Springs, Kansas; for at that time the miners were shooting out the pillars in preparation for abandoning that section of the 100 or more miles of passageways that extended under Kansas, Oklahoma and Missouri.

I was thrilled with everything I saw underground. I was awed by the tremendous size of the rooms and their supporting pillars, and was delighted as our headlamps flashed off the ore in the walls. Once I crawled into a pocket of optical calcite just for the fun of being surrounded by the glittering crystals in that "Aladdin's cave." I collected several hunks of this calcite with its rounded rhombohedral faces and inclusions of marcasite. Another pocket contained golden calcite and red sphalerite on pink "saddle" dolomite. Boodle obliged me by tapping out a calcite crystal seven inches long.

The miners who were nearby joked with Boodle about saving the worthless stuff. They called the calcite "tiff," the dolomite "rice rock," the red sphalerite "ruby zinc," and their general name for marcasite or pyrite was "mundic" (an old Cornish term). I ignored their kidding as I tenderly wrapped my treasures in newspaper and put them into a burlap bag that Boodle had brought along for that purpose.

Back at the shop on Route 66 my parents and I purchased specimens from Boodle's bewildering array. A 10-inch group of chert "splinters" mended by one great calcite crystal and several smaller ones is still a favorite in my collection.

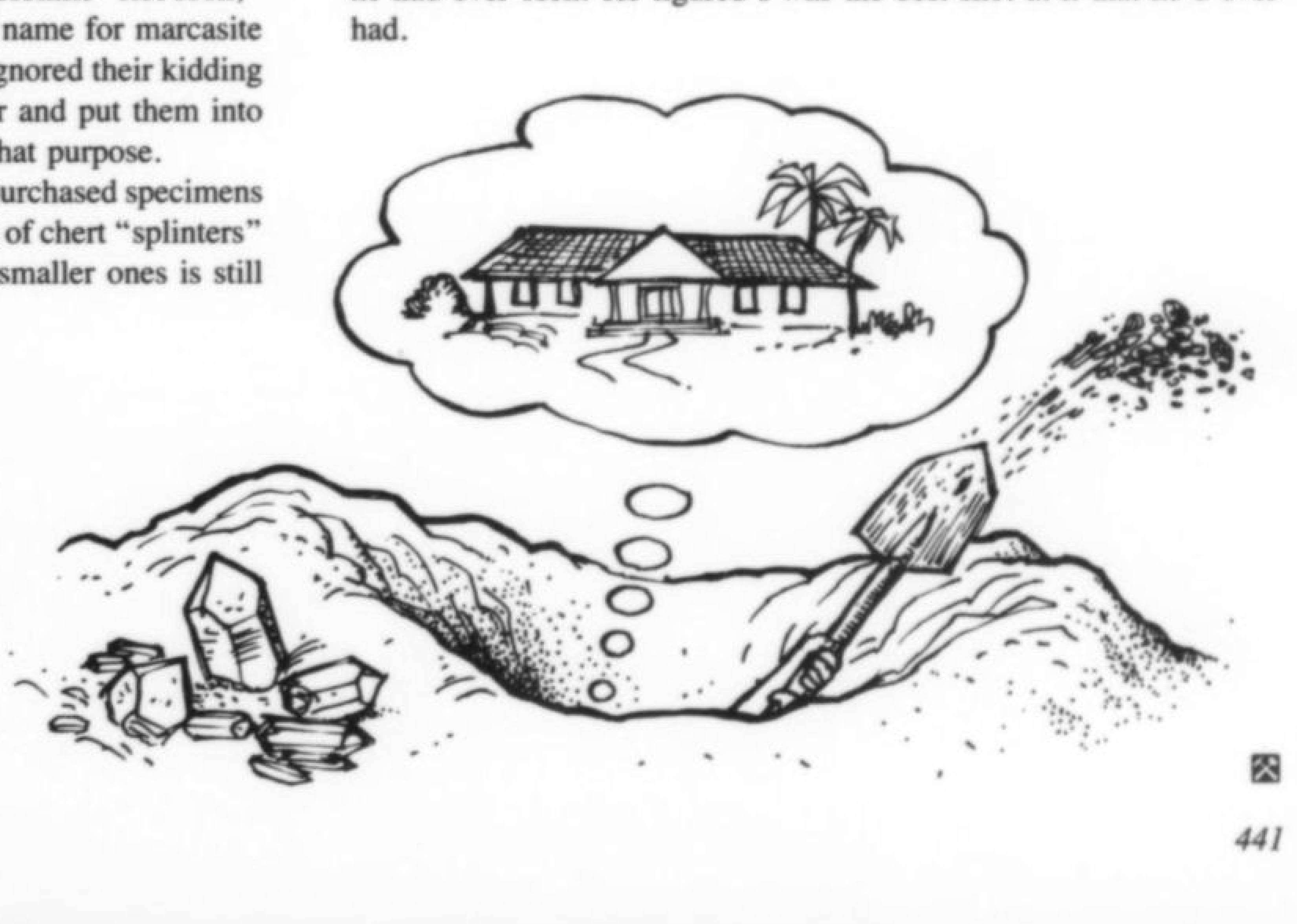
We watched, that day, while choice minerals, from miniature to cabinet size, were packed into the barrels for shipping. It was forty or more years ago that the Boodle Barrels gave so much pleasure to so many mineral collectors, while at the same time being used to raise funds for schools, clubs and museums all over the U.S.A.

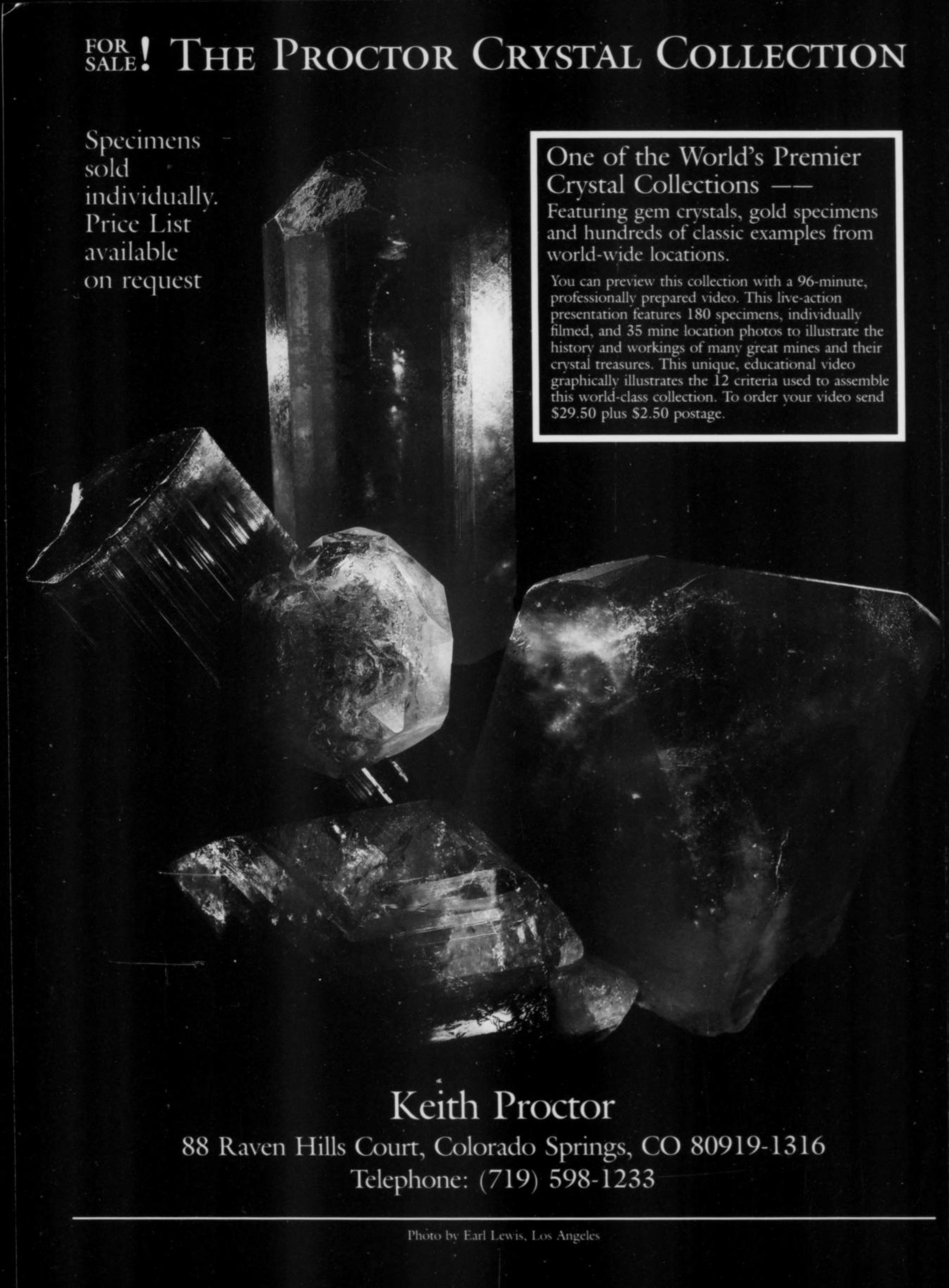
The Fazenda Complex

[The following story was provided by mineral dealer Rock H. Currier of Jewel Tunnel Imports.]

As a mineral dealer I travel extensively on buying trips to Peru, Brazil, India and southern Africa. The asking of immense prices by local natives at the most remote and least frequented localities I call the "fazenda complex," after an experience I had in Brazil.

There I was, finally standing by a hole in the ground 10,000 miles from home. I had driven for days to get there, and had done some walking as well. On the edge of the hole were about five pounds of dirty quartz crystals which might have brought $100 at home, retail. So I asked the guy in the hole, "How much?" He looks at me, my shoes, my car and the gold fillings in my teeth, and says, "$20,000 please." Bong! After making sure I'd heard him correctly, and getting over my initial surprise and irritation, I found out that he didn't even know how much a dollar was in the local currency. So I asked him, "Why not $40,000?" He replied that the *fazenda* (ranch) he had always dreamed of owning cost $20,000, and I was one of the few rich people he had ever seen. He figured I was the best shot at it that he'd ever had.

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Letters

NAVAJÚN PYRITE

Further to your article in the November-December 1989 issue ["Pyrite crystals from Soria and La Rioja provinces, Spain"]: The principal occurrence of fine cubic pyrite in the Navajún area was discovered in 1970 by Mr. Pedro Ansorena Garret, the father of the current operator. It was not given much importance at first because of its lack of what is traditionally considered to be "ore." Nevertheless, specimens gradually became known among collectors.

Because of growing interest worldwide in the pyrite specimens, some investigative work was carried out at the site in 1975. The results were very promising. In 1982, Pedro Ansorena Garret applied for and was granted a mining concession, and began serious exploration of the occurrence. This work was subsequently taken over by his son, Mr. Pedro Ansorena Conde, and is currently under the control of the Minas Victoria company formed by Pedro Ansorena Conde and Antonio Ros Vazquez.

During the course of mining, a small stope measuring roughly 4 by 7 meters was found, indicating that some early exploitation has taken place around 1850. Modern mining has involved both underground and surface workings, but currently is restricted to the opencast.

The locality, called the *Ampliacion a Victoria* mine (*Ampliacion* meaning "enlargement" or "extension") or, more simply, the Victoria mine, can be visited. Pyrite specimens can be purchased or collected personally for a reasonable fee. Contact *Minas Victoria*, asking for Pedro Ansorena or Antonio Ros, by calling 34-41-363382, 34-41-363571 or 34-41-177178.

Figure 1. **Entrance to the old underground workings at the Victoria mine near Navajún.**

Pedro Ansorena Conde
Navajún, Spain

Figure 2. **"Gold and Silver" pin. What is its origin?**

UNUSUAL PIN

Perhaps one of your readers could identify the brooch shown on the enclosed photograph. It belongs to an enquirer in Newquay, Cornwall, but nothing is known of its history. I assume it is South or Central American, rather than from Spain, and could well have been brought back to this country by a Cornish miner.

The supporters look to me rather like tin or gold streamers, remembering the rake illustrated in one of Agricola's drawings in *De Re Metallica*. However, the small object at the base of the cartouche immediately above the "Y" could be a plough.

The brooch is set on a copper pin 2.5 inches long. The brooch is gold (plated?) except for the river which is silver, and the star or moon at top right which is clear glassy. I was not able to test it to see if it was a diamond. The back is engraved "PATENT 1893."

I would be most grateful for any information you can give me.

R. D. Penhallurick
Senior Curator
Royal Cornwall Museum
River Street
Truro, Cornwall
England TR1 2SJ

MICHIGAN SILVER

As copper and silver collectors and former residents of Michigan, it was a special treat for us to read the latest issue (vol. 23, no. 2) of the *Mineralogical Record,* which is devoted to the Michigan Copper Country. We were pleased and surprised to discover that a photo of one of our specimens (Figure 96, page 64) appears in that issue. The specimen of silver (with copper associations) from the Wolverine mine, identified as having been in the collection of the late Don Pearce when the photo was taken, currently resides in our personal collection.

You may be interested in a bit of additional history. We acquired this fine specimen from Don at the Tucson Show in 1984. We met Don for the first time at that show, and we subsequently became good friends. According to one side of the label with this specimen, it came from the Centennial mine #2. But a note on the other side of the label states that it originally came from the collection of Frank Ross, who collected it "from the north side under the old Wolverine mine."

Keep up the good work!

Al and Sue Liebetrau
Kennewick, WA

GRAPHITE CRYSTALS

I'd like to add a note to John Jaszczak's interesting article on graphite crystals from the Crestmore quarry, Riverside County, California (vol. 22, no. 6). Ten years ago, as a university student in the United States, I collected at Slover Mountain, San Bernardino County, just across the county line from the Crestmore and Jensen quarries. This hill too consists of coarse-grained metamorphosed limestone, with brucite, but was ignored by collectors because of the absence of the contact-metamorphic and pegmatitic assemblages which made Crestmore and Jensen so famous. I have a few Slover Mountain specimens rich with graphite crystals very similar to some of those described by Jaszczak. They occur in white to dark gray anhedral calcite, associated sparsely with tiny bright green diopsides and light brown, rounded crystals of chondrodite or clinohumite. One unusual specimen has free-standing graphite crystals in vugs in massive, colorless to whitish quartz, with no calcite! Perhaps these particular graphite crystals formed originally in calcite which was then later replaced by quartz?

Alfred Petrov
Cochabamba, Bolivia

MAIL-ORDER WOES

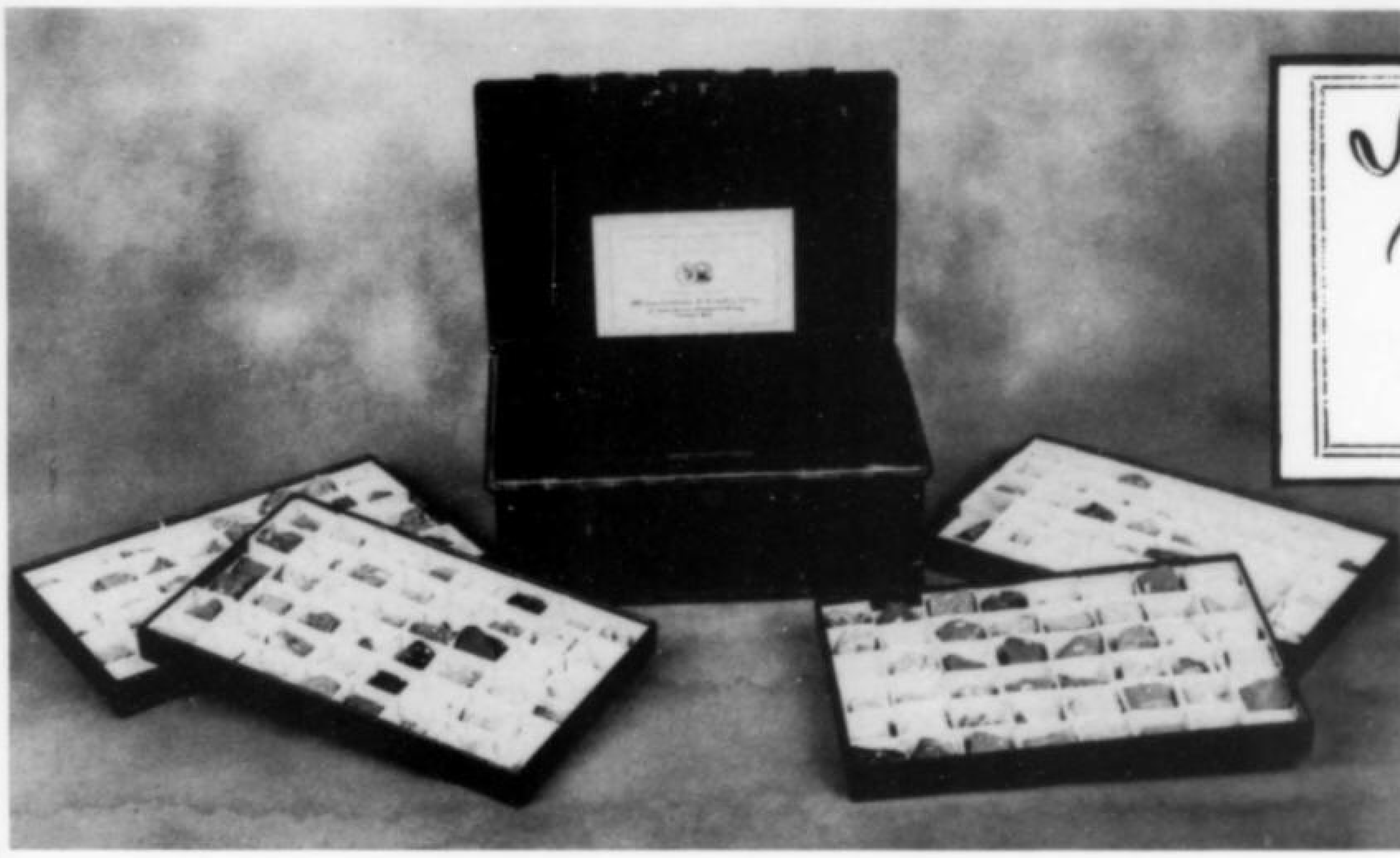
This is an open letter to all mineral collectors and dealers. Often we must put treasures of mineralogical rarity and interest in the trust of the U.S. Post Office, UPS, Federal Express or other common carriers. Mineral dealers, from experience, usually know how to protect and pack specimens to avoid damage, and most collectors are as capable, but often not as careful. One must consider that a mineral specimen has gone through the quite difficult process of creation, then erosion and tectonics that bring most minerals to the surface of the earth, and finally, discovery by miners. The process of mailing a specimen is quite easy compared to the previous existence.

But all too often, common sense is not used in packing a specimen. With bubble pack, plastic popcorn, tissue paper, and cardboard boxes easily available, there is no lack of proper packing materials. What causes damage in shipping is (1) movement inside a box, (2) insufficient size of packing containers (2" minimum should be allowed between contents and exterior), and (3) objects inside a container allowed to contact other objects enough to cause breakage.

Today I received a package with two very fine Canadian radioactive minerals, a 4" allanite tabular crystal, and a 1½" tapered, aesthetic fergusonite crystal with matrix at the base. The customer had been very inconsiderate in that he had the pieces for three months even though I had requested their return by phone, postcards, and letters. This customer is a scientific researcher at a very prestigious research center, but he obviously did not care that I needed the pieces back if he was not going to buy them. So I told him off and had to send invoices by certified mail with legal wording at the bottom. To make a long story short, he finally sent the pieces in a 2" thick box and I asked the postal carrier to witness the opening. Sure enough, the beautiful rare fergusonite was in four pieces.

When I went to the post office to claim damage, the clerk said that they would send the pieces to San Francisco, and the ultimate fate, the trash bin. I said that the piece could be glued and used still, and offered to buy the pieces just to donate, but the clerk was not educated enough to understand mineralogical rarity. And evidently, the highly paid research scientist did not care to protect the piece for posterity. So a mineral specimen is lost to the world because of the post office and a supposedly educated mineral collector. I will eventually be paid some money, minus certified mail fees, postage, phone calls, lost time, inability to sell my property to someone else, etc. I had been specific in asking the man to return the two specimens with good packing (radioactive minerals are usually more fragile than other metallic or oxide minerals due to structural degradation in the course of their lifetime).

But, thankfully, most of my customers return unneeded pieces in the same packing materials and manner (and within the right time period). To encourage the mineral trade, *and to preserve specimens of scientific value,* both dealers and collectors should prepare shipments with respect to the rarity, scientific in-



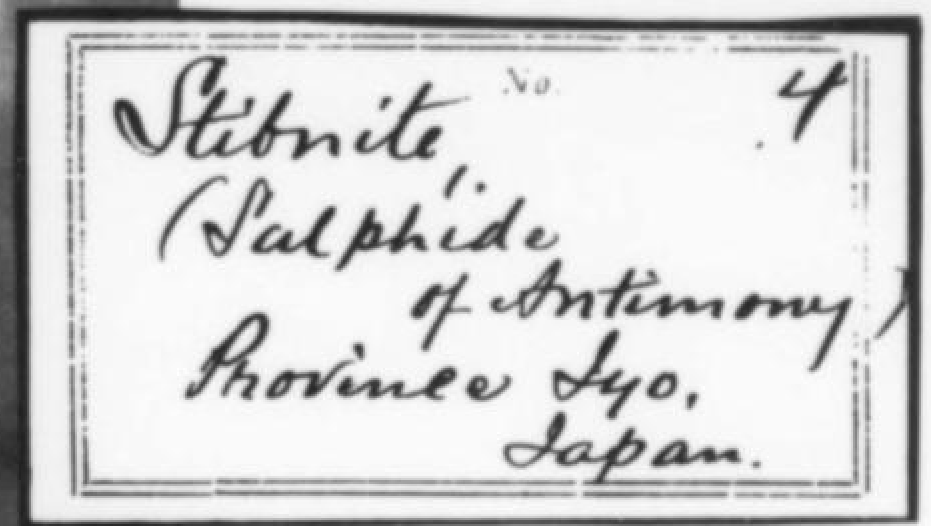
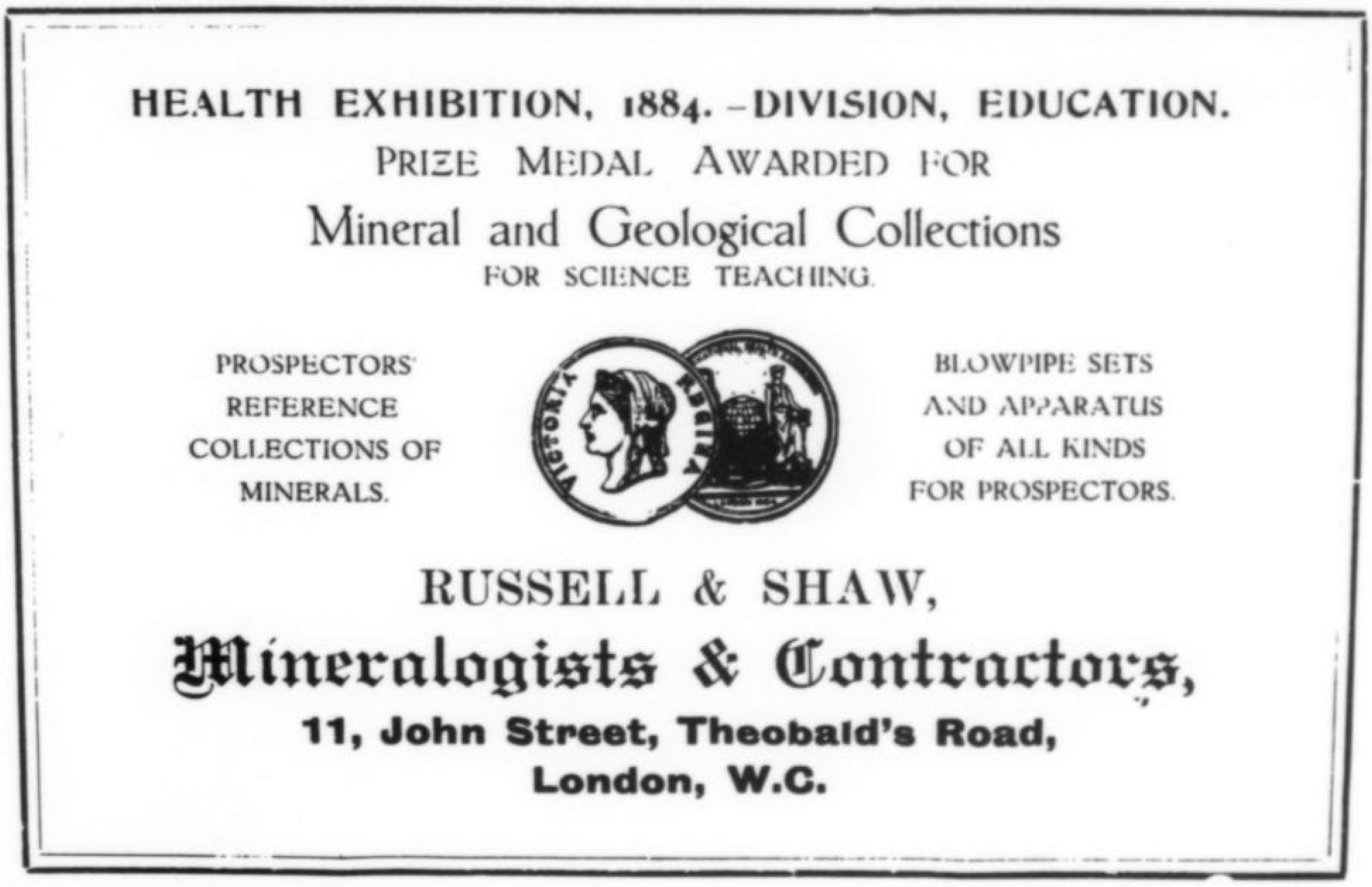


Figure 3. **Russell & Shaw mineral collection now at Rand Afrikaans University. Can anyone shed light on its history?**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formation, and beauty that mineral specimens have. They are not like disposable packaging for microwave food.

Jack Lowell
Tempe, Arizona

EARLY COLLECTION

Our department recently acquired an antique mineral collection and I would like to know if you or any of the *Mineralogical Record* readers can shed some light regarding its age, who the individual was who put the collection together (the labels are all in the same handwriting), and whether the company who originally marketed the collection still exists.

The specimens are housed in a hinged tin trunk 14 x 23 x 36 cm in size and contains 4 trays each holding 48 specimens, giving a total

↑

of 192 minerals. Although the individual specimens are unspectacular, there are many samples from old, classic and defunct mines and localities. Each mineral is in a cardboard box 2.5 x 3.5 x 4 cm, each specimen is numbered and each has its own label (see photo of labels). The collection apparently received an award in 1884 for a health exhibition (see photo of label from the inside of the trunk lid).

We appreciate any information about this collection.

Dr. Bruce Cairncross
Department of Geology
Rand Afrikaans University
P.O. Box 524
2000 Johannesburg
South Africa

"COBALTOAN CALCITE" = COBALTOAN DOLOMITE

Each avid collector seems to have a few favorite minerals, and in my case, one of my favorites is cobaltoan calcite. I have numerous specimens and recently acquired some sphaerocobaltite. Being a scientist and curious, I wondered if the amount of cobalt giving the vivid pink coloration was significant and if there was really any difference between what was labeled as cobaltoan calcite and sphaerocobaltite, since they both looked very similar. I subjected a number of samples, all reportedly from Zaire, that I had obtained from numerous vendors to EDX analysis in the scanning electron microscope. To my surprise, all but one specimen contained more Mg than Ca. Co was either not detected, appeared as a trace, or was present in measurable amounts. It is quite ap-

Table 1. **EDX analyses (ZAF corrections) of various "cobaltoan calcites," dolomite and rhodochrosite.**

Sample	Vendor	Source	Specimen Description	Cations, atom %					
				Mg	Ca	Co	Mn	Fe	Si
1	A	unknown mine, Zaire	brilliant pink crystals about 4–6 mm in size	50.2	49.8	trace	—	—	—
				46.0	54.0	trace	—	—	—
				64.6	35.4	trace	—	—	—
				59.0	35.4	1.4	—	—	4.2
				55.2	42.1	2.7	—	—	—
2	A	unknown mine, Zaire	dark, pink-burgundy crystals about 1–3 mm in size	54.5	45.5	n.d.	—	—	—
3	B	Kamoto Mine, Zaire	brilliant pink crystals about 1–2 mm in size	58.1	41.9	n.d.	—	—	—
4	B	Kamoto Mine, Zaire	large, rhomb, single crystal with cleavage facets; brilliant pink about 3 x 4 x 8 cm	n.d.	100.0	n.d.	—	—	—
5	B	Kamoto Mine, Zaire	botryoidal druse (hillocks 5–7 mm) with mini facets; some malachite balls	56.5	37.8	5.7	—	—	—
6	C	unknown mine, Zaire	magenta druse with facets and malachite balls	53.5	46.5	trace	—	—	—
7	D	unknown mine, Zaire	brilliant pink, "botryoidal" druse with 2–3 mm rhombs.	56.0	41.1	2.9	—	—	—
				62.8	37.2	n.d.	—	—	—
8	E	unknown mine, Zaire	pink-purple crystals about 10 mm in size, cleaved appearance	64.6	35.4	n.d.	—	—	—
9	F	Gunanjuato, Mexico	"dolomite"—light beige-pink rhomb. crystals about 6–12 mm	36.5	62.0	n.d.	—	1.5	—
				42.6	55.6	n.d.	—	1.8	—
10	G	Santa Rita, Peru	"rhodochrosite"—medium pink crystals about 4–7 mm, rhomb. form	8.7	—	n.d.	91.3	—	—
				8.2	—	n.d.	91.8	—	—

parent that these samples have been misnamed; they are cobaltoan dolomite. The one exception was a large (3 x 4 x 8 cm) single crystal having numerous cleaved areas and a pseudorhombohedral shape. No Mg was detected, and thus this piece clearly is cobaltoan calcite.

A summary of EDX analyses is given in Table 1. ZAF corrections were made in situ in the SEM/EDX unit; no standards were used. The lower limit of detection of Co is probably about 0.5 atom %, depending upon takeoff angle, excitation voltage (20 KV), distance, etc. The accuracy of the other elements is probably about ± 0.5 - 1 atom %. Regardless of the accuracy, there is no denying that the amount of Mg is greater than the amount of Ca, and these do indeed correspond to dolomite. For comparative purposes, analyses are included also for dolomite and rhodochrosite. Because neither C nor O are detected by EDX, results are given as atom % of the detectable cations. It is ironic that the dolomite contains more Ca than Mg, but the "calcites" have more Mg than Ca. Even the rhodochrosite contained Mg (about 8 atom %).

It should be noted that the samples are quite heterogeneous, as seen from those having multiple analyses taken at various locations on a given sample. Values are not average values in any sense of the word, but rather they simply represent the results obtained from a given spot.

The misnomer reported herein, unfortunately, is not an isolated case. I have found that this occurs all too frequently, as I am sure others have found also.

Prof. D. L. Douglass
Dept. of Materials Science and Engineering
405 Hilgard Avenue
University of California
Los Angeles, CA 90024-1595

BROOKITE MYSTERY

While laying out the article in this issue by Roy Starkey and George Robinson on the Prenteg brookite locality (see p. 391–401), I was reminded of a postage stamp from Monaco

which pictures two beautiful brookite crystals on white quartz. The stamp does not give the locality for the specimen, but it certainly looks like it *could* be from Prenteg. Does anyone know the story behind the Monaco micromineral stamps, where the actual specimens are, and what localities they came from?

The Editor

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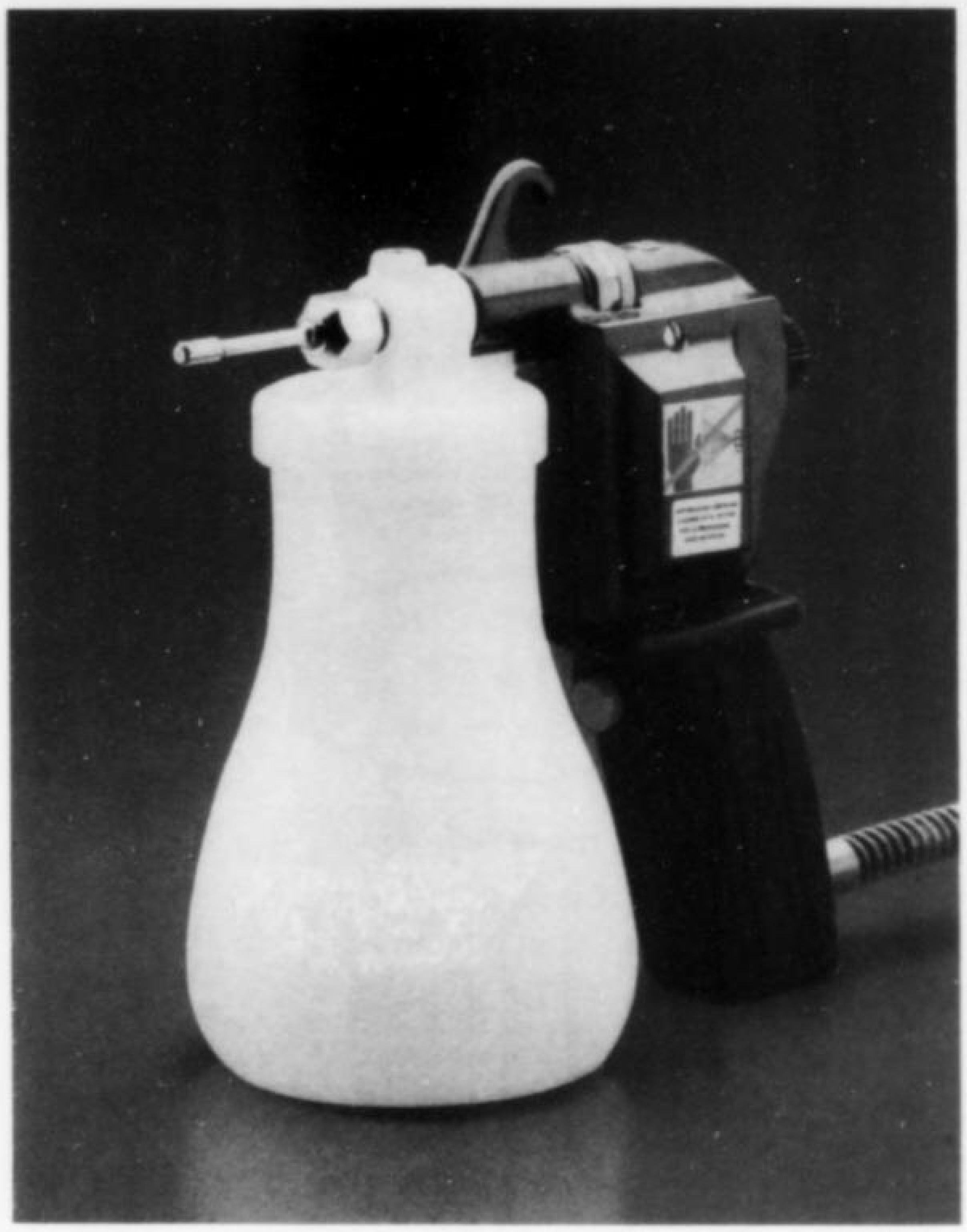

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