the Mineralogical Record

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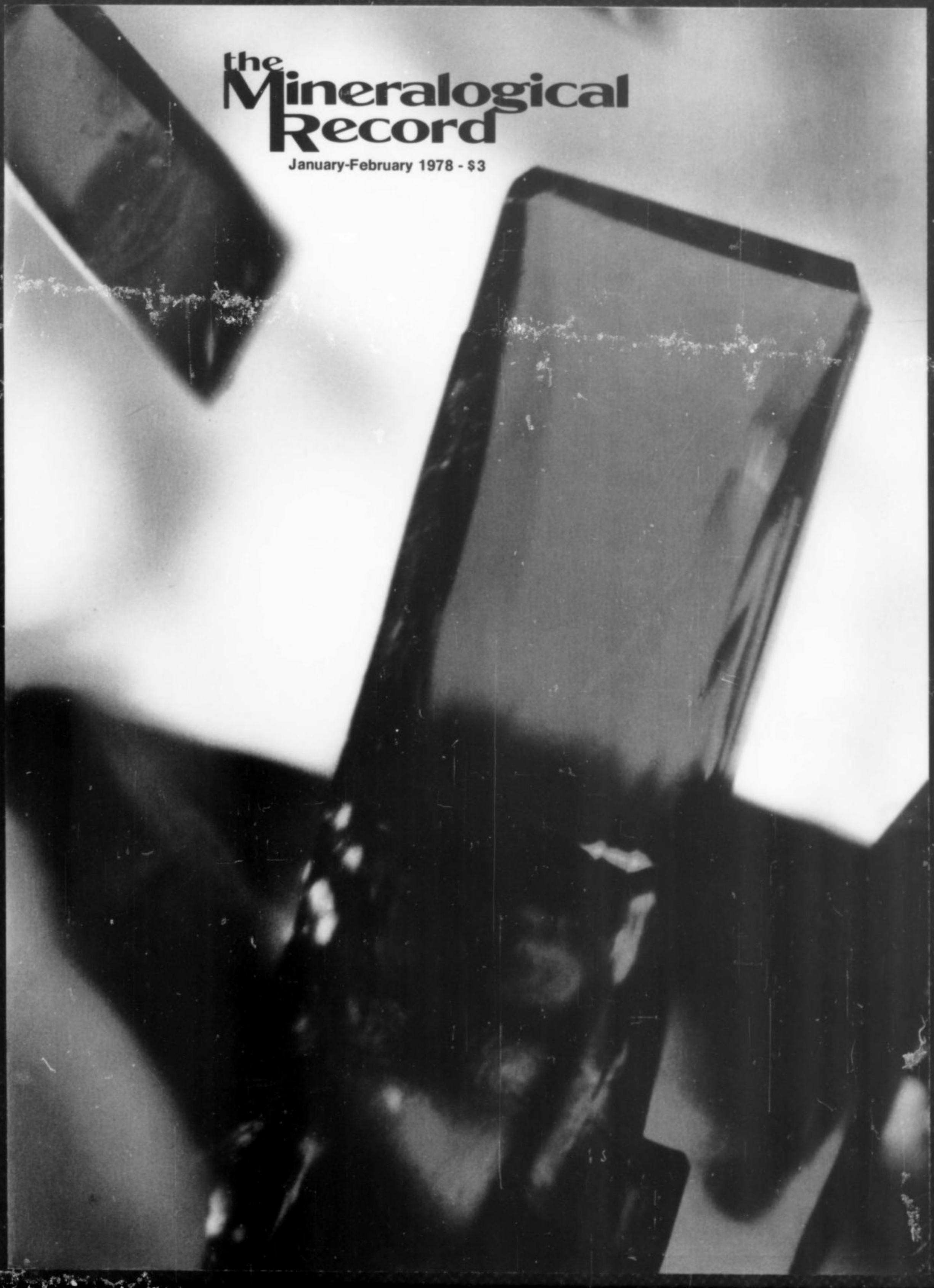

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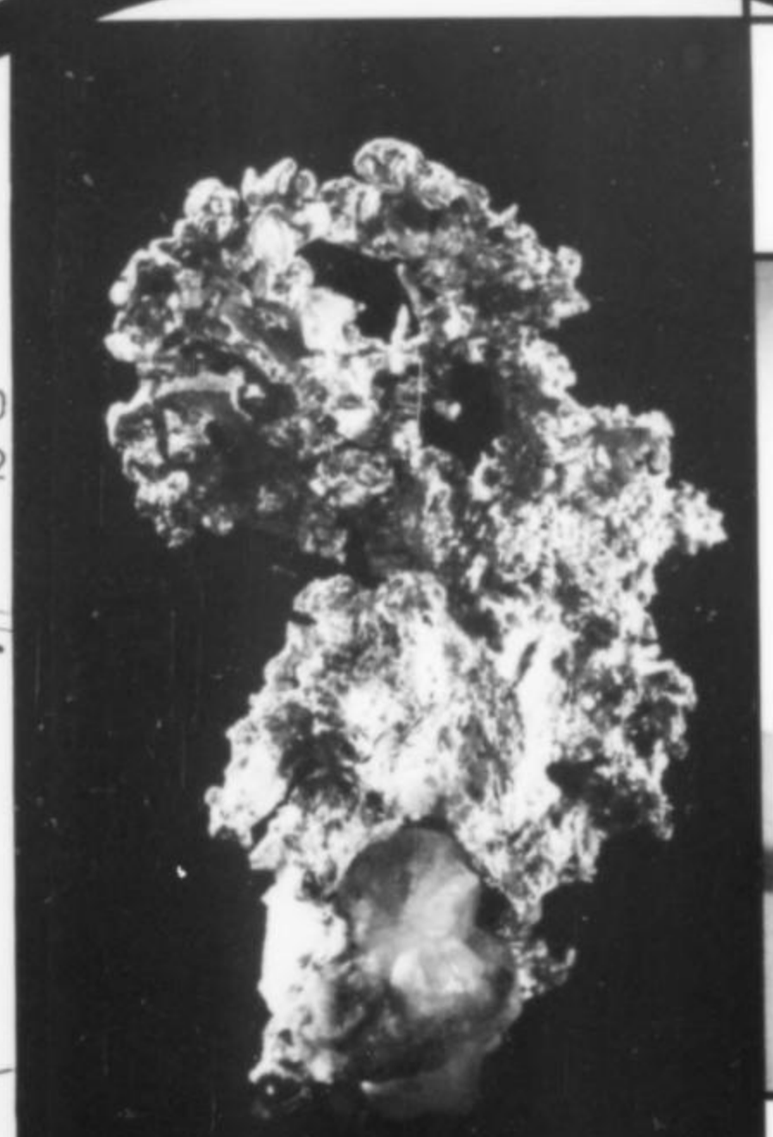

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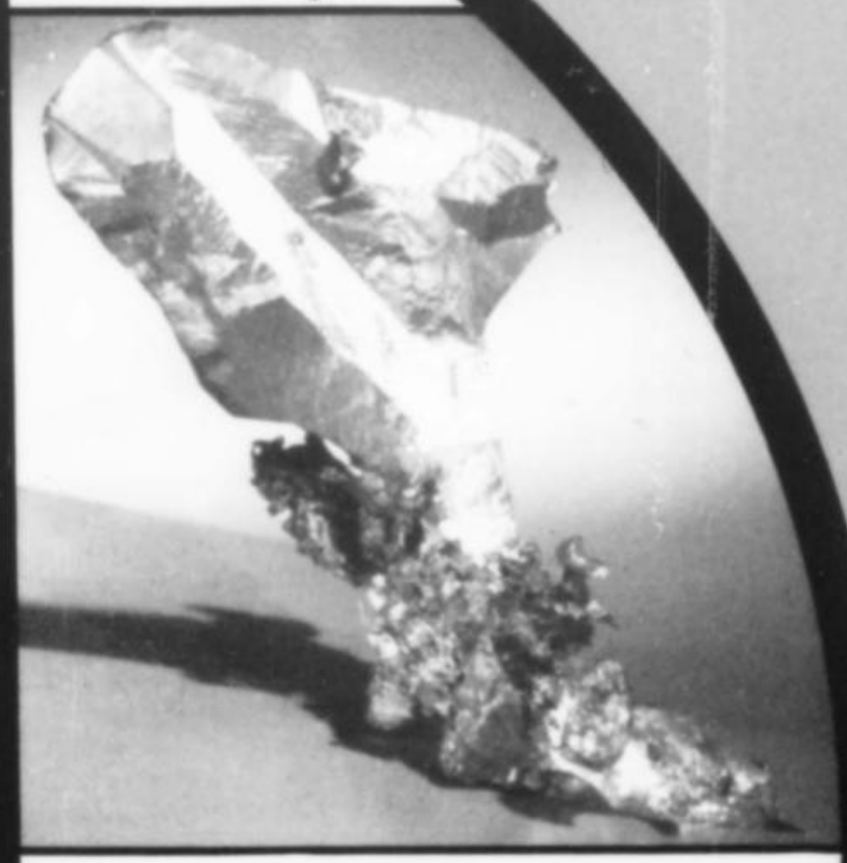

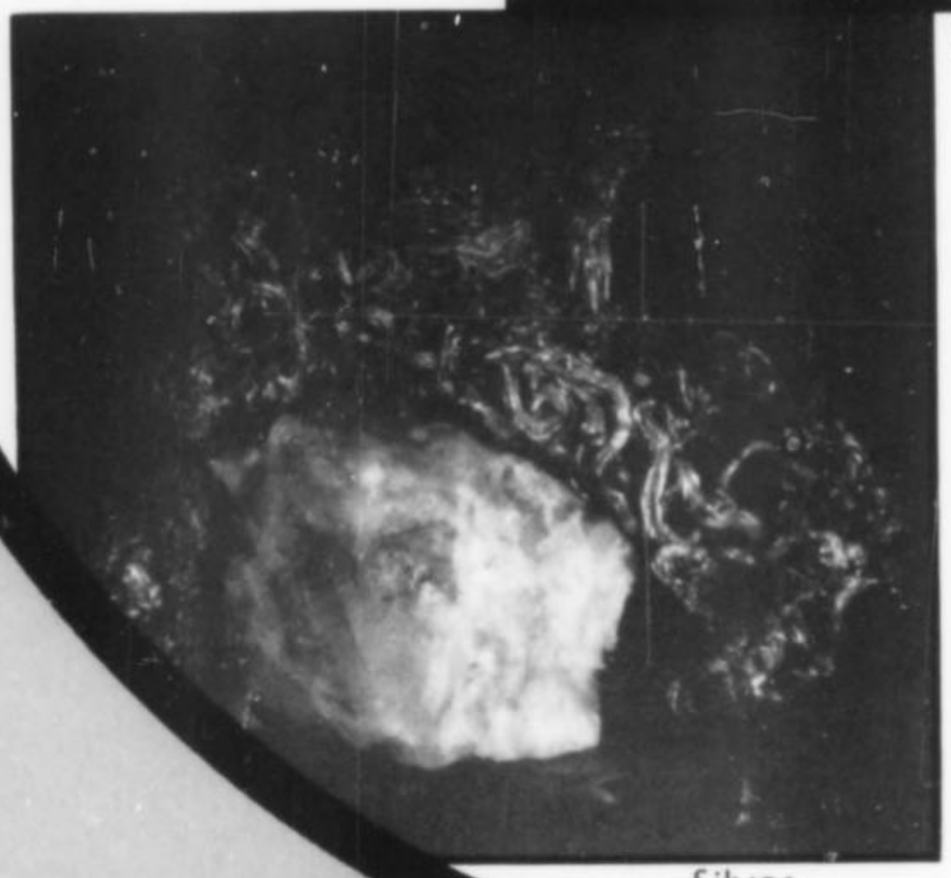

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Volume Nine/Number One
January—February 1978

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departments

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Guest EDITORIAL

TUNNEL-VISION IN MINERAL COLLECTING

TO ATTEMPT to define contemporary mineral collecting is akin to an attempt to describe the morphology of a blob of oil in a fast-flowing current. The nature of mineral collecting and the forces which compel and control its evolution are far too variable to permit a simple, concise definition which would not be obsolete before it is published. Collecting, in general, is the gathering together of objects all having something in common. The two most important and influential factors in collection development are the personal, subjective tastes and motivations of the collector.

Such personal tastes and motivations can yield a variety of different kinds of collections. This is as it should be; the likes and dislikes of collectors ensure some measure of variation in the nature of the minerals collected, preserved for posterity, and left after us as a historical record of our preferences.

But what are our preferences today? Are they broad or narrow in scope? Do the clubs and federations encourage diversity, or constrain it? Will the great collections of today rival those of yesteryear? Should they?

Many contemporary collectors seem compelled to seek the best display or competitive specimen they can afford. This is a very natural action for some, and it is extremely important that some collectors do seek the best of these. But should it be the only factor to consider in collection development?

I think not, but I fear that the "quest for the best" is becoming too dominant and that many collections are fast-becoming carbon copies of each other with the amount of money available for upgrading as the dominant variable. This is, in my opinion, deplorable! So often does one see the same species from the same locality, over and over and over again, that the viewing of many contemporary collections is a boring task of courtesy rather than an exhilarating adventure. But it doesn't have to be that way if independent-minded collectors will continue to broaden their horizons a bit, and cast aside the constraints of ribbon-winning and other silly endeavors.

How I shudder and cringe when asked by collectors at mineral shows if I would advise them to purchase a specimen for the purpose of upgrading their competitive exhibit. A rephrasing of this question might be "Will the judges like my exhibit and award me more points if I purchase this specimen?" If this is your question...perhaps you are collecting for the judge's taste and preference instead of your own. My usual response to this all-too-frequent inquiry is that the purchasing of specimens involves personal decisions and should not be too much influenced by some curator's taste; a statement which I believe and think is true. But my response is really a mild cop-out; it is evasive in part. What I wish I could say without offending anyone is that much of this copy-cat activity is indeed quite foolish; their collections should contain what they personally want to have and, unless their motivation is competition, I really think they should only purchase something if they really want it. Building a mineral collection for the purposes of winning ribbons, impressing one's peers, and the other lesser objectives of some contemporary collectors represents, in my opinion, some of the lesser purposes for collecting minerals.

The admonition of Robert William Chapman is appropriate here, and is reprinted for the reader's perspective:

> A collector should not be too careful to be sure of what he buys, or the sporting spirit will atrophy; and he who collects that he may have the best collection, or a better than his friend's, is little more than a miser.
>
> ...Robert W. Chapman, *Silver Spoons*

Few quotes serve the writer's purpose precisely, and the above is no exception, for it discourages informal competitive instincts among collectors. But, Chapman does suggest that collecting (silver-pick implied) can and should be an exciting, diversified endeavor. The foregoing comments do not apply to the collector who wishes to make a financial investment or even hopes to break-even some day. For the investment-minded collector, the editorial entitled "Investing in minerals: no guarantees" by Wendell Wilson (*MR*, vol. 7, no. 6, p. 266-267) is a very pragmatic and useful guide.

Returning to the topic at hand, I am troubled a bit when I see new, frequently impressionable collectors influenced too strongly and too early in their collecting years by those dedicated to competitive exhibiting, those who may inadvertently or intentionally channel most of the new collector's energies into the quest for ribbons, honors and peer recognition, instead of the more basic and simple urges and rewards of collecting.

My heart leaps when I encounter collectors who are pursuing very personal desires! It matters not to them what I think. They need no re-affirmation of the "standards," no approval of their choices or judgement, no advice from curators, no predictions of the specimen's potential as a winner in competition. For these collectors, the minerals are collected for their own sake and for the pleasure they give their owner. Their collections are the products of their minds and hearts, and are not polluted with other's prejudices.

Yes! I do know that many *Record* readers are diversified, individualistic collectors following their instincts. This is written for the others. I have viewed several hundred collections, or parts thereof, and the ones I remember most had a certain uniqueness to them. Whether your collection is worth a million dollars, or is more comparable to Natalie Hofstader's *"broken stuff I got cheap,"* one measure of your collection is whether or not it reflects your individual tastes, and if it was built for that purpose.

Pete J. Dunn
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notes from the EDITOR

I recently received a letter from someone trying to establish the actual number of "rockhounds" in the United States, with the intention of nominating rockhounding for the *Guinness Book of World Records* as the most popular hobby. I couldn't provide any data the Guinness people would be likely to accept, but it is an interesting question.

Any calculation of the number of American mineral collectors would best be called a "guestimate," and there are few numbers to start with. The circulation of the *Mineralogical Record* is about 6000, perhaps 5000 of which are Americans. Gore Vidal once made the cynical suggestion that no more than two or three percent of the people read books and periodicals. This is an appalling thought, so let's be safe and call it five percent, which is only half as appalling. This would mean that there are about 100,000 American mineral collectors if all five percent of the readers read the *Record*. Of course, here we get into the problem of deciding who is a mineral collector and who is not. I know many of our staunch supporters would say that anyone who does not *read* is a dolt, and is not worthy of being called a mineral collector. (This is safe for me to mention because anyone reading these words is, by definition, not among the dolts.) Nevertheless, I can remember Neal Yedlin telling me of visits to people's homes to see their collections. He remembered looking around and asking "Where are your books?" They would answer, "Books? We don't have any books." Neal was appalled too, but I think he still would have considered these people mineral collectors simply on the basis of the undeniable existence of their mineral collections.

Another possible method of getting at the number of mineral collectors might be through a study of the mineral market. Let's take the case of an attractive, generally inexpensive, widely available mineral not suitable for lapidary use: wulfenite from the San Francisco mine, Sonora, Mexico. A mineral wholesaler who held the lease to this mine during its most productive period tells me that he himself has sold at least 150,000 specimens. This does not include the amount mined and sold by other dealers of course. But if we allow for those who buy more than one specimen, and some for breakage, we again arrive at a very approximate figure of 100,000 mineral collectors who have purchased these specimens.

What other methods could be utilized for an approximation? Most of them do not distinguish between the mineral collector and the lapidary (total sales of rock hammers, for instance). Any method must be specific for mineral collectors because we all know how sadly outnumbered we are by our buffing brethren. Maybe mineral collectors should be registered like democrats. (I'd love to call myself a card-carrying collector.) A "mark on the flesh" perhaps, and then a head count (or whatever)? I remember hearing of one collector who had amassed so much radioactive mineral material in his basement (several thousand pounds) that he appeared as an anomaly on an aerial survey! However I doubt if my one little torbernite would put me on the map, so that method is out as well. The only remotely practical method I can think of would be to include the question ("Are you a mineral collector?") on the next government census questionaire in 1980. Even better, of course, would be a box to check on your income tax form requesting the government to allocate $1 of your tax money for a national mineral conservation endowment fund rather than the current political campaign fund. I would say that neither of these proposals are likely to come to pass until we can elect a mineral collector as president, and it would certainly take more than 100,000 of us to do *that*. So it seems we are doomed to live on in ignorance of our own strength, and the *Guinness Book of World Records* will go on without what could surely have been its most interesting datum.

* * *

It is time that I formally recommended to readers that two excellent German-language magazines are available and very worthwhile. The first, *Lapis*, is a monthly carrying color in every issue. Each issue is 46 to 50 pages of non-technical information for mineral collectors, and many issues are built around a single topic (corundum, gypsum, fluorite, localities, etc.). Article quality, illustrations and design are all good. *Lapis* is probably the publication which comes closest to being a European counterpart of the *Record*, although *Le Monde et Les Mineraux* comes close as well. In the future the *Record* and *Lapis* plan to exchange and translate articles of special interest, but for maximum benefit a subscription is highly recommended.

The other publication is *Mineralienfreund*, dealing mainly with Swiss minerals and localities. The most recent issue I have seen is devoted entirely to all of the localities, colors and habits of Swiss quartz. The photo quality is excellent, and much can be learned even without a knowledge of German. See their ads elsewhere in this issue for subscription information.

* * *

According to the *American Federation Newsletter*, rockhounds (pardon the term) in the West have been using CB channel 7 for quite some time to keep in touch with each other. It has been suggested that rockhounds in other parts of the country also use channel 7, much as truckers use channel 19.

* * *

See where my innocent jokes get me? (vol. 8, no. 5, p. 419, 17th letter.) Now there's a *grass roots movement* afoot for an Illinois issue! Well, so much the better; this is a (relatively) democratic magazine, and if we can get the requisite articles there will indeed be an Illinois issue! So start writing, all you Illinois fans. We already have a tentative commitment on a Cave-in-Rock article, but all other topics are still open.

W.F.W.

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300223. ODDITIES OF THE MINERAL WORLD, Sanborn. Publisher's Price $9.95, Our Price $8.55

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300444. PRECIOUS STONES, M. Bauer. A popular account of their characters, occurrence, and applications, with an introduction to their determination, for mineralogists, lapidaries, jewellers, etc., with an Appendix on Pearls and Coral, and with new Appendices on Synthetic Gems and the Cultured Pearl. English translation. Clothbound. 672 pp., 13 color plates. Publisher's Price $27.50, Our Price $22.75

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300047. ROCKS AND ROUTES OF THE NORTH COUNTRY, NEW YORK, B.B. Van Diver. A geological guide for tours, minerals, rock climbing, and white-water. 70 mineral sites. 1976. 205 pp. Paperbound. Publisher's Price $6.95, Our Price $6.20

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"Educated is he who knows how to find out what he doesn't know."

Georg Simmel

SINCE the very first issue of the *Mineralogical Record*, a feature entitled the *Record Bookshelf* has endeavored to present reviews of newly published books that might interest the mineral collector. However, few recommendations have ever appeared regarding the older texts; most of the works that should form the backbone of a useful library have therefore never been reviewed.

Consequently, many collectors might benefit by seeing a list of recommendations for those books considered essential to the active, well-informed mineral enthusiast...a small set of reference works that could adequately serve the "serious" collector and the amateur mineralogist. Naturally those people with ample funds could purchase *every* available mineralogy-related book and be certain of a useful library. But most people are not so fortunate; eight or ten good books would probably tax the resources of most collectors. Where would their money be best spent?

Many opinions on such a question will naturally be more valuable than one. A letter requesting a list of recommended books was sent to members of the *Record's* editorial board and also to a sampling of other mineralogists and advanced collectors. Twenty-six people (listed below) have provided a list of their recommendations. Although many voiced doubts that their own needs were sufficiently typical of the majority of collectors, the variability of the needs of these 26 reviewers is probably similar to the variability of the needs of advanced collectors in general.

Presented first are some general comments made by the reviewers (identified by their initials—see below). Next are listed the ten books recommended most often. Given before each title is the number of "votes" received by that work, i.e., how many of the 26 reviewers included that book on their list of recommendations. Following each title are comments made by some of the reviewers; those comments are all identified by the reviewer's initials. Of course not all reviewers commented on every title they listed.

Thanks are due these 26 reviewers for taking the time to share their experience and opinions. Thanks also to Douglas K. Miller, whose suggestion resulted in this article.

(W.E.W.)

GENERAL REMARKS

The choice of "essential" books for the amateur mineralogist will depend upon his state of advancement. To be called a mineralogist rather than a collector or hobbyist, he must have considerable knowledge, and this will at once eliminate a lot of books that others will put on their lists. You really need two lists, one for the collectors and those still in the elementary stages of the hobby, and another for those who might be entitled to the description of amateur mineralogist. For the former, the number of books is legion and their originality usually negligible. One widely published writer complained to me once that he barely sold enough books to pay for the six months of effort he put into it. No book that can be written and illustrated in six months should be published at all! (F.H.P.)

The well-equipped amateur mineralogist would serve his hobby and his soul very satisfactorily with a bookshelf consisting of basic treatises on: general inorganic chemistry, thermochem-

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istry, elementary physics and algebra. A reasonable knowledge of the behavior of cations and anions in a variety of temperature, pressure and compositional regimes is indispensable. Since crystallography and crystal chemistry are the foundations of mineralogy, group theory is an absolutely essential topic and here lies the importance of algebraic techniques. A too-heady broth perhaps? Yes, if you are one who believes the brain dies somewhere between high school and college, or that improvement of the mental powers is only for the professionals.

As for good treatises in mineralogy, there are none. The entire science badly needs revision. The science should be renamed *inorganic natural products chemistry*. Two basic books, however will give you a good idea about our science. These are *Crystallography and Crystal Chemistry* by Bloss (1971) and *An Introduction to the Rock-forming Minerals* by Deer, Howie and Zussman (1966). Good reading, and an excellent prescription for greasing the gears of thought. (P.B.M.)

Many of the reviewers commented that the ranks of advanced collectors and amateur mineralogists are still so varied that it is difficult to make generalized recommendations. Readers should therefore keep their own special interests in mind while studying the following list of recommended reference works.

THE TEN MOST RECOMMENDED

(22) ***The System of Mineralogy*** *(of James Dwight Dana and Edward Salisbury Dana) by C. Palache, H. Berman and C. Frondel. Seventh Edition. Volume I (1944), 834 p., $27.25. Volume II (1951), 1124 p., $30.75. Published by John Wiley and Sons, Inc.*

Classic treatises; still good for occurrences. Alas! — no silicates. (P.B.M.)

The seventh edition *and* the sixth edition...I still like their depth of coverage, although it has to be taken with a grain of salt due to age. (R.A.B.)

The definitive work in descriptive mineralogy, but regrettably rather outdated and incomplete in that the silicates are not covered. Still a very useful reference for the advanced collector. (Abe R.)

For non-silicates this is indispensable, for the serious amateur as well as the professional, despite its cost. (R.V.D.)

This is still the most complete reference for collectors. Would that it were really complete! It isn't, and so it must be supplemented by the earlier editions containing the silicates, or by Dana's *Textbook of Mineralogy*. (B.J.)

The standard compendium: and all your friends will think you ignorant if you don't have it. But it is badly out of date, and superceded in many ways by the *Encyclopedia of Minerals* (which used the *System* as a primary source). The sixth edition, published in 1892, is a classic if you can get one. (P.B.L.)

A handy reference for old names, and still contains the best descriptive data for many rare species (sixth edition, with appendices, 1899, 1909, 1915). (P.J.D.)

Obviously the most important work for anyone entitled to call himself an amateur (or professional) mineralogist. (F.H.P.)

Its depth of detail exceeds most other works when taken together. (W.E.W.)

(17) ***1975 Glossary of Mineral Species*** *by Michael Fleischer (1975), 145 p., $4.00. Published by the Mineralogical Record, Inc. (P.O. Box 783, Bowie, Maryland 20715). Plus supplements published in the Mineralogical Record magazine, vol. 7, no. 2 (1976) and vol. 8, no. 5 (1977).*

Essential and cheap. (P.G.E.)

The most up-to-date compilation of mineral names, formulas and species status available. The greatest shortcoming is the lack of descriptions, but references are given for most of the newer species. (Abe R.)

The book I refer to most often. (R.V.G.)

This is the bible on species, their chemical composition and family relationship. (B.J.)

Very handy to take along when visiting mineral shows or buying specimens. (B.F.M.)

An inexpensive, concise catalog of all known species, with references. You can't tell the players without a program. (P.B.L.)

A reference for formulas and for references to the *American Mineralogist*. (P.J.D.)

This book, with its periodic corrections and additions, is the most up-to-date listing of the recognized mineral species and their chemical compositions. No collector should be without one. (W.S.W.)

The most authoritative, up-to-date list of species and references. (R.O.M.)

Definitely one of the indispensable references for any mineralogist or mineral collector; its low price makes it affordable by all. (W.E.W.)

Invaluable...absolutely necessary. (Art R.)

(18) ***Encyclopedia of Minerals*** *by W.L. Roberts, G.R. Rapp, Jr., and J. Weber, (1974), 693 p., 983 color photographs, $69.50. Published by Van Nostrand Reinhold Company (450 West 33rd Street, New York, New York 10001). (Ed. note: reviewed in Min. Record, vol. 6, no. 1, p. 41.)*

The *Encyclopedia* is likely what I would grab first now, as the most up-to-date reference likely to say something about almost any mineral; this has to be the starting point. (R.A.B.)

Very useful and a good buy, although it is slightly limited by its own format. (P.G.E.)

Up to date, with excellent brief descriptions of minerals and extensively illustrated with color plates of micromount specimens. Unfortunately the illustrations are useful only for the rarer species, there being insufficient representation of the more common minerals. I would have placed this in the "vital" category except for the high price which must be paid because of the color plates. (Abe R.)

I hope the next edition will include a paperback version without the expensive photos. (L.M.)

A fine work which provides capsulized data on mineral characteristics. It also has some very good color photos of micro crystals of many species listed, including illustrations of several different habits for some of the most common species. (B.F.M.)

A lot more expensive than the *Glossary of Mineral Species*, but it includes in capsule form all you need to know about the properties of each species; the photographs are a micromounter's delight. (P.B.L.)

The most up-to-date reference which includes descriptions of physical characteristics (habit, color, etc.). (P.J.D.)

Too costly and bulky to recommend. (A.P.)

Unfortunately very expensive, but its value lies in its nearly up-to-date listing of mineral species and the excellent color photographs of micro minerals. This is a "must" for micromounters, but somewhat less useful for collectors interested in larger specimens. (W.S.W.)

Provides sufficient data on nearly all minerals at a reasonable price. Dana's *System of Mineralogy* is out of date and does not include silicates; there are similar problems with all other compilations. The *Encyclopedia* should be the standard reference. (D.R.P.)

Pending the completion (if ever) of Dana's Seventh Edition of the *System of Mineralogy*, this is the generally most useful compilation of names, including many newer ones not to be found in the older works. No one who calls himself any kind of a mineralogist can afford not to have this book. (F.H.P.)

Suffers from a lack of crystal drawings, and any pretense to detailed locality information. Also there are large gaps in the photographic coverage. Nevertheless this book can probably take the place of all but *Mineralogy for Amateurs* and the continually updated *Glossary of Mineral Species* in dealing with most of the needs of the average collectors. (W.E.W.)

Expensive but a complete list of known minerals with pictures of many. Rather more [data] than most amateurs want or need. (Art R.)

Basic information but not much on localities. (J.S.)

(14) ***A Textbook of Mineralogy*** *by E.S. Dana, revised by W.E. Ford, Fourth Edition (1932), 851 p., $18.50, Published by John Wiley and Sons, Inc.*

Nice to have but not essential. An almost hopelessly outdated book yet filled with much useful information. Don't buy this old edition (a new one is in preparation), but don't discard it if you have it. The American Federation still lists this as an acceptable

reference for mineral formulas—a practice which defies comprehension! (Abe R.)

This volume, presently being rewritten and updated, is being awaited eagerly by the entire mineral fraternity. The new edition will be an absolute "must" in the library of every mineralogist. (E.B.R.)

The best all-around guide to crystallography, optics, chemistry and mineral descriptions in a small space, even though it is 45 years old and in many ways out of date. (R.V.G.)

A "classic" for the amateur. (R.V.D.)

A good addition to any shelf, and vital to back up the incomplete Dana's *System of Mineralogy*. (B.J.)

By far the most comprehensive mineralogy textbook ever published in English. The descriptive mineralogy section describes all known species as of 1932, but there are no references to the original literature. (A.P.)

When the new edition comes out it could take the place of the *Encyclopedia of Minerals*, though it won't have the pretty illustrations. (F.H.P.)

Not to be relied on for chemical formulas! (Abe R.)

(12) ***Mineralogy for Amateurs*** *by J. Sinkankas (1964), 585 p., $16.95. Published by Van Nostrand Reinhold Company (450 West 33rd Street, New York, New York 10001).*

Excellent introductory section on principles and properties. The descriptive section contains just enough of the rarer species which are common enough to still be encountered outside of a museum. Don't be put off by the word "amateur" in the title. (P.G.E.)

...has a style attractive to the amateur collector...gives a good foundation in basic mineralogy. (B.J.)

In my opinion, still the best single work available. Easy to read, accurate, comprehensive. (I practically memorized it when I was starting out!) (B.F.M.)

Clearly written and packed with information, including observations on particularly desirable specimens. No other book is so useful to the collector; to a professional, some of the technical parts are a bit oversimplified. (P.B.L.)

An excellent introduction to the science of mineralogy. (R.O.M.)

An excellent introduction to basic principles of mineralogy, especially as concerns those properties most useful for identification when the tools of the professional are not available. (D.R.P.)

Probably the best contemporary locality reference that today's collectors can own, although the very rare species are not covered. (W.E.W.)

A gentle but authoritative introduction to the subject. One mastering this volume would have a good foundation in mineral formation, structure, form and composition. (Art R.)

(9) ***Mineralogische Tabellen*** *by H. Strunz (in collaboration with C. Tennyson), Fifth Edition (1970), 621 p. Published by Akademische Verlagsgasellschaft, Leipzig.*

Good for literature search, at least up to 1970. (P.B.M.)

A knowledge of German is not necessary...Excellent for showing relationships between minerals, groups and families. (L.M.)

Comprehensive tables for all known mineral species as of 1970, arranged on a crystallochemical basis, with literature references for each species. The index includes many thousands of obsolete and varietal names with a few words of explanation for each. A knowledge of German is not necessary for using this book. (A.P.)

Important for classification of minerals into their crystal structural groups. (R.O.M.)

The standard reference for the classification of minerals by crystal structure and chemistry; it is essential as an adjunct to the *Encyclopedia of Minerals*, largely because the latter lists minerals alphabetically and illustrates their inter-relationships only incidentally. Although in German, it requires no language facility. (D.R.P.)

(10) ***A Field Guide to Rocks and Minerals*** *by F. H. Pough, Fourth Edition (1976), 317 p., $10.80. Published by Houghton Mifflin Company (Mail Order Dept., 2 Park Street, Boston, Massachusetts 02107). (Ed. note: reviewed in Min. Record, vol. 8, no. 5, p. 416.)*

Excellent handbook in size and information for easy reference on field trips. Many colored illustrations for additional home and field reference. (E.B.R.)

...a good book, handy, and I am sure very useful to many collectors. (R.V.G.)

We have a large number of mineral clubs around the New York area and I have had the opportunity to visit many of them. Talking with their members reveals a wide range of interests, as you would expect; few that I have met have more than one book. Usually this has been the *Field Guide*. (C.G.S.)

This is now a classic. It overlaps some other works, but the photographs from the American Museum Collection are worth the price by themselves. (P.B.L.)

Much original information, new text, and an appeal to collectors to do something with their discoveries before they turn them over to the nearest overburdened X-ray mineralogist. The new edition includes extensive paragenesis discussions and brings the locality data on the covered minerals pretty much up-to-date. (F.H.P.)

(10) ***Chemical Index of Minerals*** *by M.H. Hey. Second Edition (1962). 728 p. Published by the British Museum (Natural History) (Cromwell Road, SW7, London, England). Appendices issues 1963, 1974.*

Another "must" even though it needs to be accompanied by a good library to be used to best advantage. (P.G.E.)

Although...it seems to me to obscure many group and series relationships, it is a thorough review of species to the date of publication. Its greatest value is in the coverage of varietal names, synonyms and pronunciation. (Abe R.)

The most comprehensive reference in English to all mineral names of any significance. (P.J.D.)

Superb for discovering the meanings of older mineral names and synonyms. (R.O.M.)

For serious collectors who want to display. (F.H.P.)

The best reference for mineral varietal names and discredited species. The pronunciation guide is about the only one available but lacks usefulness because accented syllables are not indicated. (W.E.W.)

Includes accredited *and* discredited minerals; the latter are not listed in the *Encyclopedia of Minerals*, and only a few are given in Fleischer's *Glossary*. (Art R.)

Best for nomenclature and references to the describers of minerals. (J.S.)

(8) ***Manual of Mineralogy, (after James D. Dana)*** *by C.S. Hurlbut and C. Klein, 19th Edition, (1977), 532 p., $19.95. Published by John Wiley and Sons, Inc. (Ed. note: see review in next issue's Record Bookshelf.)*

The standard professional textbook. The best general treatment of crystallography and crystal chemistry. Also good on the mysteries of optics. (P.B.L.)

(7) ***Rock-Forming Minerals*** *by W.A. Deere, R.A. Howie and J. Zussman (1962), in five volumes, published by Longmans, London.*

For the real professional this work is pretty much essential. (F.H.P.)

The world's standard reference on the rock-forming minerals, with copious references to the original literature and an excellent selection of chemical analyses for each species. (A.P.)

Modern, rigorous and wide-ranging. Necessary for reference when newer concepts and terms are met. (Art R.)

OTHER RECOMMENDED REFERENCES

Although the above ten references were highly recommended by many, if not most, of the reviewers, there were many other titles also mentioned on the reviewers' lists. Most of these titles were cited by only one or two people, and reflect the special interests or needs of the reviewers. Certainly many readers will share those special interests or needs, and they may find some recommendations on the following list to be of interest.

(W.E.W.)

Elements of Mineralogy *by B. Mason and L.G. Berry (1959), 630 p., Published by W.H. Freeman and Company, San Francisco.*

A basic course in mineralogy at approximately the first year university level. (R.O.M.)

This is a university-level text providing a more in-depth description of mineral properties, and a more theoretical approach than *Mineralogy for Amateurs*, especially regarding topics such as X-ray diffraction. (D.R.P.)

An excellent basic text but superceded in value by the new (1977) edition of the *Manual of Mineralogy*. (W.E.W.)

Prospecting for Gemstones and Minerals *by J. Sinkankas (1970), 397 p.*

How one master collector collects them, with emphasis on pegmatite pockets. Better than all the "How To" articles in the rockhound magazines. (P.B.L.)

Cleaning and Preserving Minerals *by Richard M. Pearl (1971),* 80 p.

Good enough that someone swiped my copy, complete with the magic rust removing recipe. Actually an assemblage of techniques rather than an organized text, but still the best reference on cleaning minerals. (P.B.L.)

Minerals of the World *by C. Sorrell (1973), 280 p. Published by Western Publishing Company, Racine, Wisconsin.*

Could be first on the list if your budget is really tight. Not all that useful as a field guide, but a good basic textbook and the drawings, mostly from specimens in the excellent collection at Bryn Mawr college, are outstanding. (P.B.L.)

Studio Handbook of Minerals *by H. Boegel (1971), Viking Press.*

Treats more of the foreign localities that U.S. texts may slight. Boegel, who writes from Europe, was aided in this project by John Sinkankas so the usual interesting and easy style is present. A very useful "How To" book that incorporates many interesting facts. Few other books deal with the problem of protecting one's specimens. Like any book of recipes, it does not guarantee success; proceed with caution and experiment before treating a valuable specimen. (Abe R.)

Gemstone and Mineral Databook *by J. Sinkankas (1972)* ***346*** *p., Winchester Press.*

Contains a great deal of information on mineral properties, cleaning and lapidary metalcrafting. Certainly a valuable reference for one whose interests include gemstones and jewelry as well as minerals. (Abe R.)

Principles of Geochemistry *by B. Mason (1962) 310 p. Published by John Wiley and Sons, Inc., New York.*

Geochemistry and crystal chemistry are what it all boils down to in the end. Books on the latter tend to get a bit esoteric, but this work on geochemistry is eminently enjoyable and instructive. (P.G.E.)

Identification and Qualitative Chemical Analysis of Minerals *by O.C. Smith (1953) 351 p. Published by Van Nostrand Reinhold.*

For those who attempt to make personal identifications it is the most useful work. (F.H.P.)

Good for simple chemical analyses. (H.E.P.)

Handbuch der Mineralogie *by C. Hintze (1904-present).*

The all-time most important work, but mostly unobtainable and copies lately have become prohibitively expensive. It contains the most detailed locality data of any book and is indispensable for the older localities. (F.H.P.)

Mineralogy of the Rare Elements*, edited by K.A. Vlasov (1964).*

The most up-to-date reference on many rare minerals, with good descriptions of some of them. (P.J.D.)

An Introduction to the Rock-forming Minerals *by W.A. Deer, R.A. Howie and J. Zussman (1966), one volume, 528 p. Published by John Wiley and Sons, Inc., New York, (hardcover), and by Longmans, London (paperback).*

Essentially a condensation of the five-volume work by the same authors. (A.P.)

This single volume is acceptable but the 5-volume set is better. (J.S.)

An Introduction to Crystallography *by F.C. Phillips (1963), 340 p. Published by John Wiley and Sons, Inc.*

Easily the best crystallography text for its purpose, and unfortunately little known in the U.S. (P.G.E.)

An Introduction to the Methods of Optical Crystallography *by F.D. Bloss (1961), 294 p. Published by Holt, Rinehart and Winston.*

I think amateurs have neglected this useful approach to identification for far too long. Even crude determinations, easy to learn, narrow down the possibilities for an unknown mineral and are marvellous for checking your wilder guesses. Transparent minerals only, of course! (P.G.E.)

Microscopic Determination of the Non-opaque Minerals *by E.S. Larsen and H. Berman (1934), U.S. Geological Survey Bulletin 848, Second Edition, 266 p.*

Wait for the new edition by Fleischer and Wilcox. (P.G.E.)

These are the only comprehensive tables of the optical properties of non-opaque minerals and are still useful. A new edition is soon to be released by the U.S.G.S. (The price of this was 20¢ in 1934.)

Mineralogy, *a First Course by J. Sinkankas (1966), 587 p. Published by Van Nostrand Reinhold.*

A fine book intended largely for amateurs, but far better than some so-called "college" texts. (A.P.)

Manual of Determinative Mineralogy *by G.L. Brush (1898), 16th Edition revised by S.L. Penfield, 312 p. Published by John Wiley and Sons, Inc., New York.*

Includes the most extensive tables for mineral identification by blowpipe and simple chemical tests ever published. Later tables designed for the same purpose, such as those of Lewis and Hawkins (1931), are more or less abridgements of the Brush-Penfield tables. (A.P.)

Mineralogy *by I. Kostov (1968), 587 p. Published by Oliver and Boyd, Edinburgh and London.*

Quite interesting because of the Eurasian locality information. (B.J.)

An excellent general mineralogy textbook comparable in scope to Dana's *Manual of Mineralogy* or Berry and Mason's *Mineralogy*. (W.E.W.)

Surprisingly good and modern but out of print. (J.S.)

Gemstones of North America, *volume II. by J. Sinkankas (1976), 494 p. Van Nostrand Reinhold Company.*

Reading texts primarily written for the lapidary is not an heretical exercise for mineral collectors. The detailed locality information coupled with an up-to-date revision make this an excellent overall U.S. guide for collectors. (B.J.)

Mineral Tables *by R.V. Dietrich (1963), 237 p.*

Inexpensive, usable, includes essentially all minerals an amateur is likely to find. (R.V.D.)

Elements of Optical Mineralogy *by A.N. Winchell (1951), 263 p.*

Although this emphasizes optical properties, the other data on physical properties and occurrences are rather good. (R.V.D.)

Those with any microscope expertise will find these volumes essential. (F.H.P.)

Atlas der Krystallformen *by V. Goldschmidt (1916-1923), 9 volumes. Published by Carl Winters Universitätsbuchhandlung, Heidelberg.*

An incredible compilation of thousands upon thousands of fascinating crystal drawings, all referenced to localities and species. Many old European minerals and localities abundantly represented. Any mineral collector with an opportunity to purchase a set of these volumes should do so even though the cost will be high. One of the great classics. (W.E.W.)

Mineralogy *by E.H. Kraus, W.F. Hunt and L.S. Ramsdell (1959), 686 p. Published by McGraw-Hill, New York.*

Good for general theory and crystallography. (H.E.P.)

International Tables for X-ray Crystallography, *edited by Henry and Lonsdale (1969).*

The bible for crystallographic notation and reference.(P.B.M.)

Structural Inorganic Chemistry *by A.F. Wells (1975).*

A great body of information atomic arrangements in crystals. (P.B.M.)

Advanced Inorganic Chemistry *by Cotton and Wilkinson (1972).*

The most outstanding treatise on the subject. (P.B.M.)

The Nature of the Chemical Bond *by L. Pauling (1960).*

Probably the most referred-to treatise of the Twentieth Century. (P.B.M.)

Handbook of Geochemistry, *edited by K.H. Wedephol (1969).*

Igneous and Metamorphic Petrology *by F.J. Turner and J. Verhoogan (1960).*

Long the standard text for college petrology courses. (P.B.M.)

Ontogeny of Minerals *by Grigoriev (19).*

Hard to get, but explains a lot about growth habits not explained elsewhere. (J.S.)

Gems, Their Sources, Descriptions and Identification *by R. (Webster (1975), third edition.*

A good reference on gemology. (C.S.H.)

Microscopic Determination of the Ore Minerals *by M.N. Shor (1940) U.S. Geological Survey Bulletin 914.*

For people having an interest in trying their hand at mineral identification, and having access to a little laboratory equipment, this bulletin is essential. (R.V.G.)

Getting Acquainted with Minerals *by G.L. English and Jensen (19).*

An excellent book explaining the why, how and where of mineral collecting. (E.B.R.)

Minerals and How to Study Them *by C.S. Hurlbut (1949)*

An outstanding beginners book in every way. Should be in every amateur mineral collector's library. (E.B.R.)

Modern Mineralogy *by K. Frye (1974)*

An excellent and worthwhile advanced mineral information book, especially regarding phase equilibria. Not a descriptive mineral species manual but excellent on basic mineralogy. (E.B.R.)

An Introduction to Crystal Chemistry *by R.C. Evans (1952).*

Excellent for explaining properties in connection with structures. (J.S.)

Crystallography and Practical Crystal Measurement *by A.E.H. Tutton (1911).*

Older but full of details not found elsewhere. (J.S.)

X-ray Crystallography *by M.J. Buerger (1942).*

Sticky, but contains much information. (J.S.)

RECOMMENDED REFERENCES ON RELATED SUBJECTS

Many reviewers agreed that several other types of reference works were of value to the advanced collector and amateur mineralogist. In particular, a good glossary and a good atlas were suggested by several reviewers; the two described below would be excellent choices.

Glossary of Geology, *edited by M. Gary, R. McAfee and C.L. Wolf (1972), 858 p., $35.00. Published by American Geological Institute (5205 Leesburg Pike, Falls Church, Virginia 22041).*

Highly useful in understanding terms used in other references. Any collector or mineralogist who reads at all should have this reference. (W.E.W.)

The Times Atlas of the World, comprehensive edition, *Fifth Edition (1975). 383 pages, $75.00. Published by Quadrangle/ The New York Times Book Company (10 East 53rd Street, New York, New York 10022).*

After studying atlases from the view of the mineral collector for more than a year, I found this atlas to be the best of the many available. It is now the standard reference used in the editing of the *Mineralogical Record*. The international glossary of geographical terms, which gives the meaning of hundreds of foreign terms used in locality names, is extremely interesting. (W.E.W.)

Locality references were also recommended, and it was recognized that the reader should choose references on localities near or dear to him. This subject will be covered in the next issue of the *Record*, but a few remarks are given here.

Since I feel every collector should get out and do his own collecting, books listing the minerals of local areas or mines are absolutely necessary. ***Mineralogy of Arizona*** by Anthony, Bideaux and Williams, and ***Minerals of Franklin and Sterling Hill*** by Frondel are examples. (W.S.W.)

Many of the states publish bulletins or books dealing more or less extensively with mineral deposits or occurrences within the state or region. Any serious collector should have at least the work dealing with the state in which he lives. It might be

a good idea for the *Mineralogical Record* to publish a complete list of all state mineralogies. *(Ed. note: Excellent idea, readers can help by sending the editor the name of the best references for their state.)* (A.P.)

Own a copy of your regional text: ***Mineralogy of Pennsylvania*** by Gordon, ***Minerals of Franklin and Sterling Hill*** by Frondel, ***Mineralogy of the Black Hills*** by Roberts and Rapp, etc. Know your collecting areas! (P.B.L.)

It is encouraging to find that so many states have revised, or are in the process of revising, their state mineralogy reference. The obvious value of this to the local collector need not be expounded! (B.J.)

What books in the field of descriptive mineralogy are best for you? Well, I recommend monographs on specialized topics. Most are eminently digestible. Here are a few: ***Minerals of Franklin and Sterling Hill, Sussex County, New Jersey.*** *U.S.G.S. Professional Paper 180 by C. Palache (1937).* ***Pegmatite Investigations 1942-1945, Black Hills.*** *U.S.G.S. Professional Paper 247 by Page, et al. (1953).* ***The Lovozero Alkali Massif*** *by Vlasov, et al. (1966).* ***The Feldspar Minerals,*** *Vols. 1-3, by J. Smith (1975).*

In other words, if you want to appreciate the conceptual foundations of our science, it is "back to the basics" for you. But if you want "working" treatises, then scholarly monographs on classic localities are your best investment. (P.B.M.)

The study of economic geology is usually of special interest to mineral collectors and mineralogists. Several works were recommended by various reviewers.

Mineral Deposits *by W. Lindgren (1933). Published by McGraw Hill, New York.*

I use this old reliable for explanations of origins, deposition and geochemistry. (H.E.P.)

Metallic and Industrial Mineral Deposits *by C.A. Lamey (1966). Published by McGraw-Hill, New York.*

Interesting and instructive without getting too heavy. Plentiful references and not yet too badly dated, unlike some of the classic works. (P.G.E.)

Selected bibliographies of hydrothermal and magmatic mineral deposits, *by J.D. Ridge (1958). Geological Society of America Memoir 75, 199 p.*

Contains reference lists for many of the most famous mineral localities including Cobalt, Ontario; eight famous Arizona mines; Keweenaw, Michigan; Butte, Montana; Boleo, Mexico; Chuquicamata, Chile; Katanga, Zaire; and dozens more. Also includes an outline for the composition of locality articles that should be read by all potential authors. Very well indexed. (W.E.W.)

Economic Mineral Deposits *by A.M. Bateman (1950).*

Excellent for explaining geneses and associates in numerous deposits yielding specimens of interest to collectors. (J.S.)

"Read diligently.
They who do not read can have
nothing to think, and little
to say."

Samuel Johnson

Epitaxial Wodginite and Cassiterite from Lavra Jabuti, Baixio, Galilea, Minas Gerais, Brazil

by

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EARLY in 1975, a pocket was opened in the Lavra Jabuti pegmatite, Saõ Geraldo do Baixio, Municipio de Galilea, Minas Gerais, Brazil. Within this pocket there were about 100 crystals of a lustrous black mineral, which resembled columbite-tantalite or something similar. The entire lot was acquired by Sr. Rafael Falcao of Governador Valadares, who recognized that it was something unusual and different.

INTRODUCTION

The Lavra Jabuti is an old garimpo (mine) which has been worked over the years for industrial beryl, amblygonite, cassiterite, quartz crystals, and green gem tourmaline. It is an underground mine, worked through tunnels, and the feldspars are largely kaolinized. The black crystals had probably originally been attached to microcline, but as this was altered to clay, the crystals as found were loose, containing only traces of attached muscovite and lithiophorite.

A preliminary investigation indicated that these lustrous black crystals (Fig. 1) were not one mineral, but two separate species intergrown in a parallel configuration.

The existence of a large group of essentially identical crystals showing two minerals intergrown in a constant and uniform morphological relationship, strongly suggested an epitaxial type of intergrowth. Since no crystals of this nature had ever been described, a detailed investigation was undertaken.

The composite crystal shown in Figure 1 is prismatic, black, and highly lustrous. The crystals vary in size from 10-40 mm in length. One of the authors (RVG) tested the composite crystal for the presence of cassiterite by immersing the crystal in a solution of dilute hydrochloric acid containing metallic zinc. In this test, cassiterite, if present, acquires a silvery-white coating of metallic tin. The test is a simple one, and can be done at home quite easily. The hydrochloric acid reacts with the zinc to form a zinc chloride solution and an effervescence of nascent hydrogen gas. The nascent hydrogen reacts with the oxygen in cassiterite, reducing the outermost portion to elemental tin. A photograph of one of these Jabuti mine crystals treated in this manner is shown in Figure 2 (the same crystal as shown in Fig. 1). This cassiterite, quite difficult to differentiate from the associated mineral by simple visual examination since they have identical color and luster, is easily seen after this treatment.

This very practical test is commonly used by ore buyers in Brazil and elsewhere who purchase from the garimpieros tantalite concentrates (derived from pegmatites) which may be contaminated with cassiterite. A handful of the concentrates is placed in the hollow of a bent sheet of galvanized iron (iron coated with zinc), and dilute acid (hydrochloric or sulfuric) is added, and within a minute or two all the cassiterite grains, heretofore indistinguishable, become bright and silvery. This test is very specific for the mineral cassiterite; it is important to the ore buyers because cassiterite has a much lower value than tantalite.

GENERAL DESCRIPTION

The two minerals were X-rayed and found to be **wodginite** [$(Ta,Nb,Sn,Mn,Fe)_{16}O_{32}$], and **cassiterite** [$SnO_2$], respectively. Wodginite is a moderately rare mineral, having been found only at the type locality, Wodgina, Western Australia, Australia (Simpson 1909), at Bernic Lake, Manitoba, Canada (Nickel *et al.*, 1963), and in Rwanda (Bourguignon *et al.*, 1965). The diffraction pattern of Jabuti wodginite is identical to that published by

Table 1. Microprobe analyses of wodginite, cassiterite, and tapiolite from the Jabuti mine, Baixio, Brazil

	FeO	MnO	MgO	CaO	CuO	SnO_2	TiO_2	Ta_2O_5	Nb_2O_5	Total
1. **Wodginite***	4.68	7.49	0.00	0.00	tr	15.23	tr	66.16	7.07	100.63
2. **Cassiterite**	2.61	0.34	0.00	0.00	tr	85.15	tr	11.10	0.43	99.63
3. **Cassiterite**	0.98	0.14	0.00	0.00	tr	97.04	tr	3.58	0.12	101.86
4. **Tapiolite**	12.58	1.52	0.00	0.00	tr	0.66	tr	80.94	3.17	98.87

Analyses 1-4 also checked negative for Si, Al, K.

*Number of atoms on the basis of 32 oxygens

Ta	7.62	15.86
Nb	1.35	
Sn	2.57	
Mn	2.67	
Fe	1.65	

Figure 1. **Wodginite with cassiterite, Jabuti mine. (Length about 25 mm) Photograph by Wendell Wilson.**

Manitoba, Canada; and Bourguignon *et al.* (1965) obtained 7.3 for wodginite from Rwanda. We believe the specific gravity of 7.36 is a better value for wodginite inasmuch as it is obtained from fresh, unaltered material (as was Simpson's value of 7.36) and because it is closer to the specific gravity of 7.63 calculated for Jabuti wodginite using the cell dimensions of Wodgina material (Nickel *et al.*, 1963), and the analysis given in Table 1 of the present study.

CHEMISTRY

The wodginite and cassiterite were analyzed with an ARL-SEMQ electron microprobe using an operating voltage of 15kV and a sample current of 0.15μA. Standards used were cassiterite for tin; hornblende for iron, magnesium, calcium, and titanium; synthetic lithium niobate for niobium; synthetic lithium tantalate for tantalum, and cuprite for copper. The data were corrected using a computerized data refinement program. The resultant analyses are presented in Table 1.

For the analysis, a thin section (perpendicular to [010] of wodginite) of a composite crystal was prepared. This thin section is shown in transmitted light in Figure 5. Several features are readily apparent; the most striking of which is the fact that the cassiterite is not one crystalline unit but is present as three separate crystals within the wodginite. Also noted in this initial internal examination is the third cassiterite crystal wholly hidden within the host wodginite. The wodginite is seen to have a distinct but irregular color-zoning roughly parallel to {100}.

Table 2. Measurement data for nine wodginite crystals from the Jabuti mine, Baixio, Brazil

Form	#Xls.	Number of times	Average Size	Average Quality	Measured ϕ_2 range	Measured ρ_2 range	Best ϕ_2	Calc ϕ_2	Best ρ_2	Calc ρ_2	$\delta\phi_2$	$\delta\rho_2$
001	3	3	5	5	88°50′- 89°58′	90°00′	89°52′	89°52′	90°00′	90°00′	0°00′	0°00′
010	7	7	5	3	----------	0°00′- 2°00′	------	------	0°00′	0°00′	-----	0°00′
100	9	14	3	3	0°00′- 2°05′	90°00′	0°00′	0°00′	90°00′	90°00′	0°00′	0°00′
110	9	16	4	3	13′- 1°34′	50°10′-52°58′	0°00′	0°00′	50°28′	50°26′	0°00′	0°02′
310	4	6	4	3	12′- 26′	74°09′-75°05′	0°00′	0°00′	74°36′	74°38′	0°00′	0°02′
021	6	7	5	3	88°36′- 89°56′	47°26′-49°26′	89°52′	89°52′	47°46′	47°46′	0°00′	0°07′
101	9	18	1	5	59°47′- 63°51′	90°00′	61°53′	61°11′	90°00′	90°00′	0°42′	0°00′
$\bar{1}01$	9	18	2	5	117°41′-119°06′	90°00′	118°01′	118°59′	90°00′	90°00′	0°39′	0°00′
111	9	13	4	3	60°24′- 64°41′	68°21′-72°19′	61°46′	61°11′	68°40′	68°39′	0°35′	0°01′
131	8	13	4	3	59°47′- 61°50′	38°32′-41°49′	61°46′	61°11′	40°03′	40°06′	0°35′	0°03′
$\bar{1}11$	8	10	4	4	117°26′-119°50′	68°13′-71°20′	118°18′	118°39′	69°43′	68°22′	0°21′	0°21′
$\bar{1}31$	9	11	5	3	117°17′-119°35′	37°25′-40°47′	118°18′	118°39′	39°55′	40°02′	0°21′	0°07′

Nickel *et al.* (1963).

The composite crystals are epitaxially intergrown crystals of cassiterite and wodginite. This intergrowth is apparently unique. None of the authors had seen this relationship previously and an examination of other wodginite, ixiolite, columbite and tantalite specimens failed to turn up any other similarly intergrown crystals. An idealized drawing of wodginite without cassiterite is shown in Figure 3, and a sketch of the wodginite-cassiterite intergrowth (same specimen as in Fig. 1 and 2) in front, top, and cross sectional views, is shown in Figure 4.

The crystals are highly lustrous and are very attractive specimens. All the crystals are single euhedra and none have been preserved on matrix.

The specific gravity of the Jabuti wodginite was measured by means of a Berman Balance using a temperature correction. The wodginite samples occur in two textures; a smooth type which is highly lustrous on fracture surfaces, and a second type which is more granular in texture. The specific gravity for the two types is 7.36 and 7.19, respectively. Simpson (1909) found the specific gravity for the unaltered material from Wodgina, Western Australia, Australia, to be 7.36; Nickel *et al.* (1963) obtained a value of 7.19 for the material from Bernic Lake,

WODGINITE

Analysis #1 in Table 1 is an average analysis (based on a large number of analyses of many random sample points) of the wodginite crystal depicted in Figure 5. There are three separate color zones seen in thin section. These are: **(1)** reddish brown zone interspersed with **(2)** yellowish brown zone as twin lamellae whose orientation is described above, and **(3)** a black opaque central zone between the two outward facing cassiterite intergrowths. The reddish zones have a slightly higher iron content than the yellowish zones. The yellowish zones have a slightly higher tin content (up to about 17.00% SnO_2) than the reddish areas. The black innermost section has a composition very close to the average of the reddish and yellowish brown zones (analysis #1), and is not compositionally distinct.

Observation of individual sample points suggested a slight sympathetic variation of niobium and tantalum and also of iron and tin in the wodginite. These observations were also noted on a second crystal fragment. There was little variation in the manganese content. The Jabuti wodginite is unique in that it

Table 3
Wodginite angle table

Monoclinic: prismatic 2/m

a:b:c = 0.825:1:0.452 ; β = 90°08′ ; $p_0:q_0:r_0$ = 0.548:0.542:1
$r_2:p_2:q_2$ = 2.21:1.21:1 ; μ = 89°52′ ; p_0' = 0.548, q_0' = 0.452, x_0' = 0.002

form	ϕ	ρ	ϕ_2	ρ_2 = B	C	A
001 c	90°00′	0°08′	89°52′	90°00′	0°00′	89°52′
010 b	0 00	90 00	---	0 00	90 00	90 00
100 a	90 00	90 00	0 00	90 00	89 52	0 00
110 m	50 26	90 00	0 00	50 26	89 55	39 34
310 n	74 38	90 00	0 00	74 38	89 52	15 22
021 w	0 15	42 07	89 52	47 53	42 07	89 57
101 d	90 00	28 49	61 11	90 00	28 41	61 11
101 D	-90 00	28 38	118 39	90 00	28 46	118 38
111 p	50 35	35 27	61 11	68 39	35 27	63 23
131 q	22 05	55 40	61 11	40 06	55 36	71 55
$\bar{1}11$ P	-50 23	35 21	118 39	68 22	35 32	63 33
$\bar{1}31$ Q	-21 56	55 38	118 39	40 02	55 41	72 03

has a higher content of tin, and a lower content of tantalum than either the Bernic Lake, Rwanda, or Wodgina occurrences.

CASSITERITE

The Jabuti mine cassiterite is also quite interesting in that it contains up to 12.80% Ta_2O_5. The "ainalite" (a variety of cassiterite) of Nordenskiold (1863) had 8.78% Ta_2O_5 but its legitimacy is doubtful (Quensel, 1941). Clark *et al.* (1976) have noted a Burmese cassiterite with 13.67% Ta_2O_5. There is an irregular color segregation in the Jabuti cassiterite; light brown and dark brown sections. Analysis #2 is of the dark brown material, and analysis #3 is of the light brown material. The brown color becomes darker with increasing iron and tantalum.

INCLUSIONS IN CASSITERITE

A dark red mineral occurs as anhedral blebs in the domains of light brown cassiterite, but not in the dark brown domains (Fig. 6). None of these blebs exceed 0.1 mm and most are considerably smaller than 0.05 mm. The above observation was made on a thin section cut normal to the elongation of the wodginite/cassiterite intergrowth giving a cross section of the host cassiterite. Therefore, these blebs may be longer in the elongation direction [010] of the host wodginite. Analysis of a number of these blebs indicates there is very little variation in their composition. An average analysis, presented as #4, suggested that the blebs are tantalite or tapiolite. X-ray examination confirmed their identity as tapiolite.

It is possible that about 11% Ta_2O_5 might be a maximum for solid solution of tantalum in cassiterite, and that these blebs may have formed by the exsolution of the excess tantalum. If this is true, the light color of the cassiterite in which they repose may be due to the iron being absorbed by the formation of the tapiolite. Similarly, the ~17% SnO_2 in the wodginite may be the maximum permissable solid solution of SnO_2 in wodginite.

Tin is not an essential constituent of synthetic wodginite (Turnock, 1966) but is present in all described natural wodginites.

Figure 2. **Wodginite with tin-coated cassiterite. This is the same crystal as in Figure 1. Photograph by Pete J. Dunn.**

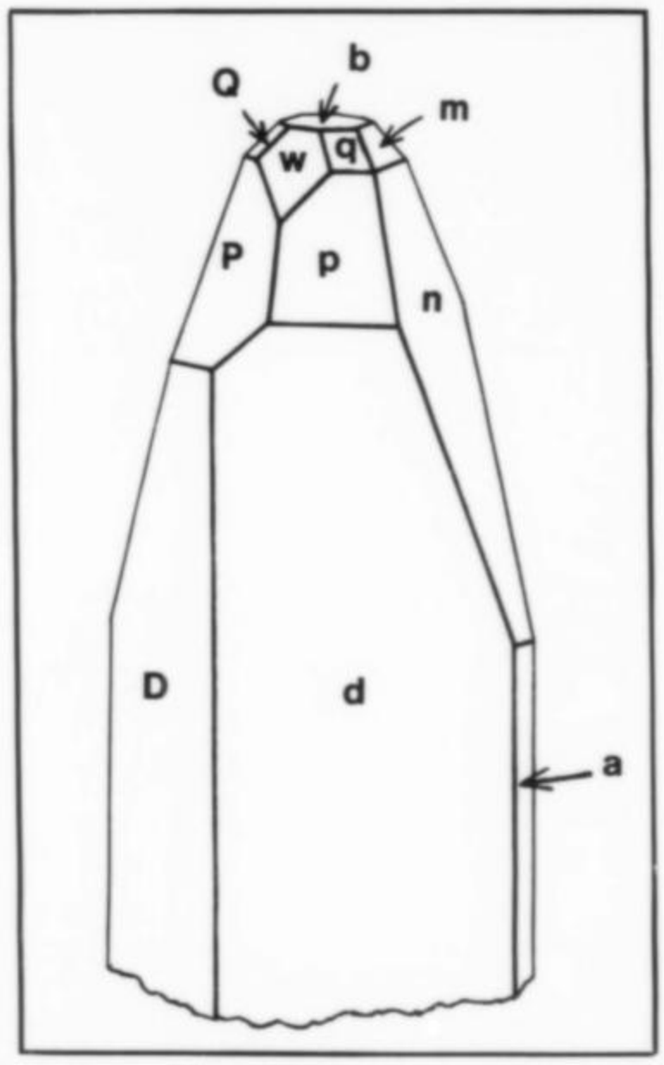

Figure 3. **Idealized crystal drawing of wodginite without cassiterite. Drawing by C. Wroe Wolfe.**

CRYSTALLOGRAPHY

The occurrence of beautiful crystals from the Jabuti mine presented the opportunity for a detailed goniometric study of wodginite. The crystals were examined using a two-circle Wolfe goniometer.

Sizes of crystals and forms

The maximum dimension of the nine crystals examined is about 20 mm, parallel to the axis of elongation, which is the *b* [010] axis. The average dimensions parallel to the *a* [100] and *c* [001] axes are 15 and 5 mm respectively (Fig. 3).

The relative sizes of forms varied from crystal to crystal, but *d* {101} and *D* {101} were always the largest forms, with the former usually larger than the latter. *p* {111} was the next largest form, followed by *q* {131}. In Table 2 the measurement data are summarized. The maximum number of times a form could be observed would obviously be nine, since that was the number of crystals measured. Aside from {010} which could never be observed more than once on the singly terminated crystals and thus could not have been observed more than nine times, all other forms could have two faces developed on the singly terminated crystals, and the maximum number of occurrences for these forms on nine crystals would be 18. The columns labeled "number of crystals" and "number of times" relates to the actual observation of the form as crystal planes on the nine crystals. The average relative sizes of faces are rated from 1 to 5, with 1 being the largest form occurring on the crystals. The average quality of the reflections from the various forms is also given on a scale from 1 to 5, with a high quality reflection having a low number on the scale. Since this quality was not the same on all crystals, the weighted angular values (best ρ_2, Q_2) given in Table 2 are not the same as the average of the measured ranges. All crystals were measured with the *b* axis as the axis of rotation for measurement. Thus, the *phi* and *rho* readings which were obtained are actually the phi_2, rho_2 readings of the normal monoclinic angle table. A comparison of the ranges, the weighted values, and the calculated values will indicate that the quality of reflections was, in general, rather poor and no great claim to precision for the crystallographic elements can be made.

CRYSTALLOGRAPHIC ELEMENTS

The crystallographic elements are listed in Table 3 with an angle table. The least certain of those elements is the angle β. For all practical purposes, wodginite is pseudo-orthorhombic. Although the extensive twinning which could be expected on (001) and (100) with such a lattice could not be observed goniometrically, it appears as color zoning in thin section on {100} (Fig. 5). The monoclinic symmetry of form development was very striking, with the quality and size of the faces of similar indices on successive quadrants of the crystal being notably different when the crystals were measured around the unique *b* axis. Geometrically, however, there was little difference in the measured angles for these alternative forms with similar indices. Since the quality of the signals was rarely as good as 3 in a scale of 1 to 5, no precision can be claimed for any of the elements.

It is interesting to compare these calculated values of *a:b:c* and β with those given by Nickel *et al.* (1963) on the basis of X-ray studies of wodginite from Bernic Lake, Manitoba and from Wodgina, Australia (Table 4). There is remarkably good agreement between X-ray and morphological values, except for the value for β. How much claim to precision Nickel *et al.* can make for their β value cannot be said, but we can certainly make no claim for precision for our value. We are somewhat amazed at how the axial ratios compare so favorably, since the general quality of the forms we measured was so poor.

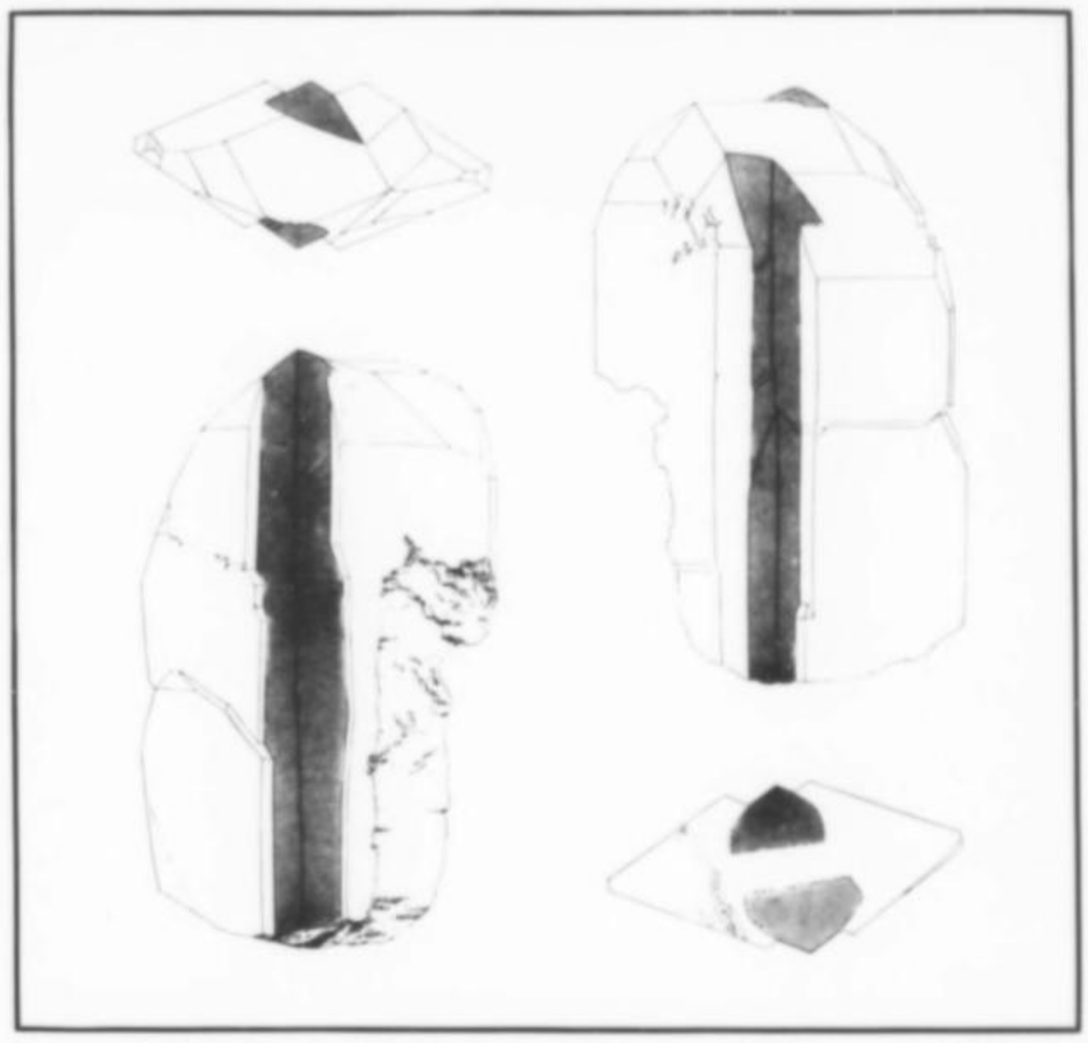

Figure 4. **Idealized sketch of wodginite-cassiterite crystal: Front, top, rear, and cross section views. Drawing by Wendell Wilson. This is the same crystal as in Figure 1.**

EXPITAXIAL INTERGROWTH OF CASSITERITE AND WODGINITE

The crystals of wodginite in this study were closely intergrown with cassiterite. In Figure 4 the cassiterite is indicated as the fine-ruled (gray) central portion. The two faces shown are from the *s* {111} dipyramid of cassiterite. The interfacial angle between two cassiterite *s* faces is 58°19′ which compares closely with the interfacial angle between *d* {101} and *D* {$\bar{1}$01} of wodginite, 59°28′. The edge between {111} and {$\bar{1}$11} of cassiterite is, therefore, parallel to the axis of elongation of wodginite, which is the *b* axis. One *a* axis of cassiterite parallels the *a* axis of wodginite. On the basis of these correlations the following statement of the epitaxy between wodginite and cassiterite is offered:

[100] Wodginite, 9.52Å = [200] Cassiterite: 2 x 4.72 = 9.44Å
[010] Wodginite, 11.47Å ≃ [022] Cassiterite, 11.37Å
[003] Wodginite, 15.30Å ≃ [024] Cassiterite, 15.80Å

A structural confirmation is not given herein, but we believe the evidence given does indicate an epitaxial relationship.

A remarkable specimen from this pocket seen by one of the authors (RVG) but not available for study, is an apparent twin (Fig. 7). This consists of two of the typical wodginite/cassiterite

Table 4

	a	*b*	*c*	β	
Jabuti mine, Baixio, Brazil					*a:b:c* = 0.83:1:0.45
Wodgina, Australia	9.52	11.47	5.10	91°18′	*a:b:c* = 0.83:1:0.45
Bernic Lake, Canada	9.47	11.42	5.09	91°02′	*a:b:c* = 0.83:1:0.45

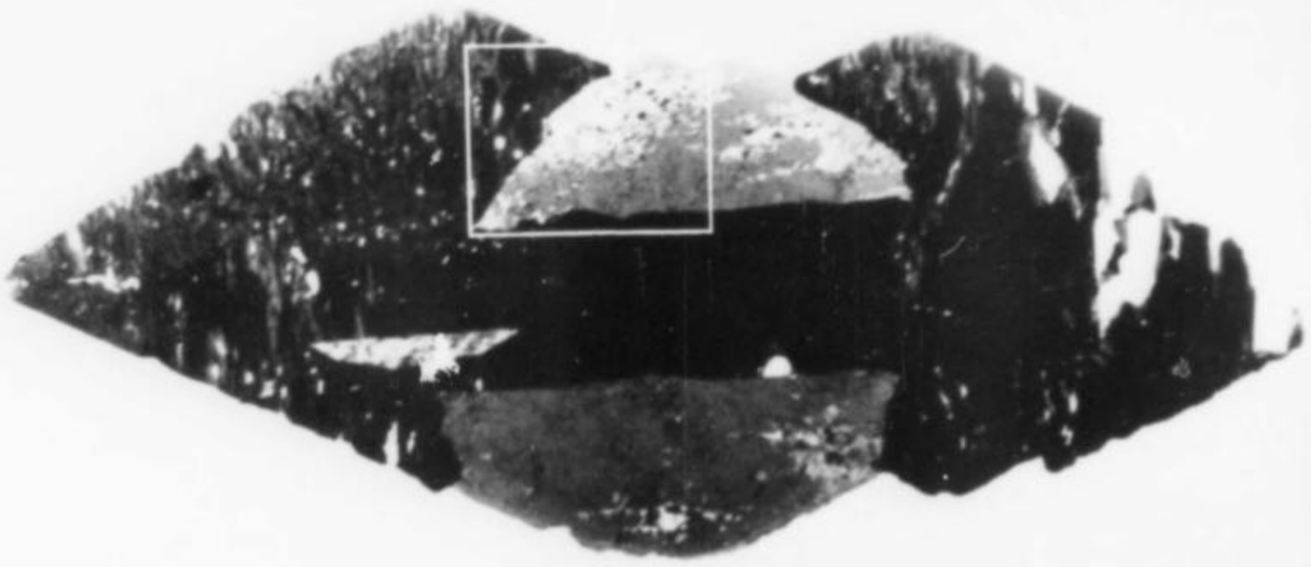

Figure 5. **Transmitted light photograph of wodginite-cassiterite section showing orientation of cassiterite. Photograph by Pete J. Dunn.**

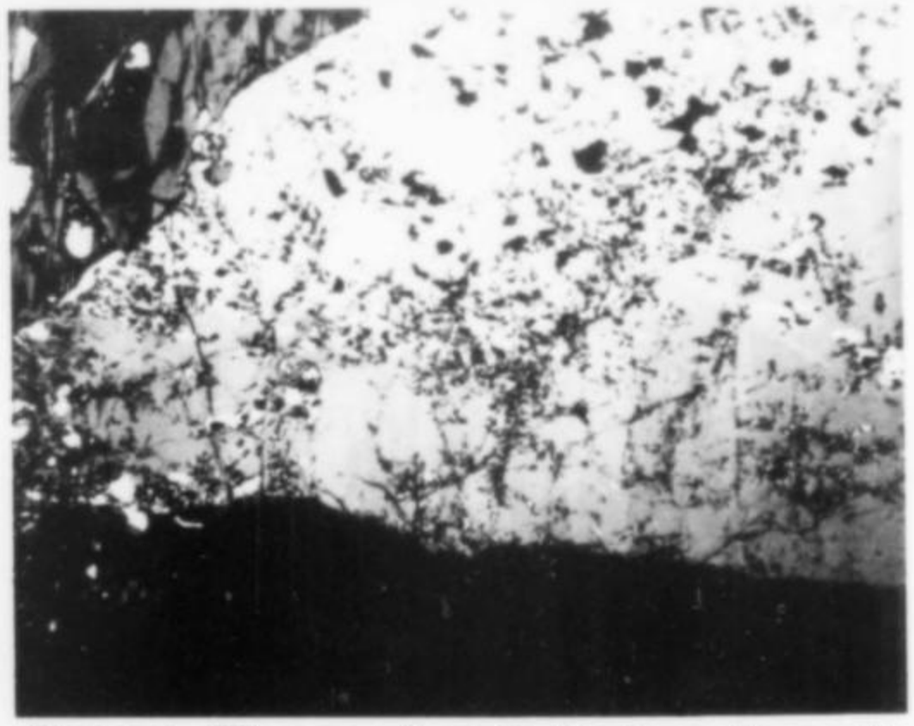

Figure 6. **Close-up of cassiterite from Figure 5, showing the color segregation of cassiterite and the tapiolite blebs (black spots in light cassiterite). Photograph by Pete J. Dunn.**

intergrowths, joined at the base in such a way that the *b* axes make an angle of about 69°, the *a* axes are common, and the {100} faces are coplanar. These crystals were larger than average, and the overall size of the probable twin is about 6 x 4.5 x 3.5 cm.

One of the strongest pieces of evidence that this might be a true twin is the fact that the {100} faces of both individuals form a single, lustrous face, with no sign of a line of demarcation between them.

Because there was no opportunity to make precise measurements, it could not be determined whether the apparent twin relationship is based on two wodginite individuals or two cassiterite individuals, nor what twin law might be involved.

SPACE GROUP OF WODGINITE

The space group listed for wodginite by Nickel *et al.* (1963) is *C*2/*c* or *Cc*. From crystallographic measurements we can state that there is a two-fold axis. The presence of the glide plane, as indicated by Nickel *et al.*, requires the existence of a center of symmetry. Thus, the space group must be accepted as *C*2/*c*. The conformity of the morphology to the predictable form development based on the space group is quite striking. All prismatic forms should conform to the requirement that $h+k=2n$. This is true for {111}, {131}, {$\bar{1}$11}, {$\bar{1}$31}, {110}, {310} and {021}. Of the pinacoids, *a,b,c,* only *c* is unaffected by the face centering, but the glide plane requires that *l* in *(00l)* actually be (002). The face centering requires that *a* and *b* really be {200} and {020}, respectively, which in large measure accounts for the minor development of the principal pinacoids. The geometry of the lattice requires that *c* be less important than *a* or *b*, which it is. In fact, it was too small to show in Figure 3. The form {101} is essentially {202} because of the lattice centering and of the *c* glide. Thus, when the effects of the space group on the form occurrence is considered, the basic crystallographic law of Haüy that the faces which occur on a crystal are those with simplest indices, is completely validated on wodginite.

SUMMARY

In summary, this occurrence of wodginite and cassiterite is a most interesting one. These wodginite crystals are the finest known, and will likely become "collector classics" for the species, as well as very desirable examples of epitaxial growth, especially since only about 100 crystals were found.

ACKNOWLEDGEMENTS

The authors are indebted to the Creator for making such beautiful crystals. Thanks also to Wendell Wilson for the excellent multi-view sketch of wodginite, and the Figure 1 photograph.

Figure 7. **Unusual twin crystal of wodginite/cassiterite. The size is about 6 x 4.5 x 3.5 cm. Photo by Richard V. Gaines.**

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zinc phosphates at Reaphook Hill south australia

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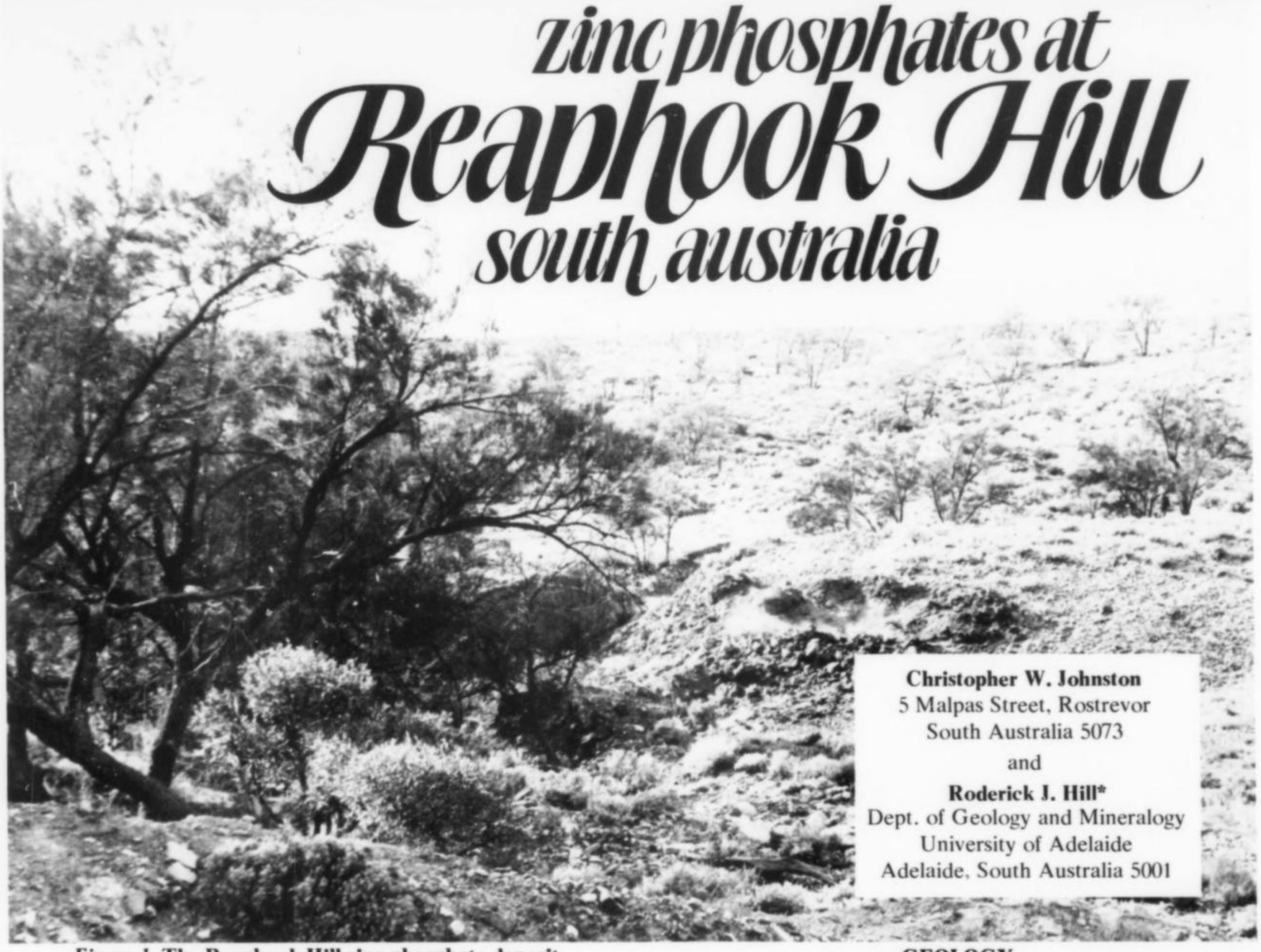

Figure 1. **The Reaphook Hill zinc phosphate deposit looking southeast.**

INTRODUCTION

Reaphook Hill is a prominent peak rising 180 m above the surrounding plain in the arid eastern Flinders Ranges of South Australia about 480 km from Adelaide. Near the base of this peak is a small deposit of the rare zinc phosphate mineral scholzite, together with tarbuttite, parahopeite, zincian collinsite, a number of manganese oxides and several other less well crystallized phosphate species (Hill, Johnson and Jones, 1973).

Man's activities in the region are predominantly pastoral, with Martins Well Station supporting some 7000 merino sheep, and an unknown number of kangaroos, emus and wild goats over a 50 square km area surrounding Reaphook Hill. The climate is BSh in the Koeppen classification scheme with an annual rainfall of 15 cm; temperatures soar over 45°C (113°F) in summer, and frosts are common in winter. The hills around the phosphate deposit are sparsely timbered with mulga *(Acacia aneura)* and several species of *Ermophilas*. Black oak *(Casuarina cristata)* is confined to the banks of a small, intermittent creek winding through the mining lease, but salt bush *(Artiplex)* and blue bush *(Kochia)* thrive everywhere. After rain, Sturt pea *(Clianthus formosus)* form a scarlet and black carpet across the valley floor, with introduced *Rumex vesicarius* on the hill slopes. The panorama from the summit of Reaphook Hill is especially magnificent at these times.

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GEOLOGY

The area is typical of the flanks of the Flinders Ranges. Sediments deposited in the Adelaide Geosyncline during the Proterozoic and early Paleozoic were uplifted in the Ordovician, and erosion appears to have been continuous since then. The ancient peneplain was uplifted and the streams were rejuvenated in the Tertiary.

Three formations are of interest in the region of the phosphate deposit: the Pound quartzite, the Parachilna formation, and the Wilkawillina limestone. The Pound quartzite is upper Proterozoic, carries *Ediacra* fauna locally and is a prominent cliff-forming rock here and in other areas of the Flinders Ranges. The Parachilna formation occurs at the base of the Cambrian sequence; it is of low relief, consisting of poorly consolidated siltstones with scattered sand and conglomerate pods and is the host rock for the zinc phosphate deposit. The Wilkawillina limestone conformably overlies the Parachilna formation; it is partly dolomitic and carries the fossil *Archeocyatha* in the vicinity of Reaphook Hill.

In view of the occurrence of detrital phosphate in the earliest Cambrian strata elsewhere in the Adelaide Geosyncline there is a possibility that the phosphorus content of the Parachilna formation has been derived from reworking of originally detrital phosphorite. Localization of manganese within these rocks, typical of the area, has resulted in the scavenging of otherwise low-grade zinc into high concentrations associated with the manganese (Loganathan and Burau, 1973). The presence of several false "gossans" of this type near the base of the Wilkawillina limestone was the original stimulus for exploration in the Reaphook Hill region, but drilling soon established that the mineralization did not persist at depth.

THE MINE

Outcrops of weathered scholzite were discovered at Reaphook Hill in the early 1960's (Johns, 1972) during reconnaissance geochemical exploration by the South Australian Geological Survey. Since then the deposit has been the subject of considerable (although intermittent) study, interest tending to concentrate on the larger of two distinct "lodes" of zinc phosphate mineralization.

The larger lode stretches approximately 40 m west from a bold but shallow outcrop 6 m above a creek bed but soon tapers off and merges into the hillside (Fig. 1). It consists of a series of ore pods less than 3 m below the surface in severely contorted and slickensided siltstones of the Parachilna formation less than 20 m above the top of the Pound quartzite. The second lode is much smaller and shallower and strikes northeast-southwest.

In the late 1960's several costeans (bulldozed trenches) were cut across the mine area (Fig. 2) but development by the present lessees has followed the strike of the lode, starting at the eastern end. Operations have been severely hampered by the inaccessibility of the area (the nearest small town is 145 km away), and the generally harsh climate. Fresh water must be carried in 10 km along a combination of dirt tracks and dry creek beds which, for a considerable period during the rainy season, are subject to flash flooding. For these reasons and because of its small size, attempts to develop the deposit for the zinc and/or phosphate content have been unsuccessful.

THE MINERALS

Detailed electron probe microanalyses of the major phosphate minerals identified at Reaphook Hill (Hill and Milnes, 1974) have demonstrated that while scholzite and tarbuttite have chemical compositions consistent with material from the type localities in Bavaria (Strunz, 1948) and Zambia (Spencer, 1908) respectively, crystals of parahopeite and collinsite represent unique compositions for these species (Table 1) and are, in addition, chemically zoned. It is likely that the other phosphates from Reaphook Hill, namely switzerite, phosphophyllite and rockbridgeite, also have chemical formulas which differ from those of the type specimens (possibly in the partial or complete replacement of manganese and iron by zinc), but they are too fine-grained and intimately intermixed to allow accurate analysis; only idealized formulas for these and the remaining Reaphook Hill minerals have been included in Table 1.

Scholzite, $CaZn_2(PO_4)_2 \cdot 2H_2O$, is ubiquitous in this deposit. It is found in a variety of colors, most commonly white, but also lime-green, reddish brown, and yellow (Fig. 3). There are two distinct habits in its crystallization. In large open vugs it occurs with parahopeite and collinsite as interlocking tufts of white, lustrous, acicular crystals up to 25 mm long (Fig. 4). Often a

Table 1. Minerals from Reaphook Hill

Name	Formula
scholzite	$CaZn_2(PO_4)_2 \cdot 2H_2O$
tarbuttite	$Zn_2(PO_4)(OH)$
parahopeite*	$Zn_2(Zn,Fe,Mn,Mg)(PO_4)_2 \cdot 4H_2O$
zincian collinsite**	$Ca_2(Zn_{0.51},Mg_{0.44})(PO_4)_2 \cdot 2H_2O$
switzerite	$(Mn,Fe)_3(PO_4)_2 \cdot 4H_2O$
phosphophyllite	$Zn_2(Fe,Mn)(PO_4)_2 \cdot 4H_2O$
rockbridgeite	$(Fe,Mn)Fe_4(PO_4)_3(OH)_5$
smithsonite	$ZnCO_3$
hemimorphite	$Zn_4Si_2O_7(OH)_2 \cdot H_2O$
cryptomelane	KMn_8O_{16}
chalcophanite	$(Zn,Fe,Mn)Mn_3O_7 \cdot 3H_2O$
psilomelane/manganite/ pyrolusite	massive Mn oxides
siderite	$FeCO_3$

*The detailed chemistry of this species corresponds to the formula $Zn_2(Zn_{0.24},Mg_{0.42},Fe_{0.17},Mn_{0.07})(PO_4)_2 \cdot 4H_2O$. Type parahopeite from Broken Hill, Zambia (Spencer, 1908) is $Zn_3(PO_4)_2 \cdot 4H_2O$.

**Collinsite is a member of the fairfieldite group of isostructural minerals with the general formula $Ca_2X(PO_4)_2 \cdot 2H_2O$. In addition to zincian collinsite from Reaphook Hill (X = Zn,Mg), this group includes fairfieldite (X = Mn,Fe) from Connecticut (Brush and Dana, 1879), type collinsite (X = Mg,Fe) from British Columbia (Poitevin, 1927), magnesian collinsite (X = Mg) from South Dakota (Mrose, 1972) and from Western Australia (Bridge and Pryce, 1974), cassidyite (X = Ni,Mg) from the Wolf Creek, Australia, meteorite (White, Henderson and Mason, 1967), and messelite (X = Fe,Mn) from Hesse, Germany (Cech and Padera, 1958).

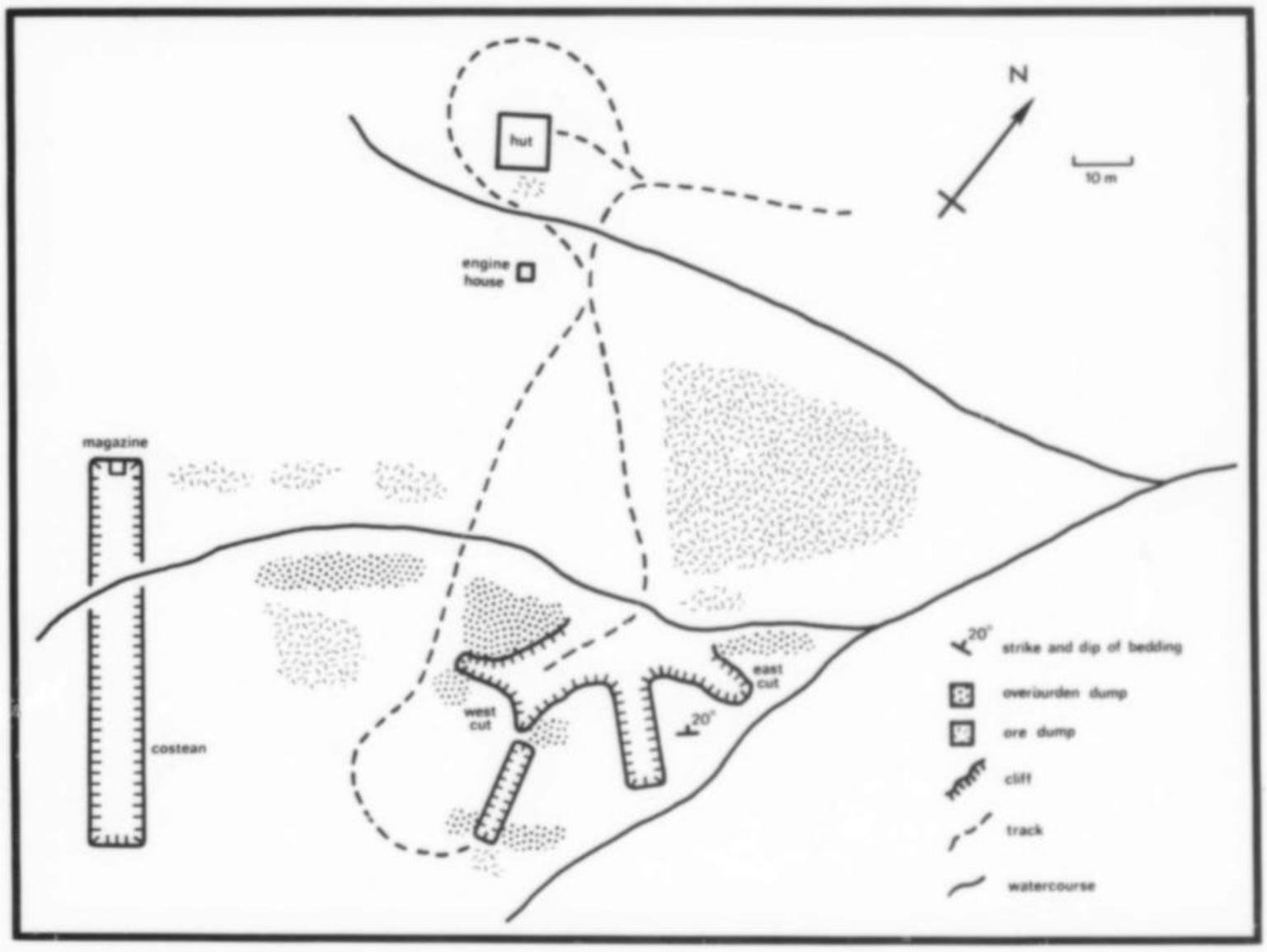

Figure 2. **Sketch plan of the Reaphook Hill mine area.**

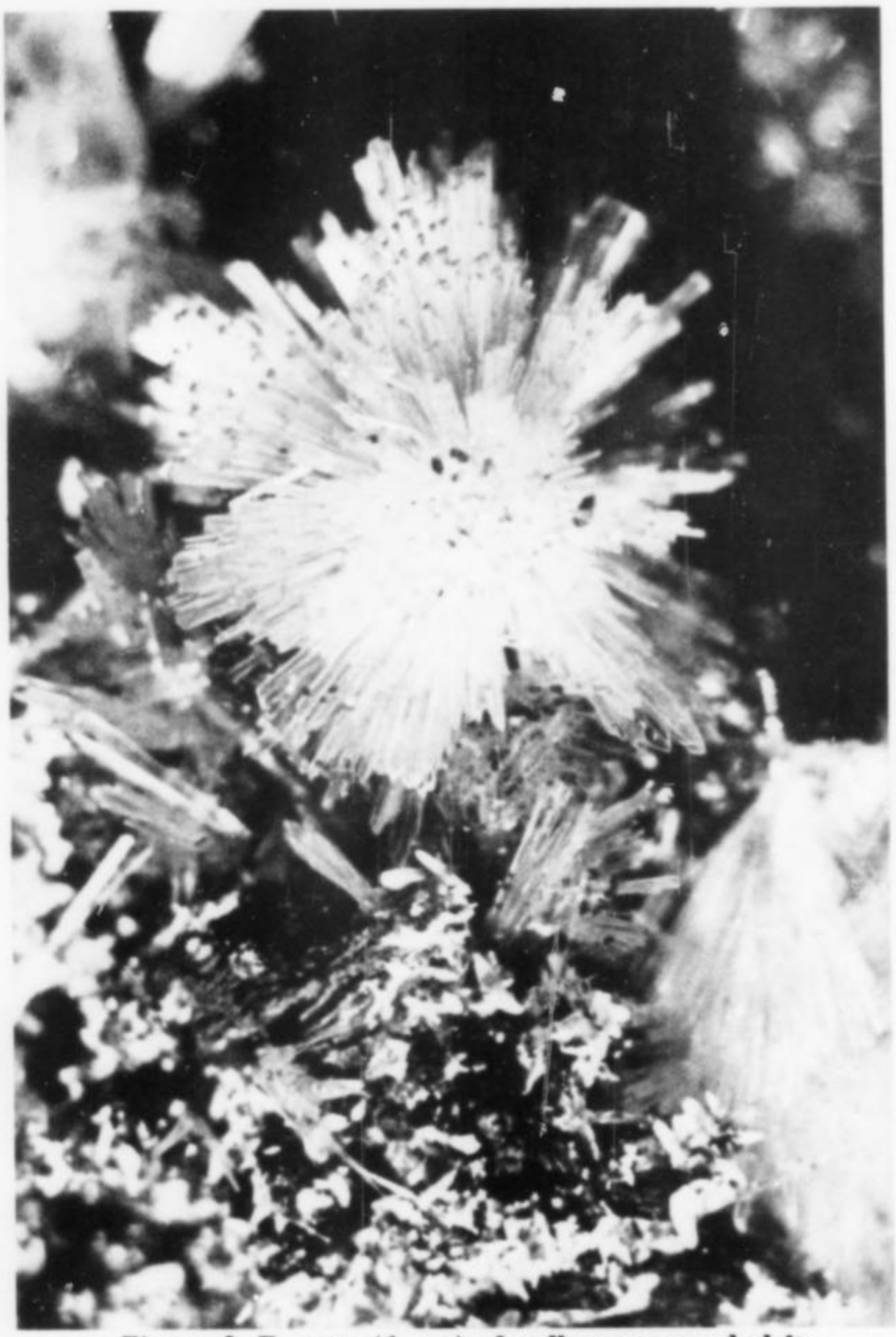

Figure 3. **Rosette (1 cm) of yellow-green scholzite crystals on a matrix of parahopeite (brown) and hemimorphite (white).**

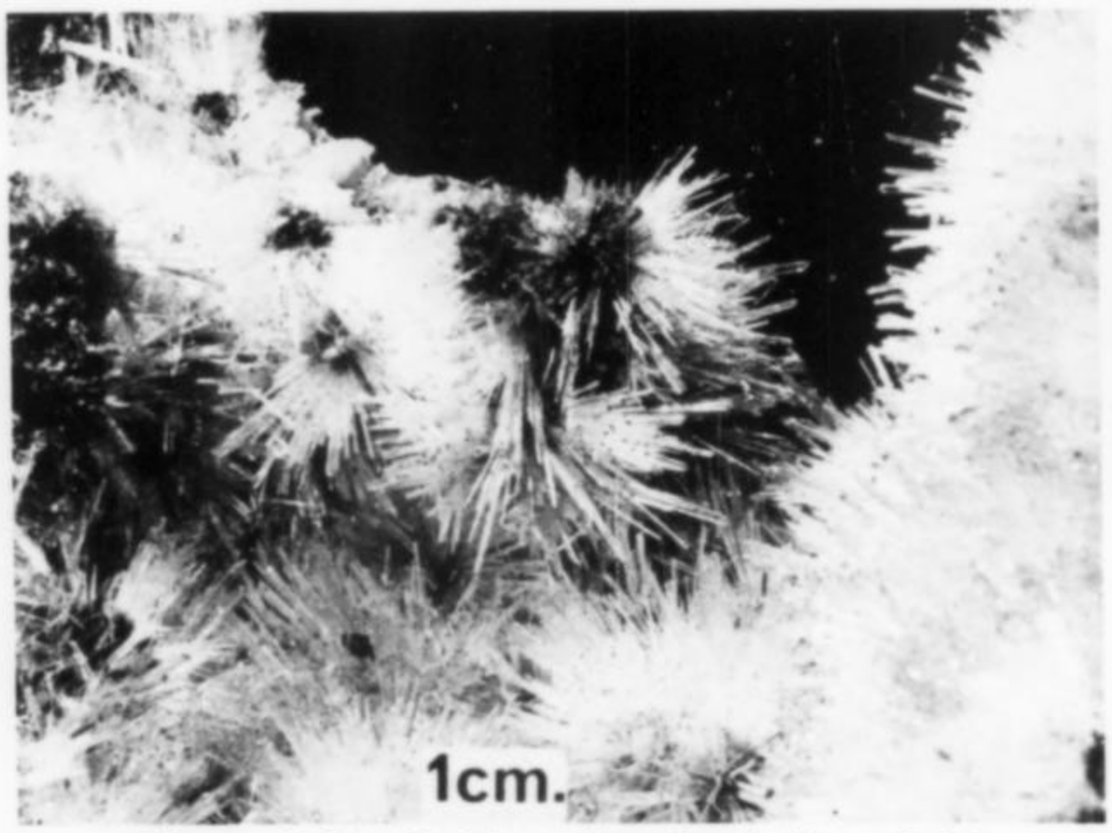

Figure 4. **Interlocking tufts of acicular scholzite crystals in a void.**

coating of cryptomelane forms a "tide line" with the white tips of the crystals showing above (Fig. 5). Some are thickly coated with cryptomelane, giving lustrous black specimens, but as the coating thins the color changes to resplendent gold at the base of the crystals with black droplets hanging above. Many vugs from the hanging wall of the east cut produced pure white specimens while those on the footwall were mostly highly colored.

The other habit of scholzite crystals is best described as "Roman sword." The crystals are white or pink, up to 1 cm in length, and are sometimes associated with tarbuttite and small brown hexagonal crystals of siderite. In the west cut several vugs were close to the footwall and richly coated with bluish chalcophanite crystals and hemimorphite but they seldom exceeded 5 cm across. This habit is not as common in the larger specimens, with the vugs generally being smaller and in more massive ore, often with tarbuttite or massive scholzite.

Tarbuttite, $Zn_2(PO_4)(OH)$, occurs in the massive reddish ore

Figure 5. **Cryptomelane coating scholzite needles.**

Figure 6. **"Roman sword" scholzite crystals up to 5 mm in length.**

lining small vugs in the upper portion of the lode (well above the present water table) and is easily identified by its high density and luster. The sharp, highly lustrous crystals vary in color from transparent white to green or golden brown and are generally less than 3 mm across (Fig. 7). They are invariably associated with "Roman sword" scholzite. All the other phosphate minerals have a lower zinc content and appear to have formed by the leaching of zinc (with the complementary addition of other cations) from that mineral at a later stage in the paragenetic sequence.

The east cut produced most of the **parahopeite**, $Zn_2(Zn,Fe,Mn,Mg)(PO_4)_2 \cdot 4H_2O$. This mineral occurs as groups of stubby, twinned crystals with a golden brown color (Fig. 9). Much of the parahopeite is covered with transparent scholzite crystals coated

in turn by hemimorphite in the form of opaque white teardrops. Add to this unique assemblage resplendent blue black chalcophanite, or black droplets of cryptomelane, to obtain some impression of the minerals obtained in the one specimen. The parahopeite vugs were generally small with the largest specimen (from the east cut) carrying crystals up to 15 mm long with magnificent sprays and delicate tufts of lemon-colored scholzite up to 4 cm across. Most of the parahopeite, however, is partially or wholly altered to microcrystalline phosphophyllite and/or a

Figure 7. **Tarbuttite crystals to 4 mm lining a vug.**

number of other as yet unidentified, poorly crystallized materials, particularly at depth.

Collinsite, $Ca_2(Mg,Zn)(PO_4)_2 \cdot 2H_2O$, was obtained only in the west cut below a black silicified cap of fractured manganese "gossan" less than 50 cm thick and appears to have crystallized late in the paragenetic sequence. The mineral occurs as greyish blue or white concentric crusts with a radial platy habit (Fig. 9). These crusts, less than 5 mm in diameter, are associated with scholzite, cryptomelane and, occasionally, microcrystalline rockbridgeite. The collinsite gradually thins out with depth, ultimately leading to a system of interconnected voids up to 10 m long. The whole series yielded magnificent specimens with scholzite on the floor and cryptomelane on the roof of each chamber.

Phosphophyllite, $Zn_2(Fe,Mn)(PO_4)_2 \cdot 4H_2O$, appears to be an alteration product of parahopeite at Reaphook Hill, commonly occurring as a rich brown coating on the latter mineral. No distinct crystals of any size have been noted to date. The rare mineral **switzerite**, $(Mn,Fe)_3(PO_4)_2 \cdot 4H_2O$, has also been identified in the lode, usually as a rusty powder coating acicular scholzite and parahopeite on the footwall, along with green **rockbridgeite**, $(Fe,Mn)Fe_4(PO_4)_3(OH)_5$.

Teardrop **smithsonite**, $ZnCO_3$, occurs on scholzite. It seldom exceeds 3 mm in size and is opaque white, but on parahopeite it has altered to **hemimorphite**, $Zn_4Si_2O_7(OH)_2 \cdot H_2O$. One pod was encountered with large smithsonite teardrops on massive cryptomelane and chalcophanite. In other specimens scholzite is coated with steel-blue chalcophanite and tipped with snow-white smithsonite or, more commonly, hemimorphite. This portion of the lode has been heavily leached and weathered, the scholzite altering to opaque, very brittle crystals.

Manganese oxides are very common throughout the lode. **Chalcophanite**, $(Zn,Fe,Mn)Mn_3O_7 \cdot 3H_2O$, invariably occurs as bluish black microcrystals, very lustrous and enhancing the beauty of the specimens, particularly in the more weathered portions of the deposit. Many vugs along the footwall in the east cut were lined with remarkable specimens of botryoidal, multilayered cryptomelane, each coated with chalcophanite.

CONCLUDING REMARKS

Despite the complexity of the depositional and structural relationships of the deposit, it appears that the major phosphates,

Figure 8. **Rare, unaltered parahopeite crystals (pink) lining a vug.**

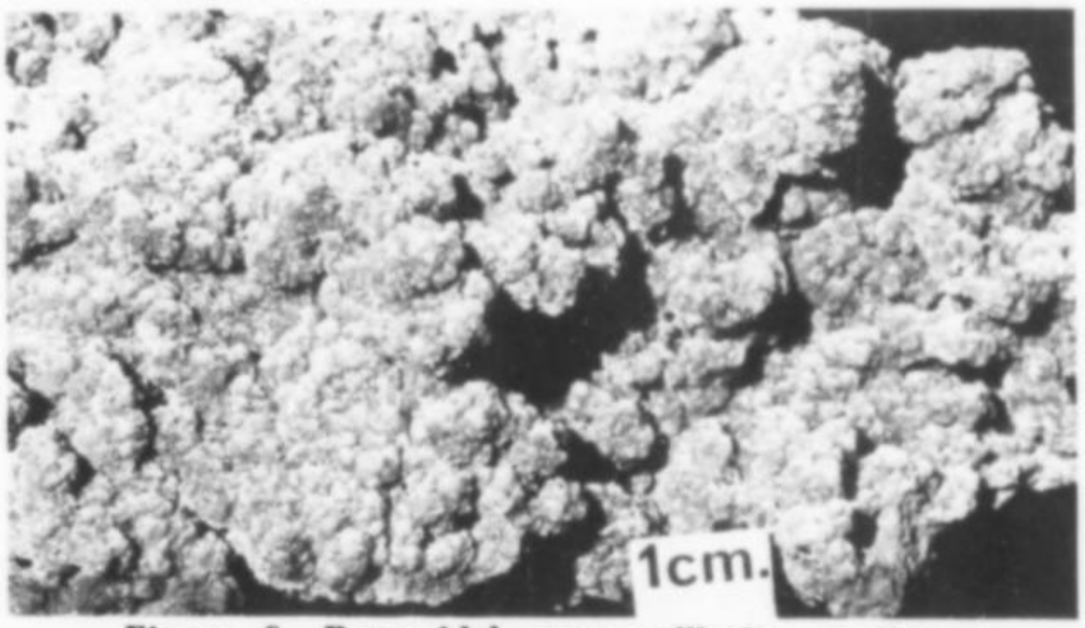

Figure 9. **Botryoidal grey collinsite coating a manganese-rich matrix.**

at least, subscribe to an overall trend. Tarbuttite was initially the most prevalent mineral at Reaphook Hill, but subsequent alteration as a result of the action of ground water has produced an assemblage of rare zinc phosphate minerals consistent with an overall decrease in Zn:P ratio and a complementary increase in the Ca, Mn, Mg, and Fe content of the mineralizing fluids.

Type material and some of the more spectacular specimens have been lodged with the South Australian Museum and the Department of Geology at the University of Adelaide. The deposit continues to yield specimens of all the minerals and, although not available in large amounts, representative material may be obtained from the senior author on request.

ACKNOWLEDGEMENTS

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NATROLITE AND ASSOCIATED SECONDARY MINERALS AT

The Chimney Rock Quarry

BOUND BROOK, NEW JERSEY

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INTRODUCTION

The occurrence of zeolites and associated minerals in the Triassic basalt and diabase of New Jersey was described, and in part understood, during the first half of this century. At that time, extensive collections of New Jersey trap rock minerals were assembled and studied, and fine zeolite specimens appeared on the open market in great abundance. Much activity centered about quarries in the zeolite-rich pillow lavas of the First Watchung Mountain in and around Paterson, New Jersey (Drake, 1943; Fenner, 1910; Hawkins, 1933; Manchester, 1931; Sachs, 1940; Schaller, 1932; Whitlock, 1927). With occasional exceptions due to road cuts or construction, the Paterson area has since declined as an important source of mineral specimens. Other nearby operations in the Watchungs continue to yield interesting specimens.

Cut into the basalt of the First Watchung Mountain at Bound Brook, Somerset County, the Chimney Rock quarry was not a prolific producer of mineral specimens and consequently was neglected in the early literature. The location of the Chimney Rock quarry relative to other quarries in the Watchung basalts is shown in Figure 1. The Chimney Rock quarry is now operated by Houdaille Industries, Inc. During the period from 1972 to 1975, I was able to observe a variety of intact mineral occurrences at the quarry, and to examine several thousand specimens. The postulated sequence of mineral deposition (paragenesis) at the Chimney Rock quarry is presented in Figure 2. Although fewer minerals are present, the order of deposition at Chimney Rock is similar to that described for the Paterson area basalts by Schaller (1932).

The first minerals deposited after emplacement of the basaltic lava at Chimney Rock were the soluble salts anhydrite and glauberite. These minerals dissolved almost completely during later periods of deposition. The soluble salts were followed by successive deposition of distinct mineral assemblages dominated by a few species. Quartz was deposited in association with native copper, followed by prehnite, other silicates, and sulfides, and then by natrolite and other zeolites. The main phase of mineralization at Chimney Rock ended with abundant deposition of calcite. The last minerals to form were weathering products such as chrysocolla and goethite.

The most significant find, which will be described in some detail, occurred late in 1972 when a blast at the Chimney Rock quarry exposed extremely large crystals of natrolite in great abundance. Some exceptional crystals of natrolite exceeded 18 cm in length and approached 3 cm in width, dwarfing all previous occurrences of this mineral from the basalt and diabase of New Jersey.

GEOLOGIC SETTING

During Late Triassic times—perhaps 210 million years ago—a long down-faulted valley, now called the Newark Basin, trended northeast across New Jersey. Rivers and streams transported

enormous volumes of sediments from the young Appalachians and began filling the slowly subsiding basin. Some of these sediments are exposed in the floor of the Chimney Rock quarry, and are composed of red micaceous siltstone from the Triassic Brunswick formation. During Triassic times, the siltstone had been a dry mudflat characterized by mud cracks and rare dinosaur footprints. A series of basaltic lava flows with a total thickness exceeding 200 m engulfed the Triassic landscape at Chimney Rock.

DEPOSITION IN OPEN SPACES

Mineral deposition at the Chimney Rock quarry was almost totally restricted to open spaces in the basalt—deposition by replacement of basalt was a relatively minor factor. The open spaces provided room for unhindered crystal growth, and porosity for circulation of mineral-bearing hydrothermal solutions. Some primary open spaces were created as the congealing lava trapped pockets of steam rising from the relatively dry Brunswick mudflats. Secondary open spaces—created after the lava had solidified—were much more abundant, occurring along steeply dipping faults and within large breccia zones. Early-formed minerals are best represented in primary open spaces in basalt near the contact with Brunswick siltstone, whereas later-formed minerals are best represented in secondary open spaces at higher stratigraphic levels in the basalt. The situation at Chimney Rock is in contrast to the Paterson area quarries where lava flowed into shallow, saline lakes and primary open spaces were formed in much greater abundance.

SOLUBLE SALTS: ANHYDRITE AND GLAUBERITE

The soluble salts **anhydrite** and **glauberite** were the first minerals deposited in the basalt at Chimney Rock, as was the case elsewhere in the Watchungs. There is good reason to assume that, at Chimney Rock, the two salts were derived from a suite of evaporite minerals already present in the mudflats (van Houten, 1965). At Paterson, the lavas flowed into saline lakes and the result was deposition of very large amounts of anhydrite and glauberite.

The two minerals were almost completely dissolved everywhere in the Watchung basalts during later periods of mineralization, resulting in so-called *crystal cavities.* These cavities were well described by Schaller (1932): "A remarkable feature of the zeolite region is the occurrence at certain places of peculiar cavities in some of the rocks. Many of these cavities are regular, bounded by plane surfaces, and have the shape of crystals. It is obvious that they represent spaces once occupied by minerals long-since removed." The origin of these cavities in the Watchung basalts was open to conjecture until unaltered anhydrite and glauberite were found at some Paterson area quarries.

At the Chimney Rock quarry solution cavities with rhombic or rectangular cross-sections, as illustrated in Figure 3, are widely distributed. Small rhombic cavities after glauberite, occurring individually and as clusters, are numerous in a bleached zone of rock about 0.5 m wide above and below the basalt-siltstone contact. This deposition appears to have been by replacement of the respective rock types. Later deposition of calcite in some

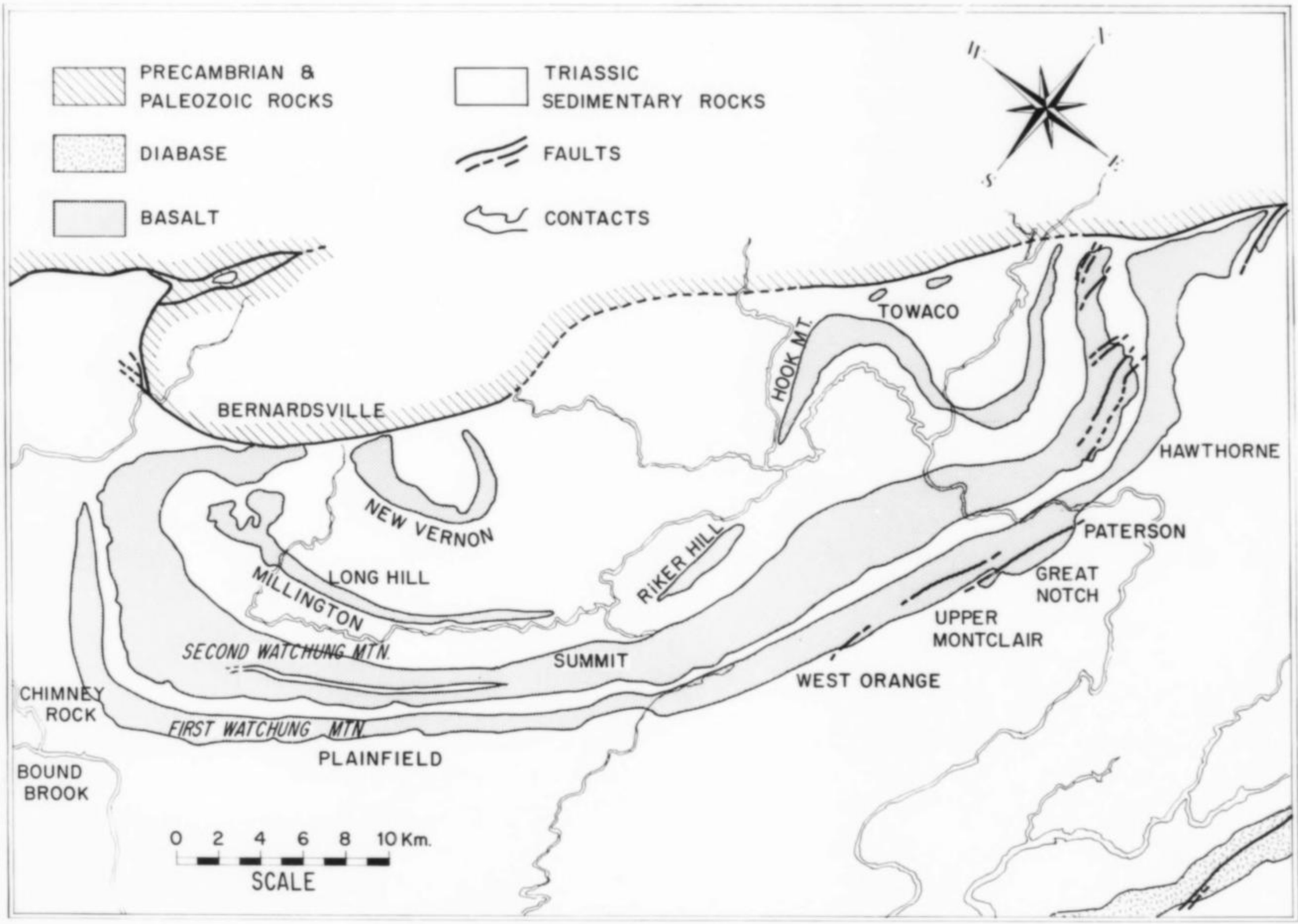

Figure 1. **Map showing the location of the Chimney Rock quarry with respect to locations of other important quarries cut into the Triassic basalts of New Jersey. After Mason (1960).**

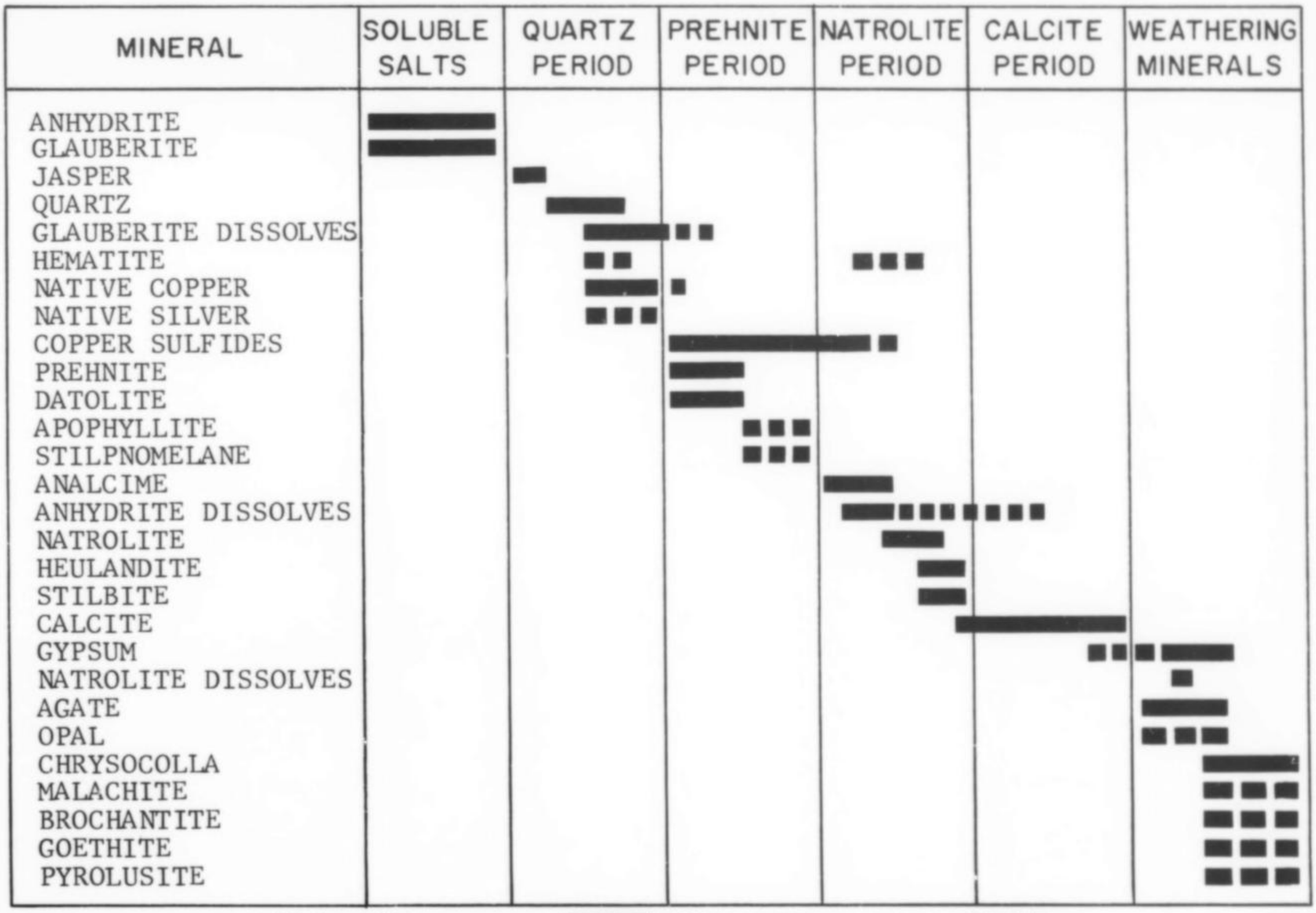

Figure 2. **Postulated sequence of mineral deposition at the Chimney Rock quarry.**

contact zone cavities resulted in calcite pseudomorphs after glauberite. Larger rectangular cavities occur sparsely in the rocks of the basalt-siltstone contact, but are more abundant in quartz, prehnite, or analcime which coated anhydrite before it dissolved. Glauberite itself has not been found here, but Mason (1960) reports the occurrence of anhydrite partially altered to gypsum at Chimney Rock.

QUARTZ PERIOD MINERALS

Following anhydrite and glauberite was deposition of **quartz** (jasper) and then **quartz** crystals. The occurrence of quartz at the Chimney Rock quarry is restricted to isolated spheroidal or pipe-like vugs—representing gas pockets trapped by congealing lava—that are found just above the contact with Brunswick siltstone. Quartz occurs as **amethyst, rock crystal,** and as **smoky quartz.** Specimens usually include solution cavities. Tiny rosettes of specular **hematite** are sometimes found on or enclosed within crystals of quartz.

Native **copper** was then deposited in considerable abundance along the basalt-siltstone contact. Probably the largest specimen of native copper recovered from the quarry was an irregular mass weighing 43 kg which jammed the crusher in 1927 (Mason, 1960). Petrographic examination of polished sections of the basalt-siltstone contact indicates that copper was deposited in

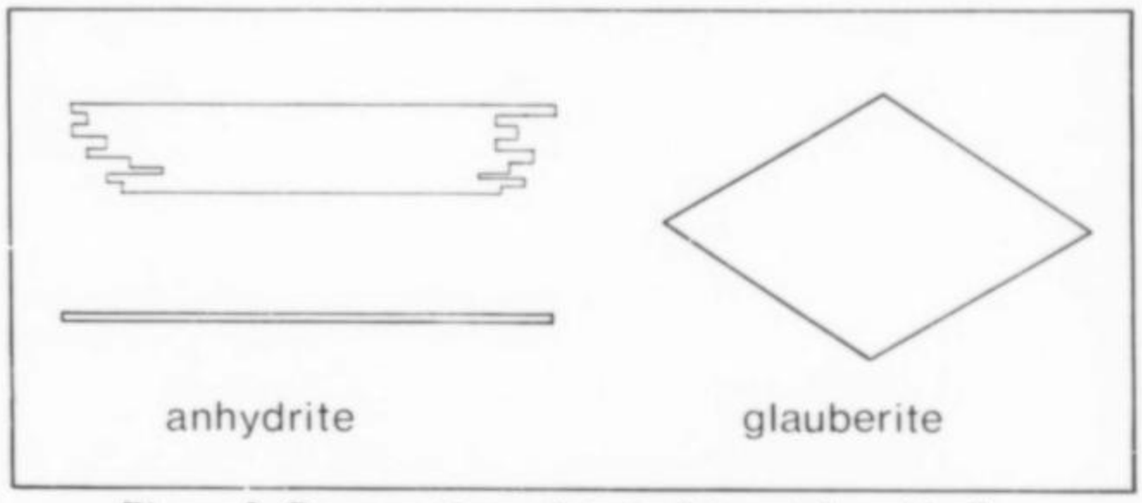

Figure 3. **Cross-sections of typical "crystal cavities" found at Chimney Rock in siltstone, basalt, quartz, prehnite, and analcime.**

Figure 4. **Micrograph of red, earthy hematite. Individual plate-like crystals average about 0.15 mm across.**

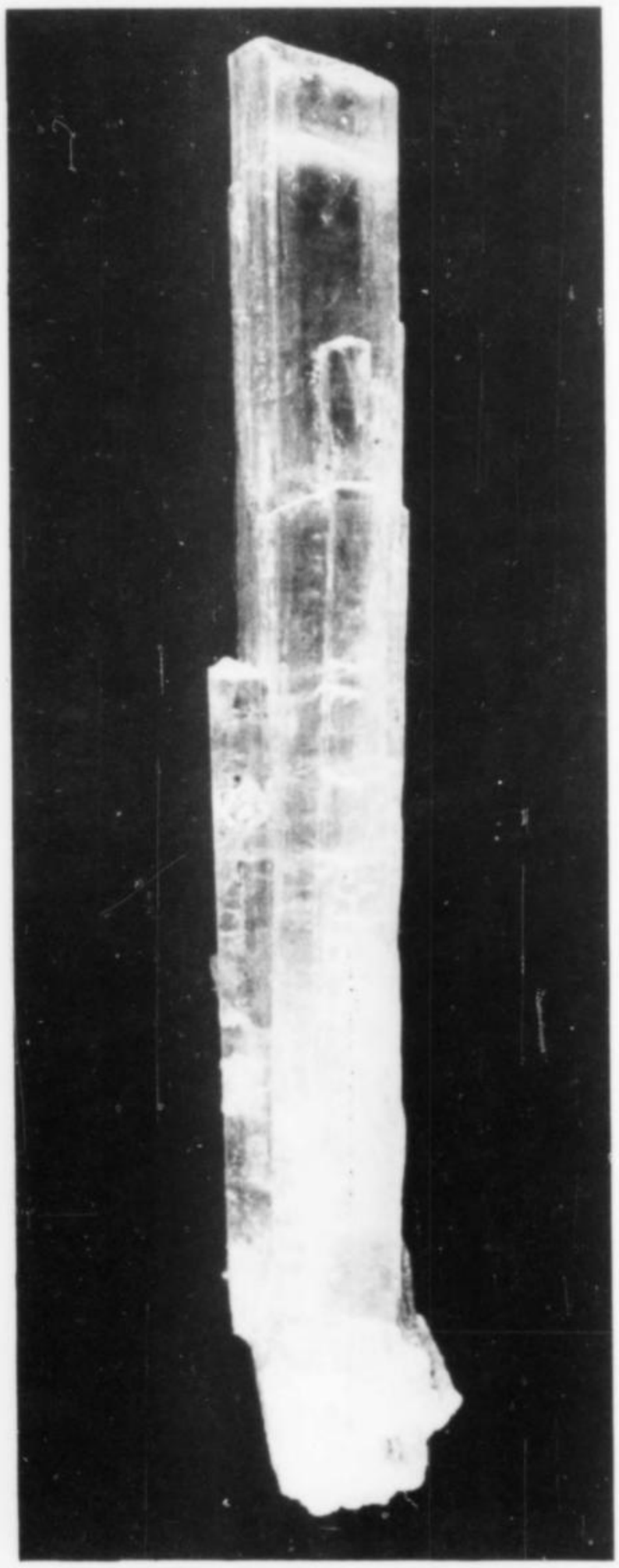

Figure 5. **An exceptional crystal of natrolite which is both large and very transparent. The crystal is 12.6 cm long.**

open spaces and also by replacement of the respective rock types. The copper occurs as large masses, tabular vein-fillings, dendrites, wires, and as single crystals. Exterior surfaces of copper specimens are frequently tarnished and partially coated with later-forming chrysocolla or malachite. However, delicate three-dimensional copper dendrites which exhibit a mirror-bright metallic luster have been found in freshly opened quartz vugs. These dendrites may represent the finest specimens of native copper found in New Jersey trap rocks. Thin wires of tarnished native **silver** in association with native copper have been reported from the quarry (Mason, 1960).

Calcite, gypsum, chalcocite, chrysocolla, malachite, and **brochantite** are found in association with quartz and native copper but belong to later periods of deposition.

PREHNITE PERIOD MINERALS

Prehnite is found as vein-fillings at Chimney Rock but does not occur as abundantly as in the Paterson area basalts. The Chimney Rock prehnite ranges from colorless to translucent yellow or green, occurring as botryoidal crusts and, infrequently, as isolated hemispheres on basalt. Lamellar solution cavities after anhydrite are often found in the prehnite, but rhombic cavities after glauberite are rarely encountered.

The borosilicate **datolite** is the most common associate of prehnite. The datolite is usually found as well-formed crystals up to 1 cm across, and ranges from colorless to pale yellow or green.

Chalcocite, chalcopyrite, and **bornite** are frequently found in association with prehnite and datolite. Chalcocite, the most commonly encountered sulfide mineral at the quarry, usually occurs on or within vein-fillings of sugary white datolite. Surprisingly, chalcocite grew as well-developed striated orthorhombic prisms up to 1 cm in length. Unweathered crystals are black in color and exhibit a bright metallic luster, whereas weathered crystals are tarnished or coated with malachite or chrysocolla. Chalcopyrite has been observed as disphenoidal microcrystals on datolite, as blebs enclosed by prehnite, and as massive vein-fillings in association with bornite and hematite. Chalcopyrite is brass-yellow when unweathered but is more

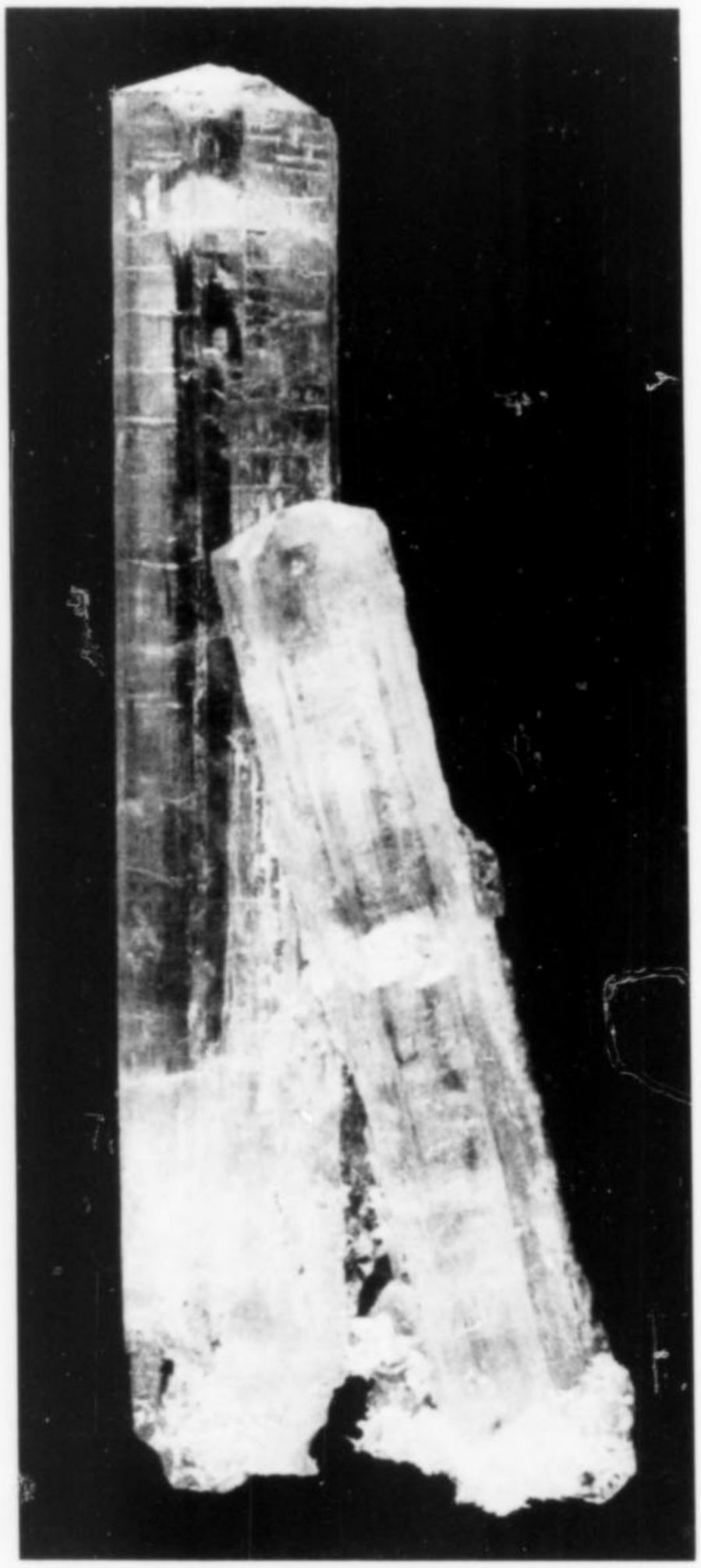

Figure 6. **Some crystals of natrolite, such as this pair, are perfect enough to yield faceted stones of excellent quality. The larger crystal is 7 cm in length.**

Figure 7. **A group of large, heulandite-coated natrolite crystals and a crystal of analcime which are partially enclosed by later-formed calcite. The specimen is 11 cm across.**

often characterized by an iridescent blue tarnish. Bornite is found as anhedral masses in vein-filling datolite, or as massive almost monomineralic vein-fillings. The mineral is reddish-brown on fresh conchoidal fractures but is characterized, when lightly weathered, by a bright purplish iridescence. **Hematite** is found in association with the sulfides as earthy red masses which, when viewed with a scanning electron microscope, can be seen to consist of random aggregates of tiny plate-like crystals (Fig. 4). The iron sulfide **pyrite** is conspicuous by its apparent absence from the sulfide assemblage at Chimney Rock.

NATROLITE PERIOD MINERALS

Although **natrolite** is relatively common in the trap rocks of New Jersey, the mineral typically occurs as fragile, radiating groups of small acicular crystals. This is in contrast to the extremely large crystals of natrolite exposed by a blast at the Chimney Rock quarry in late 1972. Some of the finer crystals from this one-time occurrence are shown in Figures 5 and 6. The natrolite and associated minerals were found within an unusual vertical breccia zone that intersected the quarry floor in the form of an ellipse about 1.6 m wide and 4 m long. It has been postulated, but not proven, that the breccia zone was a pipe-like structure created by a steam explosion shortly after the lava congealed in Triassic times. If this is so, the breccia zone probably extended about 10 m down the basalt-siltstone contact. Natrolite was still being recovered from the breccia at a depth of slightly more than 2 m when—in spite of pumping—groundwater problems halted the digging.

Anhydrite was the first mineral deposited in open spaces between breccia blocks, followed by small amounts of **prehnite** and **datolite.** The main phase of zeolite deposition opened with **analcime,** occurring as opaque white crystals up to 8 cm across. Most of the analcime crystals are etched and poorly formed. Solution cavities after anhydrite are frequently encountered in the analcime crystals. Some flat-bottomed analcime crystals apparently grew on since-dissolved anhydrite plates and show no point of attachment to basalt. Specular **hematite** occurs as inclusions within some crystals of analcime. The sulfide **chalcopyrite** is represented by rare spherical nodules of colloform texture.

Natrolite was the next mineral to be deposited, often encrusting analcime. Natrolite was by far the most abundant mineral found in the breccia. I would estimate that more than five thousand terminated crystals were recovered. As already noted, some of the largest crystals from this occurrence exceed 18 cm in length—the average length, however, is about 5 cm. The vertically striated orthorhombic crystals of natrolite range from opaque white near the base to colorless at the pyramidally terminated ends of crystals. Phantom terminations are visible in the transparent ends of many crystals.

There is clear evidence of an episode of faulting during crystal growth which caused many crystals of natrolite to be shattered. The natrolite crystals rarely were found still attached to the walls of open spaces in the breccia, but instead were found broken off and loose. In some cases, crystals grew secondary terminations along breaks giving rise to the mineralogic oddity of doubly-terminated natrolite. The secondary terminations are not as sharp nor as transparent as primary terminations, and may be differentiated on that basis. Other crystals were deformed but not broken.

Almost invariably, the natrolite crystals are partially or completely coated with tiny water-clear crystals of **heulandite.** The deposition of heulandite occurred after most growth of natrolite crystals had been completed. However, it is apparent that heulandite continued to crystallize after fault-movement because heulandite can be noted coating broken ends of some natrolite crystals. **Calcite** was the next mineral deposited, filling open

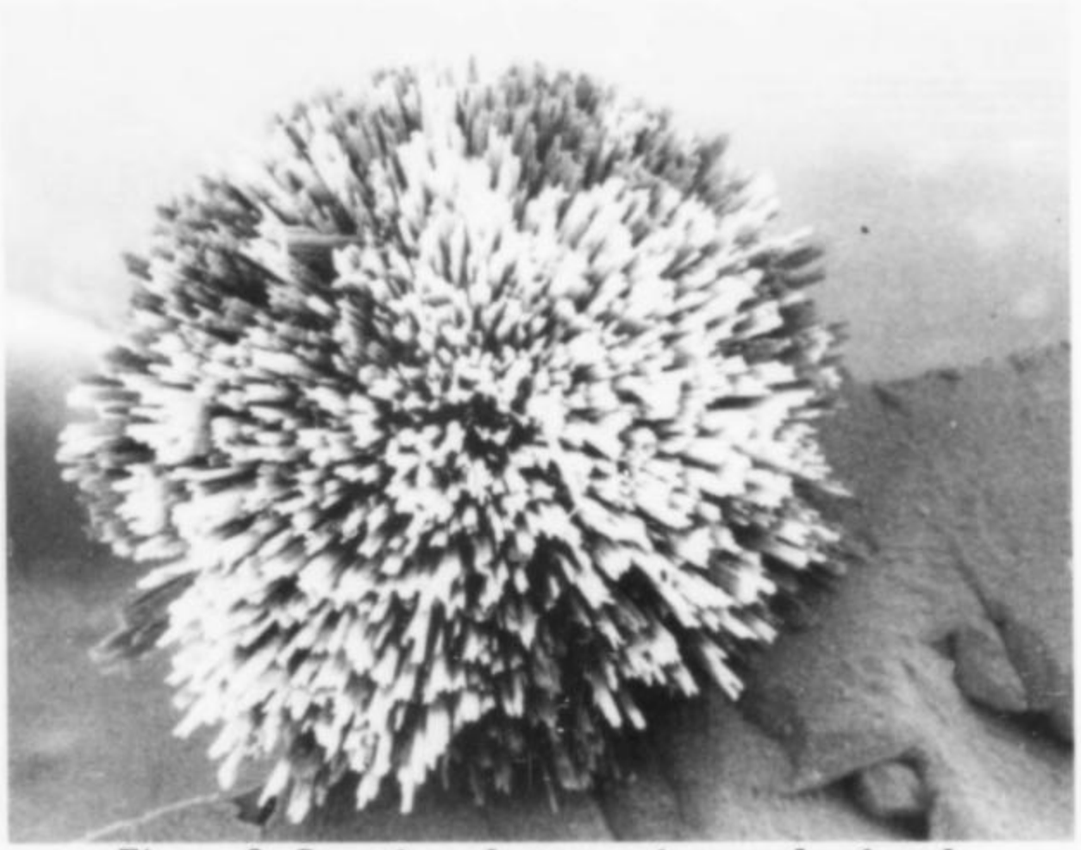

Figure 8. **Scanning electron micrograph of malachite. The radiating aggregate of green acicular crystals is about 0.6 mm in diameter.**

spaces in the breccia. Large calcite crystals partially enclosing natrolite and analcime are shown in Figure 7.

Some months previous to the main natrolite discovery, a series of blasts had exposed, in successive vertical sections on the quarry wall, breccias similar to that described above. Much open space was present between large angular breccia blocks. Colorless scalenohedral **calcite,** large crystals of **natrolite** and **analcime,** and drusy **natrolite** were of most frequent occurrence. The sequence of mineral deposition paralleled that of the main natrolite occurrence. However, some unique specimens were recovered which deserve mention. **Natrolite** prisms, coated by drusy **heulandite,** were partially or completely dissolved, leaving behind fragile, hollow structures of heulandite which retained the shape of the dissolved natrolite. True solution cavities after natrolite have not been reported previously from the New Jersey trap rocks.

The occurrence of extremely large **natrolite** crystals at Chimney Rock was not unexpected. Sinkankas (1961) described the occurrence of vein-filling crystals of natrolite at the Chimney Rock quarry which were up to about 5 cm in length. These crystals were deeply etched, included phantom terminal faces, and were associated with **gypsum** and **calcite.** Mineral deposition within the vein deposit began with natrolite, followed with gypsum coating natrolite, and finally the gypsum was coated with calcite. Few crystals were terminated, and many crystals had been broken by movements of the vein wall rock.

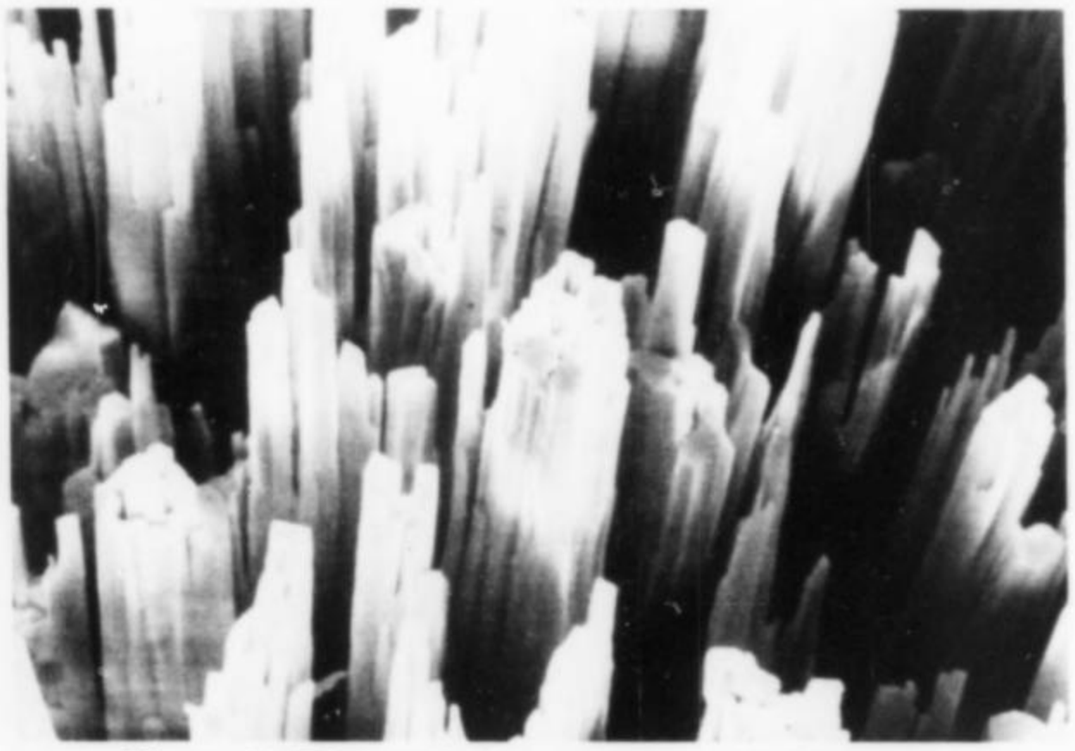

Figure 9. **The malachite specimen in Figure 8 at higher magnification. Individual crystals are about 0.3 mm in length and 0.005 mm in width.**

Stilbite is not abundant at Chimney Rock. The zeolite occurs as small, sheaf-like aggregates of single crystals ranging in color from white to green or brown. It was rarely associated with natrolite, and instead was found in a distinct assemblage characterized by drusy heulandite and analcime.

CALCITE

Calcite is the most abundant mineral at Chimney Rock and typically assumes a bewildering variety of crystal habits. It occurs in a variety of environments at the quarry, ranging from quartz-lined vugs at the basalt-siltstone contact to vein-fillings characterized by datolite-chalcocite or zeolite assemblages at higher stratigraphic levels. The most spectacular occurrences of calcite are along steeply dipping faults where open spaces may be 30 cm in width and of considerable lateral extent. Large crystal crusts have been recovered intact from such open spaces in which individual rhombs of amber calcite were over 5 cm across. It appears that rhombic calcite crystals, ranging from colorless to amber to dark brown, were deposited earlier than the colorless scalenohedral crystals.

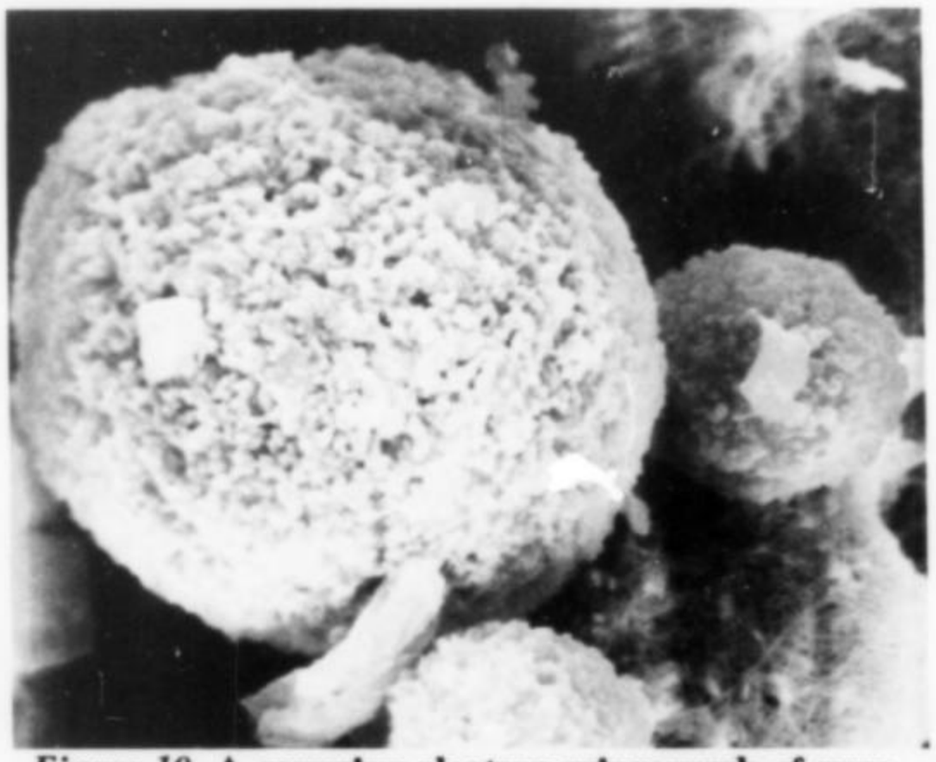

Figure 10. **A scanning electron micrograph of pyrolusite on calcite. The spherical pyrolusite mass is about 0.02 mm in diameter.**

WEATHERING MINERALS

As the main phase of hydrothermal mineralization came to an end, an assemblage of weathering products was formed. **Gypsum,** apparently derived from alteration of once abundant anhydrite, occurs as vein-fillings of banded satin spar and as individual crystals in quartz vugs. Some banded agate and lesser amounts of earthy white **opal** were deposited, usually coating datolite or calcite.

The most colorful minerals at the Chimney Rock quarry were derived from weathering of native copper and the various sulfides. The copper silicate **chrysocolla** is the most abundant of these minerals, occurring as blue-green vein-fillings and as coatings on copper and chalcocite. Chrysocolla pseudomorphs after dendritic copper or after chalcocite are encountered occasionally in quartz vugs. **Malachite** grew in the form of tiny, bright green hemispheres on basalt which were found to consist of radiating aggregates of acicular crystals (Figs. 8, 9). **Brochantite,** not previously reported from the Chimney Rock quarry, occurs as pale green earthy coatings on basalt in intimate association with malachite. Although **azurite** has not been identified from the quarry, it has been found during construction in nearby Bound Brook.

Goethite and **pyrolusite** occur sparingly at the quarry in the form of dendritic films on the surfaces of fractures in basalt and on minerals such as quartz or calcite. A scanning electron micrograph of pyrolusite coating calcite is shown in Figure 10.

OTHER MINERALS

Albite is reported by Mason (1960) as occurring at Chimney Rock. Although I was unable to identify albite in samples from the quarry, there is no reason to doubt the identification. A controversy exists, however, relative to the occurrence of the chalcotrichite variety of cuprite at Chimney Rock. Analyses of supposed cuprite samples from the quarry have invariably shown the material to be red **hematite.**

As of this date, 26 minerals have been confidently identified as occurring at the Chimney Rock quarry. There is good reason to believe that other minerals will be added to this list as blasting continues during the next few years.

Houdaille Industries, Inc., does not allow mineral collecting in the Chimney Rock quarry.

(Ed. note: an excellent, comprehensive article on the Paterson area has been accepted for publication and will appear in a future issue.)

ACKNOWLEDGMENT

I am indebted to Al Bliss, The State University of New Jersey, for the scanning electron micrographs used in this article.

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Note added in proof: While this paper was in press, data have been published which indicate that the New Jersey trap rocks may be Early Jurassic rather than Late Triassic in age.

Microminerals

by Violet Anderson

A letter from Juanita Curtis of the California Federation of Mineralogical Societies in Long Beach arrived too late for use in the California issue of the *Mineralogical Record* but since I don't want to waste her good words, I include a few here. My question to her had been: "If someone were to ask you how to go about making a collection of California micromineràls, what would you tell them?" Her advice began with something like Neal Yedlin's "Buy and use a good mineral book." Specifically, it was to write to the California Division of Mines and Geology, P.O. Box 2980, Sacramento, CA 95812, for a listing of all their publications, and a separate letter to the same address asking for a list of mineral clubs in the area that interests you. Regarding their replies, she counsels patience. Write also to the California members listed in the Baltimore Directory of Micromounters (Baltimore Mineral Society, 2909 Woodvalley Dr., Baltimore, MD 21208), searching for eager traders. Study the *Lapidary Journal* for lists of mineral clubs. If you should arrive in California to collect, always contact local museums, clubs, rock shops, or the local Division of Mines and Geology, before you find yourself lost in the woods.

Her last paragraph is pure Juanita Curtis: "Please remember that California is a BIG STATE. You can cross it in one long day's drive but to go from north to south is going to take you 2 days and that isn't going to leave you any time to collect. Plan your vacation for the north, middle, or south. The desert (high or low) is hot HOT in the summer. About the only thing you can collect then is heat and it does not cool off at night. Fall and early winter and spring are the best times to collect. Summer and fall are our worst fire seasons in case you want to collect in some remote mountain areas. Be SURE you have water for you and the OTHER GUY. Keep your head and use what common sense you were given and your collecting will be fun, educational, and wonderful memories." She knows whereof she speaks. At a recent convention in California she won the trophy for the best micros "Self-collected in the field."

The Pacific Micromounters will assemble in 1978 on February 3 - 5 at the Airport Marina Hotel (Westchester area), 8601 Lincoln Boulevard, Los Angeles, CA 90045. The Tucson Show, as usual, follows almost immediately, February 10 - 12. If you are going to collect in California, better start at least by January 15.

And now, to change course. Last year (1976) at the Detroit Show in October, I stopped in the midst of the roily crowds in the main showroom to talk to David New. He asked me if I'd like to obtain a suite of uranium minerals from Zaire, and I jumped at the chance. Out of such accidents—an unexpected conversation—new directions in interests occur. No doubt my having seen Bill Pinch's remarkable collection of uranium minerals several times at his Rochester home, together with the usual liking of the micromounter for startling colors (and the secondary uranium minerals are nothing if not colorful), prepared a charged ground, but it was the actual receiving of specimens from David New, and then from Bill Pinch, which lit the fuse.

It's probably impossible to get any mineral specimens out of Zaire right now; what is available depends on the dispersal of old collections already here or at least outside of Zaire. That means that collecting them, especially the rare ones, is not easy.

Information about the minerals is scattered in journals, most of them in French, but I found two books especially useful. For the geological background, a series of papers published in 1974 by the *Société Géologique de Belgique*, collected under the title *Gisements Stratiformes Cuprifères*, edited by Paul Bartholomé, is excellent. About half the articles are in English. My copy was given me by one of the writers in the book, J. J. Lefebvre, of UMEX in Toronto, who has been more than helpful. (UMEX is the exploration end of *Union Minière* of Belgium).

The second book, on uranium minerals in general, is the U.S. Geological Survey Bulletin 1064, entitled *Systematic Mineralogy of Uranium and Thorium*. It was written by Clifford Frondel and published in 1958.

The *Bulletin Société Francaise de Minéralogie et de Cristallographie* may be available to readers when its Belgian counterpart is harder to come by. These two usually carry the first full descriptions of new minerals from Zaire. In a recent issue (January-February 1977) of the former there is a fine overall listing of the minerals of Shinkolobwe, with an analysis of their paragenesis, written by M. Deliens. *(Ed. note: See also G.S.A. Memoir 75, p. 119-121, for 24 more references, 4 in English.)*

Most of the minerals of Zaire are found in the mines of Shaba, formerly Katanga, the most important being copper in association with cobalt, an association rarely found elsewhere, and never of Zaire quality. As for uranium, Frondel writes in 1968 that the Shinkolobwe mine "is the largest and richest known deposit of uraninite in the world."

The cupro-cobaltiferous deposits are especially interesting because they are stratiform, laid down as sediments in late Precambrian times. Those strata have suffered much folding during several orogenies, but the sedimentary origin is clear. The Katanga Basin (known as the Gulf of Shaba) is in southeastern Zaire, framed by the Kibaride basement blocks in the northwest and the Irumide basement blocks in the southeast. It was the uplift of the Kibarides (several times) and their following erosion which formed the Basin and provided the sediments to fill it. There had to be water for this, of course, and apparently it came from the south. All writers, however, insist on the lagoon-like nature of the water rather than the turbulence of a sea, although the water was definitely saline. I wish someone would stick out his geological neck and give us a pictorial suggestion of what the continent of Africa looked like in these late Precambrian times—say, 1100 to 690 million years ago. At any rate, millions of years of sediments are almost beyond thinking upon.

The copper belt of Zambia on the southern border of Zaire is somewhat similar to the Zaire Cupriferous Arc, but if there are similarities there are also differences, a topic already of compelling interest to many fine geologists.

An interesting question concerns sulfur. Sulfide ores were formed somehow. Where the sulfur came from seems to be more difficult to state with certainty than the source of the metals. Iron was apparently early, followed by some copper, then by cobalt and much copper, as well as uranium and nickel. The rich strata of copper, cobalt, and uranium probably resulted from migrations of the metals over thousands of years to certain

specific areas, as would be true of the valuable deposits of uranium at Shinkolobwe. Gold was always associated with uranium, and nickel accompanied uranium deposits in certain areas.

Obviously this column cannot bestride all Zaire minerals, of which there is quite a range, especially of sulfides, but will be restricted to those secondary uranium minerals, alteration products of uraninite, which might be available to micromounters.

Shinkolobwe was the only producing uranium mine in Zaire. Other uranium mines have been discovered in recent years, but the fall in price of uranium made it unprofitable to bring them into production. For our interests, however, the pockets of uranium discovered in many other mines, such as Musonoi, Kamoto, Swambo, Luiswishi, and Kambove, have added much.

Differentiating uranium minerals is no cinch. I can offer a few pointers, probably as ambiguous as misplaced signs at crossroads. Take color. There is yellow, and then again there is yellow—creamy, lemon, golden, amber, canary, dirty green yellow, and orange yellow. I spent an afternoon with Van King in his SUNY office near Amherst, New York, comparing yellow uranium minerals, most of them orthorhombic just to add to our confusion. Van suggested it was a case of the blind leading the blind, but I can assure you I was in greater gloom than Van. In those hours it would have been useful to hear X-ray identifications thundering down from the heavens, or even to see Bill Pinch materialize on the threshold.

Of course, not all Zaire uranium minerals are yellow, and the colors green, orange, and red, offer restful havens after long stretches of yellow. Of the greens, **torbernite** (or **metatorbernite**) is best known. Most of the copper mines of Shaba have provided it. My specimen from the Musonoi mine is made up of sheer, translucent, dark green plates stacked in groups. From Shinkolobwe, large cube-like bodies of paler green may enclose layer upon layer of darker green plates. Color seems to play a larger part in the identification of uranium minerals than with other groups of minerals, but there is no precise hue to which a given species will always adhere.

A rich, dark, glossy, green mineral, somewhat bluer than malachite, frequently almost black, is **vandenbrandeite**; my specimens again are from Musonoi. Vandenbrandeite is a copper uranium oxide, triclinic, which tends to occur in parallel or lamellar growth. It is usually associated with a yellow mineral of one kind or another or with cuprosklodowskite, depending on the mine from which it has come.

The silicate, **cuprosklodowskite**, has copper where sklodowskite has magnesium. The green is paler than that of malachite (see p. 491 of the previous issue of the *Record*). In my Musonoi specimen the crystals are sturdier acicular than those of sklodowskite, are transparent and as pretty a green as that of the diopside from Asbestos, Quebec.

Demesmaekerite and **marthozite** are two rather dirty olive-green copper-uranium selenites from Musonoi. Each forms rather distinctive crystals. The demesmaekerite (triclinic) has little olive-green blades forming sprays (they have been called bottle-green, becoming brownish when dehydrated). Marthozite (orthorhomic) is something of a problem. The three specimens I have examined show crystals which appear pyramidal, hemimorphic, and flattened on (100); the color has a bronze cast, seeming quite yellow if the light strikes it in a certain way, and criss-crossed by cleavage lines. This fits reasonably well with the marthozite description given by Cesbron, Oosterbosch, and Pierrot, in the *Bull. Soc. fr. Minéral. Cristallogr.*, 1969. But the ROM was not able to achieve an X-ray pattern such as given by these authors; in the ROM pattern some of the lines are simply missing.

The yellow group might come next, leaving the orange and red for a flashy finish. A good beginning can be made with **soddyite, schoepite,** and **studtite**, names sufficiently alike to cause havoc in one's memory. Soddyite (an orthorhombic uranium silicate) is the most common, and can be recognized by a sort of squattiness in its crystals, which tend to crowd in on top of each other. They are striated, most often opaque lemon-yellow to canary-yellow, and may display a glossy coating which, at the terminations, appears as a transparent amber edging. Frondel points out that it is "the only uranyl silicate that does not contain some lead or some other cation in addition to uranium." All my specimens are from Swambo.

Identifying any fibrous mass of yellow mineral is usually impossible by sight alone. One could have half a chance if only a limited number of yellow uranium minerals appeared as fibers but most of them seem to have a fibrous form. This is true of **soddyite**, while its uncrystallized form looks much like hard cold butter which has been slightly pushed about.

Schoepite, an orthorhombic uranium oxide, is known to me by one beautiful, yellow, tabular crystal, pseudohexagonal, a little elongated and layered, with lemon-yellow layers sandwiching an amber layer. An acicular form of schoepite is derived directly from ianthinite and for convenience is called epi-ianthinite, although the term cannot be used as that of a separate species. Ianthinite is a violet-colored acicular uranium oxide which becomes brown in the atmosphere (I have never seen it otherwise) and later yellow.

Studtite takes us from bad to worse. It is a monoclinic uranium oxide, its crystals usually tiny, yellow fibers (they can be 4 mm in length, however) forming into radial aggregates with needles sparsely placed. It is like a minor edition of uranophane, and when they both occur on the same specimen, as is frequent, one might just as well pack up and go home.

Two orthorhombic uranium oxides which can look much alike are **becquerelite** and **billietite**, minerals from Shinkolobwe and Musonoi. Becquerelite contains calcium where billietite contains barium. The former is a mineral worth having. It is a sparkling, golden yellow, transparent mineral which forms very fine prismatic crystals. It is said to be occasionally platy. Billietite is most often platy. The crystals on my specimen from Musonoi are rather chunky, a glassy golden yellow, striated, and spiced with small crystals of dark green vandenbrandeite.

A yellow orthorhombic carbonate worth pursuing is **rutherfordine.** My specimen from Shinkolobwe has pale thin lath-like crystals in clusters. It is the paleness which is distinctive for me, but heaven help us, it can be amber-orange and brownish.

Dumontite is a yellow, monoclinic, uranium phosphate. At 70 power on your scope you can see the tiny blade-like crystals but they are worth seeing. Especially is this true of the silicates, uranophane and sklodowskite: very beautiful, very popular, and not always easy to tell apart. Both have relatively long, acicular crystals, uranophane varying its color range of yellows more than sklodowskite, which is usually a clean, pale yellow.

Kasolite is probably known to all micromounters. It, too, is a silicate, with well-formed monoclinic crystals verging on the orange and looking splendid when associated with green torbernite. **Saleeite** is a tetragonal phosphate mineral belonging to the autunite group. It looks much like uranocircite, its little yellow to greenish yellow plates interlocking. Both of these minerals come from Shinkolobwe.

I hesitate to mention the next two specimens, not only because they are rare and therefore difficult to obtain, but also because I can never do more than guess that I am seeing them. One is **guilleminite**, a barium-uranium selenite with incredibly small, canary-yellow plates, or in silky masses of small dimension. I have a specimen with tiny silky patches on one side which I am led to believe are guilleminite, and on the other side the second mineral, **derriksite**, a copper-uranium selenite in minute,

splinter-like, dark olive crystals likewise almost invisible. Both sides of this teasing specimen are from Musonoi. (If ever I should really see these important rare minerals there will be a postscript in some future column.)

Michel Deliens, in the French article mentioned above, has found **schmitterite** on Shinkolobwe specimens. This is another rare mineral, a uranium tellurite, with yellow micaceous rosettes, which I have seen before from Moctezuma, Mexico (associated with emmonsite) but from nowhere else.

Masuyite, curite, fourmarierite, and **vandendriesscheite**—these are the colorful orange to red minerals to be hunted down with a glint in the eye. All my specimens are from Shinkolobwe. Masuyite is a simple uranium oxide; the other three are lead-uranium oxides and all are orthorhombic. **Masuyite** occurs as extremely small plates, but they *can* be seen, and when massed together resemble a rounded hillock of color which makes a most enticing contrast with yellow uranophane or sklodowskite so often associated with masuyite.

Curite displays short to long, slender, orange-red needles frequently along with green torbernite and yellow soddyite. What more could one wish?

Fourmarierite has relatively large orange to red tabular crystals found in various attractive groupings. **Vandendriesscheite** is not so very different. I doubt if sight alone can easily differentiate these two except that, in my experience, vandendriesscheite produces smaller crystals, and is not as red as fourmarierite.

I have not included all the possibilities—which might be called improbabilities, since they are not easy to find. But look for **sengierite** from Luiswishi, and **parsonsite, renardite, sharpite, zippeite,** and **uranopilite** from Shinkolobwe.

It would be pleasant to end by declaring that all our favorite mines are still operating but this is not true. Luishia is closed. Shinkolobwe is filled with water. Etoile, Lukuni, and Luiswishi, are worked out. The mines still operating include the Kolwezi deposits, the Kamoto and Musonoi open pits, and the Kamoto underground mine. The Kambove open pit and Kambove underground mine, near Likasi, are still being worked.

Zaire has plenty of potential. It remains to be seen how western mineral collectors may find their relatively innocuous needs met from what there is to be had.

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What's New in Minerals?

Figure 1. **Orpiment crystals (reddish orange, the largest crystal is 1.6 by 2 cm) on quartz matrix with pyrite, from the Huallapon mine, Pasto Bueno, Ancash Province, Peru. Victor Yount specimen.**

Detroit Show 1977

Among the most exciting offerings seen at Detroit this year was a flat (about 15 specimens) of superb red beryl from the Wah Wah Mountains in southwestern Utah (see *MR*, vol. 7, no. 5, p. 219). An article for the *Record* on this locality is near completion. The specimens were mined by the current lessee, Harris Mineral Development, and were being marketed by John Barlow. Although the color of Wah Wah red beryl is universally acknowledged as better than that of red beryl from the nearby Thomas Mountains, the previous lessees were never particularly successful in the Wah Wahs, mainly because insufficient effort and patience were expended. This new flat of specimens attracted a dozen or so of the top collectors and dealers within moments after the lid was removed. The reason was obvious; these specimens were clearly the largest and best yet produced. Most crystals were around 10 by 15 mm (although one was close to 4 cm), extremely sharp and adamantine, perfectly colored hexagonal prisms with pinacoid terminations, and often on matrix as well. According to the miners these were all recovered from a large open pocket in the rhyolite, a great rarity. Nearly all crystals contained clear areas of faceting quality. Faceted stones are said to bring as much as fine emeralds...perhaps $4000 per carat. The prices on these 15 specimens were clearly influenced by the high gem value, and most were in the kilobuck range (several thousand dollars). Therefore these are not specimens the average collector could hope to own; the best that can be hoped is that at least some of the pieces will be purchased by collectors or museums who will publicly display them so that the rest of us can enjoy the beauty of these spectacular crystals.

An interesting selection of Peruvian minerals was available from several dealers including Vic Yount, Gary Nagin, Gary Hansen and Rock Currier. The species included: frosty tetrahedrite crystals up to 7 cm (but not too aesthetic), gemmy, yellowish brownish green sphalerite crystals of complex form on matrix, and fine huebnerite crystals with white quartz, all from Casapalca, Junin Province, Peru; very fine, equant crystals of pyrargyrite up to 5 cm in size with gemmy red interiors, bournonite crystals to 4 cm, with many in the 1 to 2 cm range, miargyrite crystals to 3 mm, bismuthinite crystals to 7 mm, gemmy, yellow sphalerite, cuboctahedral galena and barite, all on matrix, from Huancavelica; many specimens of orpiment in translucent crystals to 3 cm (Fig. 1), often in groups to 15 cm on matrix, enargite crystals to more than 4 cm, with a drusy enargite coating associated with tetrahedrite and hutchinsonite, fine specimens of huebnerite crystals to 15 cm with Japan-law twinned quartz and bluish green fluorite, all from the Huallapon mine, Pasto Bueno, Ancash Province; and an excellent selection of large pyrite crystals and groups with sphalerite from Huansala. Perhaps one of the most attractive of the Peruvian discoveries is the rhodochrosite from the Santa Isabel vein of the Huallapon mine at Pasto Bueno. The crystals are simple rhombohedrons, sometimes modified by small faces on the rhombohedron edges and corners. The crystals have exceeded 20 cm, and two in the 10 cm range were seen at the show (Fig. 2, 3). Japan-law twins of quartz have sometimes been found with the rhodochrosite crystals.

A selection of fluorite, calcite and sphalerite specimens from the Elmwood mine in central Tennessee (see *MR*, vol. 7, no. 4, p. 186-187) was offered by Gene and Cleta Baker of Missouri Minerals. Included were pale purple fluorite crystals to 12 cm, doubly terminated calcite crystals (Fig. 4), one weighing over 23 kg (50 pounds!), and groups of black sphalerite crystals. The lot was being sold on consignment for the mining company. Relatively little Elmwood material has been reaching the general market, and calcite crystals having good, rich color (a peculiar golden brownish red) still command high prices. Undamaged specimens are difficult to find, probably because the mining company prefers to do their own collecting instead of allowing experienced collectors and dealers to remove the minerals. (Note: the calcite shown in Figure 4 has been donated by Missouri Minerals for the *Record* auction, which will be held Saturday night at the Tucson Show. A fine purple fluorite miniature from this same locality will also be up for auction.)

Bill Micol, a Detroit dealer, was offering a roomfull of blue celestine from the Scofield quarry at Maybee, Michigan (see *MR*, vol. 7, no. 1, p. 13). Most crystals were rather small, in the 5 to 10 mm range, but some were as large as several cm. According to Bill, the area in the quarry which once produced the really large crystals (some over 10 cm) is not being mined at the moment. Bill also had the first large selection of Scofield sulfur crystals that I have ever seen for sale, although I am certain they must have been available at some other time in the past. The sulfur crystals, though not as perfectly formed as Sicilian crystals, were several cm in diameter. Scofield sulfur crystals are notoriously heat sensitive, and will emit cracking sounds when held in a warm hand.

Excellent rhodochrosite from the Hotazel-Kuruman area

Figure 2. **Rhodochrosite (cherry red, about 10 cm in length) from the Santa Isabel vein, Huallapon mine, Pasto Bueno, Ancash Province, Peru. Gary Hansen specimen.**

of South Africa was still available at high prices from several dealers; Kristalle had the largest number of fine kilobuck pieces, about five or six cabinet specimens with gemmy crystals. Other habits were available from other dealers including Mineral Kingdom of Woodmere (the Zweibels) and Prosper Williams; in fact their booths looked like Christmas exhibits with all the red (rhodochrosite) and green (dioptase, malachite) colors dominating.

A large selection of the new mineral kidwellite from Polk County, Arkansas, was being offered by Arkansas Mineral Properties (Meredith York and Henry deLinde). There were many cabinet pieces partially covered with the velvety green kidwellite, some also containing pink strengite of excellent micromount potential. The specimen pictured (Fig. 5) was donated for the *Record* auction.

Figure 3. **Rhodochrosite (cherry red, about 9 cm in length) from the Santa Isabel vein, Huallapon mine, Pasto Bueno, Ancash Province, Peru. From the I. E. DuPont collection, University of Delaware.**

Gary Hansen was offering a superb selection of Cumberland, England, fluorite, about 120 pieces. These included reddish purple (Rogerly quarry), purple with brilliant galena crystals (Black Dean mine), light green (West Pastures mine), dark green (Black Dean mine), yellow (Scoredale mine), and colorless (Allenhead mine and Height mine). Some of the purple crystals were as large as 15 cm (6 inches!) on an edge although most crystals were in the 2 to 5 cm range. The galena crystals on fluorite were particularly aesthetic; some were over 4 cm in size and cuboctahedral in habit. The prices on all of these pieces, even the fine cabinet specimens, were extremely reasonable with many costing less than $100. One of the most interesting pieces consisted of a *tabular* purple fluorite crystal about 4 by 5 by 1 cm on a large block of white matrix. A few specimens also exhibited the cube penetration twins characteristic of English fluorite. Gary could only estimate that the specimens were collected within the last 30 years. This selection presented collectors with the rare opportunity of acquiring a *suite* of excellent, normally unobtainable English fluorite at a remarkably low price; it was the best buy of the show.

In the neighborhood of 20 or 30 flats of botryoidal green velvet malachite and yellow botryoidal pyromorphite from the Rum Jungle, Australia, were available from Gary Hansen, Prosper Williams, Mineral Kingdom, Rock Currier, and a few others. These specimens were apparently all from one strike made in early 1977. The exact locality was given as Brown's prospect. Most specimens were 8 to 12 cm in size.

Gene Schlepp of Western Minerals had some new stibnite specimens with crystals to 5 cm in sprays, associated with 2 mm crystals of bismuthinite, from El Sombrete, Durango, Mexico. Although the crystals are not quite as well formed as Romanian stibnite, they were still superb specimens for Mexico, and an interesting new discovery.

Kristalle offered a large collection of leaf gold specimens (over 100 pieces), very reasonably priced. There were many fine thumbnails and miniatures, some perched on white quartz matrix. The locality could only be given as "northern California," typical of the secrecy surrounding most gold mining operations these days. One of the major Swiss dealers purchased a lot to take back to Europe for resale.

A new strike of pyrite crystals with quartz occupied three vertical display cases and a considerable amount of motel room space. The locality was given as King County, Washington, and the discoverers were Bill Hawes, Sandy Ludlum, John Medici and Neal Pfaff. The pyrite crystals were striated cubes to 10 cm on an edge, and smaller crystals carried a variety of modifying forms: many were "floaters." The quartz crystals commonly exceeded 5 cm in length, some were sceptered, four were Japan-law twinned, and one rare specimen was twinned *and* sceptered. Around midnight Saturday the discoverers gave a slide show on their discovery for anyone at the Holiday Inn who could jam into their room. (An article has been promised for the *Record*, and a specimen donated for the auction.)

Oceanside Imports (the Sklars) had some new items of interest from Brazil, including excellent, textbook zircon crystals from 1 to 4 cm in size (from Goias, Fig. 7, colorless topaz in interesting parallel growth (Minas Gerais), and two remarkable apatite crystals from Virgem da Lapa, Minas Gerais. The apatite crystals were prismatic, closely resembling beryl in habit (see Fig. 8. The two crystals (38 by 91 mm and 24 by 56 mm) were

Figure 4. **Calcite (colorless interior, golden red outer layer, 9 by 4.5 cm) from the Elmwood mine, central Tennessee. Missouri Minerals specimen, donated for the 1978 *MR* auction.**

Figure 5. **Kidwellite (pale olive green, sphere width 4 to 6 mm) from Polk County, Arkansas. Arkansas Mineral Properties specimen, donated for the 1978 *MR* auction.**

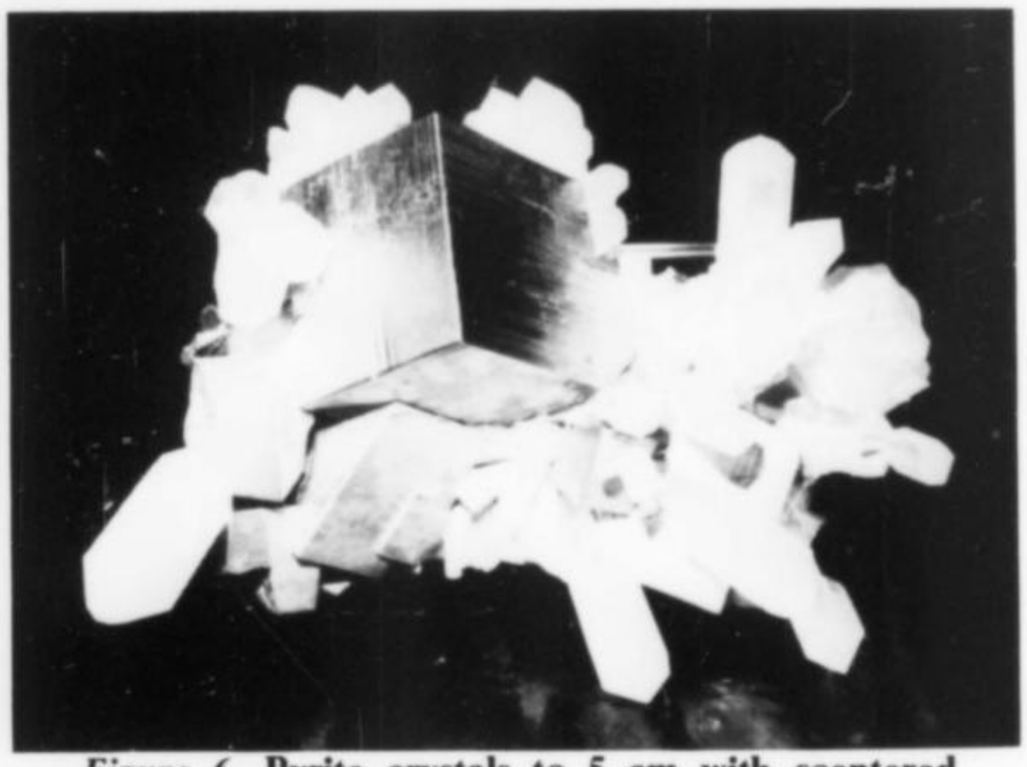

Figure 6. **Pyrite crystals to 5 cm with sceptered quart crystals from King County, Washington.**

Figure 7. **A sketch of a zircon crystal from Goias, Brazil.**

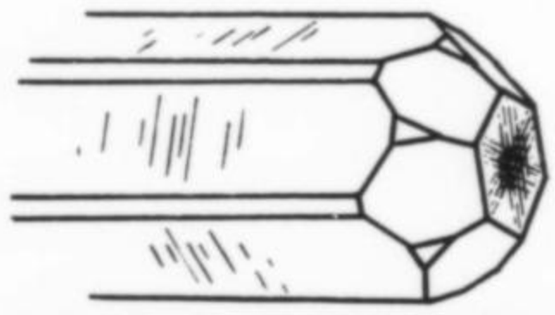

Figure 8. **A sketch of an apatite crystal from Virgem da Lapa, Minas Gerais, Brazil; the actual crystal is 24 mm wide.**

pale green in the cores and pale purple in the exterior zones, with interesting modifications and striations. The luster was slightly dull, due, perhaps, to a quick wash in acid from the miners.

As usual, a dazzling array of mineral displays, both competitive and non-competitive, delighted the mind and eye at this year's Detroit Show. The quality and diversity of displays for which the Detroit Show has become famous over the years are largely due to the efforts of the Detroit Show Committee (headed by Mel and Charlene Berry) to solicit such displays year after year. Many private collectors and museum curators must be coaxed into displaying; such a fine selection of displays could not happen entirely by itself. Once the standard has been set, more of the fine collections can be drawn in for display, and collectors of the highest level are more apt to decide that the show is an appropriate and honorable place to publicly display their collections. Although the Detroit area contains many features of interest, it does not have the resort atmosphere and climatic advantages that Tucson has. Despite this the Detroit Show Committee and the Michigan Mineral Society have built the Detroit Show into an event rivaled only by the Tucson Show in the United States, and that is indeed an accomplishment to be congratulated.

NOTE ADDED IN PROOF: The *Record* has just learned that more gold has been found at the Colorado Quartz mine, Mariposa County, California (see last issue). These specimens include a 7½-inch group of crystals which comprise possibly the finest matrix gold in the world. Wayne and Dona Leicht of KRISTALLE will have these specimens at the TUCSON show.

THE MINERALOGICAL RECORD SLIDE COMPETITION...
Something New has been added!

For several years the *Mineralogical Record* has sponsored a slide competition at the Tucson Show in February. This coming year the rules and rewards have been changed. There are now *cash prizes* and separate categories for amateur and professional photographers. But time is short, so send your entries (2 slides maximum, 35 mm only) immediately to **Dr. Arthur Roe, 85 Calle Primarosa, Tucson, Arizona 85716.** Entries must be received by February 10. Entrants may also turn in slides for the competition at the *Mineralogical Record* table next to the ticket booth at the Tucson Show. Your address must be *on the slides* if you wish them to be returned. Also indicate "Pro" or "Amateur" (see below).

Our thanks to Richard Webster for donating the prize money; we all hope that this will encourage many more people to enter, and will add to the excitement of the competition.

In each category the first prize will be **$100**, the second prize will be **$25**. To qualify as an ***amateur*** the entrant must

(a) never have received financial payment for photography,
(b) not be a member of the *Mineralogical Record* editorial board,
(c) not have won first place in any earlier *Mineralogical Record* slide competition.

All photographers not qualifying for the amateur category may enter in the ***professional category.***

Shortly before the show, ten semi-finalist slides in each category will be selected privately by a panel of judges (none but the editor will be aware of the photographers' names until after the selection). These 20 slides will be shown to the audience Saturday night and will be individually rated on a scale of 1 to 10. The scores will be totalled and the highest totals in each category will win. The decision of the audience will be final. Winning slides will be pictured in the *Record*, most likely in color, and possibly on the cover (although this is not guaranteed).

Ed.

ABSTRACTS

This new department is actually a resurrection of the old *Mineral Notes* department which used to appear occasionally in the *Record*. It's primary purpose is to keep readers abreast of new minerals described since the last update to Fleischer's *1975 Glossary of Mineral Species*, which appeared in vol. 8, no. 5. The abstracts presented here are tailored to the needs of *Record* readers in general and do not contain X-ray data, optical data, or other data associated with the use of expensive and sophisticated equipment; readers in a position to make use of sophisticated data should have the original references easily available to them.

Abstracts of new mineral descriptions will contain the mineral name, formula, crystal system, locality, physical properties (color, luster, hardness, cleavage, transparency, streak, specific gravity), crystal characteristics (size, habit, forms, twinning), environment, associations, and perhaps other remarks of interest, unless, of course, such data are not included in the original descriptions or abstracts from which *these* abstracts are drawn.

Other types of articles may occasionally be abstracted for this department, especially those in which mineral names are discredited. Readers may wish to copy these entries into the back pages of their *Glossary of Mineral Species* in order to keep it continually updated.

W.E.W.

NEW MINERALS

Texasite

$Pr_2O_2(SO_4)$ Orthorhombic

From the Clear Creek pegmatite (see *MR*, vol. 8, no. 2, p. 88), Burnet County, Texas; also occurs at the Rode Ranch pegmatite, Llano County, Texas; apple-green; vitreous luster; as individual bladed crystals from 0.1 to 0.4 mm long and elongated on the *c* axis; commonly tabular on {010} and terminated by {011} or {101}; well developed cleavage on {010}; hardness 2½; translucent; streak pale green; density (calc) 5.769; forms as a supergene alteration product of primary rare-earth minerals, intergrown with tengerite and jarosite; associated with gadolinite, allanite, yttrofluorite, bastnaesite, behoite, rowlandite, tengerite and jarosite; praseodymium accounts for 99.9% of the total rare-earths in texasite; named after the state of Texas.

CROOK, W. W. III (1977) Texasite, a new mineral: the first example of a differentiated rare-earth species. *American Mineralogist*, **62**, 1006-1008.

Otwayite

$(Ni,Mg)_2(OH)_2CO_3 \cdot O$ Orthorhombic

From the Otway prospect in the Nullagine region of Western Australia, 23 km north of the town of Nullagine; bright green with a silky luster; fibrous habit, fibers usually arranged in rosette-like aggregates more or less normal to the veinlet walls; individual fibers are about 0.05 micrometres in width, fiber bundles are several hundred micrometres in length; cleavage n.d.; specific gravity 3.41, density (calc) 3.346; appears to be unrelated to any other known mineral or mineral group; found only in narrow veinlets 0.5 to 1 mm in width; the veinlets, which cut through an ultramafic body, appear to represent late-stage fracture filling and transect nickeloan serpentine, millerite, polydymite and apatite; associated also with magnesite, gaspeite and pecoraite as vein minerals; named after Charles Otway of Gosnells, Western Australia, who helped in providing samples from and access to the occurrence.

NICKEL, E. H., ROBINSON, B. W., DAVIS, C. E. S., and MacDONALD, R. D. (1977) Otwayite, a new nickel mineral from Western Australia. *American Mineralogist*, **62**, 999-1002.

Paraspurrite

$Ca_5(SiO_4)_2CO_3$ Monoclinic

Found north of Darwin, Inyo County, California; colorless in thin section; the crystals are intergrown and average about 0.5 cm across with a maximum size of about 2.0 cm; cleavage is poor parallel to (001); crystals may exhibit polysynthetic twinning on (001); hardness n.d.; specific gravity 3.00, density (calc) 3.01; chemically identical to spurrite (i.e. a polymorph) and also crystallographically similar; occurs as the dominant phase (sic) of a dark gray, granulite facies, siliceous carbonate rock; paraspurrite occurs as a distinctive part of a small roof pendant; associated with gehlenite, vesuvianite, apatite and larnite as primary minerals; second generation associated minerals include calcite, quartz, gypsum and pyrite; in contact with the lenticular body of paraspurrite is a zone of massive grossular; named because of its similarity to spurrite.

COLVILLE, A. A., and COLVILLE, P. A. (1977) Paraspurrite, a new polymorph of spurrite from Inyo County, California. *American Mineralogist*, **62**, 1003-1005.

Archerite

$(K,NH_4)H_2PO_4$ Tetragonal

Found in Petrogale Cave, 36 km east of Madura, Western Australia; white; in crystals up to 2 mm in length; no distinct cleavage; soft; water-soluble; occurs as a constituent of crusts and stalactites in a cave; associated with biphosphammite and other phosphates and saline minerals; named after Michael Archer, Curator of Mammals, Queensland Museum, who first drew attention to the deposit.

BRIDGE, P. J. (1977) Archerite, $(K,NH_4)H_2PO_4$, a new mineral from Madura, Western Australia. *Mineralogical Magazine*, **41**, 33-35.

Fletcherite

$Cu(Ni,Co)_2S_4$ Isometric

From the Fletcher mine, Viburnum Trend (New Lead Belt), Reynolds County, Missouri; the color is steel-gray; luster metallic; in crystals ranging from less than 1 to 200 micrometres; hardness 446-464 (25 g load) kg/sq mm; occurs as crystals disseminated in bornite, chalcopyrite, and digenite in copper-rich pods; named after the mine.

CRAIG, J. R., and CARPENTER, A. B. (1977) Fletcherite, $Cu(Ni,Co)_2S_4$, a new thiospinel from the Viburnum Trend (new lead belt), Missouri. *Economic Geology*, **72**, 480-486.

Gianellaite

$(NHg_2)_2(SO_4)$ Isometric

From the Mariposa mine, Terlingua district, Brewster County, Texas; color straw-yellow; occurs as rosettes of flattened, subhedral crystals, rarely as euhedral crystals from 0.2 to 1.0 mm in diameter; habit distorted octahedral; hardness about 3; very

similar to mosesite in composition, differing in not containing Cl; occurs on fracture surfaces and in veinlets as a late-formed mineral; associated with terlinguaite, calomel, montroydite, native mercury, and cinnabar; named after Professor Emeritus Vincent Paul Gianella, Mackay School of Mines, University of Nevada.

TUNELL, G., FAHEY, J. J., DAUGHERTY, F. W., and GIBBS, G. V. (1977) Gianellaite, a new mercury mineral. *Neues Jahrbuch Mineral Monatsheft,* 119-131.

Luetheite

$Cu_2Al_2(AsO_4)_2(OH)_4 \cdot H_2O$ Monoclinic

From a small prospect in Santa Cruz County, Arizona; color indian-blue inclining to greenish; maximum crystal size 0.2 mm; habit tabular on {100}; distinct cleavage on {100}; hardness 3; specific gravity 4.28, density (calc) 4.40; brittle, luetheite is the Al-analog of chenevixite; found in a silicified rhyolite porphyry with chenevixite and hematite; named after R. D. Luethe, geologist for Phelps Dodge Corporation, who first found the new mineral.

WILLIAMS, S. A. (1977) Luethite, $Cu_2Al_2(AsO_4)_2(OH)_4 \cdot H_2O$, a new mineral from Arizona, compared with chenevixite. *Mineralogical Magazine,* **41**, 27-32.

Nickelblödite

$Na_2Ni(SO_4)_2 \cdot 4H_2O$ Monoclinic

From nickel mines at Kambalda and at Carr Boyd Rocks in Western Australia; color light green, transparent; occurs as tabular crystallites up to 150 micrometres in size; indentation hardness VHN 139; specific gravity 2.43; nickelbloedite is the Ni-analog of bloedite; occurs as a surface efflorescence on Ni-rich sulfide ore at both localities; note—the I.M.A. Commission approved the name with the spelling "nickelbloedite"; named for its relationship to bloedite.

NICKEL, E. H., and BRIDGE, P. J. (1977) Nickelblödite, $Na_2Ni(SO_4)_2 \cdot 4H_2O$, a new mineral from Western Australia. *Mineralogical Magazine,* **41**, 37-41.

Palladseite

$Pd_{17}Se_{15}$ Isometric

From Itabira, Minas Gerais, Brazil; color white; in grains up to 0.5 mm in size; hardness VHN 414; density (calc) 8.15; occurs sparingly in the residual concentrates from gold washing; associated with arsenopalladinite, isomertieite and atheneite; named for the composition.

DAVIS, R. J., CLARK, A. M., and CRIDDLE, A. J. (1977) Palladseite, a new mineral from Itabira, Minas Gerais, Brazil. *Mineralogical Magazine,* **41**, 123.

Tveitite

$Ca_{0-7}(Y,RE)_{0-3}F_{2-3}$ Monoclinic

From a pegmatite dike at Høydalen, Telemark, southern Norway; color white to pale yellow; luster greasy; fluorescent faintly yellow-orange in shortwave UV; shows complex polysynthetic twinning; associated with quartz, microcline, muscovite, beryl and monazite; named after John Tveit who found the new mineral in his quarry; pronunciation: "tvay´-tite."

BERGSTØL, S., JENSEN, B. B., and NEUMANN, H. (1977) Tveitite, a new calcium yttrium fluoride. *Lithos,* **10**, 81-87.

Vertumnite

$Ca_4Al_4Si_4O_6(OH)_{24} \cdot 3H_2O$ Monoclinic (pseudo-hexagonal)

From Campomorto, Montalto di Castro, Viterbo, Italy; colorless; luster vitreous; occurs as transparent, flattened, hexagonal prisms up to 4 mm thick, resting on tobermorite in a subspherical geode in phonolite; very brittle; conchoidal fracture; no discernable cleavage; hardness 5; specific gravity 2.15, density (calc) 2.15; soluble in cold HCl; related to "hexagonal hydrated gehlinite" and strätlingite; named after the Etruscan god Vertumnus.

PASSAGLIA, E., and GALLI, E. (1977) Vertumnite, a new natural silicate. *Tschermak's Mineralogisch Petrogn. Mitteilungen,* **24**, 57-66.

I.P.I.O.J.

(INTERESTING PAPERS IN OTHER JOURNALS)
by Pete J. Dunn

Department of Mineral Sciences
Smithsonian Institution Washington, D.C. 20560

Cited below are papers which may be of interest to readers of the *Mineralogical Record.* They were selected with the amateur mineralogist and collector in mind and are, for the most part, readily comprehensible to non-professionals. The selection of papers to be cited is admittedly subjective; readers are invited to suggest titles for inclusion. Papers dealing with the following topics will be considered:

1. "Collectables"
2. Mineral localities
3. Minerals and mineral groups, special problems, etc.
4. Philosophies of mineralogy
5. Topics of interest but outside the scope of the *Record.*
6. Publications relating to papers published in the *Record.*
7. Papers the reviewer finds interesting.

Those interested in reading cited articles can probably find the journals in any large, especially university, library. (Please do **not** write to the *Record* or the reviewer for reprints or addresses.)

* * *

Distribution of Mississippian geodes and geodal minerals in Kentucky.
(FISHER, I.S. (1977) *Economic Geology,* **72**, 864-869.)

Old mineralogical techniques.
(MANDARINO, J.A. (1977) *Canadian Mineralogist,* **15**, 1-2.)

Monohydrocalcite in a guinea pig bladder stone, a novel occurrence.
(SKINNER, H.C.W., OSBALDISTON, G.W., and WILNER, A.N. (1977) *American Mineralogist,* **62**, 273-277.)

A technique for extracting small crystals from thin sections.
(RICKWOOD, P.C. (1977) *American Mineralogist,* **62**, 382-384.)

Some mineral inclusions from African and Brazilian diamonds: their nature and significance.
(MITCHELL, R.S., and GIARDINI, A.A. (1977) *American Mineralogist,* **62**, 756-762.)

Centenary Presidential address, 1976. Progress in Mineralogy.
(DUNHAM, K. (1977) *Mineralogical Magazine,* **41**, 7-26.)

Report of the I.M.A. - I.U. Cr. Joint Committee on Nomenclature.
(BAILEY, S.W. (1977) *The American Mineralogist,* **62**, 411-415.)

Mineralogical Notes

LUDLAMITE CRYSTALS FROM GALILEIA

Very good ludlamite crystals have recently appeared among the mineral dealers of Governador Valadares, Minas Gerais, Brazil *(and among U.S. dealers. Ed.)*. The ludlamite irregularly coats feldspar masses and triphylite blocks. It is always associated with crystallized blue platy vivianite and sometimes with small clusters of eosphorite. Galileia ludlamite is apple-green and forms groups of well developed crystals to several mm.

The source is a small, heterogeneous pegmatite lens situated near Galileia, a town on the Rio Doce (Doce River) east-southeast of Governador Valadares. The famous Sapucaia phosphate locality is in the neighborhood.

The deposit is a steeply dipping (65°NE) lenticular pegmatite body striking N30°W and measuring about 10 m in width and 40 m in length. It is being mined by the open pit method and the ore is being hand-sorted. The industrial minerals being recovered include beryl, amblygonite, feldspar and mica. Abundant iron and manganese phosphates occur in lenses of several hundred kg scattered through the feldspar near the quartz core. These phosphate pods have been stockpiled near the workings.

A study of the mineralogy and paragenesis being conducted by the authors has so far revealed the following minerals:

Metallic minerals: chalcopyrite, covellite, arsenopyrite, pyrite, sphalerite and rarely wolframite. Very good arsenopyrite crystals to 8 mm as well as brown sphalerite crystals occur rarely.

Well crystallized phosphates: amblygonite (lemon-yellow crystals to 4 cm), eosphorite (or childrenite) in clusters of light brown needles, small and excellent ludlamite crystals in groups to several cm, roscherite as thin coatings on quartz, and platy crystals of tourmaline and vivianite to 1 cm.

A group of apple-green ludlamite crystals on feldspar from Galileia. The ludlamite crystals are about 5 mm in size. On the left are blue vivianite crystals in parallel growth.

Massive phosphates: many have been tentatively identified by X-ray diffraction but are presently under chemical investigation in order to identify them more accurately. These include: apatite, heterosite, graftonite, metavariscite, phosphoferrite, rockbridgeite, saleite, triphylite and varulite. Alluaudite, arrojadite, beryllonite, herderite and sarcopside have also been identified.

Other minerals: siderite (good small crystals excellent for micromounting), albite (in platy clusters), orthoclase, quartz, beryl (opaque crystals to 1 m), mica, tourmaline (scarce, in platy crystals in mica), manganese oxides, limonite, kaolinite and montmorillonite.

A detailed description of the paragenesis and of the minerals will appear in a future issue of the *Mineralogical Record.*

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TUNGSTENIAN TETRAWICKMANITE FROM LANGBAN, SWEDEN

Tetrawickmanite, $MnSn(OH)_6$, the tetragonal dimorph of wickmanite, was first described from the Foote Mineral Company spodumene mine, near Kings Mountain, North Carolina, by White and Nelen (1973). This second occurrence is from Langban, Sweden, and the specimen was found by Clifford Frondel in the Flink collection (owned by Harvard University).

The Langban tetrawickmanite occurs as bright yellow euhedra implanted on magnetite and associated with barite. The crystals are sharp, finely striated, and quite attractive (Fig. 1.). Their maximum dimension is about 0.2 mm. Although nearly rectangular and in some cases pseudocubic in shape, many crystals are slightly deformed and are nearly rhombic in appearance. It is interesting to note that the type tetrawickmanite from the Foote mine has crystals with a pseudo-octahedral habit. The X-ray powder diffraction pattern of the Langban tetrawickmanite is identical to that of tetrawickmanite from the Foote mine.

Figure 1. **Tetrawickmanite crystals from Langban, Sweden. SEM photographs; a – 280X, b – 75X.**

The Langban crystals were analysed with an ARL-SEMQ electron microprobe using an operating voltage of 15 kV and a beam current of 0.15 μA. Standards used were synthetic scheelite for tungsten, synthetic cassiterite for tin, manganite for manganese, and hornblende for calcium, iron, magnesium, aluminum and silicon. The data were corrected for background, backscatter, absorption and fluorescence using a computer program.

The analysis yields **MnO** 25.90%, **MgO** 0.59%, **CaO** 0.16%, SnO_2 45.02%, WO_3 6.52%, Sum = 78.21%, compared with a summation of 80.39% oxides for theoretical $MnSn(OH)_6$. A microprobe scan failed to detect other cations. The low summation probably reflects the imprecision of the microprobe. Tungsten is probably present in substitution for tin in this sample (NMNH # 136708) and, following the rules of Schaller (1930), it is correctly described as a tungstenian tetrawickmanite. This second occurrence of this mineral may prompt a re-examination of Langban wickmanite samples to ascertain if some of them may be tetrawickmanite.

REFERENCES

SCHALLER, W.T. (1930) Adjectival ending of chemical elements used as modifiers to mineral names. *American Mineralogist* **15**, 566-574.

WHITE, J.S. Jr., and NELEN, J.A. (1973) Tetrawickmanite, tetragonal $MnSn(OH)_6$ a new mineral from North Carolina, and the stottite group. *Mineralogical Record* **4**, 24-30.

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TUCSON 1978 TUCSON 1978

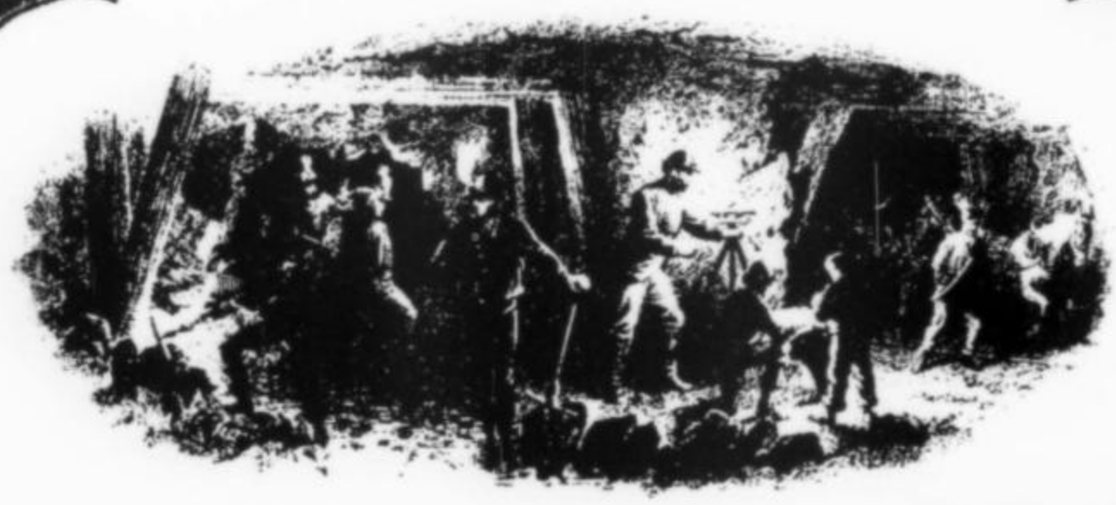
SANDS HOTEL/SHERATON HOTEL

INDEPENDENT MINERAL DEALERS TRADE SHOW

Mineral Specimens — Fossils — Gemstones — Wholesale/Retail

February 5 (Sun.) to 11 (Sat.) 1978

222 So. Freeway at Congress, Tucson, Arizona



Davis Minerals
Burrow's Mining Co.
Crystal Cavern Minerals
Arkansas Mineral Prop.
Gold Pan Rock Shop
P-K T/N & M/M of Nevada
K. H. Hollmann
Migol's Minerals
Caldwell's Gems
Stein Gems
McDermitt R.S.
Earth's Minerals
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So. American Minerals
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Don Elliott Minerals
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Del's Opals
Hammersleys Minerals
Gordner's Gem Warehouse
The Rare Earth

TUCSON 1978 TUCSON 1978

TSUMEB NOTES

INTRODUCTION

To assist readers in keeping up to date on Tsumeb mineralogy, we present here the first installment of *Tsumeb Notes.* It is recommended that these pages be xeroxed and inserted at the end of the Tsumeb issue (*TSUMEB!*, vol. 8, no. 3, of the *Mineralogical Record*). *Tsumeb Notes* pages are double numbered; one page number refers to this current issue, and the other page number refers to the numbering of the Tsumeb issue. The Tsumeb issue carried 128 pages; therefore this first page of *Tsumeb Notes* is page 129, and future installments will be sequentially numbered in the same way.

Individual notes within *Tsumeb Notes* will usually carry a page reference to the Tsumeb issue. It is recommended that readers turn to that page in their working copy of the Tsumeb issue and make a note in the margin referring back to the page in *Tsumeb Notes*; it is also recommended that the *Tsumeb Notes* page number be entered after the appropriate species names on the mineral index, inside the back cover. This will insure that your copy of *TSUMEB!* continues to be thoroughly cross-referenced and easy to use.

Subjects appropriate for *Tsumeb Notes* include discussions, letters, notes, articles, errata, additions and abstracts relating to Tsumeb mineralogy. Contributions are invited. Readers are also invited to bring to our attention any publication in another journal which refers to Tsumeb and which should therefore be abstracted here.

W.E.W.

* * *

MAWSONITE (Ref. p. 35)

A germanium and zinc bearing variety of mawsonite from the Tsumeb deposit (by OTTEMANN, J., NUBER, B., and GEIER, B. H. (1977) *Chemie der Erde,* **36**, 110-117).

ABSTRACT

In 1966 B. H. Geier discovered at Tsumeb on the 30 level (and below) a mineral which came to be known as "Feuermineral," because of its brilliant red color under crossed polarizers. More recently, superior specimens were found on the 32 level, permitting better X-ray and structure studies. Once thought to be a new species, it has now been shown to *probably* be a germanium and zinc-rich variety of mawsonite referred to by the authors as mawsonite-(Ge). (This variety was called *Ge-Zn-Mawsonite* in the Tsumeb issue. Ed.)

Figure 1. **Chalcocite crystals covered in places by a druse of smaller chalcocite crystals, from the 35 level. Zweibel specimen, 7.5 cm wide.**

Mawsonite-(Ge) appears to be concentrated between depths of 950 to 1070 m. The crystals are microscopic and range up to a few micrometres in size. The color is similar to bornite and renierite in hand specimens, but appears medium gray with a strong salmon tint in polished section. Twinning is "frequent."

Germanium substitutes for copper; zinc substitutes for iron; and minor arsenic substitutes for tin. The formula is approximately $(Cu_{.94}\mathbf{Ge}_{.06})_7(Fe_{.74}\mathbf{Zn}_{.26})_2(Sn_{.99}As_{.01})S_{10}$.

The powder patterns of mawsonite and mawsonite-(Ge) are essentially identical except that only the strongest lines (9 given) of the latter were observed, this being attributed by the authors to the very small size of the sample.

Mawsonite-(Ge) is cubic or pseudocubic with $a_o = 10.710 \pm 0.005$ Å; $Z = 8$; cell volume = 1228.5 Å^3. The calculated density is 4.2 g/cm^3; space group not known.

Mawsonite-(Ge) associations include tennantite, chalcopyrite, sphalerite, chalcocite and other sulfides.

J. S. W.

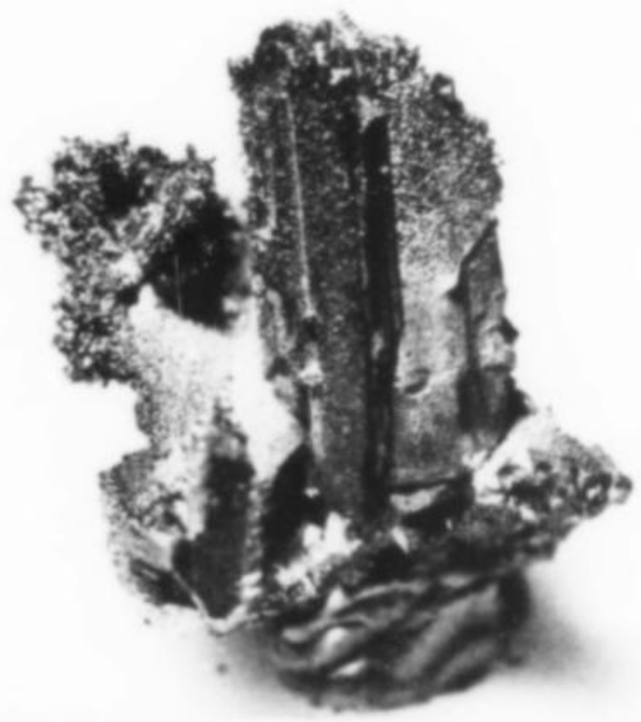

Figure 2. **Chalcocite crystal partially coated with a druse of smaller chalcocite crystals. Zweibel specimen, 2.5 cm tall.**

LEITEITE (Ref. p. 27, 95)

I would like to offer some additional information on the occurrence of leiteite at Tsumeb. In 1968, when I sold a large ludlockite specimen to F. L. Smith and Charles Key, I had also acquired two specimens of leiteite. Both the leiteite and ludlockite were found together in one pocket by K. H. Du Preez in East 19, on the 28 level, on the north side of the stope. Not being able to identify the talcy mineral I set it aside. After receiving the Tsumeb issue of the *Mineralogical Record* I recognized the leiteite and brought out the specimens I had set aside in 1968. Dr. O. von Knorring has since confirmed that they are leiteite.

A second occurrence of leiteite at Tsumeb has recently been discovered. In July, 1977, 12 pieces of ludlockite and three specimens of leiteite came into my possession. These were all found in one small pocket on the 31 level. One piece of ludlockite has shafts of leiteite through it, again confirming that the two minerals occur together. Black crystals (as yet un-

TSUMEB NOTES

Figure 3. **Cuprite crystal group partially coated with small malachite grains, from the 35 level. Zweibel specimen, 8 cm wide.**

identified but probably schneiderhöhnites) occur on the ludlockite.

Sidney Pieters
Windhoek, Southwest Africa

I wish to make some corrections and additions:

GANGUE (Ref. p. 38-47)

Except for column two on page 39, the term "gangue" should be replaced by the term "country rock."

DUFTITE (Ref. p. 45)

Page 45, column one, second paragraph under "duftite," should read "admixed Ca ions" and not "admixed calcite."

CONICHALCITE (Ref. p. 22, 45)

Conichalcite also forms tiny, lustrous,

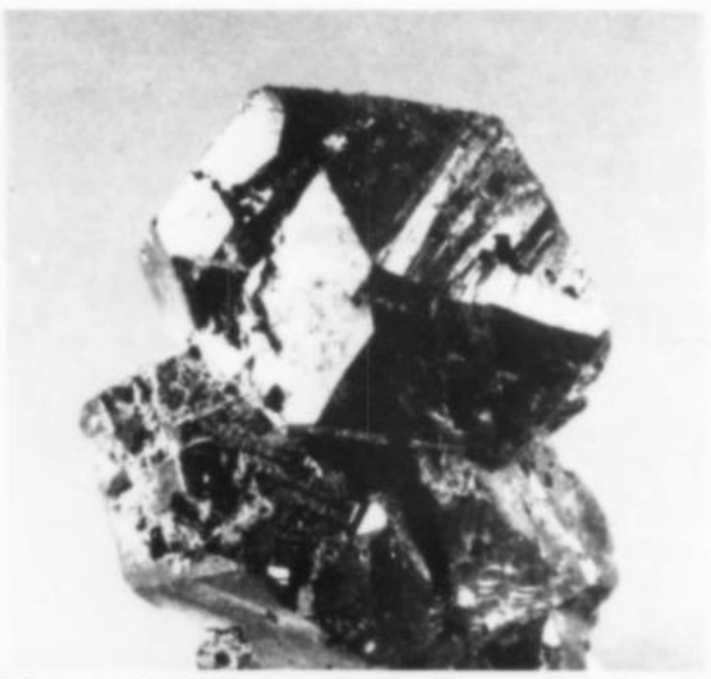

Figure 4. **Cuprite crystals, from the 35 level. Zweibel specimen, about 1.2 cm wide, very dark red.**

adamite-like crystals on the 31 level.

ALGODONITE (Ref. p. 18)

Walter Kahn's algodonite was identified by me; it occurs in euhedral crystals.

BRUNOGEIERITE (Ref. p. 21)

Brunogeierite on the Kahn specimen forms octahedral crystals.

"MOLYBDENITE" = CHALCOCITE (Ref. p. 28, photo on p. 59)

The "molybdenite" crystal pictured on page 59 has been X-ray analyzed and proved to be chalcocite.

Paul Keller
Stuttgart, West Germany

FLUORITE (Ref. p. 24-25, 58)

Fluorite appears to have been more common than you think. Before the first World War an enormous amount of very fine specimens were in Germany, and much more became available in the twenties. A great deal was destroyed during World War II but, nevertheless, almost any older German collection I have seen contained Tsumeb fluorite. But one must be careful; old German specimens of fluorite labeled "S. W. Afrika" are usually from "Pforte." They must bear a "Tsumeb" label to be considered from Tsumeb, and even then mistakes are possible—always examine the matrix. The material from Pforte is green and purple and very beautiful, as is fluorite from Orongo.

Kay Robertson
Los Angeles, California

The fluorite pictured, and actually any recent "Tsumeb" fluorite in good crystals, is probably from a mine at Okarusha about 50 miles from Tsumeb. On weekends the miners at Tsumeb sometimes go to Okarusha to collect fluorite; they bring it back and mix it in with the Tsumeb specimens they sell to dealers.

Prosper Williams
Toronto, Ontario

Judging from the two letters above, it would seem safe to label fluorite as being from Tsumeb only if self-collected! Although matrix and associations might aid identification in some instances, most fluorite specimens labeled as being from Tsumeb can probably never be positively confirmed or disproved.

W.E.W.

KEYITE ASSOCIATION (Ref. p. 88)

The "cuproadamite" that is associated with keyite is stated by Embrey, *et al.*, to have Cu:Zn near 3:2. It must therefore be zincian olivenite instead.

Michael Fleischer
Reston, Virginia

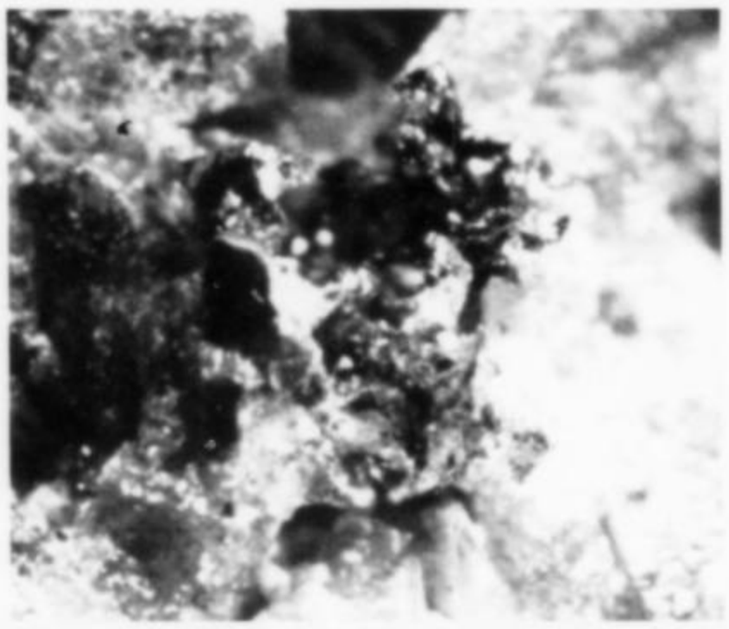

Figure 5. **Silver on cuproadamite from Tsumeb. Rolf Fahle specimen; photo by Olaf Medenbach.**

DEVILLINE (Ref. p. 23)

Devilline exists as small, sharp, hexagonal crystals on the rare pseudomorphs of tennantite or enargite after azurite, associated with crystallized posnjakite and linarite among others.

Dwight Weber
Hawthorne, California

GREENOCKITE (Ref. p. 26)

Zn-Greenockite was formerly known as *Cd-Wurtzite*, not *Cd-Voltzite*.

Ulrike Kahn
Wedesbuttel, West Germany

TSUMEB NOTES

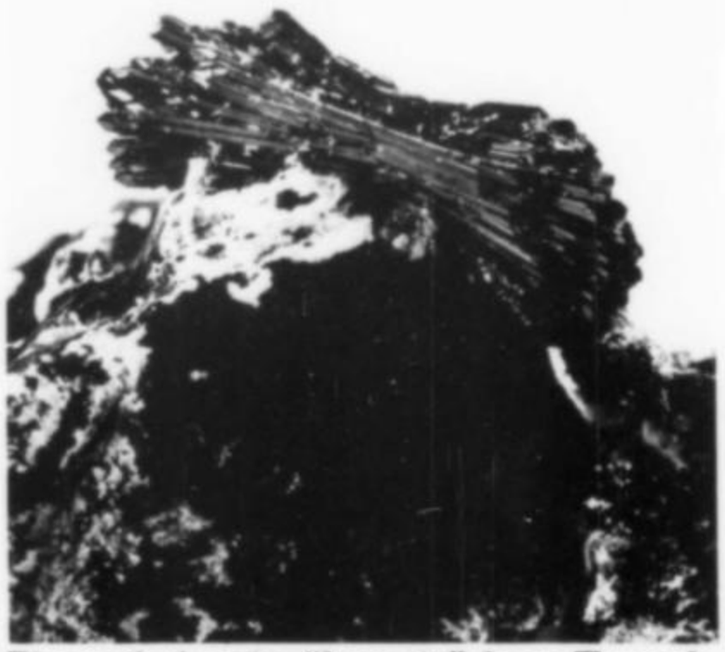

Figure 6. **Azurite "bow tie" from Tsumeb. The group is about 2.5 cm across; Richard Haug specimen and photo.**

Figure 7. **Calcite with asbolane inclusions in the crystal tips, from Tsumeb. The specimen is about 23 cm in width; the asbolane is purplish black in color. Richard Haug specimen and photo.**

Figure 8. **Siderite from Tsumeb, in 1.5 cm honey-yellow-brown crystals. Richard Haug specimen and photo.**

ERRATA

Page 6, paragraph one, "by Botswana on the *east.*" Also, the Caprivi Strip "extends to the north*east.*"

Page 4, photo credit for Figure 4, should go to S.W. Photo, Southwest Africa.

Page 24. Under *Zn-Dolomite* it should read 21.65% ZnCO_3.

Page 87, line four in the keyite abstract, "Zn" should read "ZnO."

Page 95, the author is "Czamanske," not "Czamanski."

RECENT DISCOVERIES

Crystal specimens tentatively identified as chalcocite (Ref. p. 22) by X-ray diffraction were made available at the Detroit Show by Miriam and Julius Zweibel. The crude crystals range in size from 1 to 3 cm and are coated with a druse of smaller, very lustrous and well formed micro crystals (see Figs. 1 and 2).

At the same time the Zweibels exhibited specimens of recently mined cuprite crystals (Ref. p. 23, 72) in dark crystals 1 to 1.5 cm across (see Figs. 3 and 4). The crystals are dodecahedrons with minute octahedron faces sometimes visible and carrying a light dusting of malachite on some but not all crystals. Many of the crystals are cavernous in part.

Both the chalcocite and cuprite were mined from the 35 level in July of 1977. At least 8 specimens of chalcocite and 50 specimens of cuprite, mostly small, were recovered.

W.E.W.

SILVER (Ref. p. 31)

An interesting specimen of native silver on cuproadamite (Fig. 5) has recently come to light. It was at first thought to be gold but microchemical tests proved it to be silver (O. Medenbach, personal comm.). This is the first report of silver occurring with non-sulfide secondary minerals at Tsumeb.

W.E.W.

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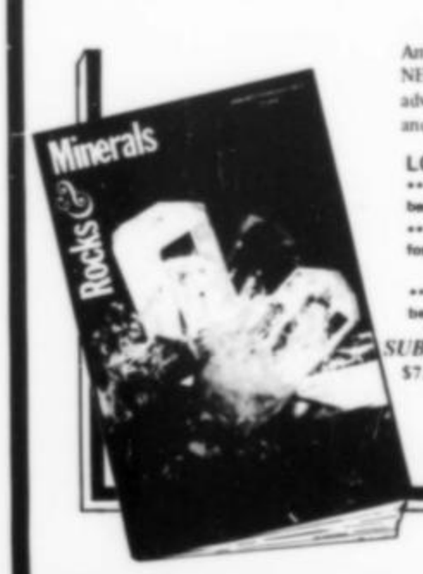

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THE HISTORICAL RECORD

by Ron Bentley
P.O. Box 366
Windsor, Connecticut 06095

For the past three years now I've been lucky enough to attend the Detroit Show, and it never fails to amaze me how the Michigan Mineralogical Society and its show committee can continue to put on such a consistently high quality show. Everyone connected with the show deserves applause for their dedication and hard work. It is well worth the time just to view the many fine exhibits and, for me, the highlights of the show were five displays of a historical nature. Dona Leicht of Kristalle displayed part of her collection of gold mining memorabilia, including a very fine assayer's kit. Another case displayed old mineral books. Most important historically, though, were two cases prepared by David Lowrie of Wayne State University. A number of years ago Dave became aware of a small collection of minerals and a box of labels that appeared not to be of any particular import. Upon examination, however, the labels matched up to 66 specimens from the Thomas Alva Edison collection, prepared by George F. Kunz! A good number of these specimens were on

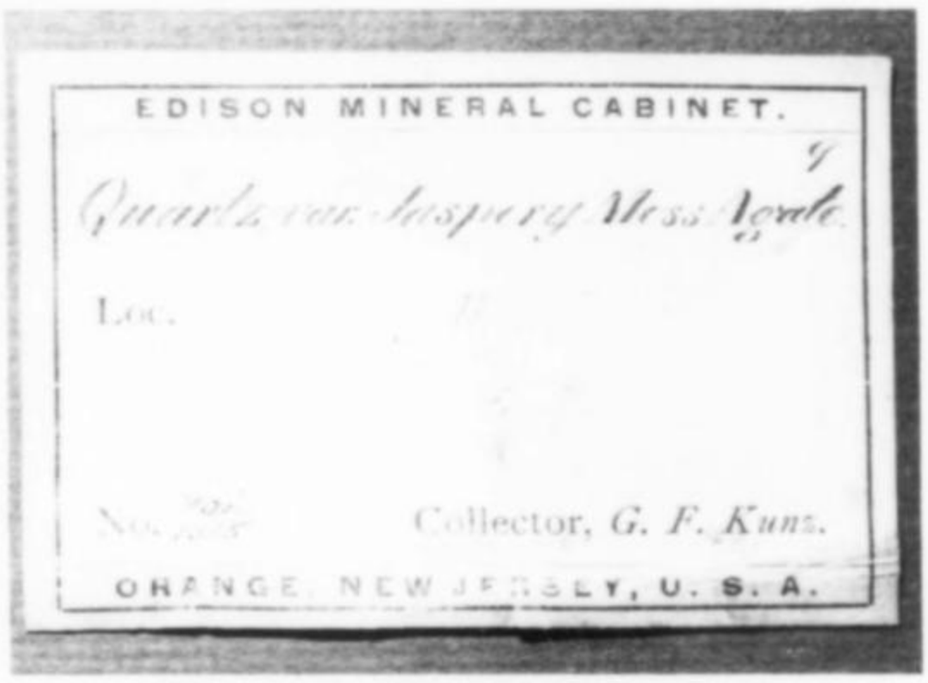


Figure 1. **A label from the mineral collection of Thomas Alva Edison, now owned by Wayne State University.**

display at the Detroit Show, and one of Edison's labels is reproduced here. I hope that at some time in the future Dave can give us some of the background of both the Edison collection and the fine collection of Wayne State University. Hopefully other collections like these will come to light out of dusty museum basements and homes and will be preserved for their historical significance.

Another attraction for me in Detroit was the opportunity to see Don Olson again at the Holiday Inn. Don has been busy since last year, as evidenced by a boxfull of old carbide lamps and spike candleholders as well as a 2-foot stack of old mining stock certificates dating from 1850 to 1950. Enough said about them for now, as Don has promised me more information on these interesting items for a future column. For anyone interested, however, Don has a catalog available at no charge. Write to him care of *Minerals International*, 304 W. Clovernook Lane, Glendale, Wisconsin 53217.

I also had the chance to study yet another facet of the historical record by way of Larry Conklin. Larry has amassed a sizeable number of old letters to and from such people as Kunz, Ward, Foote, Pennypacker and Hopping. He has preserved them in two large albums and might be persuaded to loan one or two letters for use in this column.

Unfortunately some of the spirit of Detroit was missing because of the news of Neal Yedlin's death on Saturday, October 8. Neal's interest in our historical legacy was shown by his collections of old books, lamps and mineral labels. Suffice it to say here that to the mineral world and to those of us who knew Neal personally, he'll be truly missed.

While we were looking at the Edison collection, Dave asked me a question that will take the remainder of this column to answer: how does one clean labels as old as Edison's? The de-

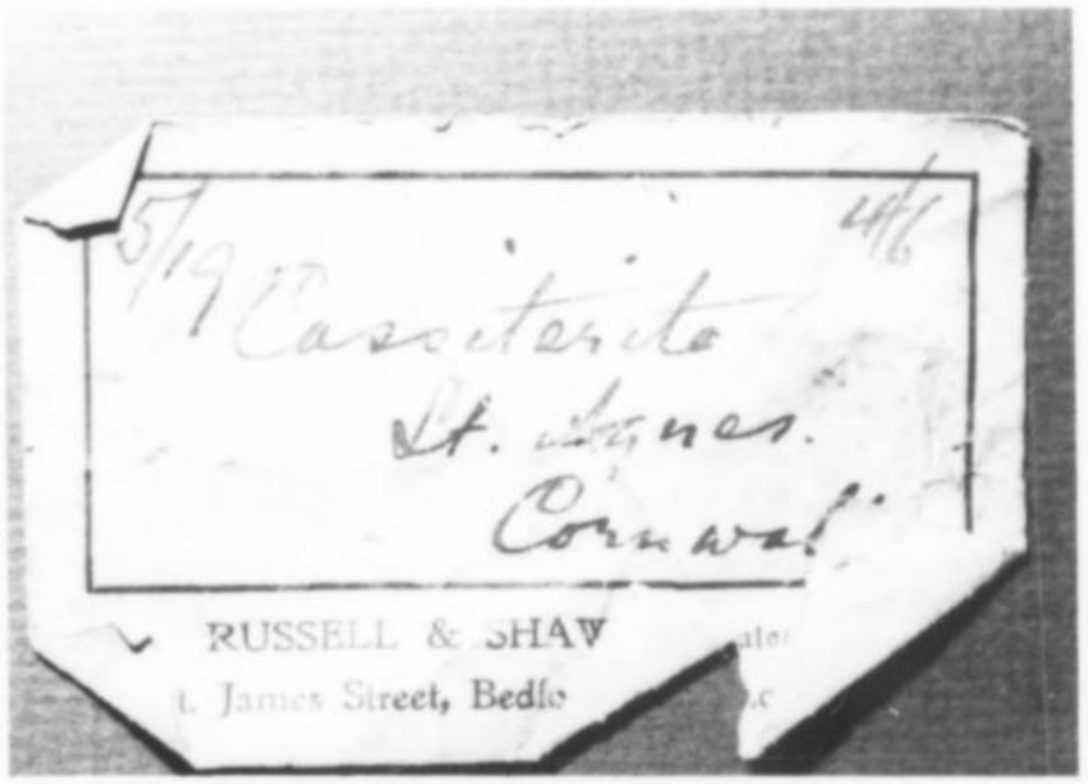


Figure 2. **This badly mangled Russell and Shaw label will respond to a thorough wet cleaning and make a nice addition to anyone's collection.**

cision whether to clean or not to clean can be made only after considering several factors. The first question is: will the label physically stand up to a cleaning? Changes in temperature and humidity along with normal aging can cause many papers to become so brittle that they may fall apart at a touch. In such cases extreme care must be taken. Only if the label is so dirty that it is questionable whether or not it has any use in its present state, should cleaning be attempted. In these cases, use a spray

Figure 3. **Unfortunately, most of Sir Arthur Russell's labels were written in water-soluble ink or pencil. Such labels can be cleaned only very selectively using an eraser.**

lacquer or spray plastic to thoroughly saturate the *back* side of the label. When this dries, the label should be tough enough to survive some cleaning. Don't worry about curling; after cleaning the front, it too can be coated and pressed flat. The second question is: will the writing medium be affected by the cleaning solution? Most labels can be effectively cleaned in a warm solution of water and mild soap. Before immersing the entire label, however, test a small spot of writing with a drop of the solution. Allow the drop to wet the paper completely, then brush with a fine bristle or camel-hair brush. If the writing remains unaffected, then it is a good bet that the entire label can be safely immersed. If, on the other hand, the writing medium

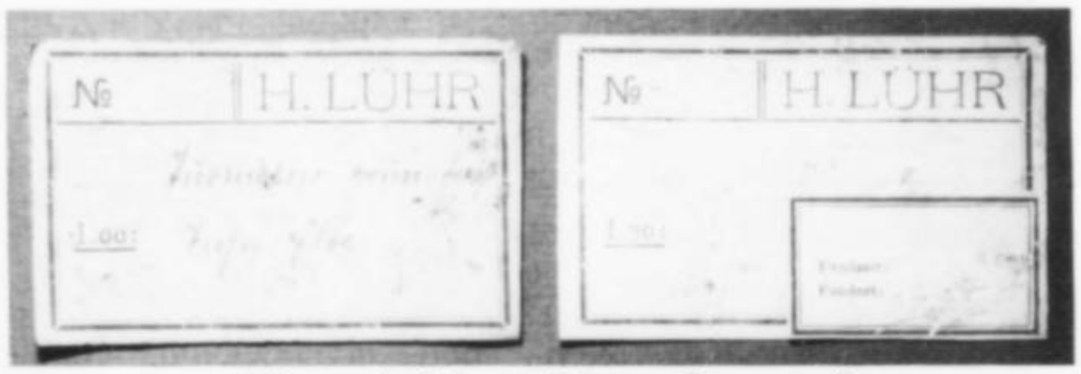


Figure 4. **Salvaged from Gregory & Botteley in London, these two Luhr labels illustrate the folly of cleaning without spot testing. The ink used was water-soluble and disappeared from the cleaned label at right.**

lifts up or blurs, dry off the spot with a towel, then try a spot with alcohol or one of the hydrocarbon solvents. If this also fails, there is only one alternative remaining. Buy a powdered gum eraser bag like draftsmen use and very gently rub over the surface of the label. You may lighten up the writing slightly, but hopefully you'll remove enough of the dirt to make it worth the loss.

Having treated the two worst cases, it is fairly simple to clean the normal, run of the mill, dirty old label. Using the above cleaning solution, completely immerse the label until it is wet. Remove it from the solution and place it on a piece of towel. Using a camel hair or bristle brush, dip the brush in a concentrated soap solution and apply in gentle circular motions. Do not rub too hard or too fast as you may loosen the fibers of the paper. After the entire surface of the label has been cleaned, rinse it with clean water, place it between towels and apply pressure to press it flat. Leave it there overnight to prevent curling, then allow the label to air-dry for at least another 24 hours before mounting it or applying a preservative. For those of you who have access to an ultrasonic cleaner, I recommend its use over a brush because physical contact is minimized. Only with cases of brittle paper do I advise spraying with a plastic or

Figure 5. **Here are two labels belonging to the English collector Colonel Rimington circa 1880. The label on the right was successfully cleaned and pressed.**

Figure 6. **A page from a "magnetic" picture album which can be used to hold old mineral labels.**

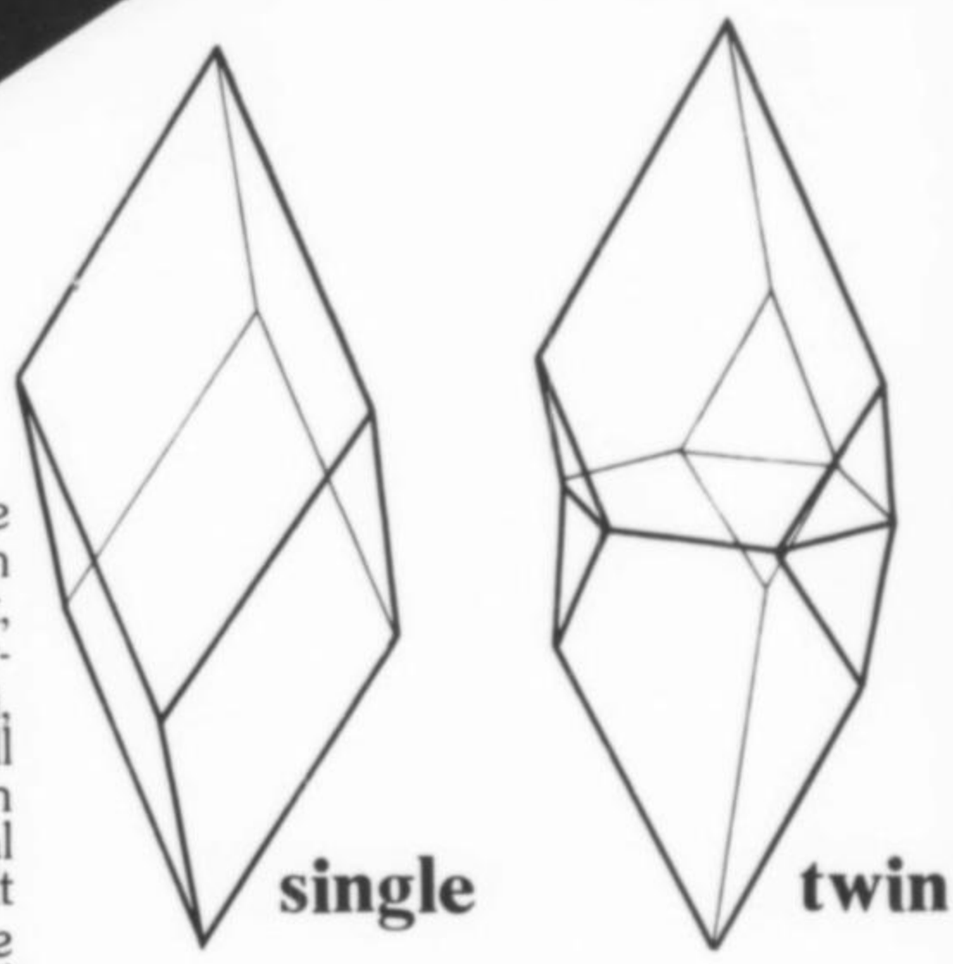
lacquer. I prefer keeping the labels in the plastic-covered leaves of an album rather than applying a coating which might age and cause more problems. I understand from Glen Bolick, however, that Marshall's Oils have a product called *spray glass* which is used by museums for preservation of art works and archeological remains and is not supposed to change with age.

Once the label has been cleaned, the final step is preservation. As mentioned, spray preservatives can be used or the labels can be put into an album protecting them from rough handling and the ravages of time. If you go into any large department or gift store, you can find any number of "magnetic" picture albums. These consist of a plastic covering placed over a slightly gummed back which stops whatever is placed within from moving or falling out. A word of caution, however. Oftentimes the department store may have albums produced on an exclusive basis and in limited quantities. Because of this, when you get ready to expand the album, you may find that refill sheets of that particular size are no longer available. If you do get a store album, just be certain that the standard refills (e.g. Hallmark) will fit them. The easiest method for organizing your labels is to use one page for each letter of the alphabet. You may also wish to use only one side of the sheet, leaving the facing page clear for comments, bibliographies of the collector or dealer, or other related information. Lastly, when using "magnetic" albums you must not place the label directly on the gummed surface. After a short time in the album, it will become very difficult to remove the paper label without tearing it. The remedy for this is to cut a slightly smaller piece of plain paper to go on the gummed surface leaving only a small border of the label exposed to the gummed area. This insures that the label will be able to be removed at some future time without damage and that it will also stay in place. If you don't wish to display your collection, you may want to use glassine envelopes to protect them and then file them for reference.

So now you have your collection cleaned *and* protected. These cleaning and display hints are by no means the only methods, only the ones I have found most effective. If you have other methods to suggest, I would be glad to hear from you. Until next time, good collecting.

Hamel
Mining & Minerals

We will again offer at the Tucson Show, at the Tucson Community Center, magnificent, transparent crystals of brilliant purplish-red *Kämmererite* from Kop Duglari, near Erzerum, Turkey. Many specimens will have lustrous, free-standing crystals to 1 cm in size. Undamaged and uncleaved material from this area is extremely rare and difficult to obtain, and these fine specimens in a range from museum size to micro, and in several habits, will be available.



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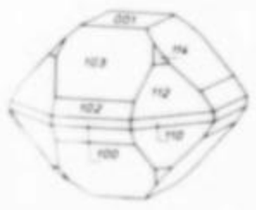

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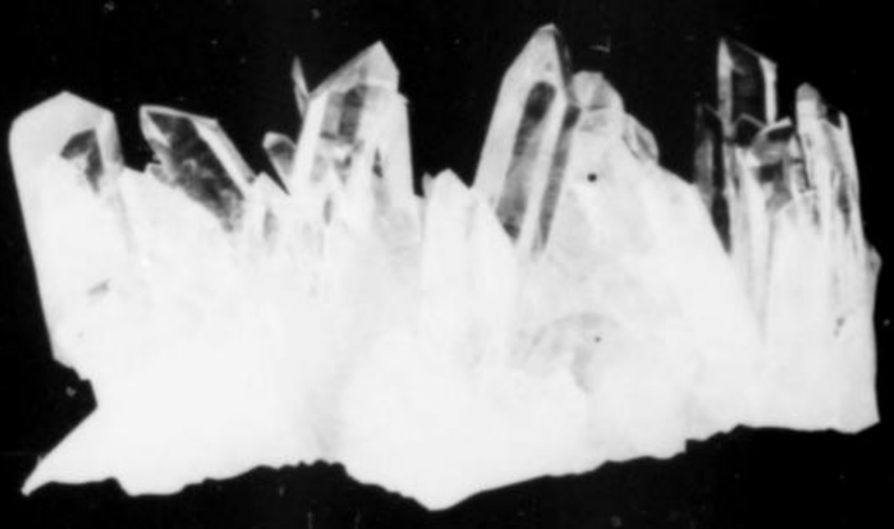

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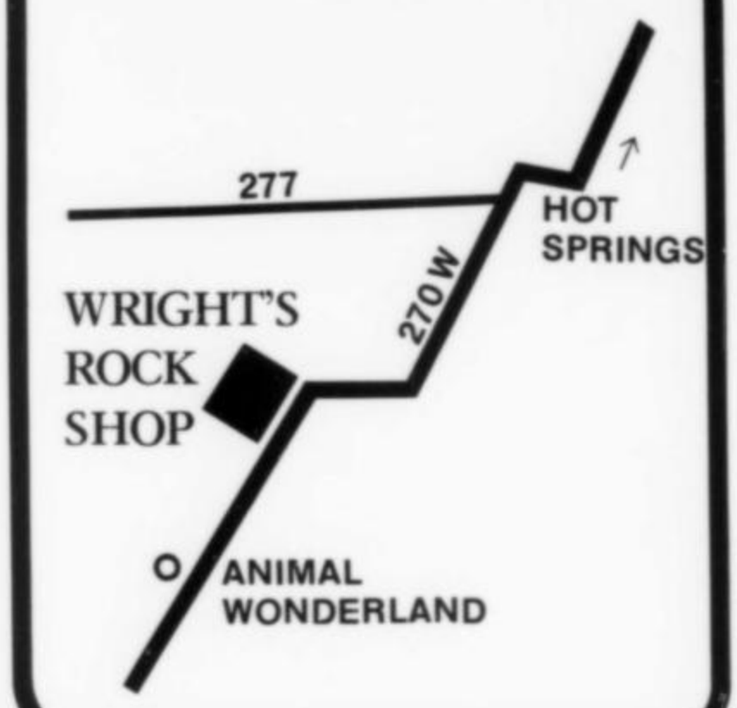

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BOB SULLIVAN'S LETTER from EUROPE

Pan for gold in Italy? I never would have thought it practical until I met up with Massimo Nepote-André of Torino at the Lanzo, Italy, bourse this summer. Massimo, an enthusiastic mineral collector in his mid-twenties, has been successfully extracting gold from a number of rivers in the Piemonte and Lombardy regions of northwest Italy for the past several years. Massimo started with the traditional gold pan but finding the method slow and tedious he built a fair-sized portable sluice box. From then on the yields soared and Massimo has had trouble keeping up with the demand, for Italian gold is highly prized by local collectors.

Massimo claims gold can be extracted from virtually any of the Italian rivers and has examples taken from nearly 20 different rivers to prove it. Very few rivers are truly productive however, and Massimo mainly concentrates his efforts on the Orco, Malone, Elvo and Ticino rivers in the mountainous regions north and northeast of Torino. Best bet and source of the largest sizes is the river Elvo which drains principally from Mars Mountain just south of the Gressoney Valley above Ivrea. A particular bend in the river near Bessa is especially productive and was worked for gold by the Romans over 2000 years ago. A number of pyramidal-shaped rock cairns erected by the Romans to mark this spot are still standing today. The surrounding mountainous scenery is also superb.

Massimo explained that one never finds nuggets as such in Italian rivers because the action of the glaciers flattened the gold to thin, wafer-like pieces many thousands of years ago. Largest piece he has found to date was a coin-like disc over 3 cm in diameter weighing 4.9 grams. Crystalline gold is also found in Italy, particularly in quartz veins in the mountains north of Sondrio and in a number of other Italian Alpine localities. I managed to trade a few sizable pieces of Elvo river gold from Massimo but, like most Italian collectors, I found him a real tough trader!

The string of mineralogical "surprises" that started this spring has continued well into the summer bourses and so far it has been a good year for the European collectors. In my last letter I mentioned dramatic magenta-colored kämmererite from Turkey, axinite from Tasmania and a phenomenal find of brilliant green pyromorphite from the province of Correze, France. With the exception of the axinite neither of the others have surfaced again, unfortunately.

The two young Swiss collectors who hit the axinite in Tasmania earlier in the year returned from a second trip in June with quite a bit more of this attractive mineral, but this appears to be the end of it. They plan a return trip in the fall "but only with power equipment could we possibly find more," they stated. Locality was finally given: Colebrook Hill, Rosebery, Tasmania.

The second Nancy, France, bourse in late May made history in two respects. Firstly, to my knowledge it was the first European mall show and was held in the hugh St. Sebastion Commercial Center right in the heart of this large industrial city in eastern France. Over 100 dealers were present and in spite of a fine array of European minerals the show was not a success. The combination of a three-day holiday weekend and beautiful weather sent most people off to the country and attendance was way down from the previous first year. This bourse will eventually become a major one I do believe.

The hit of the bourse was, however, not a French but a Spanish mineral, for a limited number of those superb multiple pyrite twins from the "Soria-Logroño" area appeared on one table. The exact locality still remains somewhat obscure, however, with some dealers (even from Spain) claiming Soria—others Logroño. I stick with Valldenegrillos in the province of Soria as the correct source of these nearly perfect cubic pyrites, this as it was given to me by a Spanish mineralogist some six years ago when I first ran into them in Madrid. Many Americans are not too fussy about their localities and the name of the country is sufficient even in competitions, but Europeans are sticklers on the subject. In Japan, if the name of the exact mine is not known, a specimen is greatly reduced in value.

In all fairness I should point out that the major pyrite vein in this area is a chainlike formation about 40 kilometres long, starting at the border where the provinces of Zargoza and Logroño join, passing through the southern tip of Logroño province into the province of Soria. The only place from which the perfect cubes and twins have been taken is reportedly an open area some 6 or 8 metres long in the province of Soria at the western end of this chain.

There is no need to describe these beautifully perfect works of nature as they were well illustrated in the *Record* (vol. 7, no. 3, pg. 134) following Vic Yount's scooping the Tucson show with them in 1976. Some idea of the rarity of the multiple crystals was given then when Vic was quoted as saying that only 24 of the 725 pieces in the lot (3.3%) were multiples. It was not stated, however, that the 725 pieces were selected from many others of lesser quality and that the lot most probably contained more perfect crystals than had ever been recovered before in the 7 or 8 years this area has been worked by amateurs. Repaired specimens of these multiple twins do have general acceptance over here, by the way.

The Paris collector-dealer who brought 50 multiple crystals to Nancy claimed they were selected by him in Spain from over 3 metric tons (6,615 pounds) of pyrite! As the total weight of the specimens was approximately 10 kilograms, this would put the yield of these multiple crystals at about 0.3%. Pushing my calculator a bit, I came up with the fact that if the 3 tons of pyrite were to be formed into a cube, it would only be about 84 cm (33 inches) on a side. If this cube were to be cut up however, it would produce approximately *36,000* 1-inch cubic pyrite crystals. If you want to do a little playing on your own calculator, plug in the fact that the average multiple pyrite crystal is about 50 cubic cm (3 cubic inches) and weighs around 250 grams, but no matter how you compute it, the answer comes out "extremely rare." The perfect single pyrite crystals, particularly 3 cm (1¼ inches) or over, are also very rare and are a fine addition to any collection. The largest single Soria pyrite crystal I have ever seen over here, by the way, was 6.4 cm (2½ inches) square at the base, 9 cm (3½ inches) tall and weighed 1½ kilograms (3.3 pounds).

Nancy failed to produce any other "spectaculars" but a few fine French minerals were available in mostly rather limited quantities. These included fine green torbernite from Allier in the Central Massif region, very brilliant octahedral pyrites to 3 cm on matrix from an unnamed source (first time I've seen these), fine brilliant tetrahedrite and lustrous twin bournonite crystals on the same matrix

from the Bourg D'Oisans region, and very attractive cubic fluorite crystals to over 5 cm from the Esterel region (see the *Record*, vol. 8, no. 4, pg. 308). Typically, most of the fluorite was badly bruised or dinged and we have as yet to add one of these beautiful specimens to our collection because of their normally damaged condition.

One dealer-collector had a table full of very fine marcasite from the chalk cliffs of Cap Blanc Nez (Cape White Nose) near Calais France. They were self-collected, which he explained was no easy feat since the formation is normally underwater and one has about an hour to work the cliff at low tide. The spear-shaped crystals to over 2 cm were particularly brilliant, exceeding the quality of the German and Czechoslovakian specimens seen quite frequently at German bourses. He also offered very attractive sausage-shaped pyrite nodules (called *boules* in French) from the sands of the same beach (see the *Record*, vol. 7, no. 4, p. 179). They are quite common at French bourses but this lad had a few—the first I have ever seen—that were brassy bright and had millemetre-sized pyrite crystals on the surfaces. Usually they are badly corroded and not at all attractive except to cutters who slice and polish very attractively color-zoned jewelry slabs from them. They are also found around the chalk cliffs of England on the opposite side of the English Channel.

French collectors and dealers generally have good access to neighboring Spain and a fair assortment of Spanish minerals are offered at many French bourses. Some Spanish dealers and traders occasionally participate in these bourses because none as yet are held in Spain or Portugal. I hear there is one brewing in Madrid for possibly the fall and I hope it materializes. Madrid is a beautiful city and most Spanish dealers, fearing the customs problem, remain at home but do have fine minerals to offer. However the world famous Eugi, Navarra, Spanish dolomites, which a few years ago were abundant at French bourses, are now unavailable. Since the mine's chief mineralogist passed away several years ago, it appears that no one else at the mine has had the interest to salvage these classics. Among European collectors they are considered tops for crystal size, formation and clarity commanding steep prices in today's market.

For some time now, fairly large quantities of a new Spanish yellow cubic fluorite has been appearing at various principally French bourses. It is reportedly from near Oviedo. The quality has been gradually improving and in many respects it rivals the famous Ft. Wayne (Indiana) material. I have seen matrix specimens with very clear crystals, over 2 cm on a side, many with penetrating twins, and a deep golden yellow color which I believe tops the Ft. Wayne material in richness. Since pure white dolomite rhombs and brassy pyrite crystals are often perched on the fluorite, they can make very fine display pieces. As it seems with all fluorite over here, damage can be a problem. I am sure some of this material will reach the States and it is one to watch for.

Switzerland's Lausanne, St. Gallen and Mels/Sargans 1977 bourses have now passed into history with no startling new offerings. Snow remains in the Alps until well into June and sometimes July, keeping the *strahlers* pretty close to their firesides until late summer. Their working season is indeed very short as the snows come again very early.

The Altdorf bourse, with number 15 coming up the first week in September, is traditionally the first showing of the results of the Swiss summer expeditions. This bourse, put on by the lively local mineral club, has grown to be quite an international bourse in the last few years. The main thing the club lacks is an adequate facility in which to put on their show; they currently squeeze down dealers to a bare minimum of space in order to accommodate the most. This same philosophy, "quantity rather than quality of displays," is still what most European bourses (unlike American shows) suffer from and our own Zürich bourse is the worst offender in this respect. Altdorf takes place in the picturesque town of William Tell in a typical Alpine setting, snow-capped mountains and all, and the usually undependable Swiss weather generally seems to be most cooperative on that weekend.

DOLOMITE, from Navarra, Spain. Wayne Leicht specimen, about 5 cm across, colorless.

Very fine anatase from the Grapsteigberg, canton Graubunden has recently been offered by several Swiss dealers. Usually only a trickle of material from this classic locality, much sought after by European collectors, appears at Swiss bourses. Fortunately several large pockets were hit of late to produce an abundance of specimens. Color was the traditional yellow to dark brown and crystals, many over 1 cm, ran unusually large. In case you have the opinion that Swiss anatase is strictly for micromounters, there was one matrix specimen in the St. Gallen Club display case over 2.5 cm in length in spite of the fact that one end of it had been broken off!

At the Lausanne bourse I met up with André Gorsatt from the village of Binn, high in the Swiss Alps. André is one of those real old-timers who has roamed the Alps for many a year and really knows his localities. He is full of wonderful stories about his experiences and I could listen to him for hours in spite of the problem of understanding his strong alpine dialect. "*Strahlering* is like fishing," he says, "every time you go out, you are hoping for the big one!"

André had a table full of titanite (still called sphene over here) taken from a number of prolific pockets near Gletsch in the canton of Wallis. This is one of Switzerland's two traditionally good localities for this much-appreciated mineral. The other is near Oberalp in the distant canton of Graubunden. The titanite from each is nearly identical, typically rich brownish green to yellowish brown in color and with most crystals lightly dusted with chlorite which does not at all detract from their beauty. The size of André's crystals, up to 6 cm and mostly twinned (some doubly), was what made this find outstanding. Due to the brittleness of the host rock, few of the large crystals were on matrix, but many were doubly terminated and a fine doubly terminated pair of back-to-back twins 5 cm long was added to our collection.

André has long worked the Val Bedretto and Val Formazza areas for matrix specimens of the famous Swiss-Italian "needle" quartz. They are truly beautiful specimens which on occasions produce an extra bonus of 1 or 2 Japan-law twins dispersed between the 2-to-6-cm-long, densely packed, clear, slender, needle-like crystals of quartz. Transport difficulties severely limit the number of these reaching the States but many have been carried back by visiting collectors. It is specimens like these that sometimes make security inspections a hold-your-breath experience. The above two valleys run parallel to each other with the Swiss-Italian border running between them and produce, as might be expected, nearly identical groups of minerals. A classic argument exists between the Italians

and Swiss in which each claims the needle quartz is more beautiful on their side of the border but, to my eyes, they are identical.

The extraction of needle quartz, André claims, is the most difficult of the tasks the Swiss strahlers must perform. The matrix is extremely hard and the slender quartz needles pop off the matrix with the slightest shock. Hand tools are used exclusively and in spite of his years of experience André claims he loses between 75-80% of all the material he finds during the process of removing it. Incidentally, in order to check the spelling of "Val Bedretto," I checked my "Swiss Bible," *A Guide to the Minerals of Switzerland* by Max Weibel, a book which I can highly recommend to anyone interested in Swiss Alpine minerals. The book, published in 1966 by John Wiley and Sons, contains 72 excellent color photos, 15 regional maps and 123 pages of excellent information including (for micromounters) a complete treatise on the famous Binnental's Lengenbach Quarry. Cost was about $10.00 several years ago.

June 10-12 were historic days in Kopparberg, Sweden, when the Bergslagens Geologiska Sällskap put on Scandinavia's first mineral show. Having spent a good part of the last 17 years in Sweden and also observed the steady growth of mineral collecting there, this news was of special interest to me. The Swedes, like their Norwegian neighbors, love the outdoors and spend a good part of their precious short summers combing the mountains and many abandoned mine dumps in search of what turns out to be mostly rare minerals. As a result virtually all Scandinavians are ardent species collectors and trading is the order of the day, for dealers are still a rarity in this part of the world. Most collectors are enthusiastic members of the many regional mineral clubs which have sprung up during the past few years.

The show was organized by president Ingemar Johansson (no relation to Sweden's ex-heavyweight champion) and several enthusiastic club members who simply hired a hall, filled it with plenty of tables and chairs and threw the doors open to everyone with no charges whatsoever. About 35 Scandinavian dealers and traders showed up and nearly 2000 visitors came from all 4 Scandinavian countries. Buying demand was so strong that many traders found themselves converted to dealers right on the spot.

Principal minerals offered were from the famous Langban area plus a good assortment of American and Mexican material. For the most part European minerals were scarce. The rare ones included blue werm-landite on white calcite (with 29 molecules of water, the most water-rich of all minerals), fine cobaltite and glaucodot crystals on chalcopyrite from Hakansboda, tellurobismuthite on sericite (some with specks of gold) and the elusive "selenokobellit," the selenium-rich variety of kobellite. The latter two were from the famous Boliden silver mine in northern Sweden which closed operations in 1967. This mine was the world's only known source of "selenokobellite." I missed the Kopparberg show, arriving in Oslo the day it closed, but thank Bjørn Strøamnaes of Norway and Lennart Narlund of Sweden for the story on it.

While in Oslo I visited with Bill Griffin, curator of the Mineralogisk-Geologisk Museum. In addition to both of us being Americans and having a deep love for minerals, Bill and I have one other thing in common. We both have been fortunate to have married Swedish girls—nuff said! Bill is doing a fine job in building up a long-neglected collection and, in particular, in modernizing the lighting and displays. Having seen the museum in the old days I can only marvel at the changes. The museum is slowly recovering from their two major robberies and, as Bill put it, "Now that the horses are gone we have installed a modern burglar alarm system." Other museums and universities have been most cooperative in rebuilding the collection and the Köngsberg silver collection is almost as good as it was previously. "We will never be able to replace the Hunan (China) cinnabar or the huge Russian platinum nugget," said Bill. Both were considered the best in the world. Bill showed me some fine Norwegian monazite crystals he recently had taken from the well-known Bjertnes, Krødern, area. They ranged to nearly 5 cm in length, most were doubly terminated, some twinned and were a rich tannish brown color. The crystals were especially well defined and were mostly floaters. Also some allanite. It is found in several localities in Norway, mostly as a brownish black massive material resembling hematite. At one time this highly radioactive mineral was cut and polished into cabachons for necklaces and the Norwegians jokingly refer to it as "the mother-in-law stone."

Bill and M. A. Takla of the University of Cairo are preparing a paper which, among other things, discredits the mineral *faraonite*. I do not find this one in my Fleischer's *Glossary* but it was described as a new mineral by El Shazley, *et al.*, in the *Proceedings of the Montreal International Geological Congress* in 1972. According to the Takla and Griffin study, "faraonite is not a single phase but is ordinary cancrinite altered by fluids from the ultramafic rock with the introduction of Mg in the form of spinel and a sheet silicate."

We attended the Milano bourse, then the St. Marie Aux Mines bourse held early in July in this picturesque mining town in the Alsace region of eastern France. This bourse, now in its 14th year, was at one time one of Europe's top shows, but for a number of reasons it has been on the decline in recent years. These include poor facilities, major customs problems which now discourage most foreign dealers from attending, and the highest priced metres of table space of any bourse in Europe, in spite of the fact they are only 50 centimetres wide. Many collectors and dealers now find it simpler to attend the many new local bourses which have sprung up rather than make the long trip to St. Marie, in spite of the very festive atmosphere—much of it takes place outdoors—and the attraction of the good food and wines in this region.

St. Marie did, however, produce the top mineral spectacular of the year to date when a German dealer offered a fantastic collection of that "hot" Hotazel, South Africa, rhodocrosite for the first time in Europe. The collection initially consisted of about 70 specimens, many of which were quite small, and "came from pocket number 4 in the late spring." Supposedly the entire contents of the previous 3 pockets ended up in the States.

What will the big bourses of the fall produce? As I write this I wonder. It has been a great mineralogical year in Europe so far and no doubt Geneva, Münich, Zürich, Paris, Brussels, Torino, Basel, Berlin, Amsterdam and the other "biggies" will bring their share of surprises as well.

We met a number of first-time visiting Americans at Münich last year, all of whom were really surprised at the scope and beauty of this bourse. In addition to inviting over 250 selected dealers, organizer Johannes Keilmann goes all out with a number of top mineral and educational displays, competions (virtually unknown in Europe) and generous and beautiful facilities for both the dealers and visitors.

Incidentally I can't always promise you a personal answer to your letters but they are welcome and I would be pleased to hear any suggestions for this column. Until next time—*Think Young!*

Cheers,

Bob Sullivan

Alte Bühlhofstrasse 10
8303 Oberwil, Switzerland

Letters

SHOW REVIEWS

Dear Sir,

During the current year I had the opportunity to visit several U.S. mineral shows—notably Tucson—as well as the Münich and Zürich *Mineralienboersen.* Some general comments and comparisons might be of interest to you and your readers.

To start off with Tucson, most ardent collectors know the hectic atmosphere pervading the hotels during the days preceeding the show. Unfortunately activity has spread to too many hotels and action is too confusing since not many of us have the stamina to constantly survey new arrivals in each hotel. To overcome this problem one European dealer plans to equip his crew with walkie-talkies to report to a central post! For the lucky and energetic, as well as for the few "in" collectors, there are still exceptional specimens to be obtained in the Tucson hotels and each year there appears to be a release of some new find. As for the show itself, variety and quality of the merchandise for sale is often notably lower than for minerals available in the hotels, and there are certain people not even bothering to attend the show. Most exhibits at Tucson are a delight to any discerning collector and of great educational value for all people intrigued by the hobby.

Moving on to the Münich show—held the same weekend as the Detroit Show—one is impressed by the organization and great expense and time spent for elaborate displays. Of course there is no hotel dealing and most specimens reach the show. Each dealer selects at least one of the best specimens from his stock to be jointly displayed and entered into a competition. References to dealers booths are given in the display, and the collector can quickly orientate himself and establish a priority of whom to see. Furthermore there is a non-competitive exhibit of the collection of an invited guest (1977: K. Proctor, 1978: Smithsonian Institution) as well as other educational displays by the geological survey and university institutes. This year there was a good variety of minerals available, appealing especially to the species collector. As far as quality is concerned, most European collectors appear to have not yet developed a discriminating taste. This fact is particularly surprising in countries with long traditions and great mineral collections for reference comparisons. A possible explanation might be the generally more academic orientation of the European mineralogy enthusiast as opposed to his sometimes more investment-oriented North American counterpart. Although there were only a few outstanding specimens available in Münich one could obtain a good selection of European minerals at fair prices.

The Zürich show was held one week after the Münich show and I must confess that I was somewhat disappointed. Displays were generally appalling, there were no significant exhibits, and quality and variety of the stock were generally low. The only highlight I noticed at Zürich was a superb Indian powellite in Bob Sullivan's booth.

To summarize my subjective impressions, I believe the Tucson show has gotten out of hand, and increasing activity in the future within Europe will likely be centered around Münich rather than Zürich.

Uli Burchard
West Hill, Ontario

A RECOMMENDED REFERENCE

Dear Sir,

In a recent issue (vol. 8, no. 4, p. 313) I read that you use *Glossary of Geology* 3rd edition (AGI) as a standard reference. Excellent.

May I suggest the addition of *A Dictionary of Mining, Mineral and Related Terms* of the U.S. Bureau of Mines. Example of use: some writers in MR have used the expression "ceiling" for the overhead part of an underground mining opening. The proper general mining term is "back." Sometimes "roof" is used or "hangingwall" or "hanging" where appropriate, but never "ceiling."

Now where did I leave the dag?

Hatfield Goudey
San Mateo, CA

COLLECTING AS THEFT

Dear Sir,

My congratulations on the *Record's* special issue *TSUMEB!*, promoting the wares of the thieves and fences who are our only sources of the incomparable specimens which make Tsumeb a unique locality. One would almost think from the magazine that those unrivalled crystals, Nature's finest works of art, are as important to our civilization as the finest works of Raphael, Da Vinci, Picasso and Rodin, and as uniquely beautiful as any artifacts known to man. One might think they were made available to the entire world through an enlightened mining policy which no longer sees maximum daily metal production as man's finest endeavor. Unfortunately this is not the case. Below is a copy of the official company line with respect to these irreplaceable treasures:

TSUMEB CORPORATION LIMITED
NOTICE

TO: All departments
FROM: The General Manager
REMOVAL OF MINERAL SPECIMENS

It has become apparent that numerous employees are removing mineral specimens from the Tsumeb mine and that this is being done for personal gain.

As all concerned must be aware, removal of these specimens is unauthorized and, as such, constitutes theft. In the future, all persons who steal mineral specimens from the Corporation's mines will be liable to legal prosecution.

J. P. RATLEDGE
GENERAL MANAGER
Tsumeb, March 13, 1974.

It is an intolerable situation, and certainly not unique to Tsumeb, that dedicated scientists and lovers of natural beauty are forced to become criminals (and we all certainly are) by such selfish and short-sighted attitudes. It is perhaps unfortunate that Ratledge enlightenedly tempers the official line by a benign blindness, allowing a fine selection of Tsumeb's treasures to be preserved for posterity. Yes, unfortunate, because were there a real attempt to enforce the rule they would lose many miners and, it is hoped, would arouse a public outcry against the destruction of some of the world's greatest treasures, an outcry that would eventually force a policy requiring the preservation of representative selections of these unique objects, in place of smelting them for a few cent's-worth of metal.

The most valuable contribution to mineralogy that the Friends of Mineralogy could possibly make would be to force a change in attitude toward mineral rescue on the part of the mining companies. Even if a few tons of metal are lost through a little company arranged or sanctioned collecting, the aesthetic, public relations, and (if companies really have any of their vaunted business acumen) financial returns would be vastly increased.

Ore veins represent the seepings from cubic miles of intrusives, in many cases. The mere ownership of a few apex acres

should not give *carte blanche* rights to the destruction of natural treasures which should be the property of the people of the world. Were I the owner of a famous work of art like the Mona Lisa, I would still have no right to destroy it. Neither should mining companies have the right to forbid the salvage of the unique objects encountered in the course of their work. If the Friends of Mineralogy can get this across, our children and grandchildren will be everlastingly grateful. Meanwhile, *Glück auf,* fellow criminals.

Frederick H. Pough
Reno, Nevada

DIRECTORY OF MICROMOUNTERS

Dear Sir,

The *International Directory of Micromounters* is published biennially (in "even" years) by the Baltimore Mineral Society at the time of its annual Micromount Symposium in September. The 9th edition will be published in September of 1978, and in order for it to be as correct and up-to-date as possible the following information is needed.

1. The full name, address and zipcode of each micromounter who wishes to be listed without charge in the 9th edition and who was not (or who does not remember whether he or she was) listed in the 8th edition—we will do the checking if you are not sure. If a listing is to be for both husband and wife, please also furnish the wife's first name.

2. The new (and old) address and/or name of each person listed in the 8th edition who has moved and/or changed his or her name since it was published.

3. Identification of each person listed in the 8th edition whose mail is undeliverable at the address shown therein. Furnishing the face of one or more envelopes returned by the Post Office would be as easy a method as any of accomplishing this.

4. The zipcode of each Canadian micromounter listed without zipcode in the 8th edition (there are lots of them).

5. If you are a member of a micromount group or society, please send, or ask your secretary to send, an up-to-date list of your members.

6. The full name and address of each dealer in micromounts, micromount material and/or tools who would like to be listed, without charge, in the Directory of Dealers which will be a part of the Directory of Micromounters. If each such dealer who purchases the Directory and uses it for business purposes would comply with item 3, above, by contacting the Editor named below, it would be most helpful.

The cost of each copy of the 9th edition will be 75¢; by mail, $1.25 (a bit—but not much—more than the price of the 8th edition); this applies to the United States and Canada—for all other countries the mail cost is higher and the price will vary accordingly. All information and checks for copies to be mailed should be sent to the editor:

Randolph S. Rothschild
2909 Woodvalley Drive
Baltimore, MD 21208 U.S.A.

NAMED AFTER WHOM?

Dear sir,

I enjoyed reading the *Historical Record* column in the November—December, 1977, issue of the *Record.* However, in checking some of the data contained in this paper, I found some factual errors. These are summarized as follows:

(a) The mineral galeite was not named for Hoyt S. Gale, but rather for William Alexander Gale (1898 -), who was associated with the American Potash and Chemical Corporation in California.

(b) Frederick L. Ransome was born in 1868 rather than in 1865.

(c) Rogersite is not a synonym for lawsonite (a silicate), but for lausenite (a sulfate). The name rogersite also was used to honor William Barton Rogers (1804-1882), but it too is now considered obsolete. Austinite was named for Austin F. Rogers.

(d) The Foshag name as given is incorrect. William Frederick Foshag is correct. Both foshagite and foshallasite were named for him.

Richard S. Mitchell
Charlottesville, Virginia

Errors (a) and (c) were my fault, for which I apologize to author Bentley, as well as to Gale and Rogers. *Ed.*

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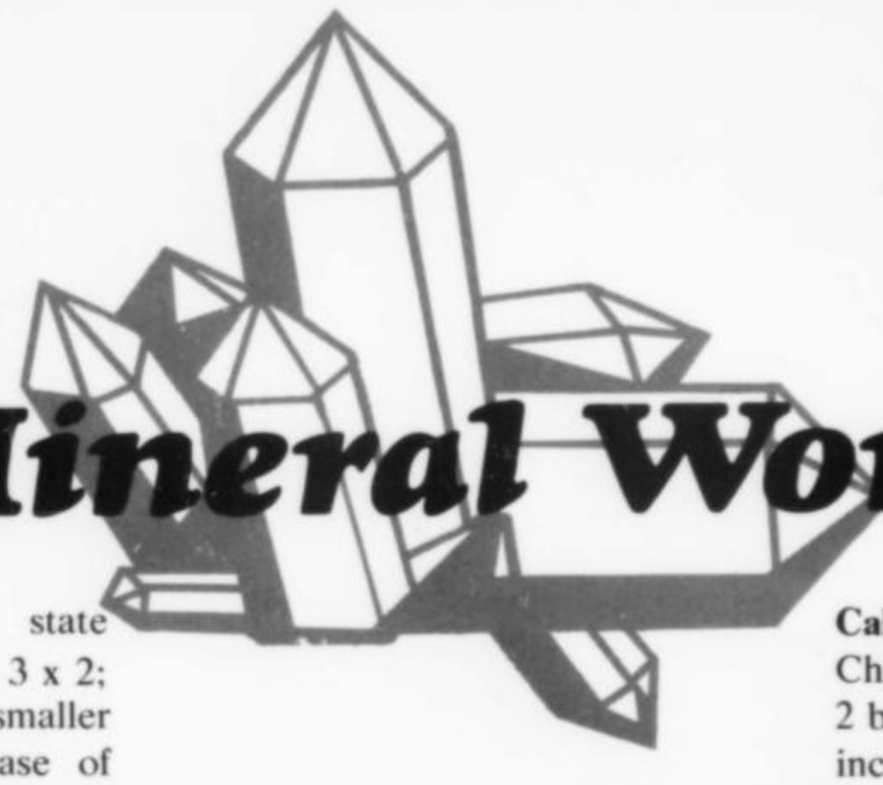

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Galena – Naica, state of Chihuahua, Mexico. Extremely showy with pale blue fluorite and minor amounts of pyrite, 3 x 3 x 1½; **$92.00**

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Amethyst – Denny Mountain, King County, Washington, 1⅞ x ½ x ½ single scepter xl. resting on a single milky quartz xl. **$45.00**

Rose quartz – Island of Lavra da Ilha, Jequitinhonha River, near Taquaral, state of Minas Gerais, Brazil. 1¾ x 1½ x 1⅛ excellent display specimen with no matrix, brilliant xls. **$175.00**

Enargite & pyrite – Quiruvilca mine, near Trujillo, La Libertad Department, Peru. 2¼ x 1½ x 1½ with minor amounts of quartz **$52.00**

Pyrite – region of Tuscany, Italy. 2½ x 2¼ x 1¾; very well xld. show winning type of specimen with no matrix, truly a superb piece **$100.00**

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