THE MINERALOGICAL RECORD

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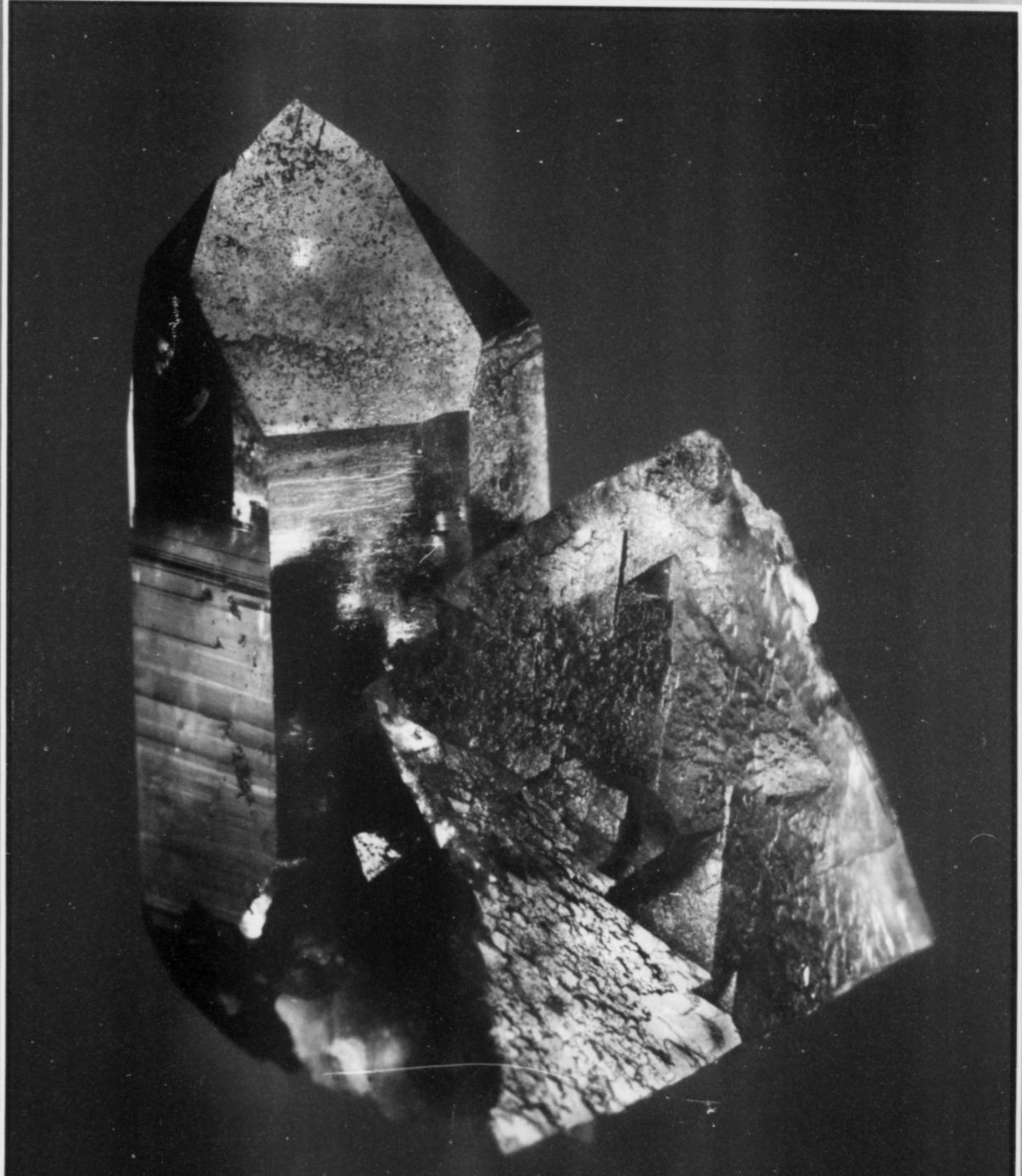

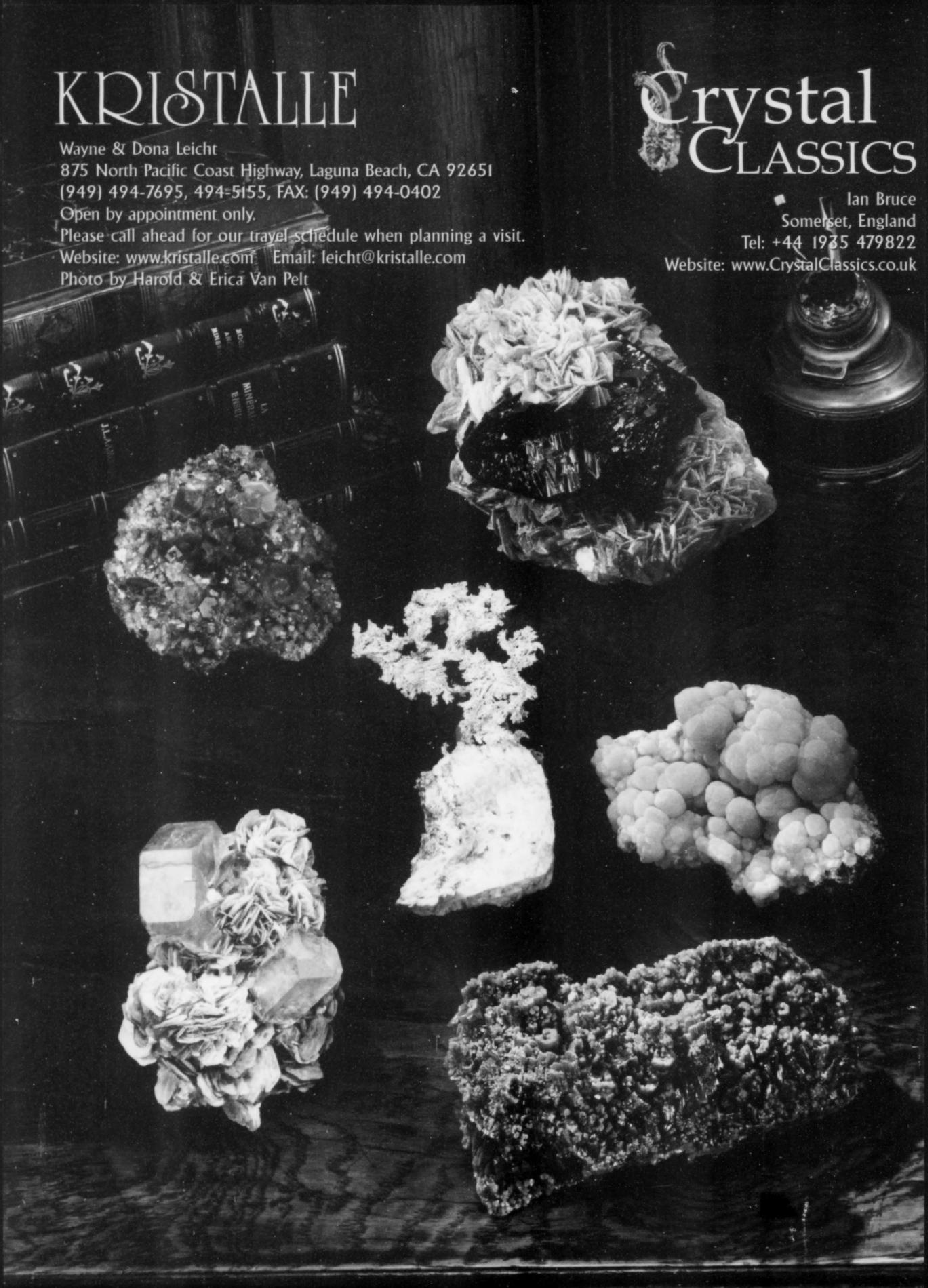
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The
Mineralogical Record

The International Magazine for Mineral Collectors

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Continued on page facing inside back cover

Articles

Columns

This issue was made possible in part by contributions from Philip G. Rust and the Fellows of the Mineralogical Record

COVER: PINK FLUORITE on smoky quartz, 4 cm, from the Mont Blanc massif near Chamonix, France. See the article in this issue on Alpine pink fluorite. Stuart Wilensky collection; Jeff Scovil photo.

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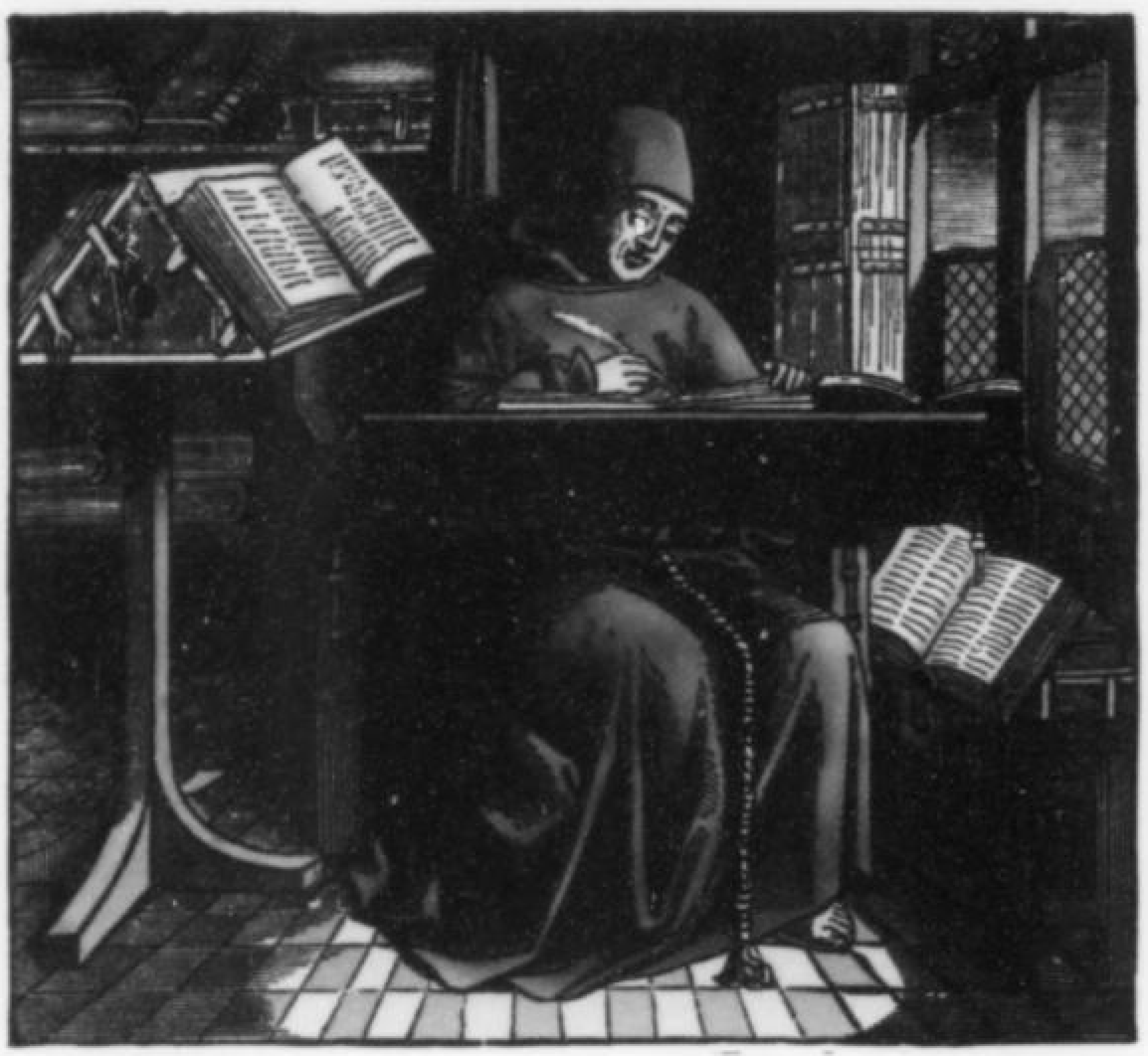


Notes from the Editors

Greenbank Supplement

With this issue our readers are receiving a very special supplement devoted to the mines and minerals of northern England, an area that many American collectors are not especially familiar with. And yet, it is a region containing many famous localities—names that resonate with collectors but have carried a certain mystery. Illustrated with specimens from the uniquely comprehensive and well-documented collection of Lindsay and Patricia Greenbank, this book documents enough detailed background, history and mineralogical information to qualify as an important reference work for the serious collector. The Greenbank collection has been tightly focused on northern England occurrences through four decades of diligent acquisition, and could surely not be recreated from scratch today. Moreover, it shows that one can collect with an eye to history and importance, while still satisfying a refined aesthetic taste. It therefore ranks as one of those rare collections that has become a sort of reference in itself, a goal that any highly specialized collector might aspire to, but few achieve. We owe a sincere debt of thanks to Lindsay and Patricia Greenbank, Ralph Sutcliffe and Rob Lavinsky for making this publication possible, and for giving it away at no charge to our subscribers.

NOTE: We have a very limited number (50) of hardcover copies available at $75 plus shipping. Reserve your copy with Tom Gressman (tgressman@comcast.net) or order through the Bookstore section on our website at www.MineralogicalRecord.com.

Specimen Portrait Supplement

In your mailing envelope with this issue is something new: a one-page "supplement" consisting of a framing-quality portrait print of a particularly fine specimen. Think of it as the mineral equivalent of a collectible trading card. Stephanie and Robert Snyder of *Stonetrust* are underwriting these for us; they have promised to produce one for each issue this year, and perhaps beyond that if the prints are well-received. They will depict specimens that have been sold in the past by Stonetrust and are now in various private collections. These prints will be available *only* with the corresponding issue of the *Mineralogical Record* (subscriber copy or back issue) and will not be distributed separately. If you are not going to frame it, file it in a safe place. There is no telling how long the series might continue, and it will be nice in the future to have a complete set.

Mary Lynn Michela Retires

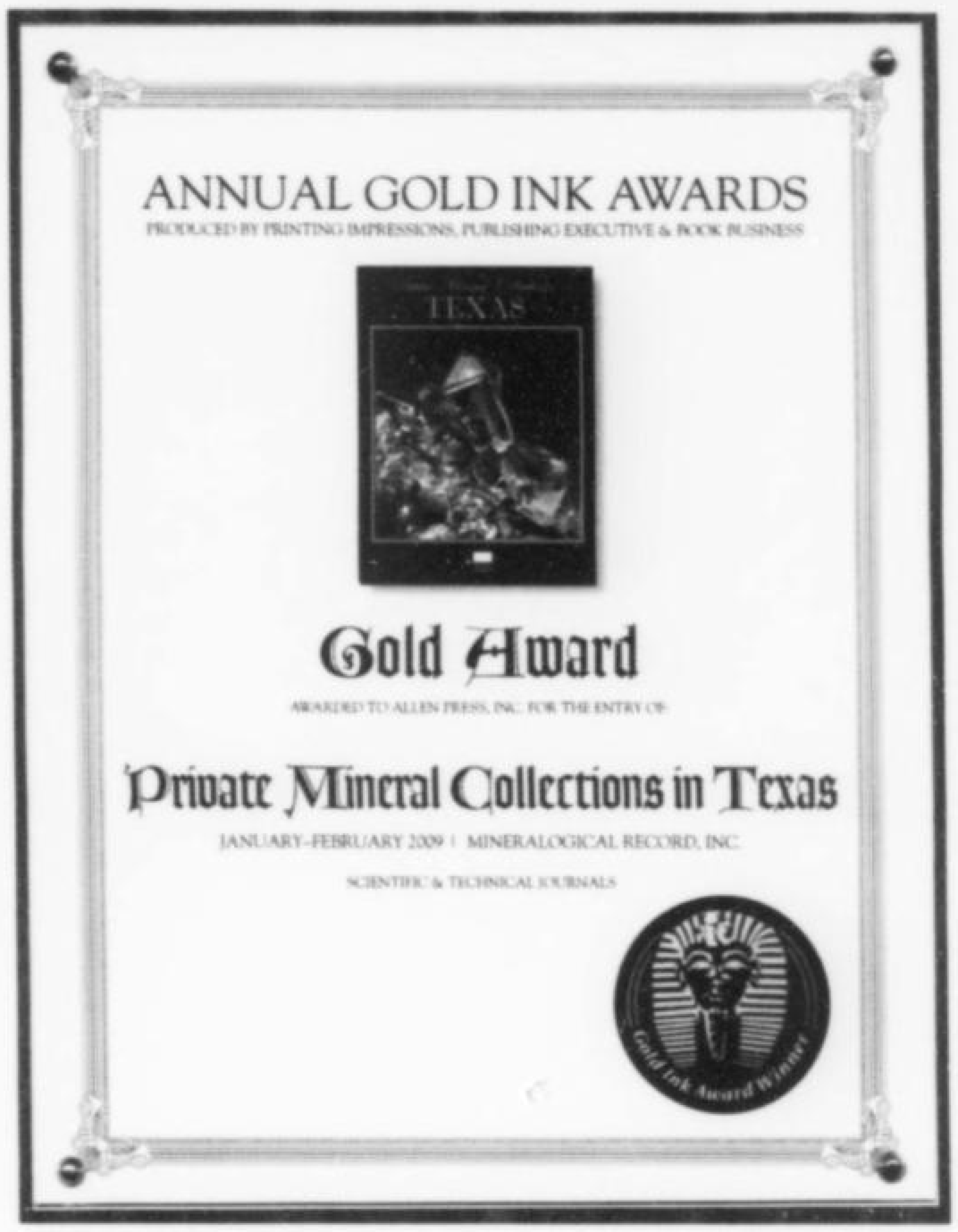
Mary Lynn Michela, familiar to virtually every subscriber as the *Mineralogical Record*'s long-time Circulation Manager, retired as of December 31, 2009. She began helping out informally when the magazine was founded 40 years ago by her then-husband, John S. White, and her name first appeared on the masthead in 1971.

Born Mary Lynn Goebel in Tucson in 1943, she attended Tucson High School and the University of Arizona where she was a member of Kappa Alpha Theta sorority. While at the University in 1961 she met John White, who was then a geology graduate student. They were married in 1963, and subsequently had three daughters: Wendy (1963), Kendahl (1965) and Leslie (1968) (John and Mary Lynn are now grandparents several times over).

After finishing his studies John hired on as a field geologist for the American Smelting and Refining Company (ASARCO) in Tucson, and the following year (1963) he was hired by the Smithsonian Institution as a museum technician/specialist in the Mineral Sciences Department, under his old mentor, curator Paul Desautels. Consequently John and Mary Lynn left Arizona and moved to the town of Bowie in suburban Maryland outside Washington, DC.

In 1970, while still employed at the Smithsonian, John founded the *Mineralogical Record* magazine. It soon became obvious that he needed help in managing the growing list of subscribers, and Mary Lynn began to pitch in as necessary.

John and Mary Lynn separated in 1976, but remained on friendly terms, and she continued as Circulation Manager. In 1980 the *Mineral-*



ogical Record, now under the management of Wendell Wilson, moved its publishing offices to Mary Lynn's hometown of Tucson, where she met attorney Richard Michela; they were married in 1983.

Throughout the years Mary Lynn has been an important part of the *Mineralogical Record*'s success, serving on the Board of Directors, becoming well-known to thousands of subscribers, handling the sale of countless thousands of back issues and a substantial tonnage of books, serving as finance officer for the corporation, and taking care of the complex task of bookkeeping. Her duties are being taken over by Associate Publisher Thomas M. Gressman, who will henceforth also be Circulation Director.

Mary Lynn will be deeply missed as a co-worker, as a long-time friend, and as an irreplaceable corporate-memory resource. We wish her all the best in her well-earned retirement.

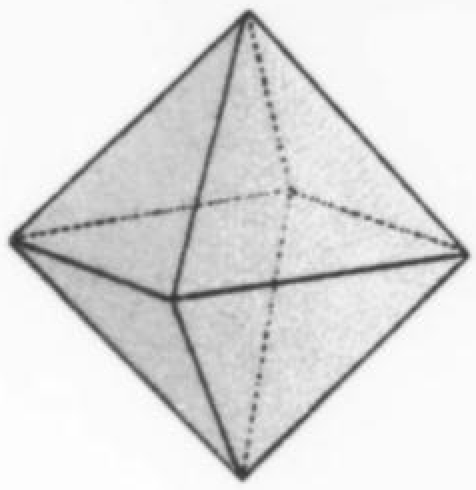
Mineral Cabinet

We periodically bring to the attention of our readers new mineral cabinets that come onto the market, and we recently came across the cabinet of drawers being offered by Ray Hill's company, *Great South Gems & Minerals, Inc*. Designed by Ray Hill (patent pending), it is a 12-drawer cabinet with a Plexiglas door on the front. The measurements are: 17 inches wide by 12.5 inches deep, standing 27 inches tall. The brown-painted case is made of 1-inch pine, and the drawers are bottomed with masonite. The drawers will accommodate specimens up to 1.8 inches tall, and will hold a total of 420 2×2-inch specimen trays. The door is attached with a long "piano hinge" and is secured with a spring latch. Price: $229.50. The company address is 38 Bond Drive, Ellenwood, Georgia 30294; telephone 770-507-7113; email rayhill@greatsouth.net or visit his website at www.greatsouth.net. Ray has been in business since 1985.

Gold Ink Award

The annual Gold Ink Awards competition, sponsored by three prominent trade journals (*Publishing Executive, Book Business* and *Printing Impressions*), has earned a reputation for attracting the highest quality of work from printing professionals throughout North America. Widely regarded as the print industry's most prestigious honor, the 2009 competition received more than 1,000 entries across 45 competitive categories. The award recognizes excellence in prepress and printing quality. This year the *Mineralogical Record*'s *Private Mineral Collections in Texas* special supplement won the gold medal (our first gold) in the scientific & technical journals category. We would like to thank our printer, Allen Press in Lawrence, Kansas, for working with us at every stage of production and doing such a fine job on our challenging subject matter. The staff at Allen Press, from John Aamot (Director of Business Development) and Justin Roberts (our Account Manager) right down to the keen-eyed pressmen, have been consistently quality-oriented and highly competent. We would also like to thank our donors, subscribers and advertisers for their continued financial support of our efforts to produce the finest mineral magazine possible.

Apophyllite on Stilbite



Alpine Pink Fluorite

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Octahedral, pink to rose-red fluorite crystals are historically among the most treasured and sought after of all Alpine minerals. In the European Alps the best pink fluorite specimens are found in just two small regions, in Switzerland and France, where a long and honored history of field collecting has flourished for centuries, yielding numerous important discoveries.

INTRODUCTION

The three words alone have power to conjure: "Alpine pink fluorite" evokes images of transparent pink or rose-red octahedral crystals resting on clean-looking, coarse-grained white granite, or squatting directly on mirrored faces of gemmy smoky quartz crystals. To recall or imagine such specimens is somehow to call up the exotic, the fugitive and elusive—clearly, in Alpine pink fluorite there is an otherworldliness not to be found in the fluorites, however beautiful, from Weardale or Dalnegorsk or Xianghualing or Cave-in-Rock. How about that label? Well, it will say either "Chamonix, France," perhaps with a few extra terms in French, or something Germanic, crisper and frostier, so there is nothing for it but to imagine serrated ranges of snow-capped peaks in Swiss middle distances where we will never contrive to go.

Because cleft discoveries in the high mountains typically yield very limited numbers of specimens, Alpine pink fluorite will never be common, and good specimens will never be inexpensive. But the fortunate paradox is that Alpine pink fluorite will never entirely cease showing up on the specimen market, either: the "deposits" can never realistically be "mined out." More crystallized clefts will always be there, however sparsely dispersed, awaiting discovery by *Strahlers*.[1]

For present purposes, *Alpine* pink fluorite is that which comes from the European Alps and not from "alpine-type" clefts elsewhere, although, as it happens, the earth contains only one important "alpine-type" locality outside Europe (though only just: it lies in the Polar Urals of Russia) which has produced octahedral pink fluorite crystals. Even within Europe's heartland region of rocks deformed by the (early Tertiary) Alpine Orogeny, nearly all clefts which contain pink fluorite are found within two small areas of granite and orthogneiss: (1) most of the Aare and part of the Gotthard massifs of south-central Switzerland, and (2) the Mont Blanc massif in east-central France. This review of historic occurrences of Alpine pink fluorite will be confined mostly to these two areas, with only brief descriptions of other, sparsely productive localities in Switzerland, Austria and Italy.

Also, the discussion will be restricted primarily to Alpine *pink* fluorite crystals, since it is almost nowhere else but in these Alpine regions that fluorite routinely forms crystals which are octahedral and pink. Of course, there have been Alpine finds of fluorite crystals in other colors: the largest octahedral crystal of fluorite ever found in a Swiss cleft is a 16-cm *green* octahedron encountered during construction of the Sommerloch power station during the 1950s (Weibel, 1966; Parker, 1973). But as every experienced collector knows, the real charisma belongs to the "pinks" alone.

Alpine *color-zoned* fluorite octahedrons occur as well. Most commonly these have pink cores and green, blue or purple outer zones showing successive changes in morphology during growth. Such crystals have tales to tell about their formation conditions and trace-element chemistry. Moreover, the hue of Alpine "pink" fluorite actually ranges from almost colorless through very pale pink, medium-pink, rose-red, and almost crimson, with the Swiss localities (generally) producing the paler crystals and French Mont Blanc (generally) the more deeply colored crystals.

[1] To be clear at once: the German word *Strahler* denotes a skilled mountain-climber and crystal-seeker, whether amateur or semi-professional; the French word *cristallier* denotes the same thing.

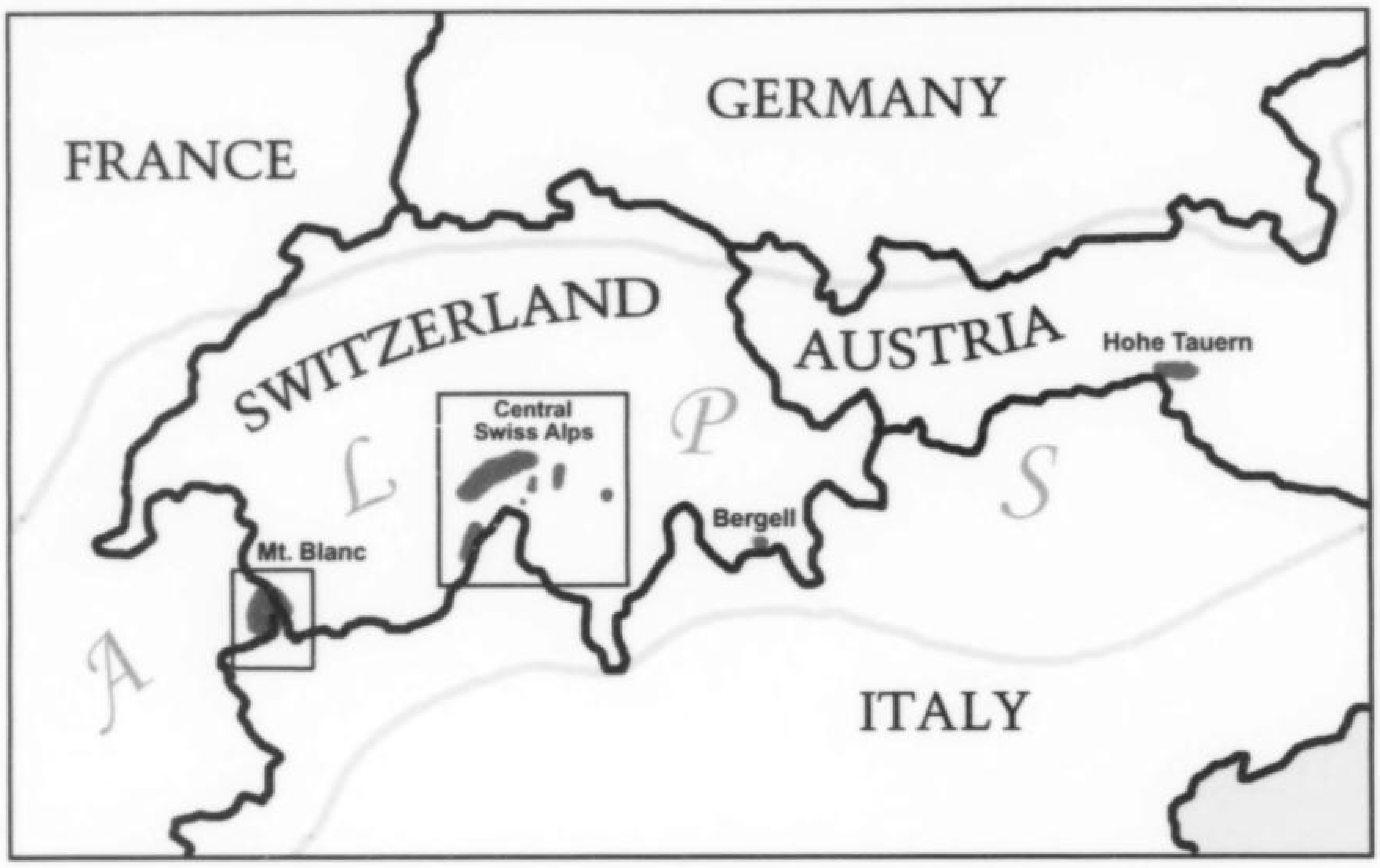


Figure 1. **The central portion of the Alps showing the areas in which pink fluorite specimens have been recovered.**

A few other differences between Swiss and French specimens may be stated in broadly general terms. Swiss pink fluorite crystals, when fresh, are more lustrous and have more internal "sparkle" than their French counterparts; French crystals have more nearly mirror-smooth faces; Swiss crystals are more likely to rest on granite while French crystals are more likely to rest on the faces of large quartz crystals. Lab work may discern that whereas most French crystals are simple and solid within, Swiss crystals commonly have tiny, tetrahedron-shaped, internal cavities in which primary fluids of crystallization have been preserved (Stalder *et al.*, 1998). But in both regions the fluorite crystals have formed in clefts in granite which is either purely igneous or to some degree metamorphosed, and in both regions the associated species are colorless to smoky quartz, adularia, albite, white calcite in tabular to papery—"paper spar"—crystals, and minor apatite-(CaF), hematite and zeolites.

Unfortunately, both Swiss and French crystals are prone to corrosion by circulating waters, turning their lustrous faces dull or frosted, or worse: many a promising cleft has greeted the strahler or cristallier with corroded, eroded, or nearly vanished pink fluorite crystals.

While we are listing less than pleasant facts it should also be mentioned that Alpine pink fluorite specimens have commonly been faked. The very high prices which collectors have always been willing to pay for Alpine pink fluorite specimens have inspired unscrupulous sellers to glue fluorite crystals (or even cleavage octahedrons) where they don't belong on matrix rock or on the faces of quartz crystals. In all likelihood, deceits of these kinds have been practiced regularly throughout the 250 years or so during which Alpine pink fluorite has been gathered to delight collectors.

Figure 2. **Pliny the Elder (23–79 A.D.), the Roman naturalist who first mentioned the activities of mineral collectors in the Alps.**

HISTORY

Switzerland

An exhaustive account of the history of crystal-collecting in the Swiss Alps has yet to be written, but any such account would have to begin with fragmentary reports from as far back as early Roman Imperial times. Ten of the 37 books of the *Historia Naturalis* of Pliny the Elder (Gaius Plinius Secundus, 23–79 A.D.) were published in 77 A.D., and the great work's remaining books, probably edited by Pliny the Younger, the author's nephew, were published after the elder Pliny perished in the famous eruption of Vesuvius in 79 A.D. (Schuh, 2008). One tantalizing passage in Pliny's 37th book (in the English translation of Philemon Holland, 1634) makes it clear that Strahlers were actively and skillfully collecting minerals even in those early times:

> Thus much I dare my ſelfe avouch, that cryſtall [quartz] groweth within certain rockes vpon the Alps, and thoſe ſo ſteep and inacceſſible, that for the moſt part they are conſtrained to hang by ropes that ſhall get it forth. They that be skilfull and well experienced therein, go by divers markes and ſignes which direct them to places where there is criſtall, and where alſo they can diſerne good from bad . . .

Figure 3. **Johann Jakob Scheuchzer (1672–1733) was the first to document pink fluorite specimens from Switzerland in his description of the natural history of Switzerland (1708).**

MEMORIA
MINERALOGICA
SULLA MONTAGNA
E SUI CONTORNI DI S. GOTTARDO
DI ERMENEGILDO PINI
C. R. B.

IN MILANO

NELLA STAMPERIA DI GIUSEPPE MARELLI
Con licenza de' Superiori.
MDCCLXXXIII.

Figure 4. **Ermenegildo Pini, an Italian priest and natural history professor, wrote a memoir on the mineralogy of the St. Gotthard area (1783), describing pink octahedral fluorite.**

There is also archaeological evidence of interest in "crystal" some 2000 years ago: in a mountain pass often traversed by Roman legions during the 1st century A.D., a bronze Roman dagger was found in 1966, its broken-off blade still stuck in the crystallized cleft where someone had tried to pry out quartz crystals (Graeser, 1998).

Very early records of Alpine crystals and crystal collecting, when they refer to particular mineral species at all, refer solely to quartz, whose transparent, colorless crystals (thought to be hyper-frozen water) were widely used during the Middle Ages as raw material for carved vessels such as goblets and bowls (Graeser, 1998) as well as, surely, for decorative purposes. But it was not until the 18th century that written documents refer to Swiss specimens of pink fluorite. The Swiss naturalist Johann Jakob Scheuchzer (1672–1733), in a first edition of what would be his *Beschreibung der Naturgeschichte des Schweizerlandes* ("Description of the Natural History of Switzerland"), published in London in 1708, refers to specimens of "quartz and fluorite" which he had gathered during his yearly nature-observing trips through his homeland. Seventy-four years later, in 1782, the Italian priest and natural history professor Father Ermengildo Pini (1739–1825) published *Memoria Mineralogica sulla montagna e sui contorni di S. Gottardo* ("Mineralogical memoir of the mountains and the contours of St. Gotthard"), in which he wrote of his trips to the Gotthard region, describing "pink fluorite, as octahedrons, from the granite mountains around Realp, Uri" (paraphrased in Schuh, 2008). This relative reticence about mentioning the beautiful pink crystals is in a way surprising, as there were private mineral collections in Switzerland at least as far back as the 16th century (for accounts of some, see Wilson, 1994), and we may safely surmise that some of these collections contained Alpine fluorite. Moreover, abundant records exist which make clear that Alpine minerals were dug for their collector interest (as we would now call it) earlier than Scheuchzer's and Father Pini's times. Indeed, one known center of such activities was Oberwallis, i.e. northeastern Canton Wallis, around the Grimsel Pass—the heart of Swiss pink fluorite country.

Strahlers already were active in Oberwallis in the mid-16th century: in 1545, one Johannes Stumpf wrote that in several places one could find superb quartz crystals, both "white and brown," and "I myself found several specimens near the Grimsel [Pass] on 27 August 1544." The same diarist noted exciting finds by himself and others in Goms (the Rhône Valley), just southwest of the Grimsel Pass (Werlen, 1967). By the next century, commercial mineral-trading activities in the area were being recorded: an I.O.U. written in 1671 in the village of Fiesch, in Goms, Oberwallis, by a person whose signature is not clear, averred that he, the collector, owed a *Handler* (dealer) named Johann Kreig a certain (illegible) sum for "crystals," plus assorted expenses of Kreig's; other commercial records from the same time show various lists of costs of supplies and provisions for strahlers. Two letters dated 1676 and 1678 respectively are addressed by one J. Cournoysié of Vevey (on Lake Geneva) to Johann Kreig, the dealer who lived in Fiesch. The

Figure 5. **Swiss geologist Horace Bénédict de Saussure (1740–1799) described dark pink octahedral fluorite from the Sandbalm cleft near Goschenen, Switzerland in 1796.**

first letter acknowledges a consignment of "many quartz crystals shipped to France" four years before, and asks Kreig to ship more, though cautioning him not to send any crystals with "internal flecks or clouds," since such crystals "no longer have value." In the 1678 letter Cournoysié asks Kreig to send 15 or 20 transparent, doubly terminated quartz crystals to Sion (whether Sion, Switzerland or Sion, France is not specified) with a promise of payment partly "in goods" (Werlen, 1967). In Switzerland generally, mineral collectors' activities were intense enough as early as 1609 to cause an ordnance to be issued in the Binntal area which prohibited digging for crystals in farmers' cow pastures (in 1714 the strahlers were compensated in part, when another edict affirmed their rights to unrestricted collecting in the high mountains) (Werlen, 1967; Graeser, 1998).

The activities of strahlers like Stumpf and dealers like Kreig were unconnected with anything we would now call science, but in 1669 there began a movement towards scientific awareness when the naturalist, geologist and anatomist Nicolaus Steno (1631–1687) published *Solido Intra Soldum Naturaliter*, "the greatest contribution to crystallography, paleontology and geology made during the seventeenth century" (Schuh, 2008). The book contained the first statement of the fundamental crystallographic law of the constancy of interfacial angles, this insight having been inspired in part by Steno's examination of a collection of Alpine quartz crystals (Werlen, 1967). In 1698, Hottinger's *Krystallologia* argued in print that quartz, after all, is *not* hyper-frozen water (Graeser, 1998). Throughout the 17th and early 18th centuries in Switzerland, it is clear, interest in minerals quickened and the strahlers' art flourished, and yet, oddly, it remained true that "mineral" collecting meant quartz-crystal collecting, crystals of other species being largely considered worthless (Werlen, 1967). In 1719 the largest crystallized cleft ever found in the Alps was opened, and between 1719 and 1721 it produced prodigious numbers of quartz crystals measuring to 50 cm long (Parker, 1973; Wilson, 1984b). The cleft was found on the Zinggenstock, in the richest pink-fluorite region of Switzerland—and in 1951 a cleft very nearby, on the Zinggenlücke, produced octahedral pink fluorite crystals to 3.2 cm (Parker, 1973), but the records of the 1719 cleft mention only quartz (Werlen, 1967).

Pink fluorite from central Switzerland was at last clearly heard of in 1796, when the Swiss geologist Horace Bénédict de Saussure (1740–1799) visited the cleft workings at Sandbalm, about 3 km west of the village of Göschenen. This enormous cleft system had first been opened in 1670, and intermittent working for specimens had gone on ever since: probably this is Switzerland's first example of a "specimen mine." By the time of the visit of J. G. Sulzer in 1742 the Sandbalm cleft system had been thoroughly explored, though the nature of its products to this time (besides quartz) is unrecorded (Stalder *et al.*, 1998); at any rate, Sulzer found that a secure wooden door had been installed over the main entrance to keep out thieves. In 1796 at Sandbalm, de Saussure specifically noted some recent finds of colorless quartz, rhombohedral white crystals of calcite, chlorite, and "red fluorite," although ". . . the fluorite was not noticed at first but was later saved from material which had been discarded. [The crystals] are rough, translucent octahedrons" (Parker, 1973).

Written references to pink fluorite discoveries remained sparse during the 19th century. In 1861 an enthusiastic Swiss mineral collector, David Friedrich Wiser (1802–1878), published *Weg von Vrin auf die Greina* ("The Route from [the town of] Vrin to the Greina [Pass]")—the title refers to a region of Canton Graubünden, considerably to the east of the main Swiss pink-fluorite area, where, in the mid-19th century, fine discoveries of pink fluorite nevertheless were made (Weiß and Derungs, 2004). Wiser's *Weg* lies about 12 km north of the Frunthorn, in the Adula Mountain Group, where superb pink fluorite crystals have been unearthed much more recently, i.e. during the 1990s and 2000s (see later). In 1862, Gerhard vom Rath, in describing a specimen showing 7.5-cm pink fluorite crystals on quartz, became "one of the first to mention pink fluorite in Swiss literature" (Bancroft, 1984). And in 1868 on the Tiefengletscher—about 10 km northeast of the Grimsel Pass and about the same distance southwest of Göscheneralp—another gigantic quartz crystal cleft was opened (for good summary accounts of it see Wilson, 1984b, and Bancroft, 1984). Besides a haul of dark smoky quartz crystals to 95 cm long, the Tiefengletscher cleft (or "grotto") produced pink fluorite crystals, although in noting the fact Parker (1973) does not describe the crystals or judge their quality.

In Switzerland the period of "modern" pink fluorite discoveries might as well be said to begin as the 20th century opens. Since then the frequency of discoveries has probably been about what it was in earlier times, as the strahlers have quickened their pace and improved their techniques, thus staying ahead of the increasing scarcity of accessible clefts. Some major Swiss discoveries of the 20th century are surveyed later, in the "Occurrences" section.

That fine specimens of Swiss pink fluorite are cherished in a nationalistic way even by ordinary Swiss citizens is testified to by Burgdorfer's account (1972) of a *Rettungsaktion* ("rescue operation") which took place in Bern in 1971, for the sake of a great specimen now safely ensconced in the Natural History Museum of Bern. The specimen, from the Grimsel area, is a group of quartz crystals measuring 25 × 35 × 40 cm, partly covered by beautiful pink fluorite crystals. It was to be part of a lot of gem, jewelry and mineral specimens auctioned in Bern to diverse international bidders, creating the likelihood that, if things went as planned, the specimen would leave the country. To head off this danger, members

Figure 6. **The Teifengletscher smoky quartz grotto in Canton Uri, Switzerland, was discovered in 1868. It yielded 10 metric tons of quartz crystals, as well as pink fluorite and a variety of other minerals.**

of *Mineralienfreunde Bern* ("Bern Friends of Minerals") took hasty action, led by the officers of the club and aided by the co-operation of the specimen's owner and of the auctioneer, both of whom were club members. The auction catalog listed the specimen's value at 30,000 Swiss francs. With difficulty the auction contract was re-negotiated, and the specimen separated from the rest of the lot. Since the Natural History Museum of Bern lacked anything like enough funds to buy it outright, letters and circulars were sent out everywhere, donations being solicited from political leaders of the city and canton of Bern, from local business concerns, and from the general population. In a special meeting of *Mineralienfreunde Bern*, members voted 99 to 2 to contribute 500 francs from the club's own shallow coffers. Another 10,000 francs were raised from the sources mentioned above, and the rest of the money came finally from the Citizens' Council of Bern, i.e. from the city government in its capacity as owner of the Natural History Museum. Thus the specimen was saved for Switzerland, amid great civic rejoicing (readers are now are permitted to mutter things like "No *wonder* Swiss minerals are so expensive . . .").

France

During the last three decades of the 20th century and to the present, specimens from the French part of Mont Blanc showing pink (more commonly, rose-red) octahedral fluorite crystals, many resting on faces of smoky quartz crystals, have eclipsed Swiss specimens in numbers gathered and in fame won among mineral collectors. Partly this surge in supply and in consequent popularity has been due to increased prospecting by French cristalliers, but partly it also results from the fact that, even more on Mont Blanc than elsewhere, the retreats of glaciers have revealed new outcrops of cleft-bearing rock, so that new clefts have been and are being found at a fairly good clip (for such rare treasure-chests). But the recorded *history* of pink fluorite discoveries on French Mont Blanc is, as for Switzerland, on the sketchy side . . .

As in Switzerland, there are in France faint echoes of Roman interest in quartz crystals (from Mont Blanc), but no such echoes at all from the Middle Ages (Asselborn, 1999). Predictably, interest in Mont Blanc quartz stirred during the Renaissance, and by the 17th century there are fragments of written accounts of the risky work of unnamed cristalliers: a 1674 journal entry by one Henry Justel of London actually describes specific techniques of Alpine crystal collecting (Asselborn, 1999). Indeed, during the 17th century so many mountain guides also became crystal hunters that, according to Asselborn (1999), the century probably should be considered a "*grande époque* of prospecting for quartz on the Mont Blanc massif." However, there is no specific word of Mont Blanc pink fluorite in 17th-century records.

The 18th century saw increased interest in recreational climbing and crystal-prospecting, and the beginning of the organized mercantile tourism which prevails to this day in the beautiful ski-resort and cristalliers' town of Chamonix. By the century's latter half, mineral specimens brought down by cristalliers were being sold as far afield as Paris, and Geneva-based scholars were encouraging scientific investigation of the massif (Asselborn, 1999). In 1779, Horace Bénédict de Saussure of Geneva (mentioned above) published the first edition of his classic work on Alpine geology, *Voyages dans les Alpes* ("Travels Through the Alps"). To gather material, Saussure "crossed the whole chain of the Alps

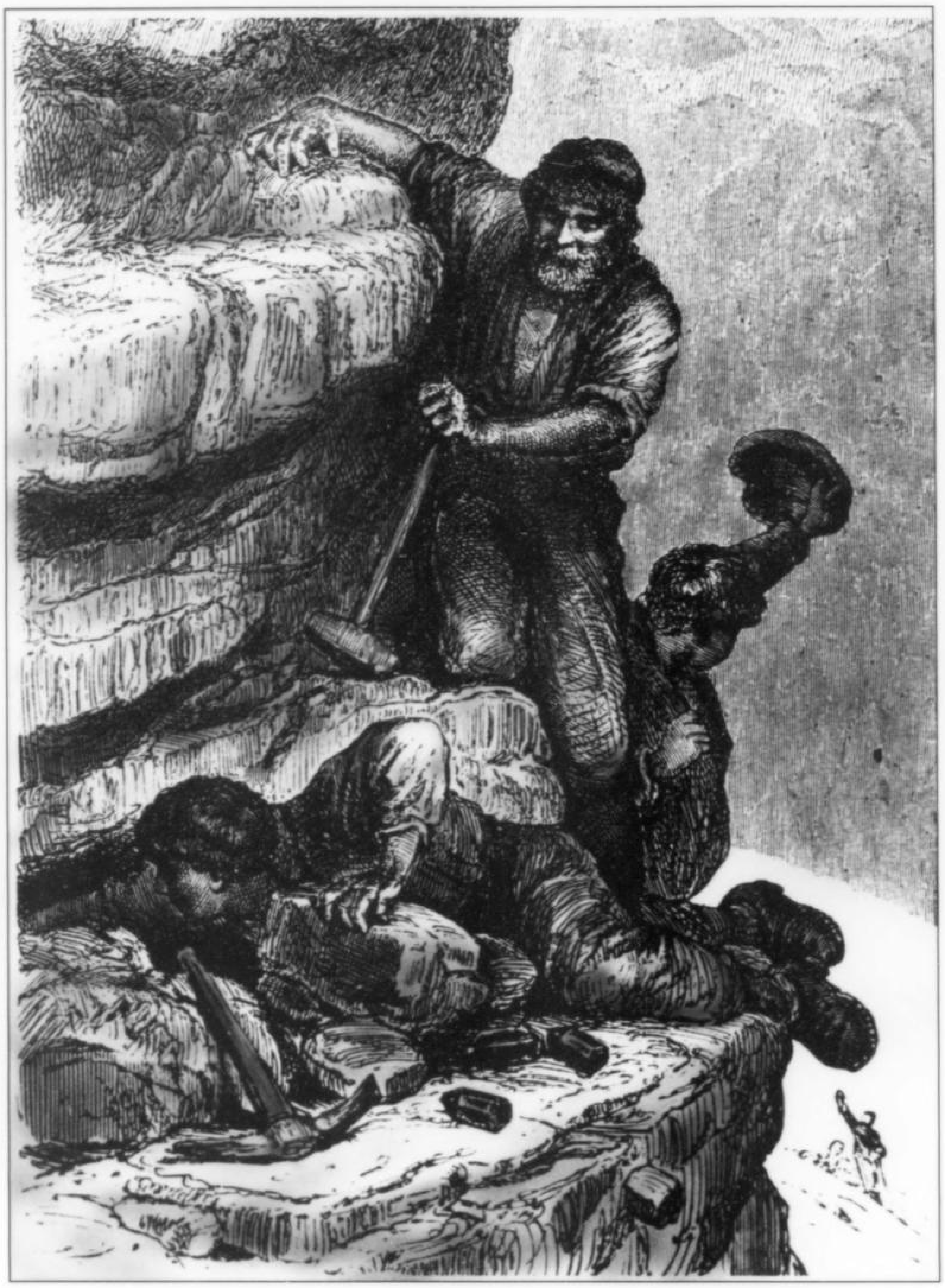


Figure 7. **Strahlers discovering a crystal-filled cleft in the mid-1800s.**

no less than fourteen times [and] climbed all the accessible summits, collect[ing] specimens," and, in his notes, celebrating the exhilarations of climbing and recording respectfully the lives and customs of the mountain people (Schuh, 2008). However, he also wrote that ". . . the search for crystals [on French Mont Blanc] has decreased. Either the mountains are considered exhausted, or the crystals from Madagascar are too competitive" (quoted by Schwab, 1998). By "crystals" Saussure meant quartz, of course; there is no explicit mention of pink fluorite in his work. And his observation of a decline in collecting seems questionable: French Alpine *réfuges* such as served (and still serve) as rest stations and staging areas for cristalliers were then being constructed (Gautron, 1999b; Asselborn, 1999), and enthusiastic climbers were setting out from them. In October 1791, on a margin of the Glacier des Bois (today Mer de Glace), near the Grandes Jorasses Rocks, cristalliers out of Chamonix made the first recorded discoveries of Mont Blanc pink fluorite crystals. The specimens were publicly shown in Geneva on October 20, 1791, by Marc Auguste Pictet (1752–1825), a Geneva physician and naturalist and a friend of Saussure's. Pictet described the specimens as "transparent pieces of pink fluorite of the tetrahedral double-pyramidal form, sometimes layered in feldspar and transparent quartz" (Asselborn, 1993, 1999).

Nineteenth-century records afford more glimpses of Mont Blanc pink fluorite. During the early and middle part of the century there existed in the Chamonix area dealers in "natural history" materials who made little collections of local minerals and arrayed them carefully in little boxes made of Scotch pine, distributing these souvenirs, or curiosities, fairly widely (Asselborn, 1993). And it is highly likely that some of those little boxes harbored pink fluorite. Most of the local cristalliers remained interested solely in quartz—but in 1844 Joseph-Marie Couttet (1792–1877), the most famous mountain guide and cristallier of the time, sold for 600 francs to the English poet John Ruskin, a close friend of his, a fine "red" fluorite specimen purportedly from the Glacier du Tacul (Eric Asselborn, personal communication, 2009). This specimen ended up in the British Museum (Asselborn, 1999), and likewise three specimens showing 1-cm pink octahedrons were acquired by two large Parisian museums before 1900 (Gautron, 1999b).

During the later 19th century, one of Chamonix's most prominent characters was the naturalist/cristallier/autodidact Venance-Arthur Payot (1827–1902), who sold local mineral specimens from a store called "Le Cristal de Roche" (its façade can still be seen today in the old heart of Chamonix). In 1873 Payot published "the first true mineralogical inventory" (Gautron, 1999b) of Mont

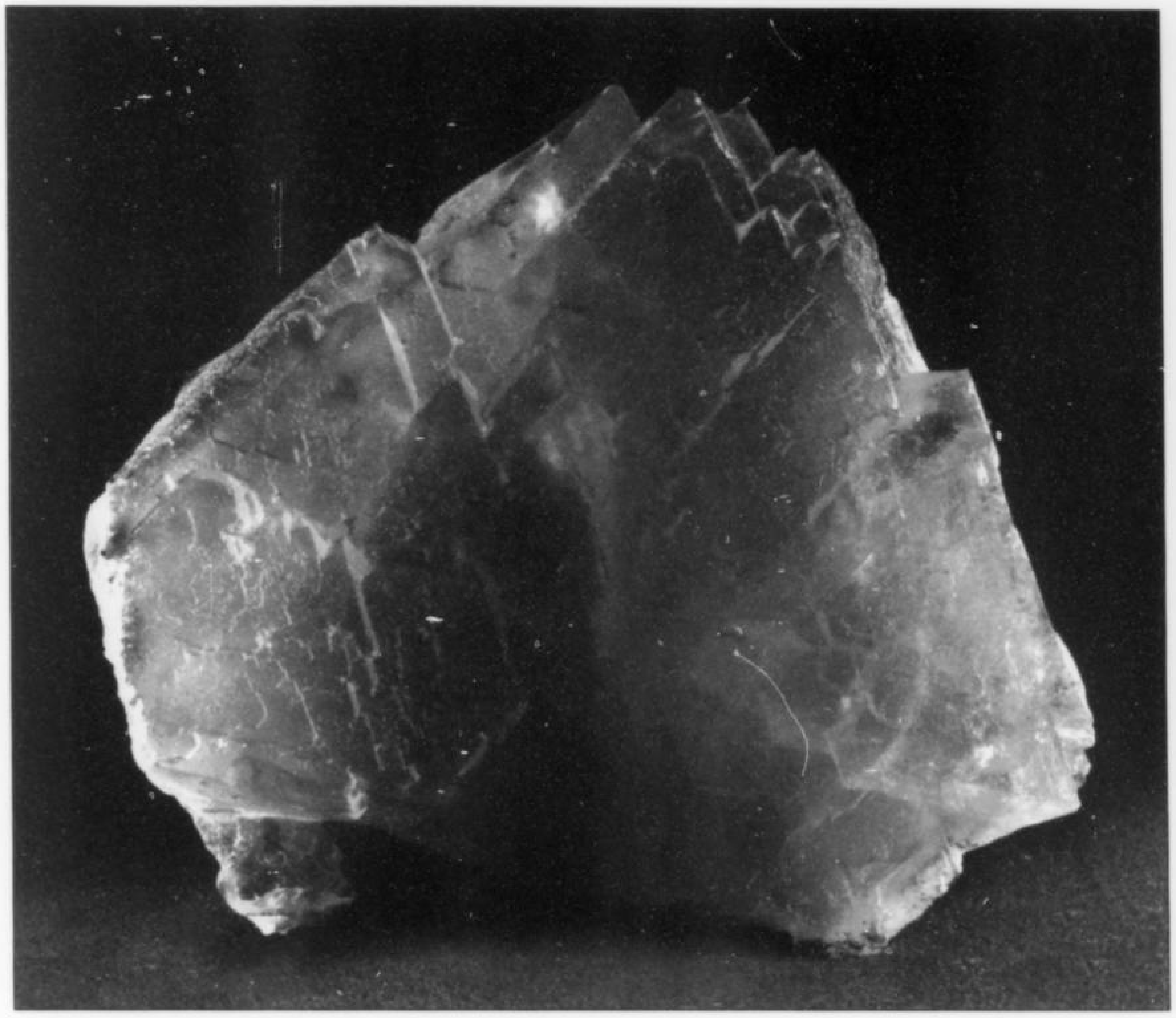


Figure 8. **The big 18-cm pink fluorite crystal known as "Georges" (pronounced "Zhorzh"), found in a cleft in the western face of the Aiguille des Pélerins on July 18, 1975 by cristalliers Georges Bettembourg and Daniel Audibert. Eric Asselborn collection and photo.**

Blanc, listing about 90 distinct minerals. And yet by the end of the 19th century, even while Payot, who by that time had become the mayor of Chamonix, was working hard to encourage crystal collecting (Schwab, 1998), pink fluorite had been but sparsely described in mineralogical literature. Alfred Lacroix (1863–1948), in his exhaustive, five-volume *Mineralogie de la France et de ses Colonies* (1893–1910), devoted just a few lines to

> . . . the beautiful pink fluorite [which] is one of the most interesting minerals sought for in the clefts of the Mont Blanc massif…There are many collecting sites . . . but at none of them is [pink fluorite] present in any abundance. The regular octahedrons rest on colorless and smoky quartz and are accompanied by other minerals including prehnite, sphene and adularia.

The real glory days of pink-fluorite collecting on French Mont Blanc run through the 20th century's three or four final decades and seem now to be continuing; accordingly, major finds after 1975 will be surveyed later. The year 1975 makes a convenient cut-off between the "historical" and "modern" eras because this is the year in which the largest pink octahedral fluorite crystal ever found anywhere in the Alps was collected. This amazing crystal is a sharp, compound, translucent rose-red octahedron 18 cm (7 inches) on edge, free of matrix, forever to be known as "Georges" in tribute to the cristallier who collected it, Georges Bettembourg of Chamonix. Bettembourg found "Georges" in a cleft on the Aiguille des Pélerins, Aiguilles Rouges massif, northwest of Chamonix, in July 1975. On August 18, 1983, at the age of 33, he was killed by an avalanche on the Aiguille Verte—while hunting for crystals, of course. In 1993 the story of the pink fluorite called "Georges" was told (in German) in *ExtraLapis No. 4* ("Fluorit"), by French collector Eric Asselborn—and is worth repeating here (in a loose translation):

The "Georges" Cleft

The western cliff-face of Aiguille des Pélerins had first given up fluorite specimens during the summer of 1925, when the mountain guide and cristallier Georges Charlet (1901–1978) found a large cleft near the foot of the cliff-face. Charlet and an associate extracted a few large fluorite specimens, not crystallized all around but of a fine red color; the largest of these was sold to Colonel Louis Vésigné (1870–1954), then the leading private collector in France. After Vésigné's death his collection went to the Natural History Museum in the Jardins des Plantes, Paris, where the 1925 fluorite specimen remains today: it is a large pink to red specimen—primarily a cleavage section—measuring 15 cm.

Having decided that the continual rock-falls on the western side of Aiguille des Pélerins made the area too dangerous, Georges Charlet left off collecting there altogether. The site remained largely undisturbed until 1975, when two cousins, Georges Bettembourg and Jean-Franck Charlet, who recently had declared themselves a professional cristallier team, decided to revisit it. Jean-Franck had learned of the 1925 cleft from his grandfather Georges, and the Aiguille des Pélerins was attractive additionally because one year earlier, following a large landslide, two cristalliers had investigated newly created rock exposures and brought back a few specimens of pink fluorite. On the appointed day in July 1975 Jean-Franck Charlet was held back by practical obligations, and Bettembourg invited another alpinist he knew, Daniel Audibert, to accompany him on the expedition. On their first partial ascent of the cliff-face, Bettembourg and Audibert found a few rough pieces of pink fluorite among the float; on their second try, thanks to the recent landslide which had bared new expanses of rock, they found the entrance to a large cleft. After a third long, rope-aided climb they worked hard for 12 hours to clear the cleft entrance so that they could enter. As they had expected, extensive parts of the cleft had collapsed, but many remaining vugs contained massive fluorite—a rarity—instead

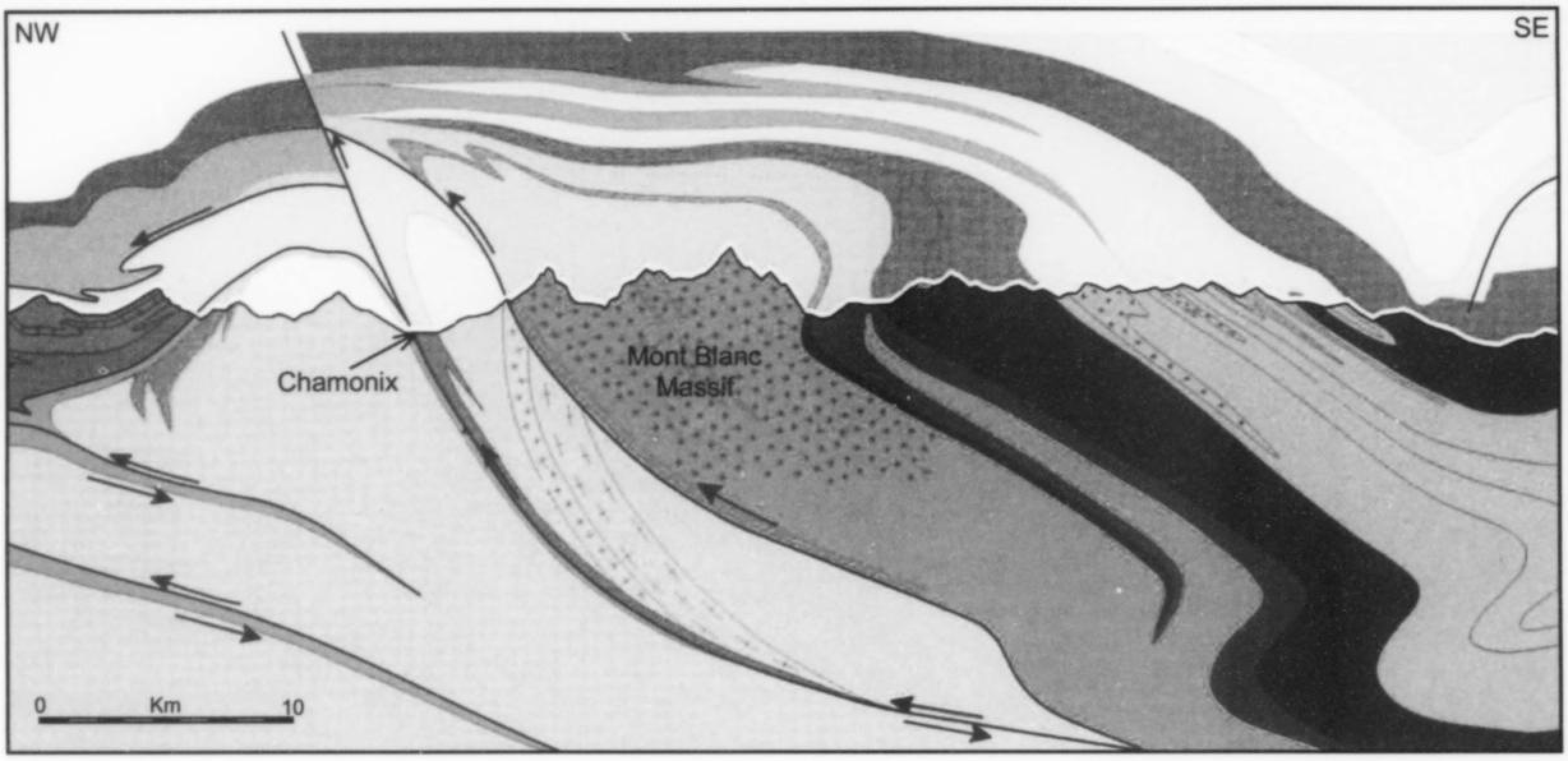


Figure 9. Geologic cross-section through the Alps in the neighborhood of Chamonix, showing the Mont Blanc Massif wherein pink fluorite occurs. (Adapted from a map by Arthur Escher, Musée de Cristaux, Chamonix.)

of quartz. And in one spot, lying loose in a mixture of muddy clay and chlorite sand, was the stunning, 18-cm "Georges." The collectors' reactions to the discovery are not recorded (which is all the better: we get to make them up for ourselves).

Otherwise the cleft offered little of mineralogical interest. During a later ascent that season the partners found another fluorite cleft about one meter higher, and from it they collected a fine fluorite specimen which Daniel Audibert kept; returning in 1976, they found two more nearby clefts and collected a few superb fluorite and fluorite/quartz specimens from them. But in August 1975 it was agreed that Georges Bettembourg would keep "Georges" (not yet so-called). In fact he guarded it in close secrecy until finally displaying it to the general public at the Chamonix Show of 1979. On that occasion, Eric Asselborn, an advanced, highly sophisticated collector with sensors particularly responsive to Alpine minerals and to pink fluorite, asked Georges Bettembourg whether he, Asselborn, might aspire to buy "Georges." The unequivocal answer was No.

Shortly thereafter Bettembourg went to live for a while in the U.S. (working there as a ski instructor) while his grandmother, Georges Charlet's widow, held on to "Georges." By 1981 Bettembourg had decided to return to Chamonix and to resettle there, and he needed money. He and Asselborn met in December 1982, and at this time Asselborn held the great crystal in his hands for the first time. The arrangement they reached was simple: if within six months Bettembourg proved unable to sell the crystal in the United States, he would offer it to Asselborn; if he did find an American buyer, Asselborn would have the right to raise that buyer's offer. At the end of May 1982, Bettembourg telephoned Asselborn with the news that "Georges" could be his—with the stipulation that, to the extent that the matter remained in Asselborn's power, the crystal would remain in France in perpetuity.

George Bettembourg died on the Aiguille Verte in the following year. In 1988—13 years after the great find—a powerful avalanche again sent a great deal of the western wall of Aiguille des Pélerins hurtling into the valley, and now there is only a virtual gash in airy space where "Georges" once resided, and behind it a sheer rock wall. "Georges," however, has been saved for indefinite residence in its home country: the great specimen is still in the collection of Eric Asselborn, in Dijon.

GEOLOGIC SETTING AND DISTRIBUTION

About 80 million years ago, during the first stages of the subduction of the African plate under the Eurasian plate, an orogeny began which would raise the Alps and which indeed has not yet ended—the mountains are still rising at a rate of about 2 mm per year (Zopfi, 1993). In south-central Switzerland, the highest, most famous and most beautiful mountains are formed by the relatively homogenous, quartz-rich, medium to coarse-grained granite of two massifs, the Aare and the Gotthard. Each massif measures about 100 km along its east-northeast to west-southwest strike; the thicker Aare massif lies just to the north of the Rhône River and the Gotthard massif lies just to the south. These granite batholiths were emplaced in early Paleozoic times, whereas the gneisses and schists which surround them are of late Precambrian age. Granites, gneisses and schists alike were displaced to the north by the Alpine Orogeny, and simultaneously they were pinched, twisted and overturned intricately, forming nappes on various scales. For other brief summaries of these orogenic events, see the earlier article in this series (Moore, 2007a), and see Graeser (1998).

Switzerland's richest concentration of pink fluorite-bearing clefts corresponds rather closely to the western three-quarters of the region shown in the map in Moore (2007a) as historically having offered the richest finds of quartz gwindels: it is the east-northeast to west-southwest striking belt, about 40 km long, running between the Fieschergletscher on the southwest, through the areas around the Grimsel Pass, along the Rhônegletscher and past the Furka Pass, to the peaks called Planggenstock and Feldschijen, and up the valley called Göschenertal as far as the village of Göschenen, on the Reuss River. Geologically, according to Parker (1973), this belt corresponds to the Central Granite Zone of the Aare massif, parallel to two north-lying belts of schist and a south-lying belt of gneiss within the massif. Mineralogically, again according to Parker (1973), the Central Granite Zone of the Aare massif west of the Reuss belongs to *Fundortgruppe* (locality group) *4a*, displaying *Mineralgesellschaft* (mineral assemblage) *A1*, which consists primarily of quartz, calcite, chlorite and feldspars, with subordinate fluorite, apatite, hematite, pyrite, galena, zeolites, epidote, titanite, and titanium oxides. In Parker's paragenetic classification scheme for Alpine clefts, this is one of only two assemblages which have fluorite as the most common of their subordinate species; the other is *Fundortgruppe 14a*, which prevails in the central granite of the Mont Blanc massif. A third one of Parker's *Fundortgruppen*, namely *3c*, is closely similar to *4a* and *14a*, except that fluorite is second to hematite in prevalence among the subordinate species. *Fundortgruppe 3c* prevails in the part of the Aare massif which lies east of the Reuss River, and some notable pink fluorite-bearing clefts have been found in this region also.

Other sites in the Alps outside the domains of the three *Fundortgruppen* mentioned above have occasionally produced good specimens of octahedral pink fluorite—see later, e.g., for a survey of some of these in Austria. However, it is the granites, granodiorites and orthogneisses of the central Aare massif which host the most famous, most storiedly "classic," Swiss Alpine crystal occurrences, with the largest clefts, the largest quartz crystals, and the longest histories of hunting by strahlers. Their specimens showing pink fluorite crystals, commonly resting on faces of quartz crystals, are among "the most highly sought-after collector objects in the whole of the Swiss Alps" (Stalder *et al.*, 1998). Pink octahedral fluorite specimens from Grimsel, Galenstock, Planggenstock, Göschenertal, etc. have always been prized (and priced) very highly, in part out of long-established tradition, in part in recognition of the strahlers' labors and dangers, but essentially because such crystals are *rare*, even locally: only one in every five clefts in the Aare massif's central granite contains pink fluorite (Stalder, 2006), and similarly, in the French sector of Mont Blanc just one in 20 clefts that give up smoky quartz also give up pink fluorite (Arlt, 2004).

The Mont Blanc massif, the second of Europe's two renowned regions of pink fluorite-bearing clefts, crops out as an oval-shaped region of high mountains between the towns of Martigny, Wallis, Switzerland; Chamonix, Haute-Savoie, France; and Courmayeur, Aosta, Italy, the three countries' borders meeting at Mont Dolent, just southeast of the Argentiére glacial field. The richest cleft-bearing areas lie in France, in exposures of granite around the Argentiére and Talèfre glaciers. Geologically the Mont Blanc massif very closely resembles the Aare and Gotthard massifs of central Switzerland, having, like them, a granite core and a border zone of older metamorphic rocks. It is most cleft-rich in its middle and southern parts, again like its Swiss counterparts, although crystal-bearing clefts tend to be smaller here than in Aare and Gotthard. For more summary data on the Mont Blanc massif see Arlt (2004), Moore (2007a) and Von Raumer (1999).

FORMATION OF FLUORITE IN ALPINE CLEFTS

The earliest stages of the Alpine Orogeny began about 80 million years ago, with crustal compression as the African plate plunged under Europe. Rock units were folded, thrust over and piled upon each other to a depth of several kilometers in some places, forming the complex nappe structures of the central massifs. Under such conditions most of the rocks were at least slightly metamorphosed—e.g. much granite became orthogneiss—and the rocks were extensively fractured and sheared. What would later become crystal-lined clefts originated as slit-like tension gashes (or "pressure shadows") with long axes perpendicular to the main vectors of stress. But clefts could only form in this way when the rock became cool enough for plastic deformation to cease and fractures to form. In granites and gneisses such as those of the central Aare and Mont Blanc massifs, the threshold temperature for the ductile/brittle transition lies between 300° and 500° C (Graeser, 1998). This is in agreement with the estimate of Zopfi (1993) that the first hydrothermal solutions began circulating through the newly formed Aare clefts at a temperature of about 500° C. Zopfi further specifies that at this time the pressure was in excess of 2 kilobars (more than 2000 atmospheres), and the cleft zone was about 10 km below the surface. The orogenic uplift which first brought the rocks near enough to the surface for the first clefts to form has been dated by Stalder *et al.* (1998) at 17 million years ago for the Gotthard massif, and by Macchieraldo (2005) and Poty and Cathelineau (1999) at 18.5 million years ago for the Mont Blanc massif; presumably the date for the Aare massif is similar.

The earliest crystallization of minerals from hydrothermal solutions within the clefts was contemporaneous with cleft formation: when the first cracks appeared in the rock, solutions which had been seeping through the rock mass at once migrated into the voids. The composition of the solutions and pressure conditions prevailing during the earliest crystallization of the cleft minerals have been deduced from the study of fluid inclusions (largely of water and CO_2) in early-formed quartz crystals which grew on cleft walls when the temperature was around 450° C. Elements carried by the hydrothermal solutions were once believed to have come from very deep-seated basement rock masses, but are now generally thought to have been leached from nearby rocks. The silica which formed the quartz crystals in clefts, and much of the water in the hydrothermal solutions, came primarily from the breakdown of phyllosilicate minerals in the surrounding rock. The CO_2 in the fluid inclusions came from calcareous marine sediments in the nappe regions, and from these rocks also came the calcium for the ubiquitous calcite of the Aare and Mont Blanc clefts, and for the fluorite. Fluorine for the fluorite is thought to have been leached from biotite in the granite and gneiss (Asselborn, 1998; Gautron, 1999a; Arlt, 2004)—the Aare and Mont Blanc igneous rocks contain an average of up to a kilogram of fluorine per cubic meter of rock (Asselborn, 1998).

Precipitation of crystals in the clefts is thought to have continued for around 5 million years, until temperatures and pressures had fallen so far that hydrothermal activity ceased. Zopfi (1993) suggests that pink fluorite began to form at temperatures of around 300° C, while Stalder (2006) prefers a formation temperature closer

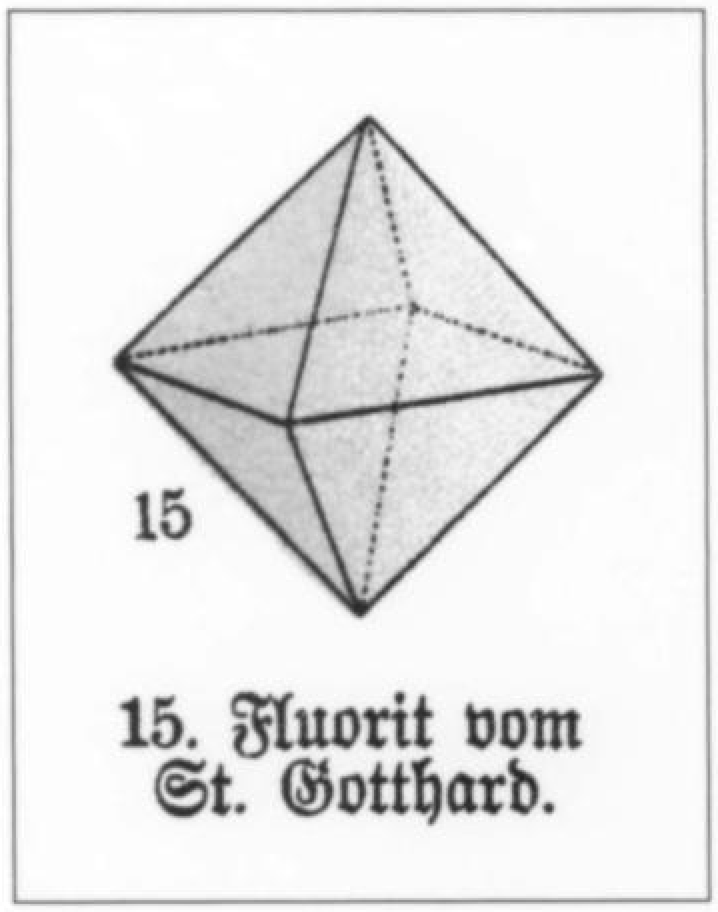


Figure 10. **Illustration of a pink fluorite octahedron from St. Gotthard, Switzerland; from A. Kenngott's *Illustrierte Mineralogie* (c.1890), reprinted from J. G. Kurr's *Das Mineralreich* (1859).**

to 400° C, adding that the YO_2 defect responsible for the pink color (see later) forms at 400° C in laboratory experiments. These temperatures are within the 300°–500° C range generally given for the formation of "high-temperature" fluorite (Toroni, 1994)—which is typically octahedral in habit. It is interesting to note, however, that some of the Alpine crystals may have formed, at least in part, under cooler conditions: some of them show distinct zoning, both in color and habit, grading outward from pink octahedral cores formed at high temperatures to green, purple or colorless, cuboctahedral or dodecahedral exteriors presumably formed at lower temperatures

WHY PINK?

Absolutely pure fluorite (CaF_2) is colorless, but this most allochromatic of popular collector species comes in a wonderful rainbow of colors. In the illustrious case of octahedral fluorite crystals from Alpine clefts—why pink?

The causes of color in fluorite vary. The most straightforward is mechanical inclusion: some Illinois fluorites are tinted brown by finely divided hydrocarbons, and the brick-red spherulitic fluorites of India owe their color to included hematite. The pinkness of Alpine fluorite can resemble that of rose quartz, imparted by submicroscopic inclusions of rutile (Weibel, 1977). But for relatively pure Alpine pink fluorite, mechanical coloring agents have been ruled out. More exotic agents are sometimes at work in coloring crystals: some deep blue fluorite specimens (e.g. from Illinois and from ore veins in France, as well as the blue-purple English carving material called "blue John" fluorite) are now known to owe their color to very small aggregates of elemental calcium, called "calcium colloids" (Wright, 2002; Curto, 2006). However, in nearly all other cases the explanation for fluorite colors begins with trace-element substitutions. Very commonly the substituting ions are rare-earths elements from the lanthanide series (La, Ce, Nd, Sm, Eu, Yb etc.) and/or yttrium, which is lighter than the lanthanides but routinely accompanies them in rare-earth-rich environments. Since these ions are all similar in size and in chemical behavior to Ca^{2+} they can readily substitute for calcium in a crystal structure and serve as chromophores. The rare-earth element samarium (Sm), sometimes in combination with cerium and yttrium, is responsible for the green colors of fluorite from England, Spain, China, and some Alpine localities. (For a helpful table summarizing some causes of color in fluorite see Belsher, 1982).

Research has shown that trace elements can only function as fluorite chromophores in conjunction with certain flaws in the crystal structure, and in the presence of radiation. The structural flaws are called "color centers" (or "F-centers," from *Farbe*, the German word for color)—structural defects involving an absence or displacement of an ion or ions of F^{-1} or Ca^{2+} from their normal places in the CaF_2 lattice. Bill *et al.* (1967) doped synthetic fluorite crystals with rare-earth elements and then exposed them to X-rays. The study revealed that a pink coloration resulted when CaF_2 was doped with yttrium and then irradiated, suggesting that a particular kind of F-center, which they call an R-center, had formed; the R-center is:

> . . . an association of a yttrium ion with two oxygen ions placed as an impurity in the crystal and ionized in course of time by natural radiation. . . . For the red fluorites from Switzerland we propose a center which is responsible for the coloration of those crystals, e.g. a YO_2 complex.

In general the model has been accepted (Althaus, 1977; Weibel, 1977; Gautron, 1999a; Curto, 2006) and somewhat refined by later research (Wright and Rakovan, 2001; Wright, 2002). The substitution is as follows: the YO_2 complex, with a net charge of -1, is inserted into the fluorite structure, a Y^{3+} ion replacing a Ca^{2+} ion and two O^{2-} ions replacing two of the eight F^{-1} ions which surround the calcium site. Radiation detaches an electron from one of the two oxygen ions, restoring charge balance. The R-center complex preferentially absorbs light of higher wavelengths, leaving the pink color. The effect is reversible: heating will re-introduce the lost electron, eliminating the pink color, but exposure to radiation will drive off the electron again, restoring the color (Althaus, 1977; Stalder *et al.*, 1998; Curto, 2006).

The model corresponds nicely to observed facts regarding Alpine pink fluorite. First, the YO_2-governed R-center forms at a relatively high temperature (400° C in the lab), and so it would have formed just when "high-temperature" octahedral crystals of fluorite were being precipitated in the young clefts (Stalder, 2006). Also clarified is the role of natural radioactivity, which not only catalyzes the pinkness of yttrium-contaminated fluorite but also imparts the smoky tint to quartz crystals with which the fluorite is commonly found. The granitic rocks of the central zones of the Aare and Mont Blanc massifs have fairly high trace-element contents of rare-earth elements and uranium: the correlation of the intensity and duration of radioactive influence with the degree of smokiness in smoky quartz has long been accepted. The most spectacular specimens which show rose-pink fluorite octahedrons resting on faces of dark smoky quartz crystals tend to come from clefts in the highest mountains of the massifs' central zones (Parker, 1973; Bancroft, 1984), i.e. they come from the oldest clefts, those with the longest histories of tectonic uplift and of exposure to radiation from the groundmass. Finally there is the fact that the color of pink fluorite fades—but only very slowly—with exposure to sunlight. The loss of color is slow since the strong bonds between the yttrium and oxygen ions ensure that the chromophores (and therefore the color) remain very stable (Stalder, 2006); however, the color *does* fade in collector specimens, since the crystals are no longer being exposed to the color-catalyzing radioactivity. But pink fluorite, like colorless quartz, may be quickly (re)colored by strong doses of radiation.

As already mentioned, pink fluorite can be damaged or corroded when exposed to temperature changes, percolating groundwater, and other pernicious influences. Groundwater is particularly destructive: the solubility of fluorite in clean water at normal temperatures is higher than that of calcite, with only about 60 liters of water sufficing to dissolve at least one gram of fluorite (Weiß and Derungs, 2004). Thus, clefts which are close to the surface or—worse yet—have been naturally opened and exposed directly to the Alps' winds and ices may contain quartz crystals which look fresh enough, but associated pink fluorite crystals may be frosted or corroded away altogether. Consequently the brightest, freshest-looking, most transparent pink fluorite crystals are typically found in clefts which either have been sealed off by permafrost or are relatively deep-lying and have been breached by tunnels for road construction or for the building of hydroelectric facilities.

SOME MAJOR PINK FLUORITE OCCURRENCES

Central Switzerland

As noted above, Switzerland's pink-fluorite-bearing clefts are overwhelmingly concentrated in the Central Granite Zone of the Aare massif, just north of the Rhône—the area of *Fundortgruppe 4a*, displaying *Mineralgesellschaft A1*, of Parker (1973). Accordingly the short tour of fluorite discoveries here will linger longest in central parts of the Aare massif and will note as well some localities in the Gotthard massif immediately to the south. But there are also outlying fluorite occurrences south of both Aare and Gotthard, in the Penninic area of highly folded marine-sedimentary, granitic and gneissic rocks where the leading edge of the African plate began its plunge under Europe. The Penninic area includes the rocks of the Swiss-Italian borderlands near the Binn Valley in Canton Wallis

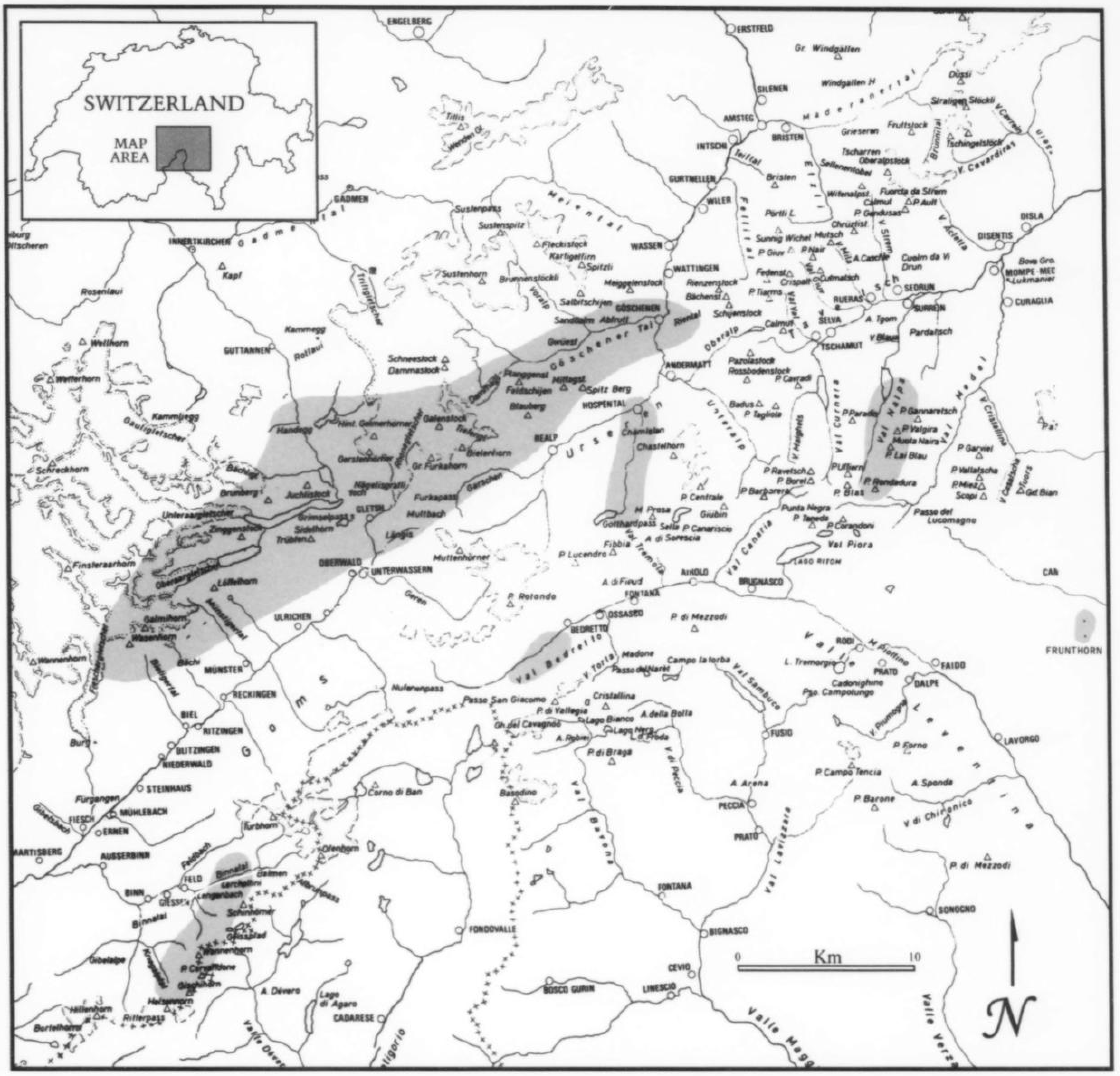


Figure 11. **The principal areas in the central Swiss Alps where pink fluorite crystals have been found in clefts.**

and the Bergell region of southeastern Canton Graubünden. These two areas, lying respectively south-southwest and south-southeast of Aare and Gotthard, will be the beginning and ending points of the Swiss tour.

During the 1960s and probably earlier, scattered collecting sites in the **Binntal** (*tal* = "valley") and in the mountains and glacial fields south of it, near or on the Swiss-Italian border, have occasionally produced sharp fluorite crystals of varying colors and forms, including pink octahedrons. In the mid-1960s, clefts in orthogneiss around the **Ritter Pass** and on the **Gischihorn** (*horn* = "peak") and **Helsenhorn**, about 10 km south of the Binntal, yielded slightly corroded but still sharp, deep rose-pink octahedral fluorite crystals to a remarkable 8 cm on edge (Graeser, 1995). About halfway between the Ritterpass and the Binntal, i.e. 5 km south of the latter, some clefts around the **Wannigletscher** (*gletscher* = "glacier"), on the Swiss side of **Mt. Cervandone** (Italian: Alpe Devero), have yielded pink fluorite octahedrons, some modified by dodecahedron and cube faces, to 3 cm (Graeser and Albertini, 1995; Stalder *et al.*, 1998). Collecting in the mid-1960s produced a few specimens in which pink octahedral fluorite crystals to 1 cm are associated with crystals of the rare, attractively lustrous brown, highly coveted arsenate species cafarsite, known in good crystals only from Mt. Cervandone (Graeser and Albertini, 1995).

To move north and across the Rhône from the Binntal region is to enter the Aare massif, in whose total expanse pink fluorite discoveries large and small over 20 decades have been beyond counting: no really complete inventory is possible, especially as the strahlers have often refused to reveal the precise sites of finds. For example, in 1991 Kaspar Fahner, one of the most successful and famous of modern Swiss strahlers, opened a cleft from which

Figure 12. **Pink fluorite with black cafarsite crystal on albite and muscovite, 3.3 cm, from the Wannigletscher area, Binntal, Wallis, Switzerland. Rüdi Lüssi collection; Thomas Schüpbach photo.**

he took clusters of pale smoky quartz crystals (with individuals to 43 cm long) on which rest octahedral pink fluorite crystals to 7 cm on edge; specimens from the cleft were shown on the cover of *Schweizer Strahler* but Fahner would not divulge where the cleft is except to say that it lies somewhere in the central part of the Aare (Zopfi, 1992).

Near the western edge of the Aare massif, just east of the peak of the Finsteraarhorn, the snouts of two glaciers, the Unteraargletscher and Oberaargletscher, point to the east and contribute meltwater to small glacial lakes. In 1950–1952, construction of the **Oberaar Power Station** (*Kraftwerke Oberaar*) led to the discovery of several clefts yielding superb specimens of octahedral pink fluorite associated with quartz gwindels, adularian orthoclase crystals, and small but fine crystals of milarite and apatite-(CaF). In 1969, in a drainage tunnel associated with the power station, Kaspar Fahner found wonderful specimens showing pink to violet-blue, octahedral fluorite crystals with quartz, calcite and milarite crystals (Parker, 1973).

Between the two glaciers named above and about 6 km west of the Grimsel Pass lies the upland area called the **Zinggenstock**, the site of the enormous quartz cleft discovered in 1719 and, ever since then, of rich discoveries of smoky quartz gwindels and of some of the best of Switzerland's rare amethystine quartz specimens. In the late summer of 1951, at an elevation of 2810 meters on the edge of a small glacier on the Zinggenstock, H. Streun and Kaspar Fahner opened a cleft containing fine crystals of quartz, epidote, calcite, sagenitic rutile, and slightly corroded, translucent raspberry-red octahedral fluorite crystals to 3.2 cm; the strahlers collected a total of 5 kilograms of fluorite from the cleft (Parker, 1973). In the early 1960s the Zinggenstock was intensely prospected by the brothers Hans and Ernst Rufibach, and in 1966, 2700 meters above sea level, these expert strahlers opened an enormous cleft from which came many dramatic quartz specimens (including a one-meter-square plate of crystals which went on display in Ernst Rufibach's private museum in Gutannen), as well as pink fluorite crystals to 2 cm, some resting on faces of smoky quartz crystals (Parker, 1973; Rufibach, 1979; Graeser, 1998). The region has continued to be intermittently fruitful: specimens showing tight groups of deeply rose-colored octahedral fluorite crystals on granite, attributed to the Zinggenstock, were marketed at the Ste.-Marie-aux-Mines Show in 1988 (Moore, 1989).

The glacial lake called **Grimselsee** (*see* = "lake") begins at the eastern snout of the Oberaargletscher and stretches for about 5 km eastward, ending a little beyond, and just north of, the **Grimsel Pass**. At the northeastern corner of Grimselsee is **Sommerloch**, where, during hydroelectric plant construction in the 1950s, Switzerland's largest known octahedral fluorite crystal from an Alpine cleft was discovered; it measures 17 cm and is pale pink in its core, colorless to pale green in its outer zones (Parker, 1973; Cook, 1998). Excavations for industrial purposes, as well as prospecting by strahlers, have turned up fluorite-bearing clefts all along and around Grimselsee for many decades. At an unspecified date, a small stream feeding into the lake was pumped dry, and clefts newly exposed in the stream bed yielded excellent specimens of pink fluorite (Parker, 1973). Sharp pink fluorite crystals to 2 cm resting on quartz crystals were collected from two neighboring, very large clefts found in 1942 during tunneling in the **Juchlistock**, near the Grimsel Pass (Parker, 1973). Five kilometers north-northwest of the Pass, a cleft opened in a support tunnel during construction of the **Hendegg I power plant** in 1925–1932 produced pink fluorite octahedrons to 8 cm (Parker, 1973). Kaspar Fahner—again!—collected fine pink fluorite specimens at Sommerloch in the summer of 1969 (Burger, 1979). And very recently, pretty pink and pale lilac fluorite crystals to 2 cm have come from the **Bächlital**, in the north of the Grimsel area (Felix Garcia Garcia, personal communication, 2008). However, beware of obfuscated localities for finds around the Grimsel Pass (as indeed for other finds): beautiful fluorite/smoky quartz specimens found at a "forbidden" collecting site somewhere near Grimsel in the 1980s were falsely said to have come from Scheuchzerhorn, near the Oberaargletscher (Borzykowski, 1997).

The Oberhasli hydroelectric power station at **Gerstenegg**, on a slope of the Gerstenhorn about 4 km northeast of Grimsel, is the site of a "display" cleft: a tourist attraction originally opened during construction of the power station in the mid-1970s. Until the station was finished the great cleft was sealed by a concrete wall, and its maintenance thereafter was entrusted to Ernst Rufibach. The cavity is lined by quartz crystals "with pink fluorite crystals sprinkled

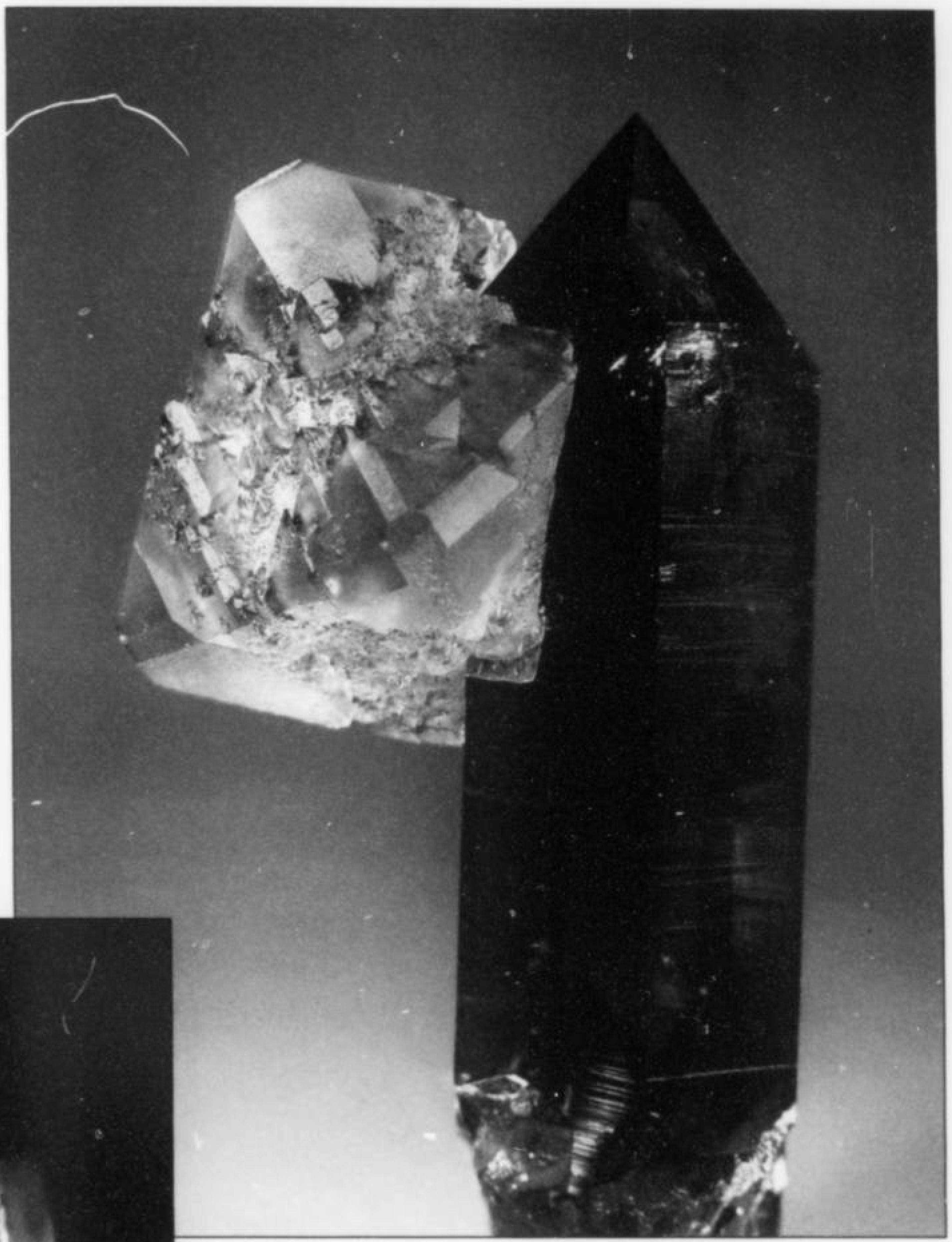


Figure 13. **Pink fluorite crystal, 1.5 cm, with tiny amounts of purple overgrowth, on a smoky quartz crystal from Zinggenstock, Bern, Switzerland. Ernst Rufibach specimen; Thomas Schüpbach photo.**

Figure 14. **Pink fluorite crystal with purple overgrowth, 2.3 cm, on adularian orthoclase, from Zinggenstock, Bern, Switzerland. Ernst Rufibach specimen; Thomas Schüpbach photo.**

like sugar over them" (Stalder *et al.*, 1998; Wachtler, 2006). About 3 km south-southeast of the Gerstenhorn lies the **Furka Pass**, and just north of it the icefields of the **Winterstock**. Here, in 1975 and 1977, Kaspar Fahner collected specimens showing octahedral pink fluorite crystals resting on brilliant hematite "iron roses," the latter reaching 6 cm (Burger, 1979); and here, in the early 2000s, the Austrian strahler Miggel Zwyssig found an exposed quartz vein and was able to open a near-surface cleft that bore beautiful pink fluorite crystals to 2 cm on edge (Zwyssig, 2004).

About 6 km northeast of the Furka Pass lies the eastern edge of the **Tiefengletscher**, site of the great 1868 quartz cleft mentioned above and described by Wilson (1984b). "Minor" pink fluorite specimens came out with the wonderful quartz crystals of 1868 (Cook, 1998), and some pink fluorite crystals, to varying degrees corroded, have come from areas adjacent to the glacier, especially during a heavy period of prospecting by strahlers in the mid-20th century (Parker, 1973).

A few kilometers farther northeast one comes to the peaks called Planggenstock and Feldschijen, which, with two other peaks, constitute the complex known as the **Göscheneralp**, at the southwestern head of the Göschenertal. This cluster of localities, most commonly designated on labels simply as "Göscheneralp," has produced isolated finds of pink fluorite for many decades—e.g. 40 fine, newly dug specimens from "Göscheneralp," with fluorite crystals to 3 cm, both as floaters and attached to quartz crystals, were marketed in Europe in 1978 (Sullivan, 1978). During the 1990s there was production from a truly superlative discovery in the **Planggenstock** sector of Göscheneralp: in the summer of 1994, Franz von Arx und Paul von Känel opened a 6-meter-wide cleft in granite which gave up huge plates of pale smoky quartz crystals (including gwindels) and,

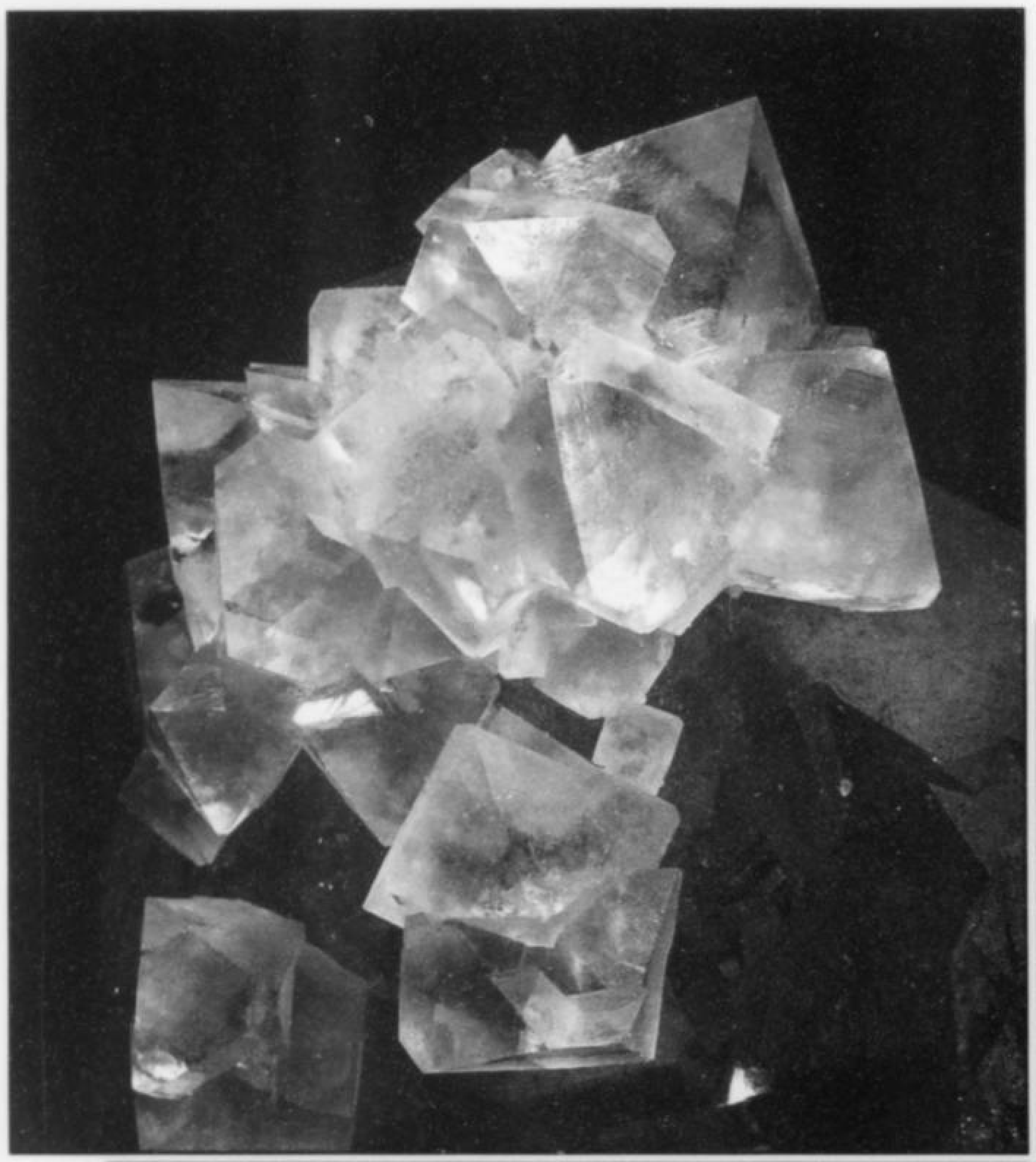
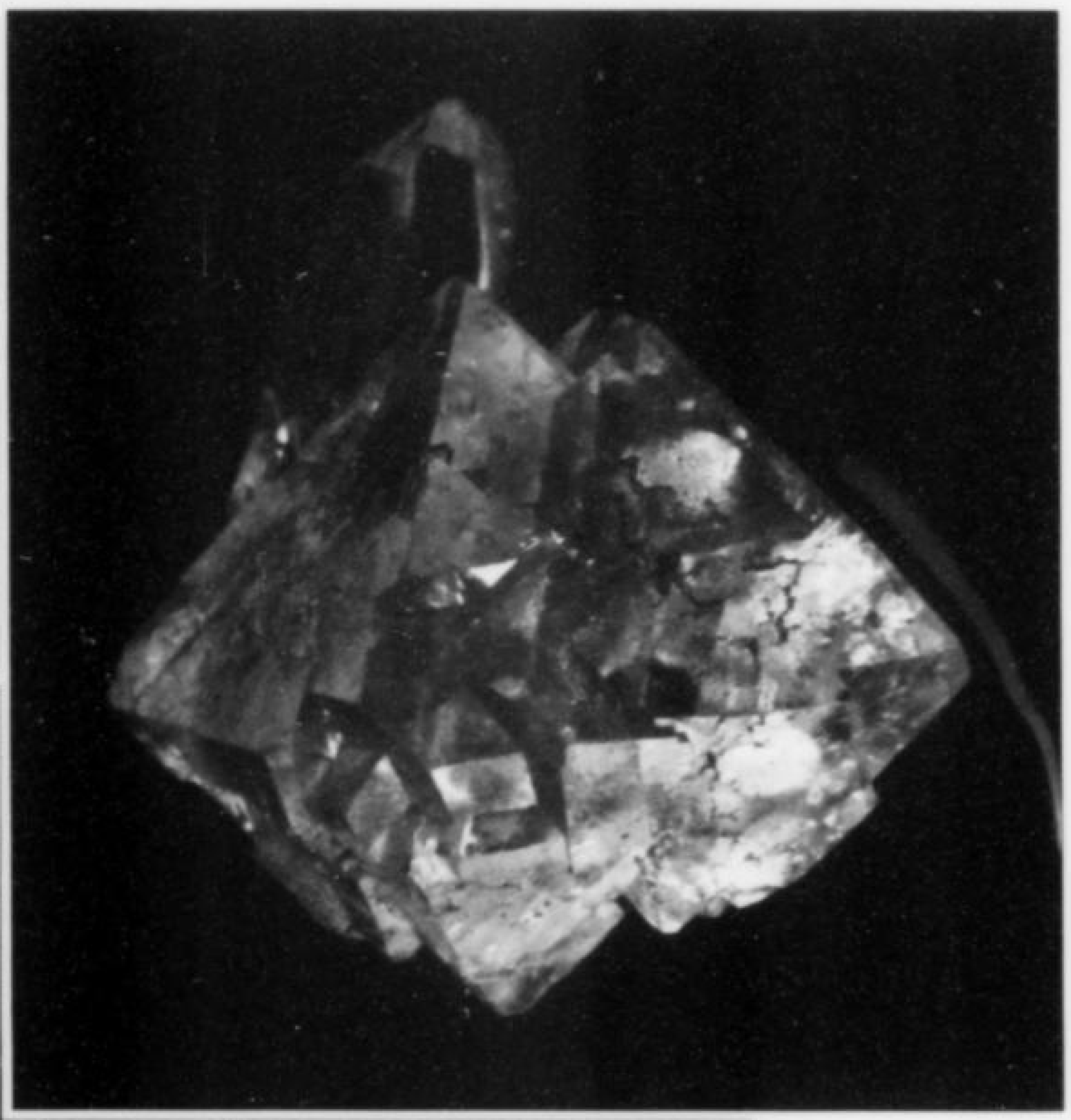


Figure 15. (*left*) **Pink fluorite on a large quartz crystal, 14 cm, from the Grimsel Pass, Bern, Switzerland. Ernst Rufibach collection; Thomas Schüpbach photo.**

Figure 16. (*below*) **Pink fluorite with quartz, 1.8 cm, from the Grimsel Pass, Bern, Switzerland. Keith Proctor collection; Jeff Scovil photo.**

Figure 17. (*bottom*) **Pink fluorite on quartz, 22 cm, from the Grimsel Pass, Bern, Switzerland (collected by Kaspar Fahner). Eric Asselborn collection; Jeff Scovil photo.**



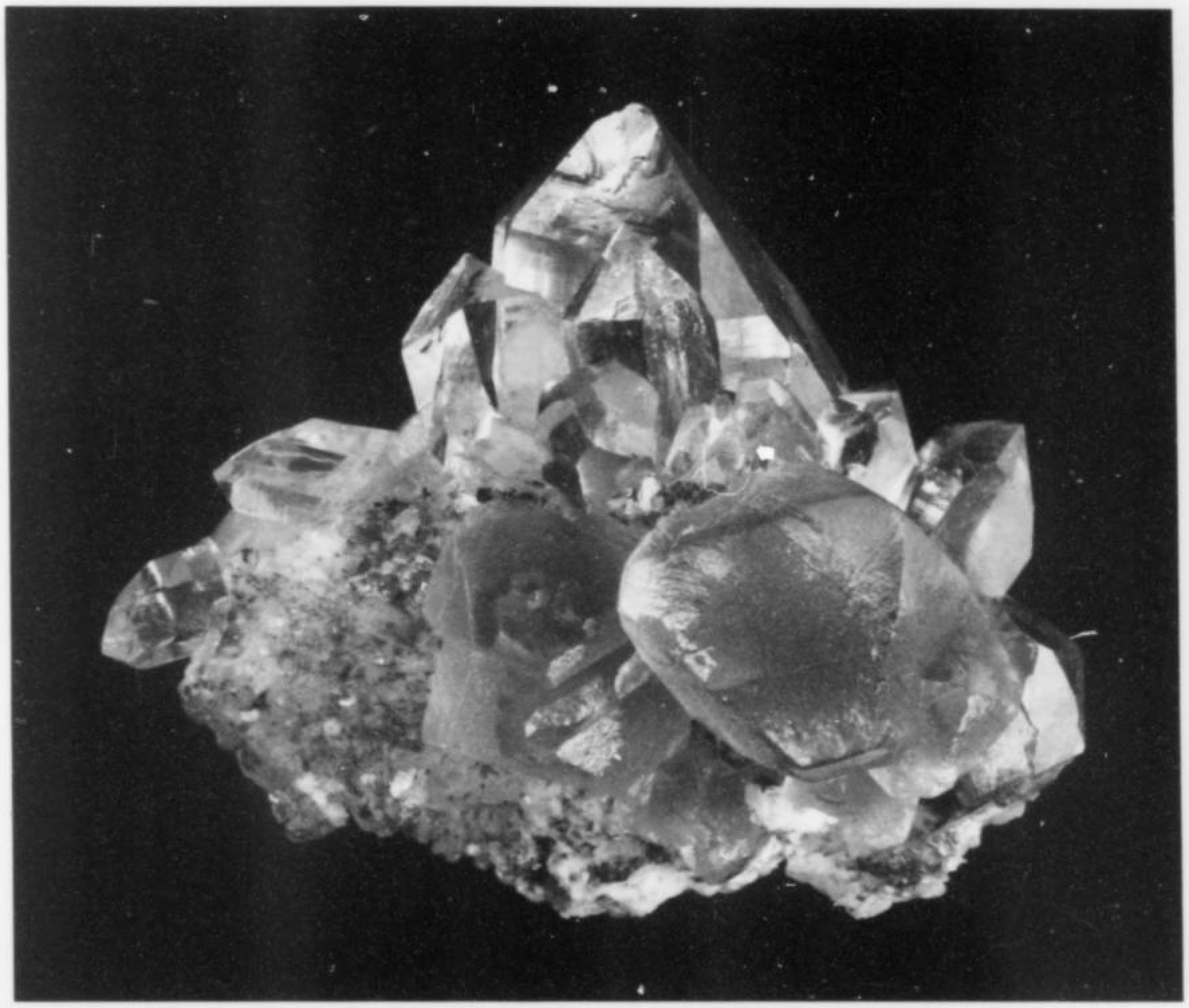
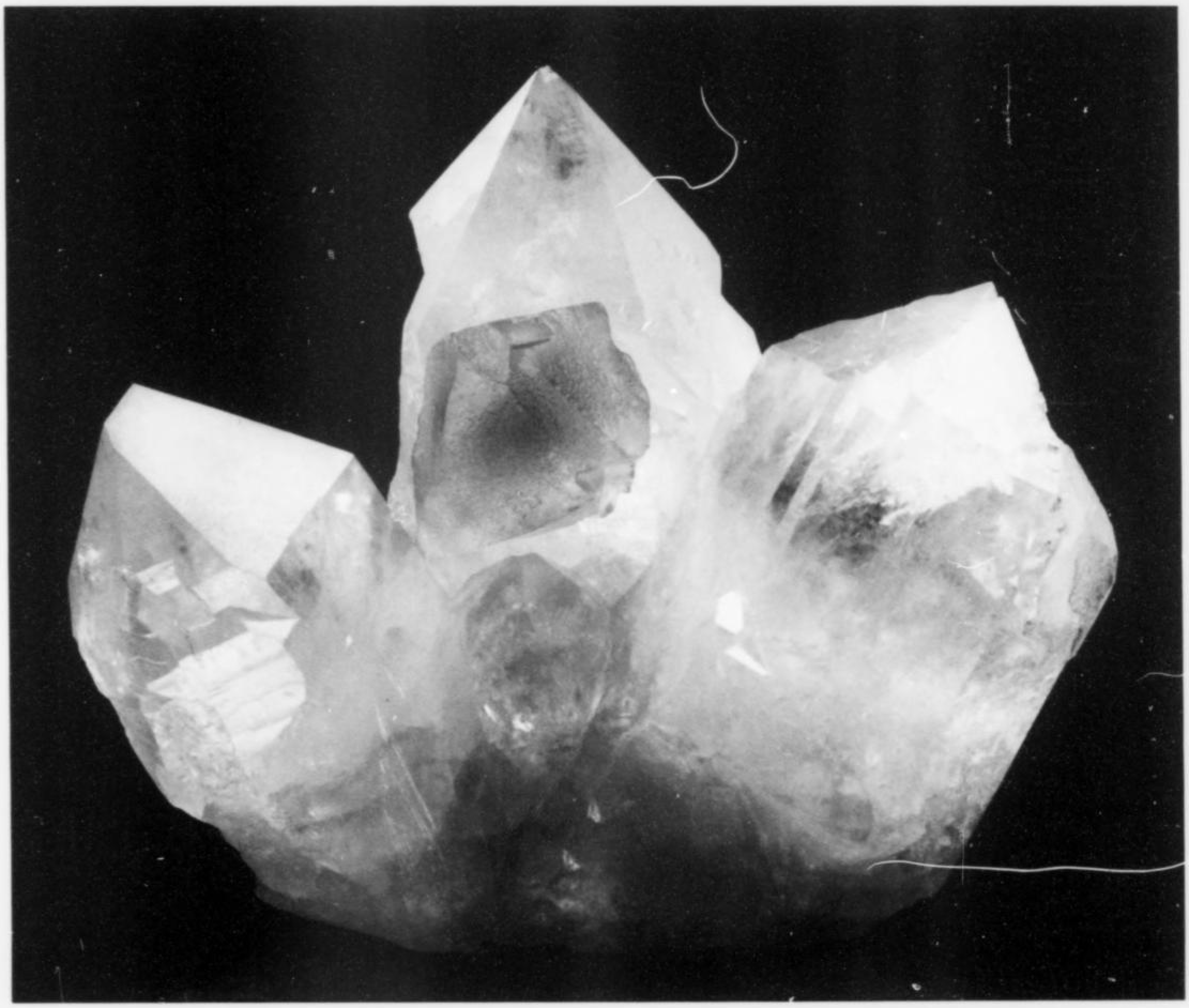


Figure 18. Pink fluorite on quartz, 9.3 cm, from the Grimsel region, Switzerland. William Larson collection; Jeff Scovil photo.

Figure 19. Pink fluorite crystal, 4 cm, on quartz, from Planggenstock, Canton Uri, Switzerland. Marco and Livio Tironi collection; Roberto Appiani photo.



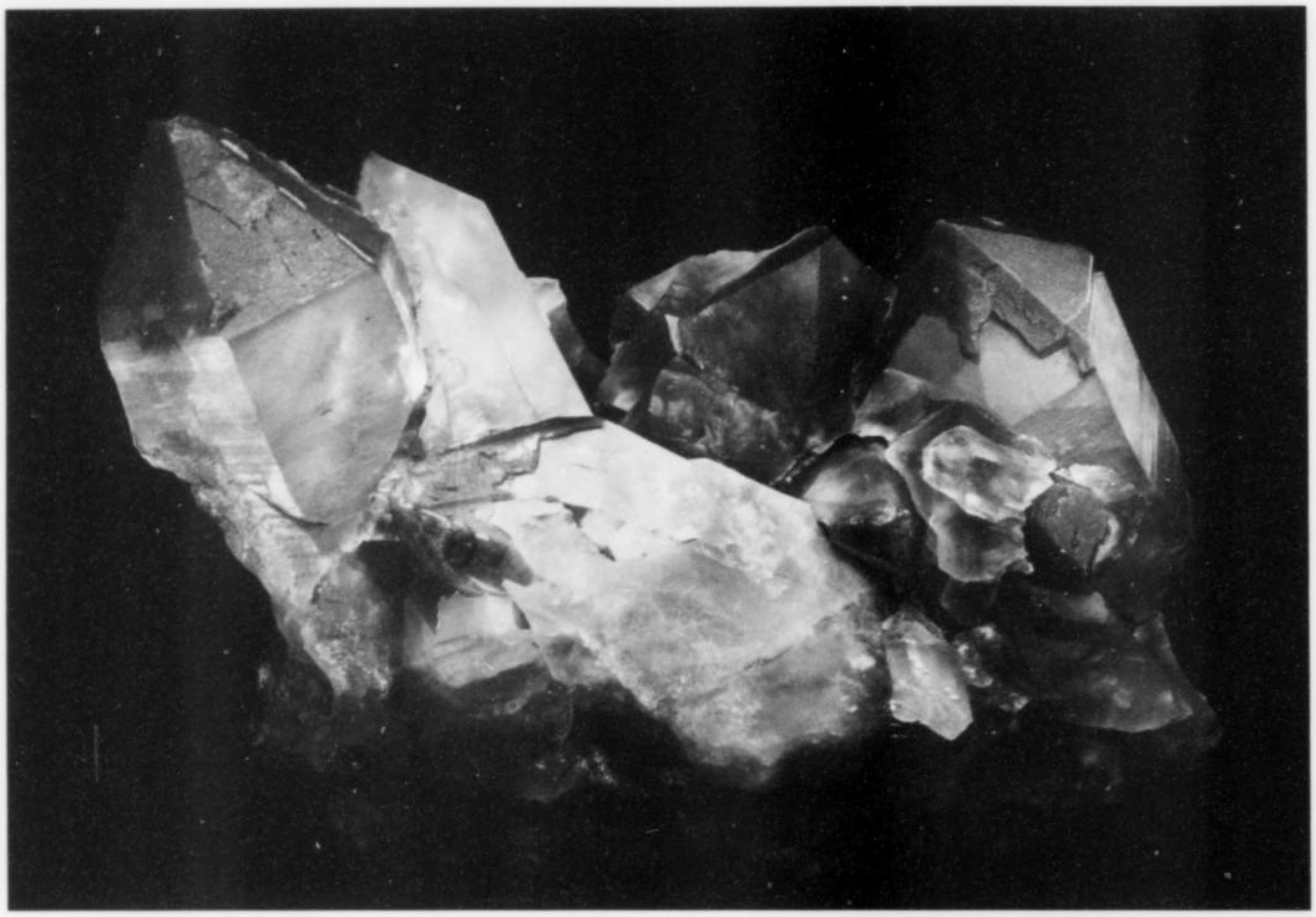


Figure 20. **Pink fluorite with quartz and chlorite, 21.6 cm, from Planggenstock, Göscheneralp, Switzerland. Adalberto Giazotto collection; Jeff Scovil photo.**

from one part of the cavity, fluorite octahedrons to almost 10 cm on edge. Many of the fluorite crystals are edge-rounded and slightly corroded, but some are sharp-edged and transparent, with a "wet" luster and a deep rose-red color (Arx, 1995; Stalder *et al.*, 1998). The partners continued to mine the cleft for another five years, and some specimens from it were marketed at the 1999 Tucson Show (Ream, 1999); see Arx (1995) for the complete collecting story for this remarkable find.

In the 1880s and again in the 1940s the **Feldschijen** peak, just south of Planggenstock on the Göscheneralp, produced good specimens of smoky quartz and pink fluorite associated with calcite and zeolites (Parker, 1973), but a much more recent, truly major discovery was made by members of the Tresch family in 2003–2004. A large ice-filled cleft yielded superb, lustrous, dark smoky quartz crystals (again including gwindels), and on some of these crystals rest sharp, transparent, medium rose-red fluorite octahedrons; in other specimens the fluorite crystals rest directly on granite. For this collecting story see Tresch (2006).

Between the heights of the Göscheneralp and the town of Göschenen on the Reuss River, the Göschenertal runs east for about 10 km, the ancient Sandbalm cleft (or "mine") lying just to its north, about halfway along the valley. Among the best of the numerous pink fluorite finds of the Göschenertal is one made in 1964 during construction of hydroelectric tunnel facilities at **Bratschi**; these specimens show fine, sharp, pale pink crystals resting on colorless quartz prisms (Bancroft, 1984; Cook, 1998). In 1957, in a tunnel being dug for the **Göschenen hydroelectric power station,** a large cleft produced fine, very large quartz gwindels and many transparent, highly lustrous, pale pink fluorite octahedrons to 2 cm; the fluorite crystals rest either on quartz crystals, white tabular calcite crystals, or unweathered granite. This cleft, under the name "Stäupiloch" or

Figure 21. **Pink fluorite crystal, 5 cm, on quartz from Planggenstock, Canton Uri, Switzerland. Marco and Livio Tironi collection; Roberto Appiani photo.**

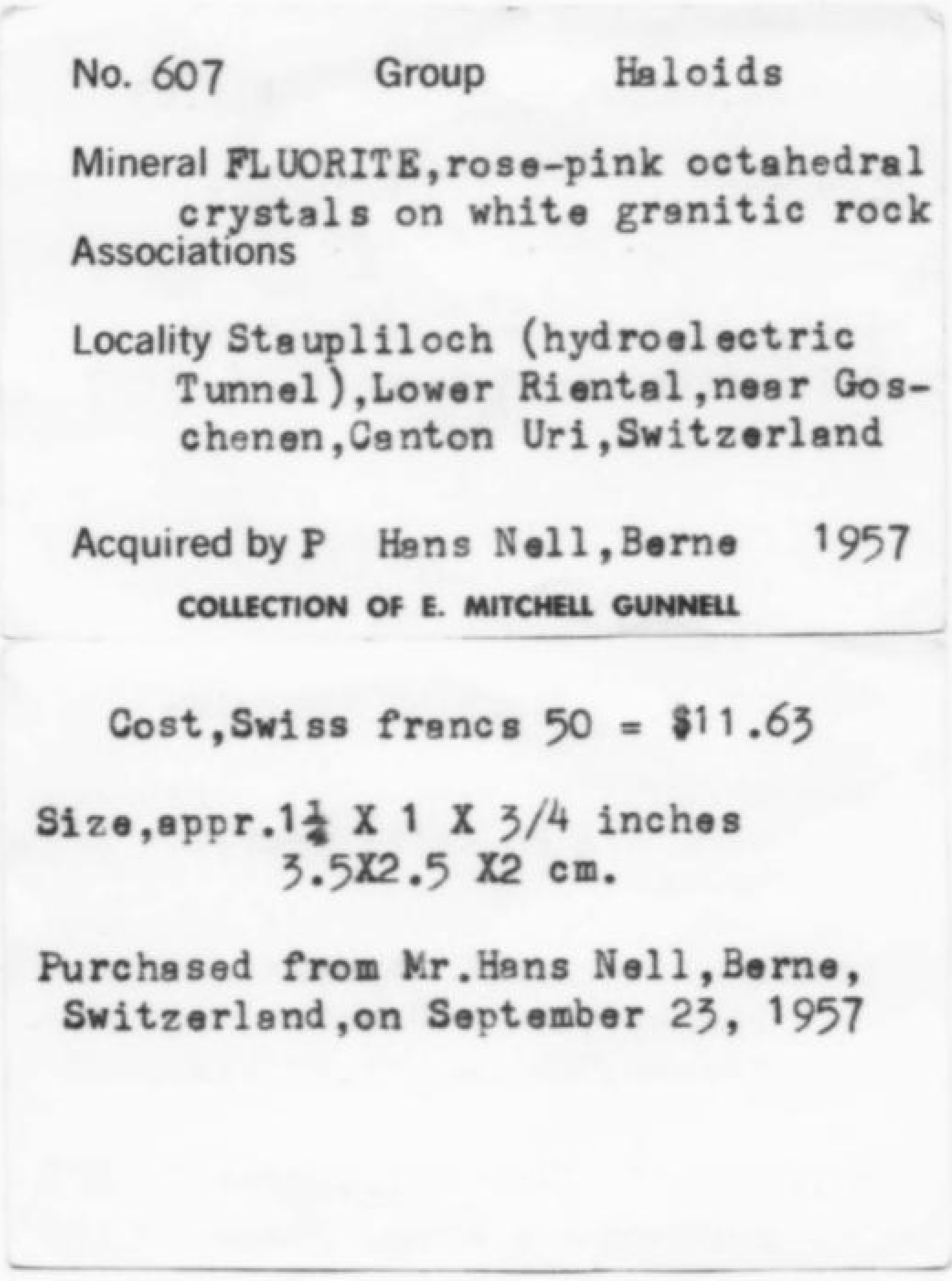
Figure 22. **Pink fluorite on white granite with quartz, 5 cm, from the hydroelectric tunnel near Göschenen, Switzerland. Wendell Wilson collection and photo, ex Fred Kennedy collection; now in the Smithsonian Institution collection.**

Figure 23. **Pink fluorite on quartz, 9.8 cm, from the hydroelectric tunnel near Göschenen, Switzerland. Wayne and Dona Leicht specimen; Wendell Wilson photo.**

"Stäupliloch" (*loch* = "cavity"), was among the most famous pink fluorite localities of the 1950s–1960s, and is represented in many museum collections. Many specimens dating to the late 1950s and labeled "Göschenen" are probably from this find.[2]

[2] On page 93 of his *Die Mineralfunde der Schweiz* ("Mineral Finds of Switzerland") (1973), R. L. Parker asserted that "Stäupiloch" is a "false" locality designation for these widely marketed fluorite specimens. I am indebted to Dr. Edwin Gnos of the Natural History Museum of Geneva for ferreting out the facts which probably underlie this puzzling (because unexplained) judgment. The fluorite specimens were collected in 1957 (Parker gives the date as "around 1958") by men employed in constructing facilities for the Göschenen hydroelectric power station. The cleft in question was opened during construction of the Rötiboden water tunnel, running between Göschenen and the hamlet of Rötiboden, 1 km to the southwest. One or more of the workers brought the specimens to a mineral dealer—perhaps he was Hans Nelle of Bern, whom an old label names as having "acquired" the specimens in 1957 and then as having sold some. Since crystal-collecting during construction work in the tunnels was strictly forbidden, the dealer, to protect his source, deliberately misattributed the specimens to "Stäupiloch." This is a local term, not shown on any map, which sounds more like "Steipiloch" in the local dialect of Swiss German; it denoted a waterfall which then lay at a point where the Reuss River joined another small river, with "Stäup-" from German "Staub," dust, alluding to the clouds of water spray which billowed up at the site. Later damming of the Reuss River destroyed the beautiful place of the "water dust," and today the spot is covered by logistics buildings around the entrance to the Gotthard road tunnel at Göschenen. Although the former "Stäupiloch" waterfall lay only some hundreds of meters away from the true collecting site, Parker could justifiably call the locality "false," as the specimens really came from somewhere along the 1-km length of the Rötiboden tunnel.

About 12 km south of Göschenen lies the **Gotthard Pass**, with Val Tremola and the peaks called Fibbia and Pizzo Lucendro to its south. We have now passed out of the Aare massif and into the Gotthard massif, whose chief riches are other than fluorite: this part of central Switzerland is most distinguished for hematite "iron rose" specimens (see Moore, 2005b). However, notable finds of pink fluorite have indeed been made in the Gotthard Pass area, mostly during construction of (first) the Gotthard railroad tunnel and (then) the Gotthard road tunnel. The railroad tunnel, opened in 1882, provided, during its construction in the 1870s, a few specimens showing pale pink octahedral fluorite crystals with crystals of tabular white calcite, quartz, and chlorite-infused apophyllite (Parker, 1973). The road tunnel, opened in 1980, did better: in 1962–1964, work on an auxiliary tunnel revealed a cleft with pink octahedral fluorite crystals to 1.7 cm associated with calcite, chlorite



No. 607 Group Haloids

Mineral FLUORITE, rose-pink octahedral crystals on white granitic rock

Associations

Locality Staupliloch (hydroelectric Tunnel), Lower Riental, near Goschenen, Canton Uri, Switzerland

Acquired by P Hans Nell, Berne 1957

COLLECTION OF E. MITCHELL GUNNELL

Cost, Swiss francs 50 = $11.63

Size, appr. 1¼ X 1 X 3/4 inches
3.5X2.5 X2 cm.

Purchased from Mr. Hans Nell, Berne, Switzerland, on September 23, 1957

Figure 25. **An old label from the Colorado dealer E. Mitchell Gunnell (1903–1986) describing a pink fluorite (now in the collection of Wendell Wilson) which is essentially identical in habit, granite matrix, color and luster to the ones pictured on the previous page. It confirms that the "Staupliloch" locality is actually in the hydroelectric tunnel near Göschenen, and that the specimen was obtained on September 23, 1957 from "Mr. Hans Nell of Berne, Switzerland" for $11.63.**

Figure 24. **Pink fluorite on smoky quartz, 3 cm, from the Göscheneralp, Uri, Switzerland. Karl Tresch collection; Thomas Schüpbach photo.**

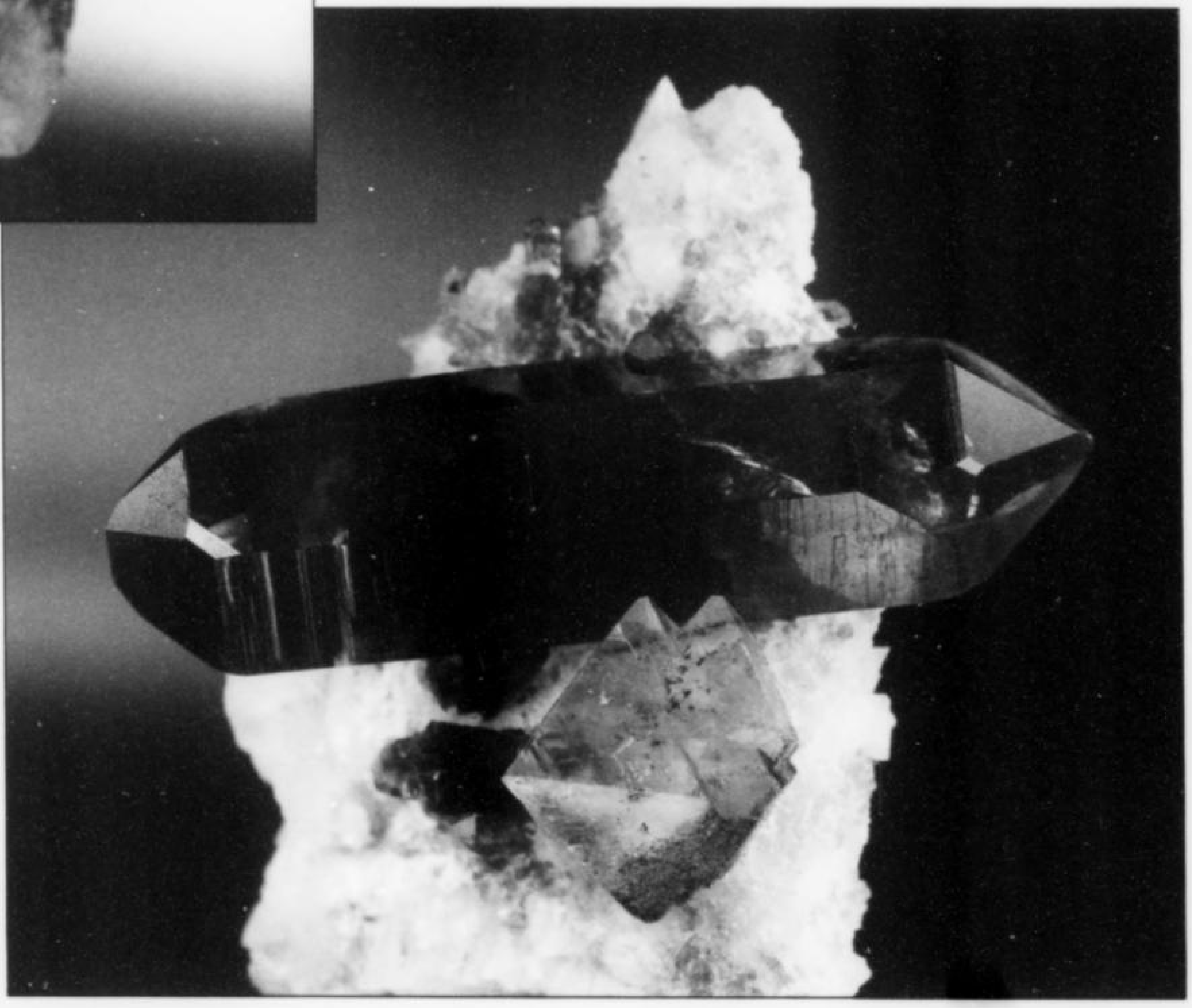


Figure 26. **Pink fluorite crystal (5 mm) with doubly terminated smoky quartz crystal, from the Göscheneralp, Uri, Switzerland. Josef Jauch collection; Thomas Schüpbach photo.**

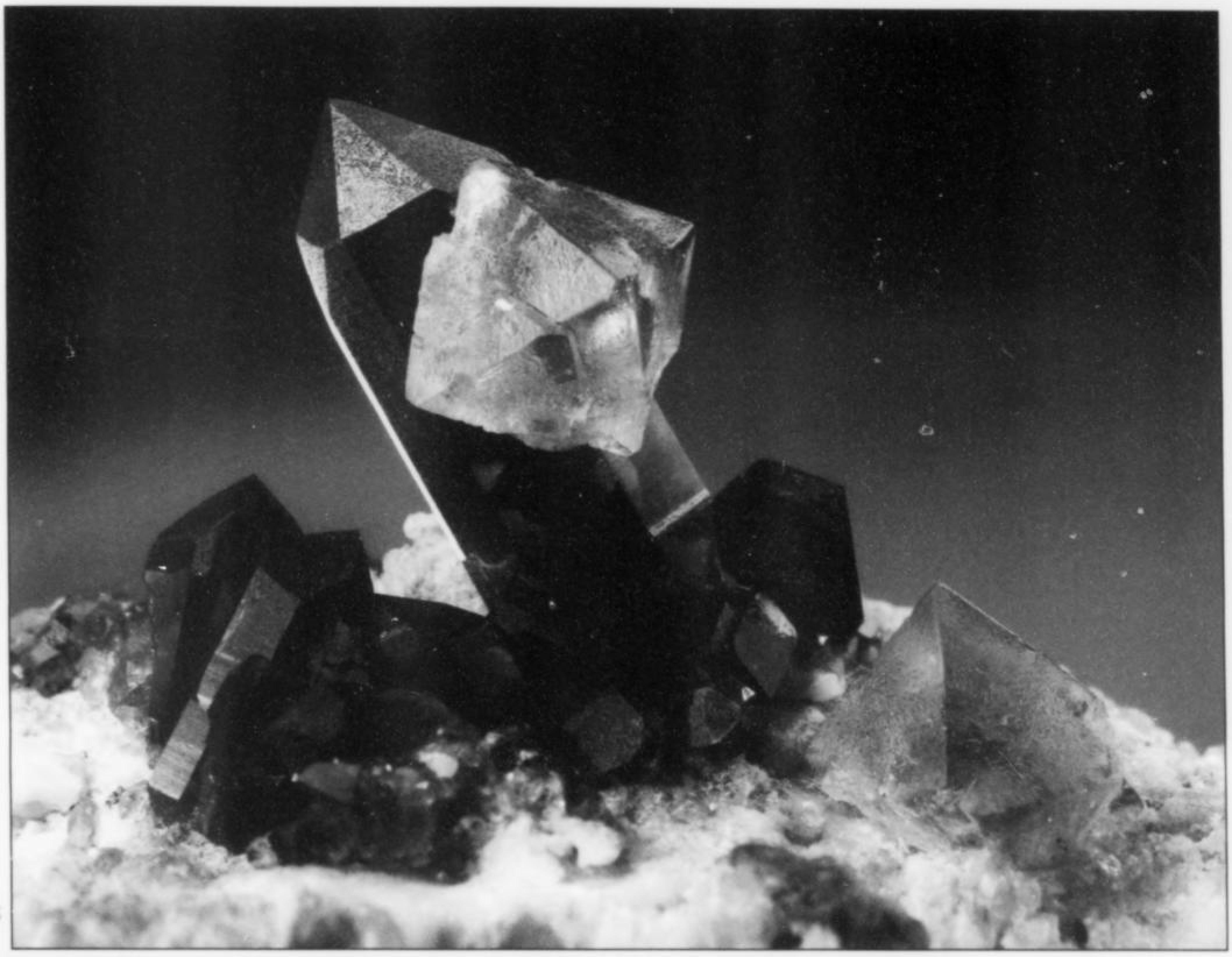
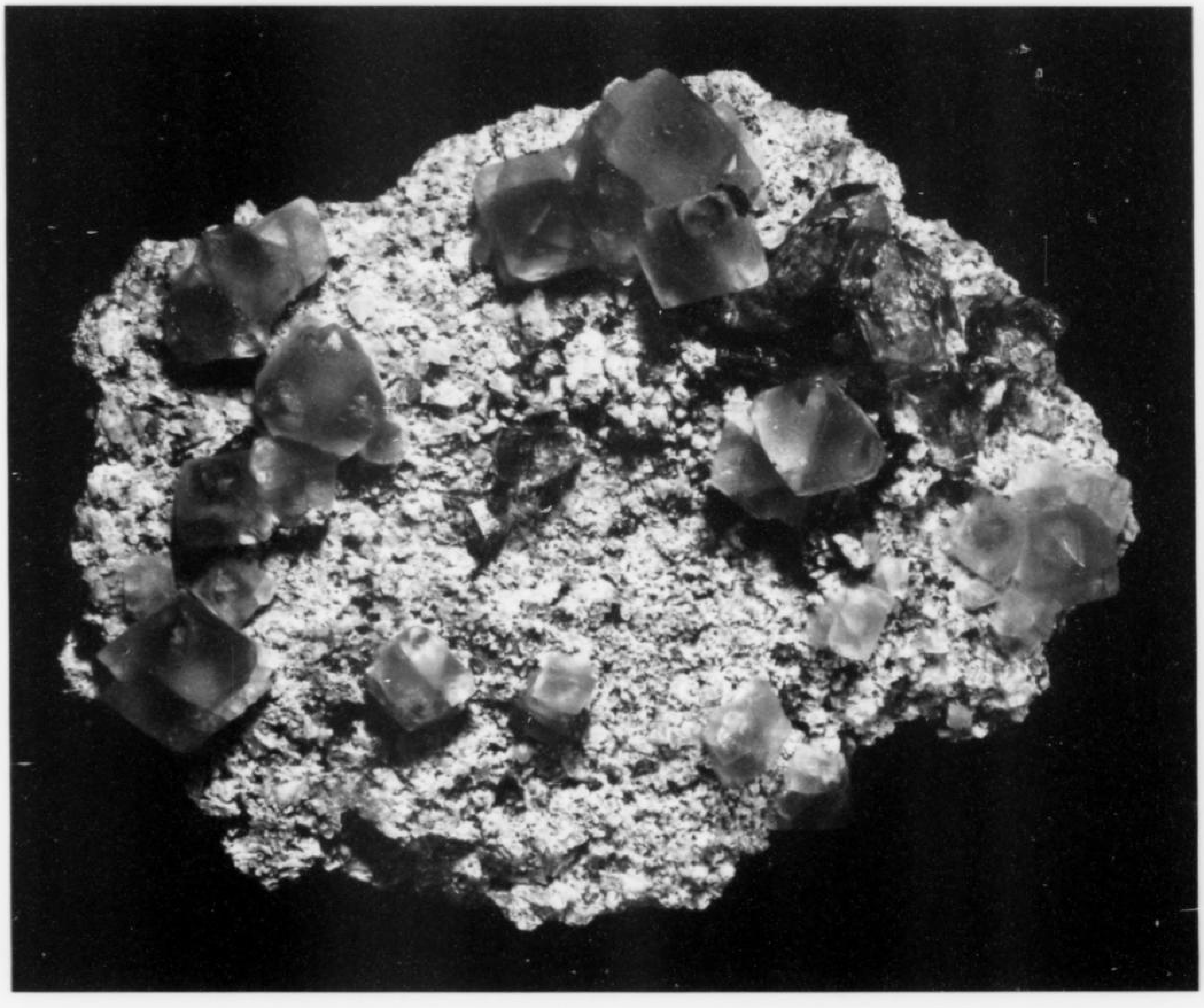


***Figure 27*. Pink fluorite crystal (1.3 cm) on smoky quartz, from the Göscheneralp, Uri, Switzerland. Bruno Müller collection; Thomas Schüpbach photo.**

***Figure 28*. Pink fluorite with quartz on granite, 25.5 cm, from Brätsch, Göscheneralp, Switzerland. Eric Asselborn collection; Jeff Scovil photo.**



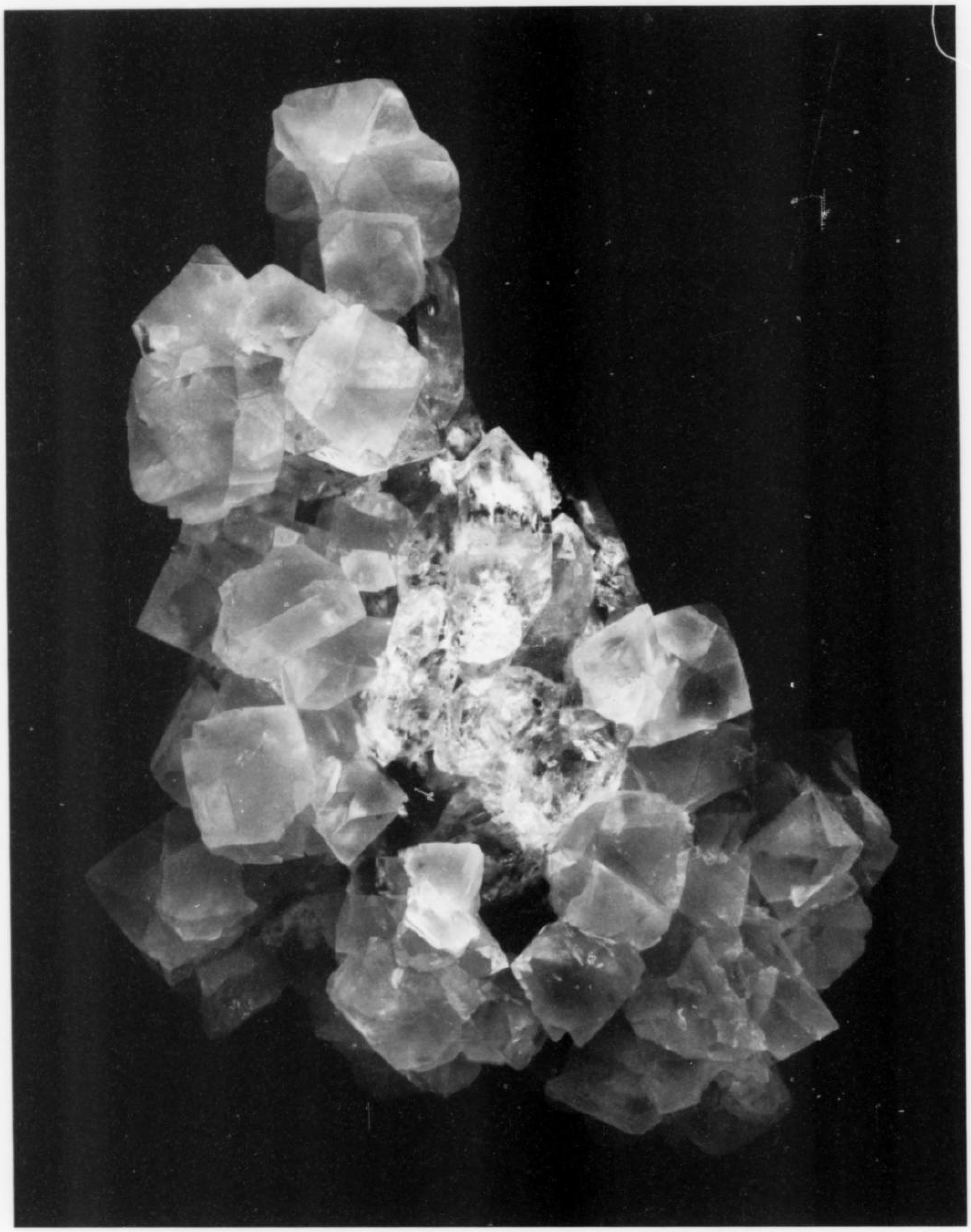


Figure 29. **Pink fluorite with quartz, 20.3 cm, from the St. Gotthard area, Graubünden, Switzerland. Karl Kempf collection; Jeff Scovil photo.**

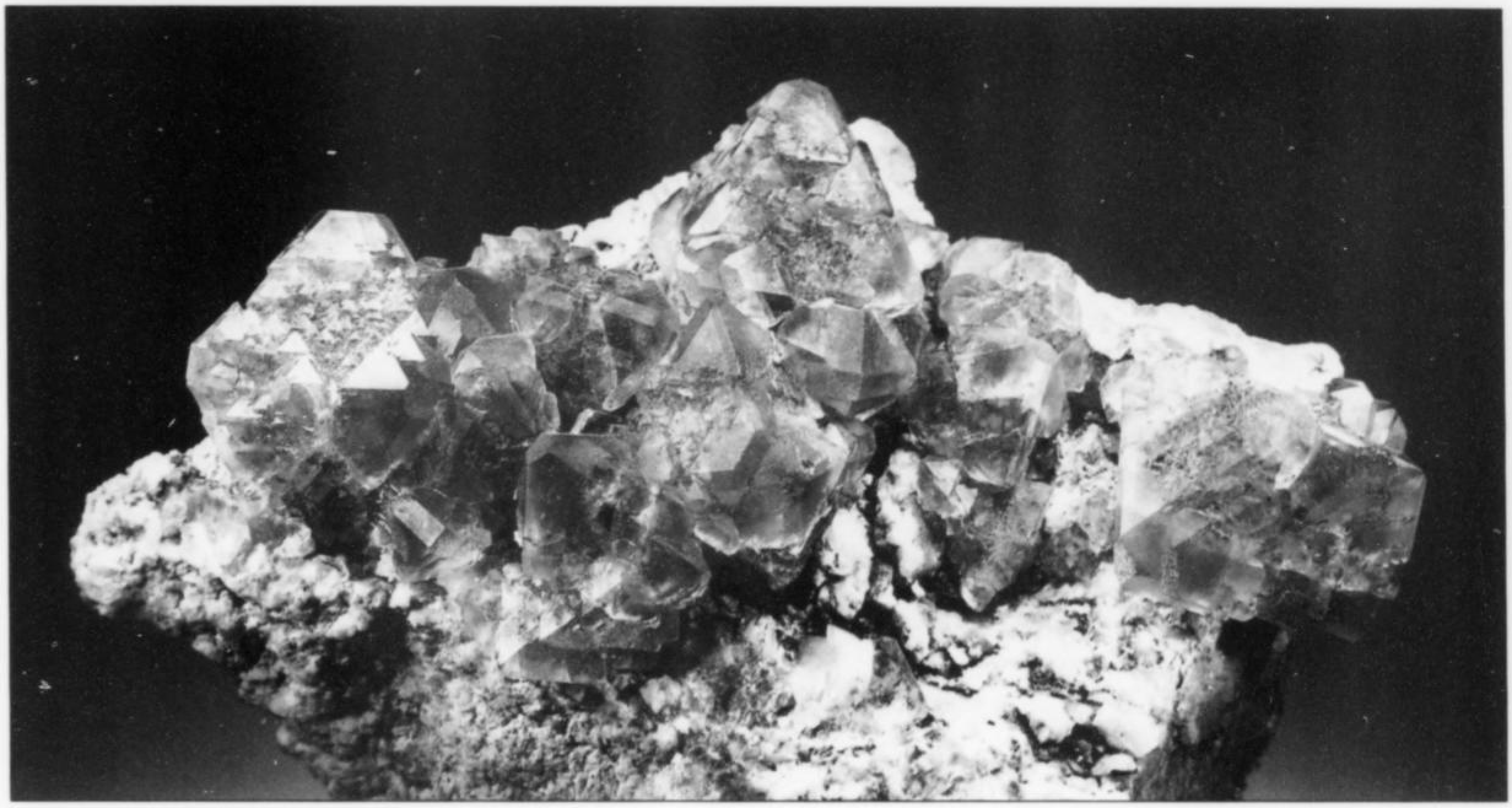
and hematite (Parker, 1973; Stalder, 1984), and in December 1970 a cleft produced fresh-looking, transparent, deep pink octahedral fluorite crystals to 5 cm associated with well crystallized quartz, calcite, apatite-(CaF), adularian orthoclase, titanite and epidote (Lussmann, 1984). Stalder *et al.* (1998) mention fluorite crystals, both pink and violet, to 4 cm from the Gotthard road tunnel.

About 7 km southwest of the Gotthard Pass (and still in the Gotthard massif) lies the upper **Bedretto Valley**, on the northern edge of the Italian-speaking canton of Ticino. Pink fluorite crystals came from this valley for the first (known) time in 1990, when Benedetto Bellometti extracted a few specimens from a cleft at Poncione di Maniò. The crystals, reaching 10 cm on edge, are of atypically complex form, being compound octahedrons with oriented dodecahedral sub-individuals perched on their points (Toroni, 1994).

East of the Reuss River we pass from Parker's *Fundortgruppe 4a* to *Fundortgruppe 3c*—an area less rich in fluorite but still capable of producing significant fluorite specimens, as well as hematite, calcite and zeolites. Cavradi Gorge, long famous as the source of

Figure 30. **Pink fluorite with quartz, 3 cm, from the St. Gotthard area, Graubünden, Switzerland. Jeff Starr collection; Jeff Scovil photo.**

Figure 31. **Pink Fluorite on matrix, 6.5 cm, from Galenstock, Wallis, Switzerland. Bruno Müller specimen; Thomas Schüpbach photo.**



Switzerland's best (and some of the world's best) hematite specimens, lies in Val Curnera; fluorite does not occur in the Gorge but is found about 7 km southeast of it, in the upper part of **Val Nalps** (*val* = "valley"), the drainage parallel to and immediately to the east of Curnera. In 1959, in a cleft in the gneissic rocks of **Piz Rondadura** (*piz* = "peak"), Val Nalps, Lucas Monn found transparent, color-zoned octahedral fluorite "floaters," their cores pink, their outer zones pale green. The largest of these crystals, 9 cm on edge, now belongs to the Natural History Museum of Bern (Weibel, 1977; Stalder *et al.*, 1998); a 15-cm fluorite octahedron found at another time on Piz Rondadura is now in the British Museum collection (Russ, 1990). Other fine fluorite specimens have been collected, mostly before 1959, on neighboring mountains in upper Val Nalps, among them **Piz Blas, Piz Uffiern** and **Piz Fuorcla** (Stalder *et al.*, 1998).

About 25 km east-southeast of upper Val Nalps, the small Adula Mountain Group (namesake of the *adularia* variety of orthoclase) rises beyond the head of the Valsertal, barely on the Graubünden side of the Ticino/Graubünden cantonal border and in the Pennine geological province. Although these mountains are not an especially rich area for mineral specimens, the octahedral fluorite crystals found there can be superb, with unusually intense pink, rose-red, strawberry-red or (rarely) orange-red colorations. In 1994, 1996, 2000 and 2003, fine fluorite and fluorite/smoky quartz specimens were dug from narrow clefts in granite gneiss on the rubble-strewn northwestern flank of the **Frunthorn**. Strahlers had worked these

Figure 32. Swiss Strahler Paul von Känel, with a large quartz and pink fluorite specimen, at his home in Reichenbach, Bern, Switerland. Thomas Schüpbach photo.

difficult slopes since the mid-19th century, but the major finds had to wait until modern times when accelerated warming melted the permafrost and ice which earlier had blanketed the Frunthorn's northwestern flank. Because this melting has been so recent, most of the fluorite crystals collected since 1994 on the Frunthorn are remarkably fresh, showing little or no corrosion. The sharp octahedral crystals, all of which show small triangular vicinal growth features, range between a few millimeters and 3.5 cm on edge (Stalder *et al.*, 1998; Weiß and Derungs, 2004). The greatest single find on the Frunthorn occurred in September 2000, when Alex Derungs collected about 200 pink fluorite specimens from a cleft which measured 2 meters long, 1 meter high and 30 cm wide. The deep rose-pink crystals reach 2 cm, and some show sparse drusy coatings of adularian orthoclase; matrix specimens from the find reach 25 cm across (Weiß and Derungs, 2004). A few specimens from this discovery were marketed at the 2001 Tucson Show (Moore, 2001).

Switzerland's easternmost locality for significant pink fluorite crystals is in the Bergell region of the Bernina Alps, almost 40 km southeast of the Frunthorn. In quarries in gneiss near the town of **Soglio, Bregaglia Valley**, pink fluorite octahedrons, exceptionally to several centimeters on edge, occur in chlorite-filled clefts with prehnite, quartz and zeolites. Elsewhere in Bergell, fluorite occurs sporadically as blue-green octahedrons and purple cubes (Lareida, 1977; Stalder *et al.*, 1998).

Pink octahedral fluorite has been found in the clefts of the eastern (Swiss and Italian) parts of the Mont Blanc massif, and also in the Swiss part of the Aiguilles-Rouges massif near Mont Blanc. These occurrences in the southwestern corner of Switzerland will be treated later, under the heading "Mont Blanc area: Switzerland and Italy."

Austria

The Austrian Alps strike east-west across parts of the provinces of Tirol, Salzburg and Ost (East) Tirol. Pink-fluorite-bearing clefts in these mountains occur very rarely, but a few discoveries of fine specimens have been made. In the **Tuxer Alps**, Tirol, during the 1980s, bicolored pink-green octahedral crystals of fluorite reaching 7 cm on edge were collected at a site called **Alpeiner Scharte** (*Scharte* = "fissure"); these crystals are associated with molybdenite (Niedermayr, 1990). Also in the Tuxer Alps, between 1980 and the mid-1990s, fine fluorite specimens were found **at Schrammacher,**

***Figure 33.* A view of a portion of the Hohe Tauern mountain range in west-central Austria looking south, showing the valleys (from left to right) of the Hollersbachtal, Habachtal, Untersulzbachtal, Obersulzbachtal, Krimmler Achental (with tributary Rainbachtal), and Wildgerlostal. The high peak at center left is Grossvenediger at 3,674 meters (11,941 feet).**

Valsertal: some of these specimens show pale pink to almost colorless octahedral fluorite crystals to almost 14 cm (5.5 inches) on edge, while others sport beautiful green fluorite octahedrons to 2.5 cm partially coated by acicular quartz crystals (Niedermayr, 1990; Burgsteiner, 1996).

Austria's highest peaks lie in the 75-km-long Hohe Tauern range, in the Pinzgau region of westernmost Salzburg Province. Here a huge anticline has caused high-grade metamorphic rocks of the underlying Penninic nappes to crop out—the term "Hohe Tauern window" is sometimes used, as these mountains provide a "window" into the deep structure of the Austro-alpine mountain belt. A series of small, parallel stream drainages run down the northern side of the peaks of the Hohe Tauern to join the little Salzach River, and in some of these drainages lie famous mineral localities—pre-eminently the great cleft in amphibolite at Knappenwand, Untersulzbachtal, which, since its discovery in the 1860s, has given up what are probably still the world's finest specimens of epidote.

With regard to pink fluorite, the Pinzgau's westernmost drainage of interest is the **Krimmler Achental**, where, in a sub-drainage called **Rainbachtal**, octahedral pink fluorite crystals to 9 cm were once found (Niedermayr, 2002). The **Habachtal** (with the dumps of the old Leckbachrinne emerald mine reposing at one point on the eastern slope of the valley) lies three drainages to the east of the Krimmler Achental. At the head of the Habachtal, at a site called **Wildenkar** near the peak of the mountain called **Breitfuss**, Erwin Burgsteiner and Erich Mosser opened two clefts in gneiss in the summer of 1988, taking out about 10 fine specimens showing octahedral pink fluorite crystals to 3.5 cm. The transparent crystals are almost colorless within, but have thin, intensely rose-pink outer zones. One of the clefts also yielded colorless, transparent fluorite octahedrons, modified by dodecahedron and trapezohedron faces, to 2 cm; good crystals of adularian orthoclase, smoky quartz and white tabular calcite also came from both clefts (Burgsteiner, 1989; Niedermayr, 1990). When Burgsteiner and Mosser revisited Wildenkar in the summer of 2005 they found only a handful of fluorite crystals, but the best of these is a glowing rose-pink octahedron 4 cm on edge, with calcite and adularian orthoclase crystals, on a matrix of gneiss (Burgsteiner and Mosser, 2007).

One more drainage eastward, in the **Hollersbachtal**, pink fluorite octahedrons to 12 cm were found in a cleft in the old **Achselalm lead-zinc mine** in 1911—Niedermayr (1986, 1990, 2002) opined that these anomalous old classics are the finest fluorite specimens from anywhere in the eastern Alps. In 1913, Georg Gasser, a mineralogist from Bolzano, Italy, wrote the following in his *Die Mineralien Tirols*:

> In 1911, by chance, I was able to track down some remarkable large fluorite crystals [from the Achselalm mine], raspberry-red to rose-red, of a kind such as was only found decades ago in the St. Gotthard region of Switzerland. In their simple octahedral form and the qualities of their faces the crystals are exactly like those from St. Gotthard. . . . The largest and most beautiful crystals, seeing which put me onto the scent of the rest . . . measure exactly 12 cm. The crystals were found loose in a cleft in the mica schist which surrounds the orebody, associated with fine-grained white fluorite, green fuschite, yellow sphalerite, galena, and other species; the cleft was wholly filled with iron oxides and clayey mud.

Unfortunately, the only fluorite crystals which have been found in the Achselalm mine since 1911 are corroded, almost colorless,

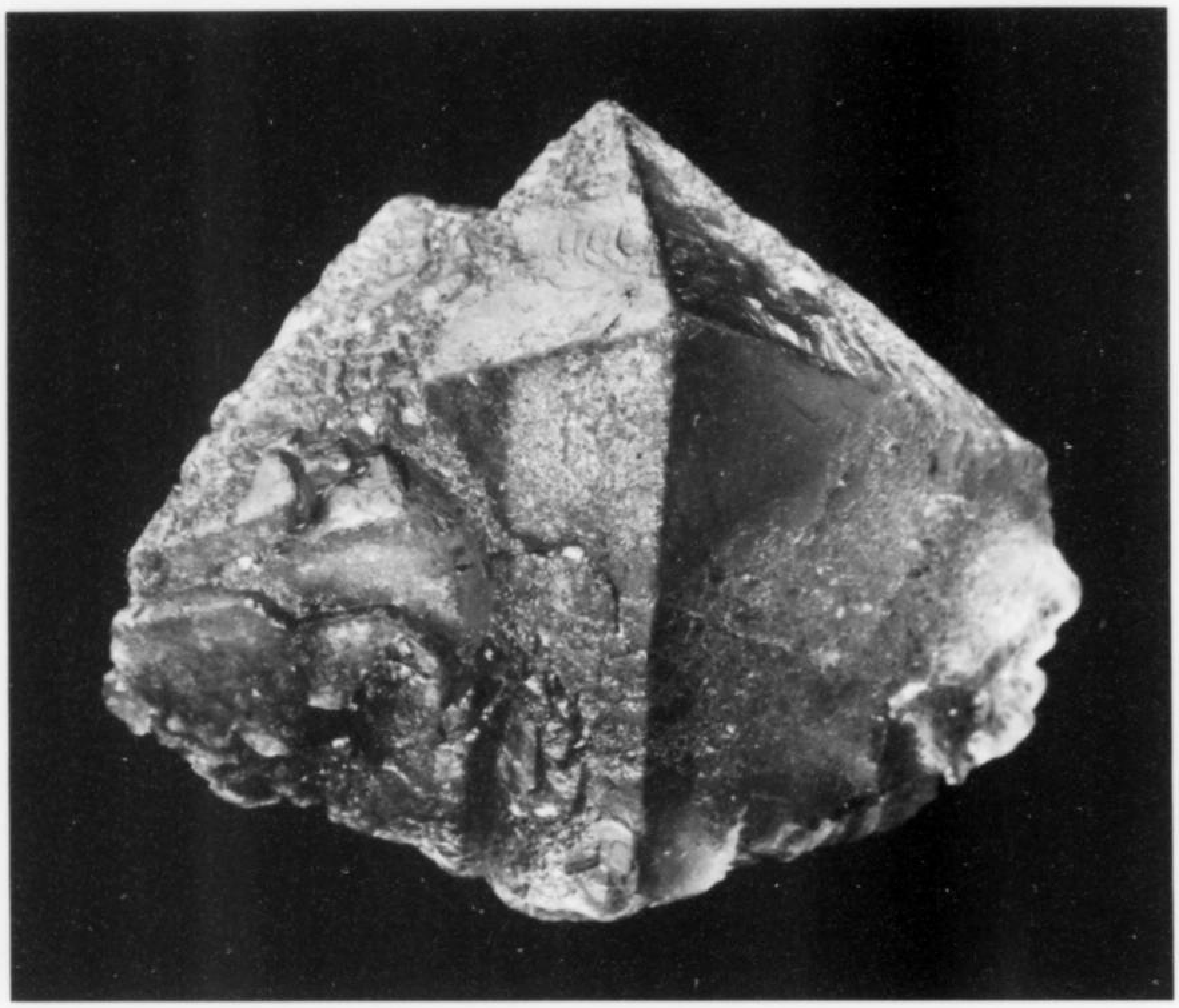


Figure 34. **Pink fluorite, 2.9 cm, from Schrammacher, Zamser Tal, Zillertal, Tirol, Austria. Kosnar family collection; Joe Budd photo.**

wholly unremarkable octahedrons measuring no more than 7 mm on edge (Kohout, 1997).

About 35 km farther east, the **Rauristal** runs about 25 km from the heights of the Grossglockner Pass to meet the Salzach at the village of Taxenbach. Narrow clefts in the southwestern face of a mountain called **Hocharn**, fronting the upper Rauristal, produced fine fluorite crystals during the 1960s, including uncorroded and fresh-looking, lustrous rose-pink octahedrons to 6 cm; other clefts on the Hocharn have yielded sharp fluorite octahedrons which are pale green, dark purple, dark blue, and bicolored purple/rose-pink. The typically Alpine associations include crystals of quartz, white tabular calcite, apatite-(CaF) and bavenite (Stroh, 1985; Niedermayr, 1986, 2002).

Finally, clefts in gneiss along the very steep slopes of the **Gasteinertal**, at the eastern edge of the Hohe Tauern, are famous for good fluorite crystals, most of them octahedral but almost none of them pink, associated with small white stilbite crystals. Superb bicolored green-pink fluorite octahedrons to 6 cm were found during construction of the Theresienstollen (*stollen* = "tunnel") of the **Hohe Tauern electric power station, Böckstein**, Gasteinertal, during the 1950s (Niedermayr, 1986, 1990).

Italy

The only significant Italian source of octahedral pink fluorite outside the Mont Blanc massif is a small group of quarries which face a highway along the Val d'Ossola near the towns of **Beura and Villadossola**, Piedmont. Geologically this locality belongs to the Penninic belt of the Alps, in which the Swiss Binntal also lies. The quarries have operated for decades and are still active, though mineral collectors currently are forbidden access; most extant specimens date from the 1950s and 1960s, when numerous local enthusiasts were allowed to collect without restriction (Preite *et al*, 1997). The quarries, of which the most specimen-rich is probably **Cava Maddalena** ("cava" = "quarry"), exploit a tough but cavity-rich granite gneiss for building stone, and the cavities yield a generally "Alpine" mineral suite of about 50 species, mostly as microcrystals. Simple octahedral crystals of fluorite seldom exceed 1 cm on edge, but exceptionally they can reach 7 cm. Some of the fluorite crystals are of a "standard" pale pink but the color-palette also includes colorless, pale yellow, pale green, medium-green, color-zoned pink/green, and rose-red; the most common associated species are quartz, adularian orthoclase, titanite and laumontite (Gramaccioli, 1975; Preite *et al*., 1997). Some exquisite specimens show sharp, complete fluorite octahedrons impaled by black, sleek, needle-like crystals of schorl (Gramaccioli, 1975).

Mont Blanc area: Switzerland and Italy

In its southwestern corner, south of the town of Martigny-Ville, Switzerland shares the high mountains of the Mont Blanc massif with Italy and France. Also, about 20 km north of the northern edge of Swiss Mont Blanc, the northeastern (and higher) part of the **Aiguilles Rouges massif** falls within the country's borders (the southwestern part lies in France, across the Valle de Chamonix from Mont Blanc). The Aiguilles Rouges massif is composed essentially of granitic rocks like those of Mont Blanc, but it is not as strongly metamorphosed and is poorer in mineralized clefts (Arlt, 2004); on the other hand, cleft-hunting is easier, as the modest elevation has kept Aiguilles Rouges largely unglaciated. Hiking is good and the views are splendid: the massif's name (*Aiguilles Rouges* = "red needles") was inspired by the way morning light shows roseate red on the granite spires near the peaks. In 1974, attractive specimens showing pink octahedral fluorite crystals to 1 cm associated with quartz, albite, epidote and galena were found in a cleft in granite at **Miéville**, north of Vernayaz, in the Swiss part of Aiguilles Rouges (Stalder *et al*., 1998).

A few fine octahedral pink fluorite specimens, most of them with smoky quartz crystals, have come from sites in the Swiss sector of the Mont Blanc massif. (Collectors should take care not to confuse

Figure 35. **Pink fluorite crystals to 1.5 cm, on granite gneiss, from Beura, Verbania, Italy. Lino Caserini collection collection; Roberto Appiani photo.**

Figure 36. **Pink fluorite, 4.8 cm, from Cava Maddalena, Beura, Val d'Ossola, Piemonte, Italy. Kosnar family collection; Joe Budd photo.**

these with the more common specimens from French Mont Blanc and from the Aare and Gotthard regions.) Swiss Mont Blanc fluorite specimens, with octahedral crystals to 3 cm on edge, have come from exposed clefts around the **Glacier du Trient** (whose western edge is just meters away from France); other good finds have occurred near **Glacier d'Orny**, the mountain peak called **Catogne**, and the eastern side of the mountain called **Tour Noir**, which straddles the Swiss-French border (Stalder *et al*., 1998; Meisser, 1999). Also numbered among remarkable Swiss Mont Blanc fluorite specimens are one showing a rich pink 10-cm octahedron, found in 1997 on **Glacier des Grands**, and a magnificent 4.2 × 5.8-cm piece with transparent deep pink fluorite octahedrons resting on a quartz crystal, from **Pilier** (Meisser, 1999).

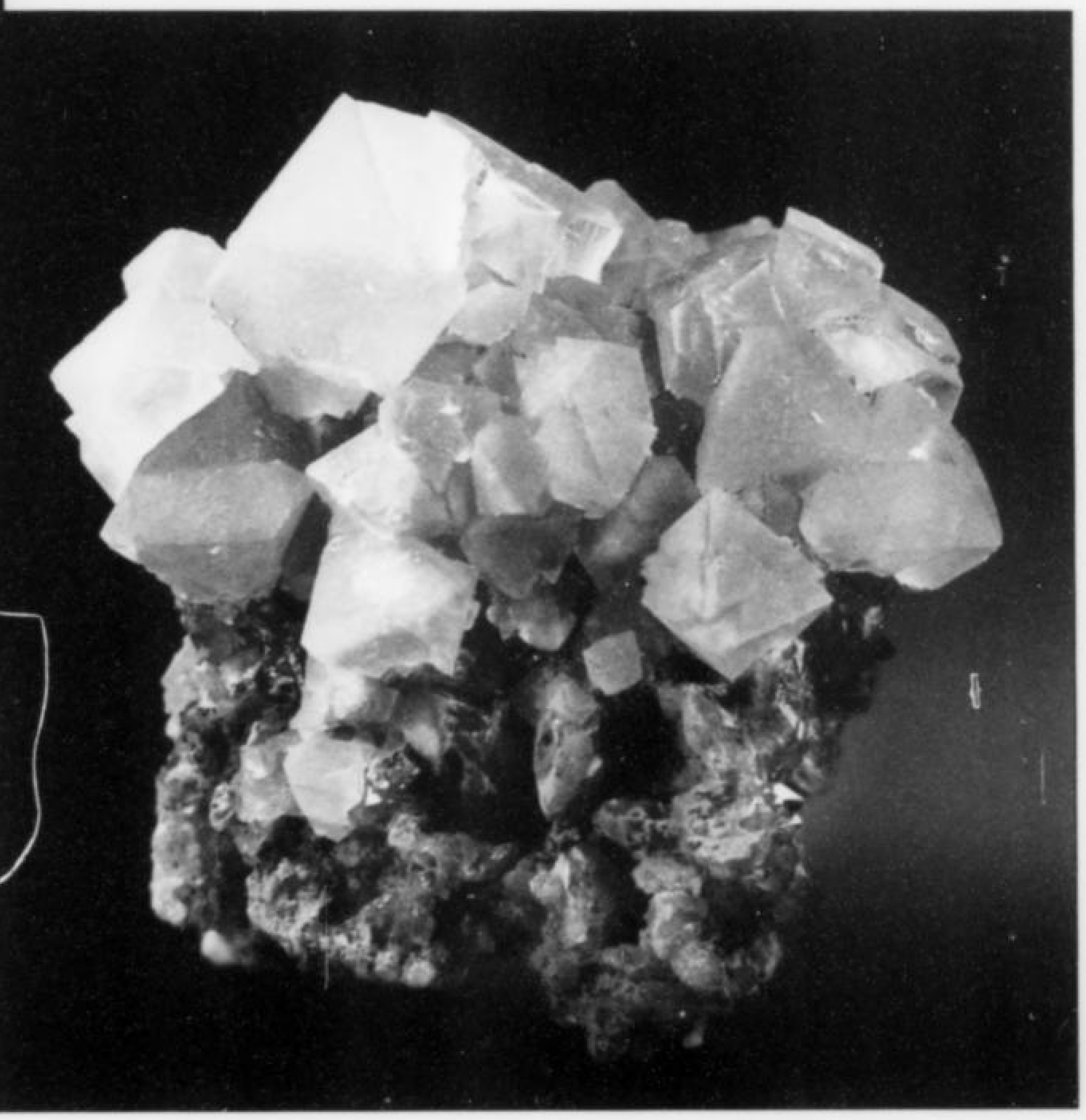


Figure 37. **Pink fluorite on chlorite-including quartz, 6 cm, from Le Catogne, Sembrancher, Mont Blanc massif, Wallis, Switzerland. Roger May specimen; Thomas Schüpbach photo.**

Italy's Aosta Province owns a small southeastern sliver of the Mont Blanc (Monte Bianco) massif, and pink fluorite specimens are occasionally found in clefts around the **Miage glacier**, on the southern end of Mont Blanc, and the **Triolet glacier**, just on the other side of the border from the Talèfre glacier in France. The area of the Triolet glacier occasionally produces pink octahedral fluorite crystals to 2 cm (Monistier, 2004). In general, finds on Italian Mont Blanc are isolated and sparse: color-zoned octahedrons, pale pink to strawberry-red, and crystals with the familiar pink cores and pale green outer zones, occur at scattered sites, and fluorite (and other) crystals are sometimes discovered in glacial moraine material which has tumbled down from the heights (Macchieraldo, 2005). A spectacular specimen from Italian Mont Blanc, with a perfect 2-cm pink fluorite octahedron on a lustrous, 10-cm, terminated, pale smoky quartz crystal, collected in 1986, was marketed at the 1990 Tucson Show (Robinson and King, 1990).

The Italian part of Mont Blanc is now a nature preserve, and strahlers are no longer permitted to dig for minerals there (Arlt, 2004).

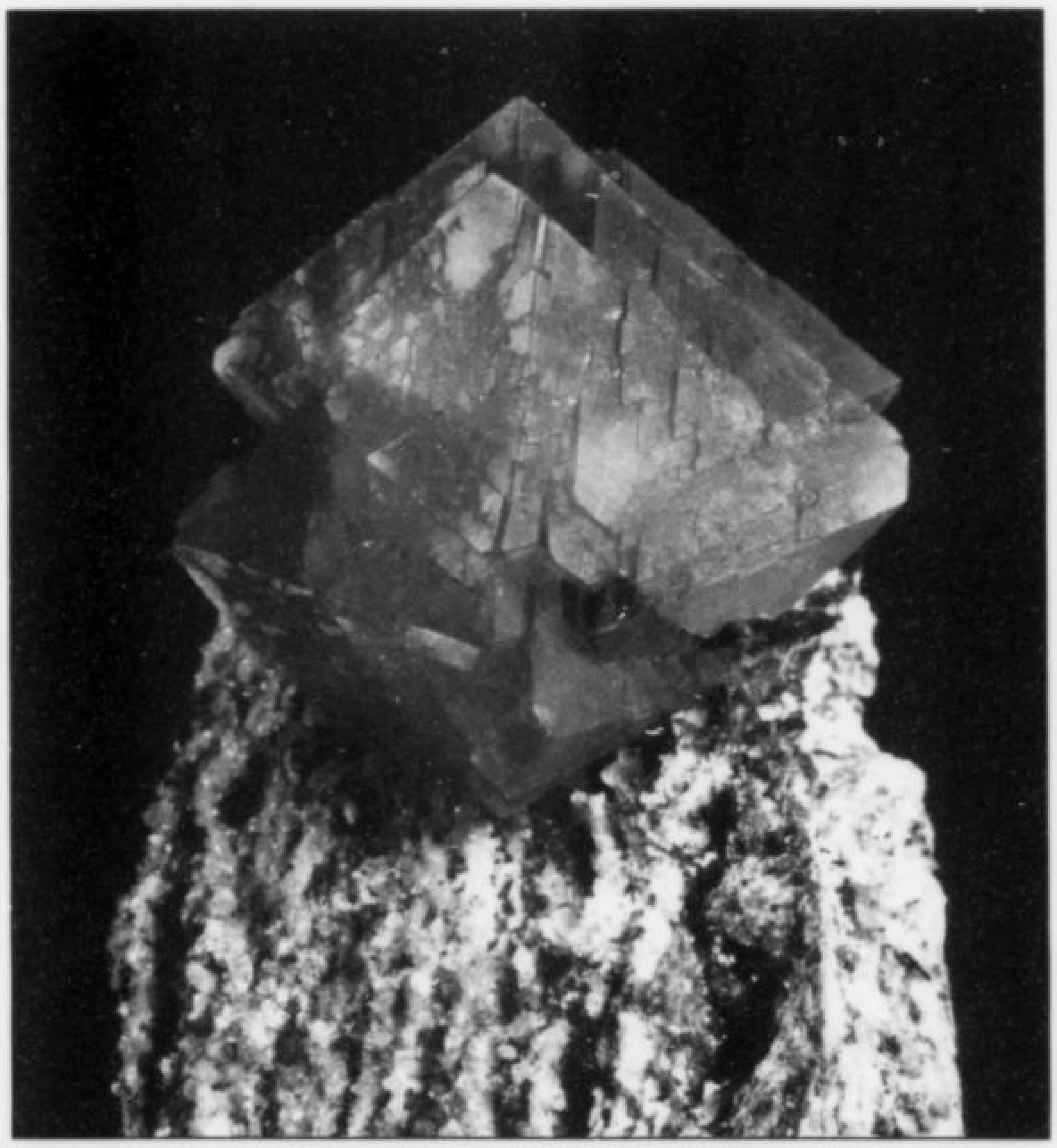


Figure 38. (right) **Pink fluorite crystal on granite, 8.7 cm, from Cava Falcioni, Beura, Val d'Ossola, Piemonte, Italy. William Larson collection, ex Marc Weill collection; Robert Weldon photo.**

Figure 39. **Pink fluorite with acicular bavenite and dark green clinochlore, 6 cm, from Cava Pianasca, Italy. Kosnar family collection; Joe Budd photo.**

Figure 40. **Hand-colored postcard photograph of Mont Blanc dating to the 1890s (Library of Congress).**

Figure 41. **Travel poster featuring Mont Blanc, by the French artist, Roger Broders (1883–1953), published by the Paris-Lyon-Mediteranée railway company in the 1920s.**

Mont Blanc area: France

Asselborn (1993) remarked that "Since 1950, very fine specimens showing small, pink octahedral fluorite crystals resting on smoky quartz crystals have been unearthed by Jean-Paul Charlet (1924–1984), the father of Jean-Franck Charlet, as well as by Roger Fournier (1939–1976), the widely known cristallier who did much to spearhead new searches for fluorite crystals around Chamonix." As recounted above, Georges Bettembourg and Daniel Audibert collected the great 18-cm crystal called "Georges" in 1975, and Roger Fournier, "always in rivalry with Georges Bettembourg" (Asselborn, 1993) made some of his last great finds at around the same time, i.e. before his own early death in 1976. Fournier opened a huge cleft which had been found on **Aiguille de Grand Montets** during construction work on a ski run. At the collecting site, called "Pierre à Bochard," he extracted specimens showing fluorite octahedrons of incomparable deep red color; the crystals are slightly corroded but they reach 10 cm on edge (Asselborn, 1993). In 1968, in a cleft called "Amédé" on the **Aiguilles de Chardonnet**, Fournier found a spectacular specimen with a parallel row of pink fluorite octahedrons resting aesthetically on a smoky quartz crystal cluster (Benz, 2004).

***Figure 42.* Major peaks and glaciers in the Mont Blanc massif, with noted areas for pink fluorite indicated in pink, particularly in the Argentière and the Talèfre basins.**

From the mid-1970s on, pink fluorite specimens from French Mont Blanc have been increasingly seen on the mineral market, the majority of them from rich collecting sites around the Argentière and Talèfre glaciers. These sites lie in granite exposures (many quite new, courtesy of glacial retreats) near **Aiguilles de Requin, Aiguilles de Pierre Joseph** and **Aiguilles Talèfre** (south of the Talèfre glacier); **Aiguilles Verte, Les Droites,** and **Les Courtes** (between the two glaciers); and **Mont Dolent, Pointe Kurz,** and **Le Tour Noir** (east of the Argentière glacier, almost on the Swiss border). Outlying finds have also been made elsewhere in the Mont Blanc massif and (as for "Georges") in the Aiguilles Rouges massif on the other side of the Chamonix Valley.

In 1977, two young Swiss strahlers took about a dozen fluorite/smoky quartz specimens from a cleft somewhere on the Mont Blanc massif, and these pieces, sporting dark pink octahedrons to 2 cm on dark brown quartz prisms, were offered (for very high prices) at European shows (Sullivan, 1978). At the 1983 Munich Show, Jean-Franck Charlet and René Ghilini offered specimens with highly lustrous pink fluorite octahedrons to 2.5 cm on edge, transparent and with sparkling internal reflections, resting on quartz crystals or on white granite (Wilson, 1984a); these had been taken from a cleft on the north face of **Les Droites** by Charlet and Ghilini, assisted by Georges Bettembourg, just before his death (Asselborn, 1993).

In 1985 the mountain guide Jean François Hagenmuller opened a cleft at **Pointe Kurz** which yielded beautiful specimens showing cuboctahedral fluorite crystals with pink cores and violet outer zones (Asselborn, 1993). In the late summer of 1987, somewhere in the massif, a cleft produced about 10 specimens with pink fluorite octahedrons to 5 cm on smoky quartz crystals, and a neighboring cleft produced about 30 specimens showing fluorite crystals to 1 cm,

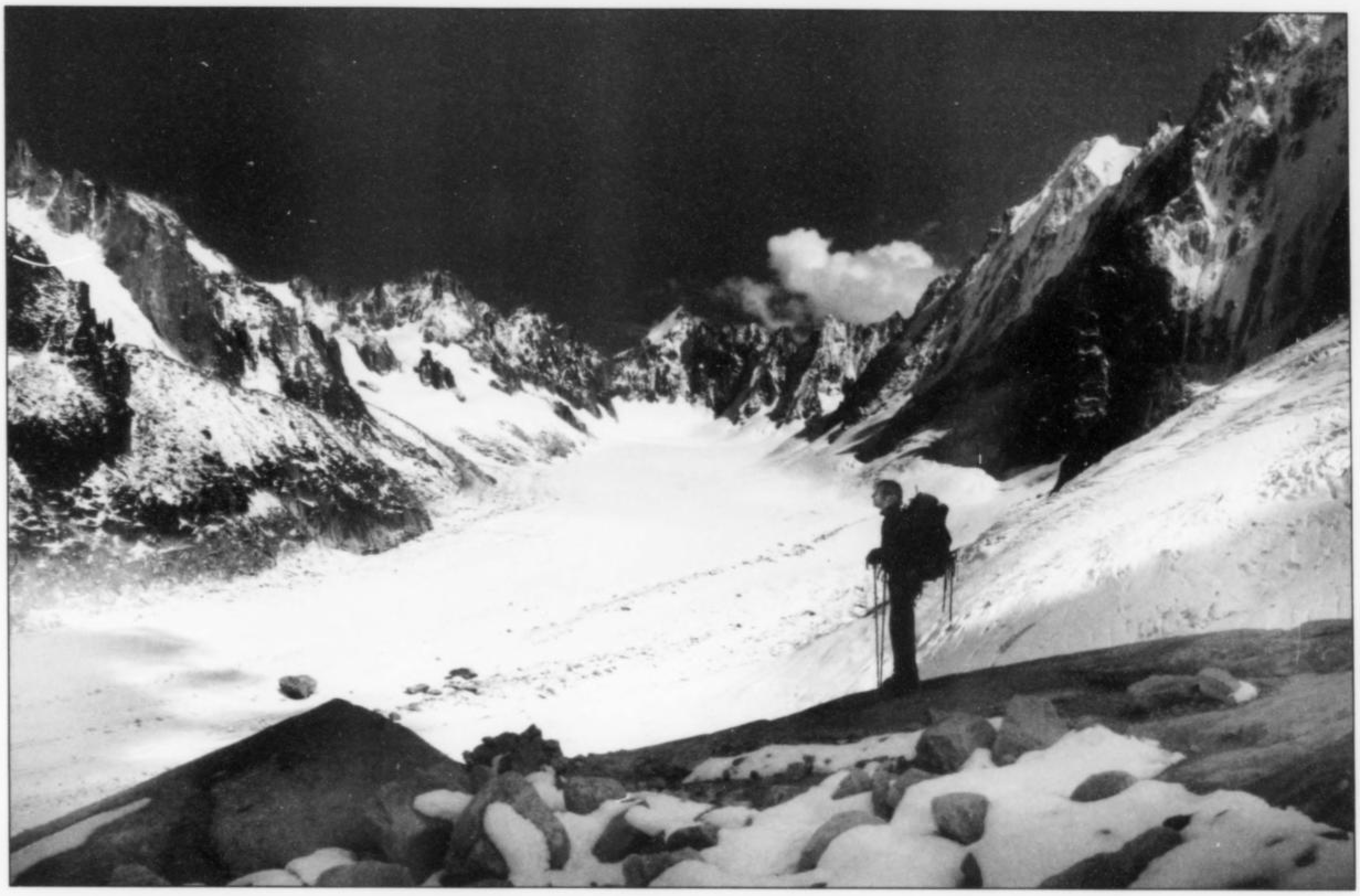


Figure 43. **The Argentière glacier, Mont Blanc massif, near Chamonix, France. Thomas Schüpbach photo.**

Figure 44. **The Talèfre glacier, Mont Blanc massif, near Chamonix, France. Thomas Schüpbach photo.**

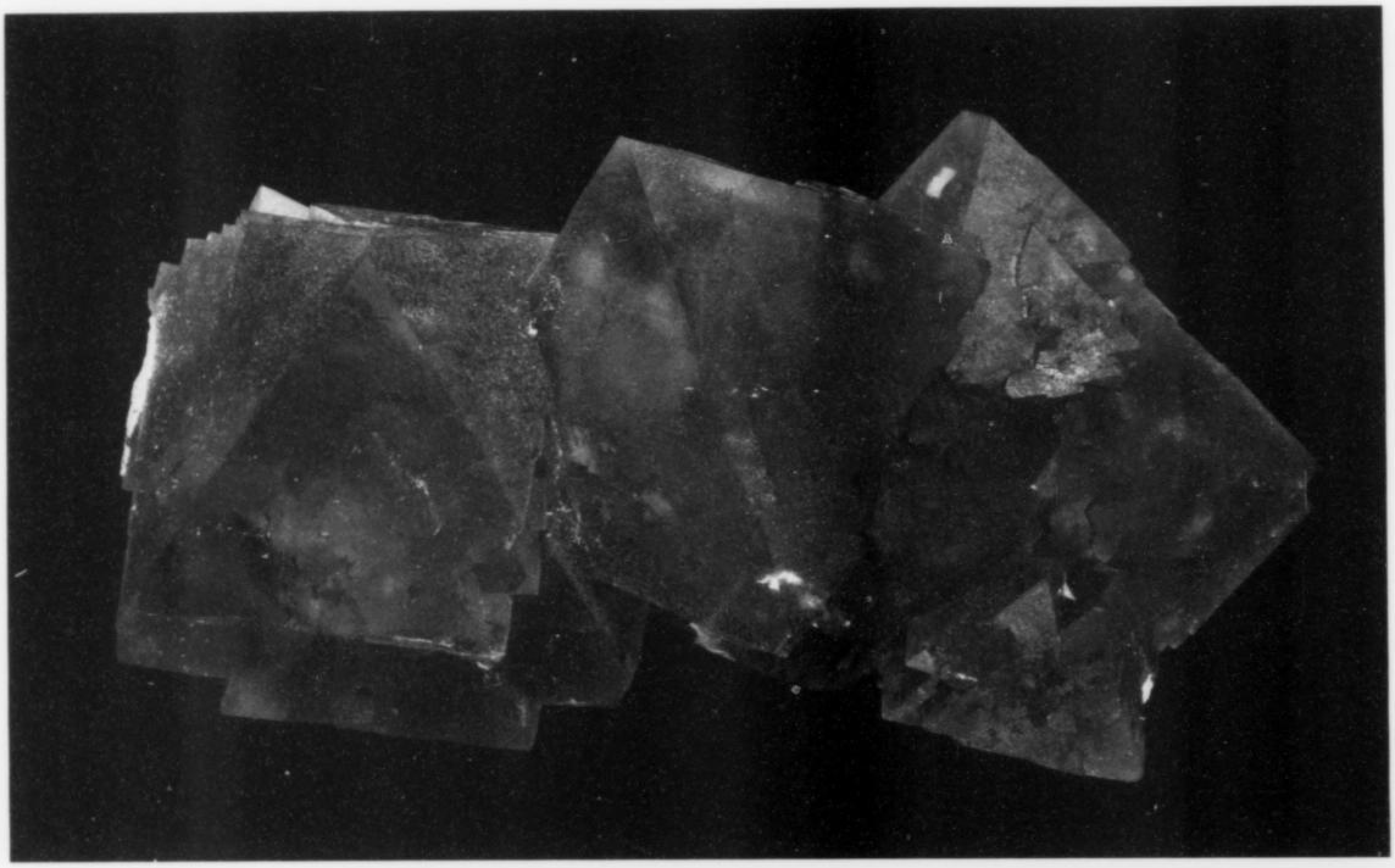


Figure 45. **Dark pink fluorite crystal cluster, 9.4 cm, from northeast of the Talèfre glacier, Aiguille Verte area, Mont Blanc massif near Chamonix, France. Fédéric Éva collection; L. D. Bayle photo.**

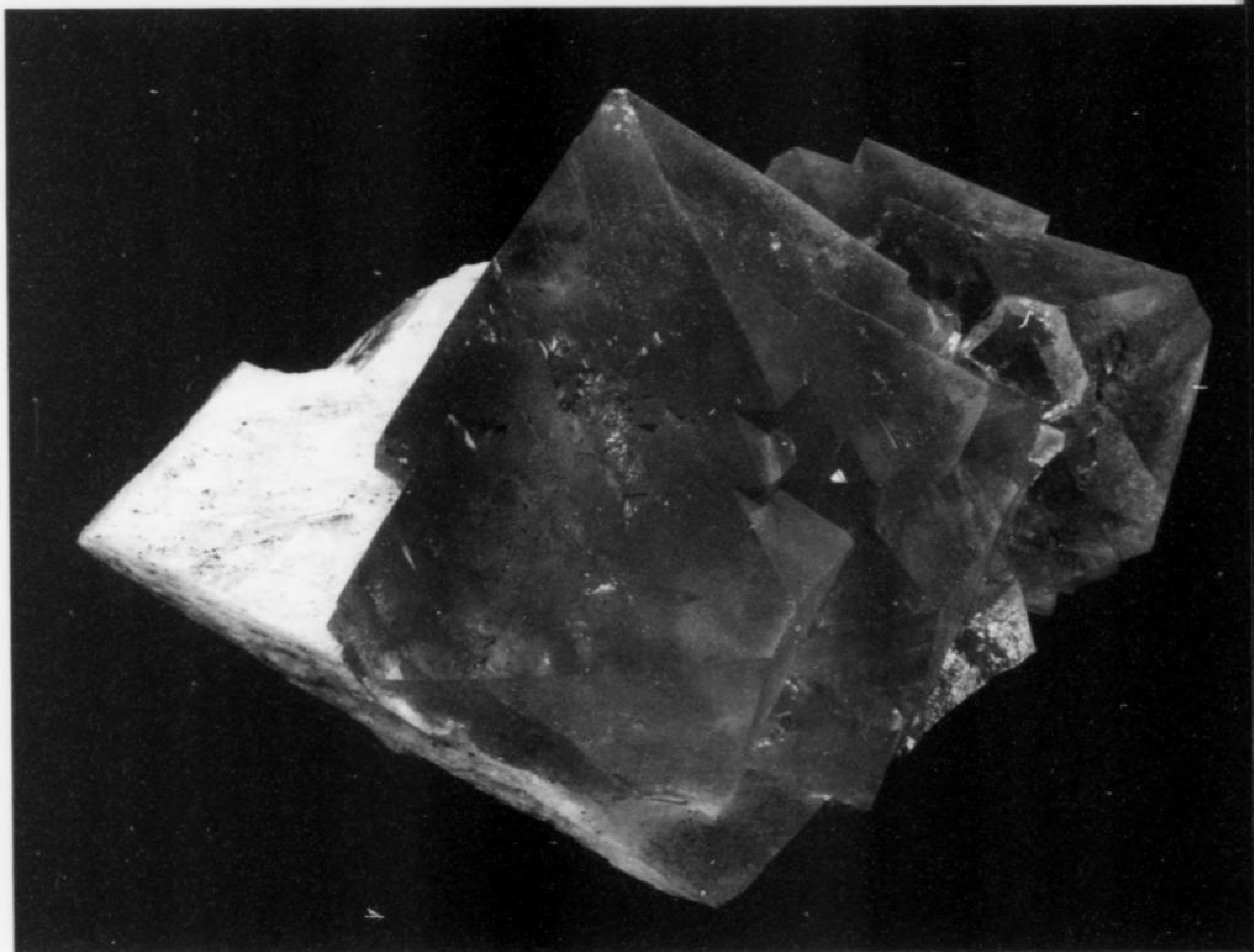


Figure 46. **Dark pink fluorite crystals on calcite crystal, 7 cm, from northeast of the Talèfre glacier, Aiguille Verte area, Mont Blanc massif near Chamonix, France. Fédéric Éva collection; L. D. Bayle photo.**

in cube-octahedron-dodecahedron combinations which are color-zoned in pink and blue/purple. Both specimen lots were marketed at the 1987 Denver Show (Wilson, 1988).

The summer of 1989 was balmy in Europe, creating especially favorable collecting conditions for cristalliers (and strahlers). In this banner year, three very large and very great fluorite-on-quartz specimens were collected by two cristalliers whose names have come up more than once in this article, Jean-Franck Charlet and René Ghilini. After a great deal of work they managed to extract the specimens from an ice-filled pocket on **Les Droites** at an elevation of 3600 meters. On these magnificent pieces, very sharp, entirely gemmy, deep rose-red fluorite octahedrons to 2.9 cm are thickly

Figure 47. **Dark pink fluorite crystal cluster with quartz, 7 cm, from northeast of the Talèfre glacier, Aiguille Verte area, Mont Blanc massif near Chamonix, France. Pierre Bavuz collection; L. D. Bayle photo.**

Figure 48. **Dark pink fluorite crystals on calcite crystal, 6.8 cm, from northeast of the Talèfre glacier, Aiguille Verte area, Mont Blanc massif near Chamonix, France. Fédéric Éva collection; L. D. Bayle photo.**

strewn over the faces of smoky quartz crystals to 18 cm long; that these may be "the greatest fluorite specimens in the world" is by now a well-aired proposition. One of the specimens is pictured in Cook (1998); another appears on the cover of vol. 23 no. 3 of the *Mineralogical Record* (May–June 1992), at which time the specimen was in the F. John Barlow collection. The latter specimen is also shown in Wilson *et al.* (2004), by which time it had reached the Houston Museum of Natural Science, where it reposes today. Also in 1989, about 25 lesser but nonetheless excellent fluorite specimens emerged from an unspecified site on the Mont Blanc massif and were marketed at the 1989 Munich Show. In these thumbnails and miniatures the fluorite crystals rest not on smoky quartz crystals

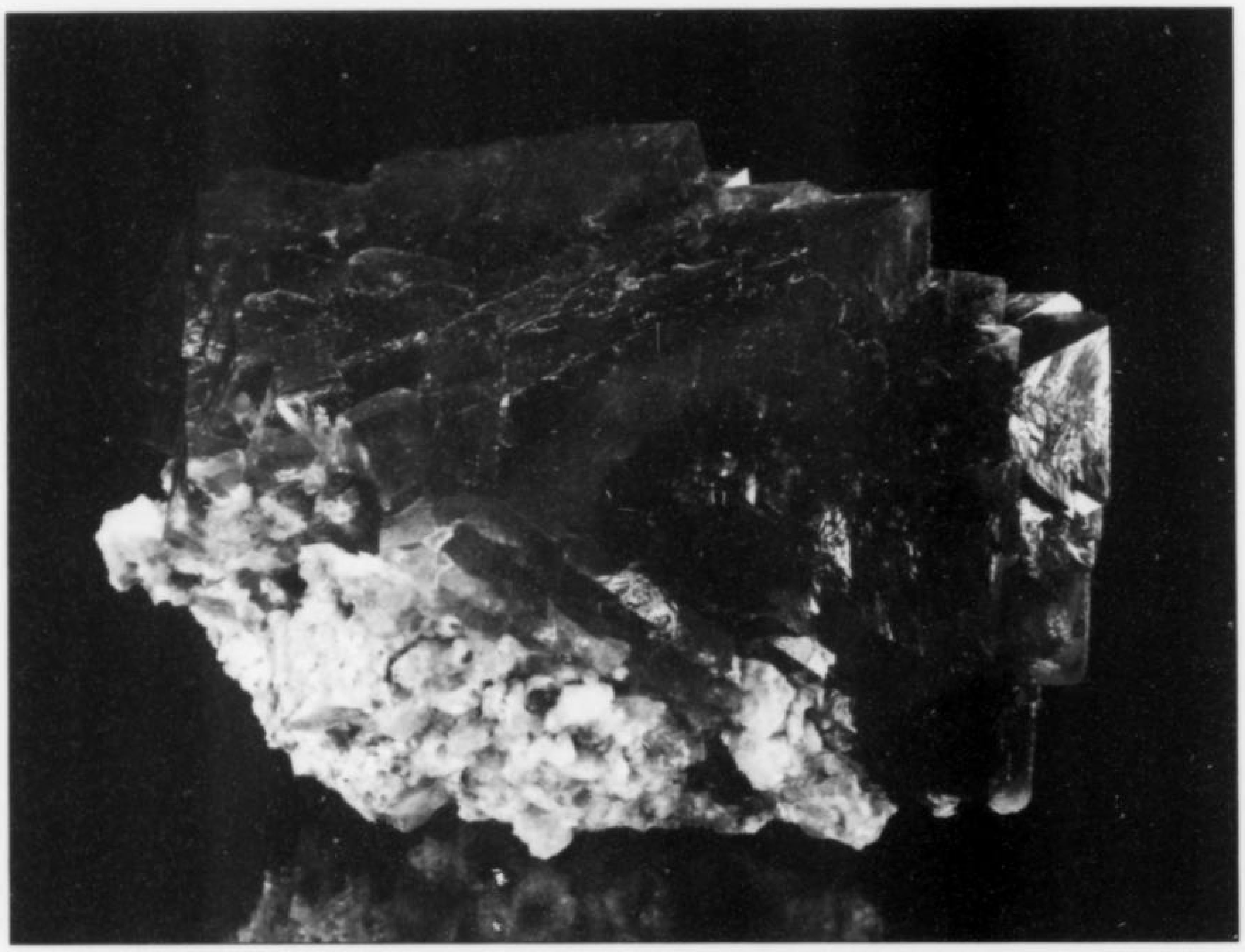


Figure 49. **Dark pink fluorite crystals on granite, 8.5 cm, from La Capucin, Mont Blanc massif near Chamonix, France. Eric Asselborn collection; L. D. Bayle photo.**

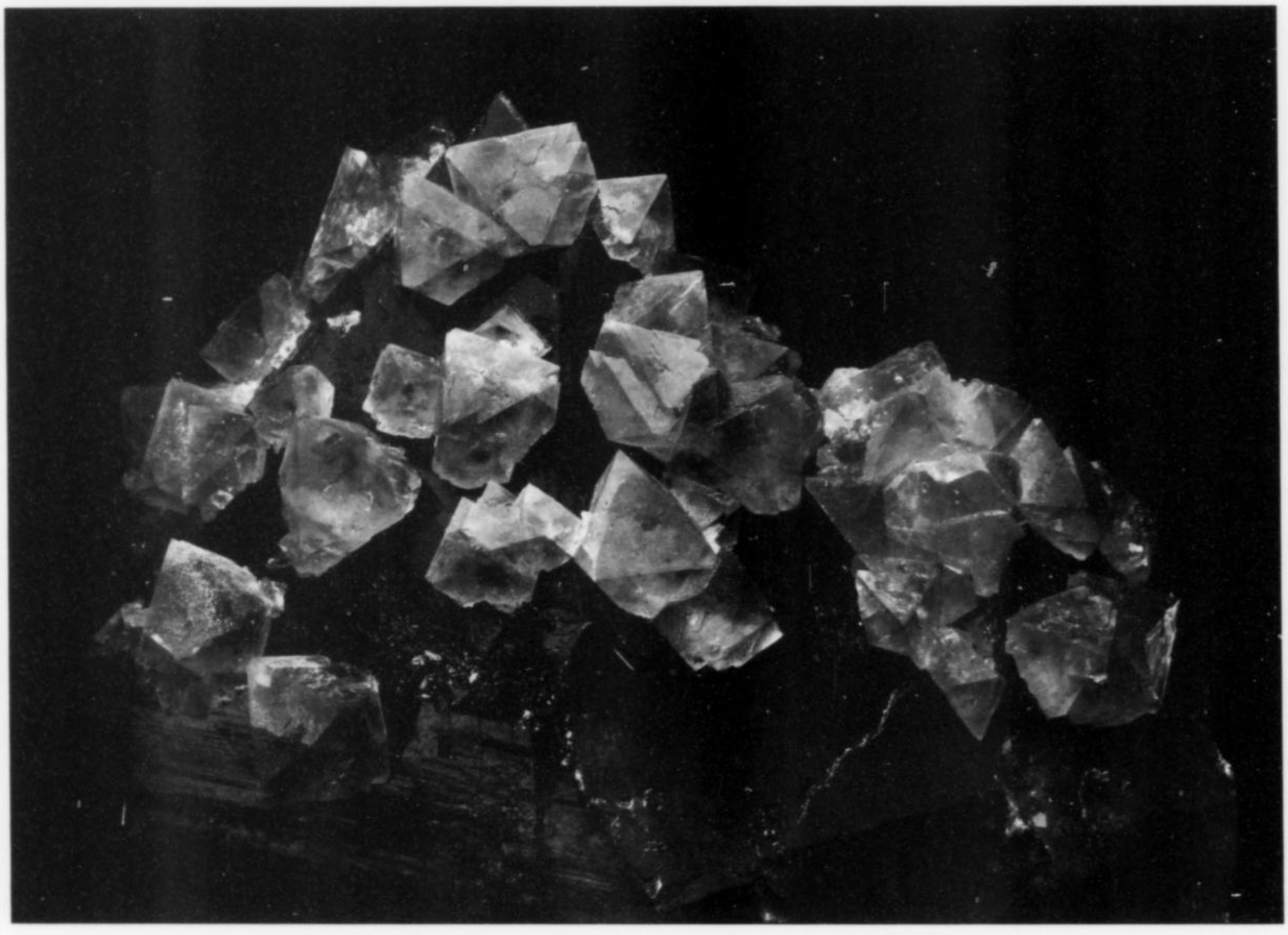


Figure 50. **Pink fluorite on a large smoky quartz crystal, 22.3 cm wide, from the Mont Blanc massif near Chamonix, France. It is one of three such specimens found in an ice-filled cleft ca. 1989. Karl Kempf collection; Jeff Scovil photo.**

Figure 51. **Fluorite (heavily included by chlorite) with quartz and feldspar, 11 cm, from the Mont Blanc massif near Chamonix, France. Serge Lagarde collection; L. D. Bayle photo.**

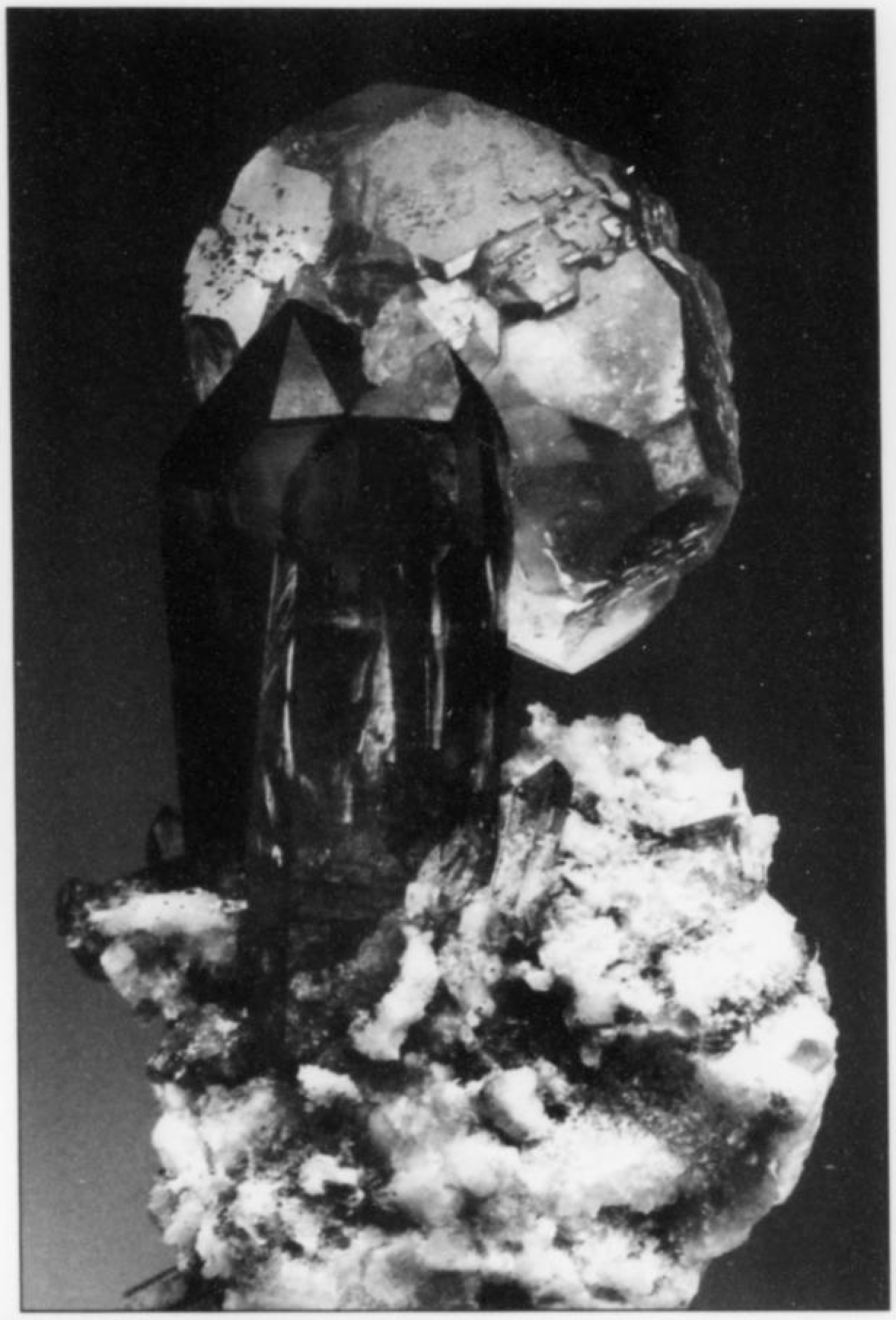


Figure 52. **Cubo-dodecahedral pink and purple fluorite with smoky quartz on feldspar, 10.7 cm, from Glacier des Grands, Mont Blanc massif near Tricut, Valais, Switzerland. Eric Asselborn collection; Jeff Scovil photo.**

Figure 53. **Pink fluorite on quartz, 5.8 cm, from the north face of Aiguille Verte, Argentière basin, Mont Blanc massif near Chamonix, France. Francis Benjamin collection; L. D. Bayle photo.**

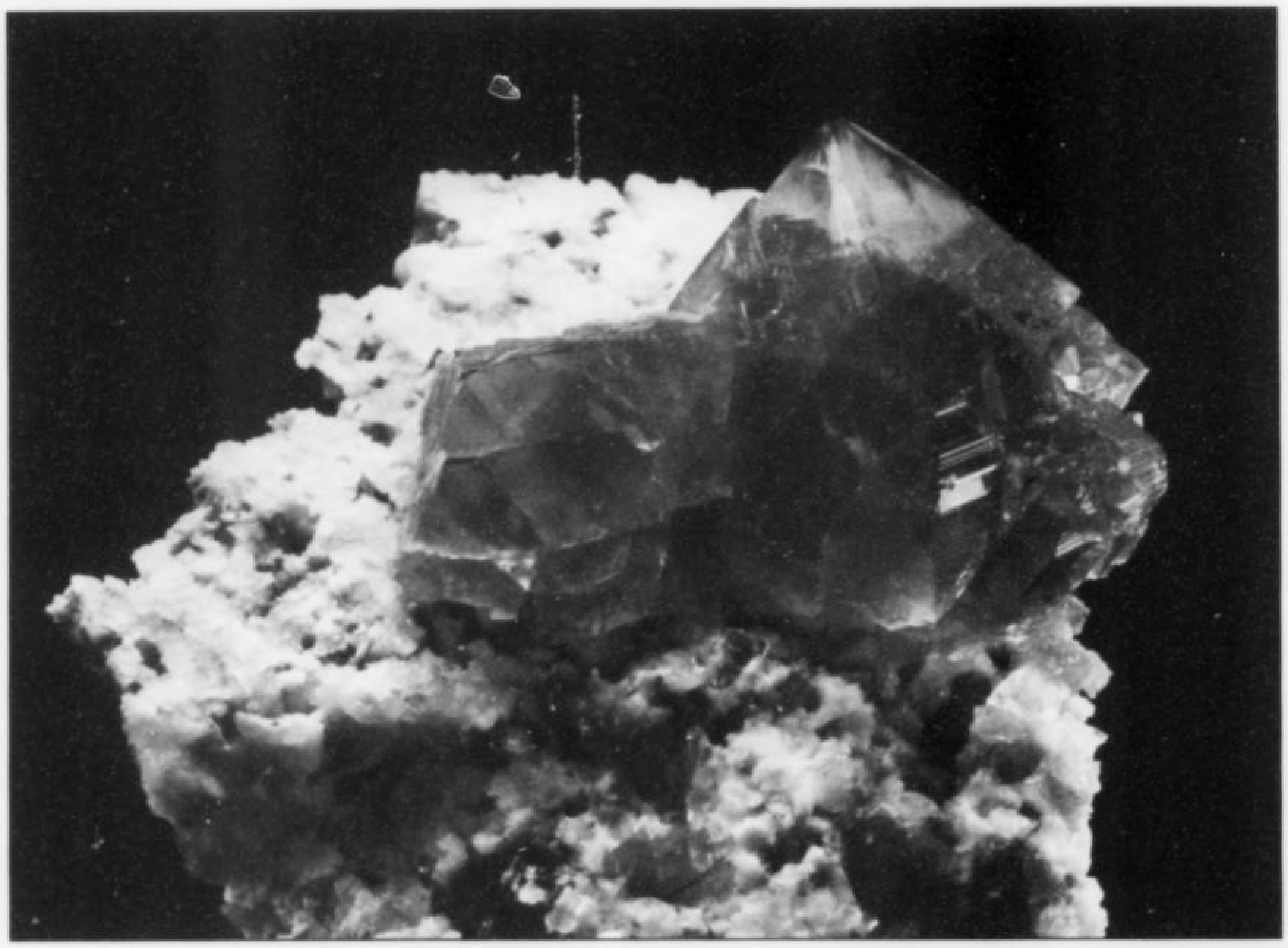


Figure 54. **Pink fluorite on granite, 5.2 cm, from Pointe Kurz, Argentière basin, Mont Blanc massif near Chamonix, France. Francis Benjamin collection; L. D. Bayle photo.**

Figure 55. **Pink fluorite with smoky quartz on granite, 3.7 cm, from the Argentière basin, Mont Blanc massif near Chamonix, France. Francis Benjamin collection; L. D. Bayle photo.**

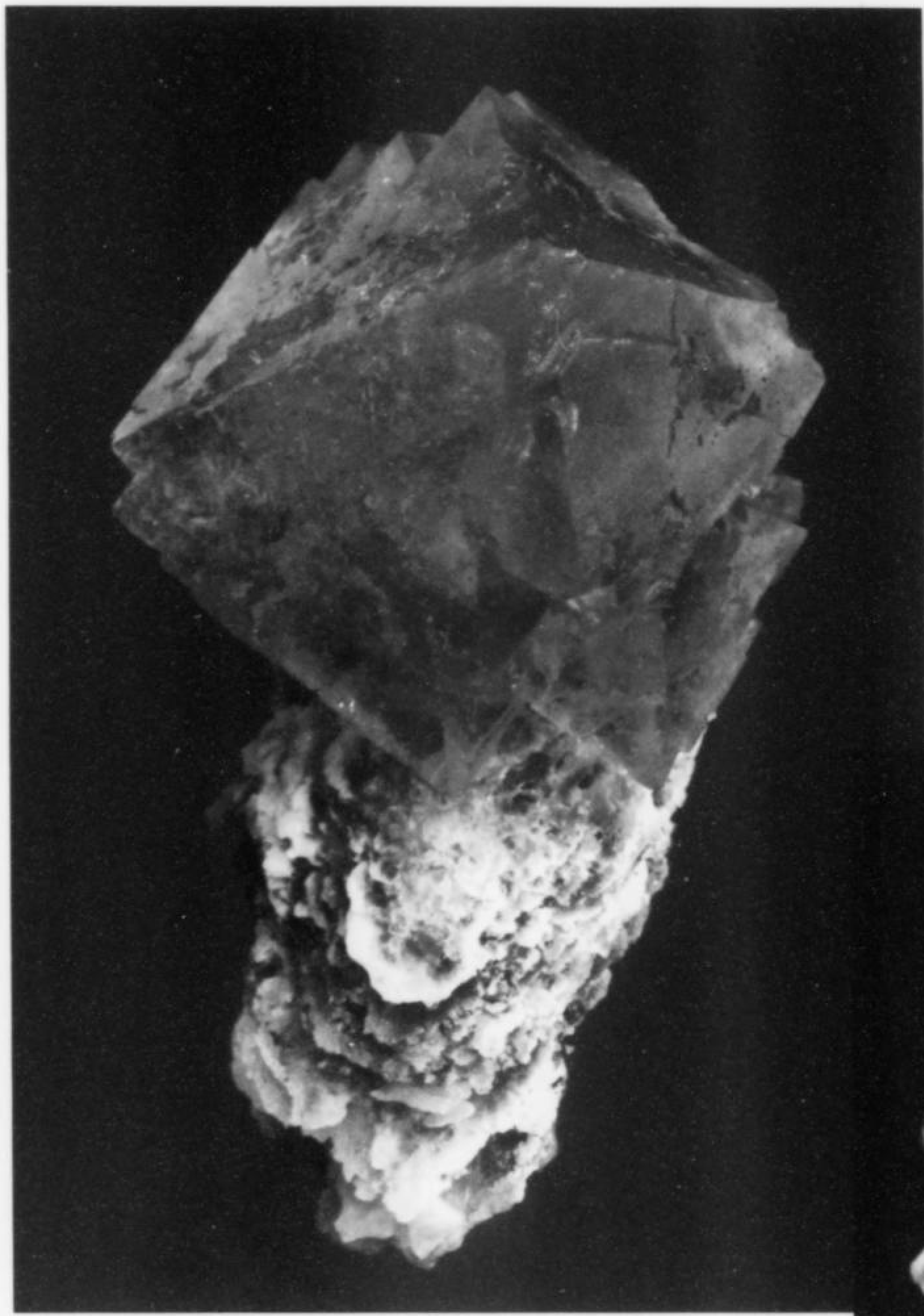
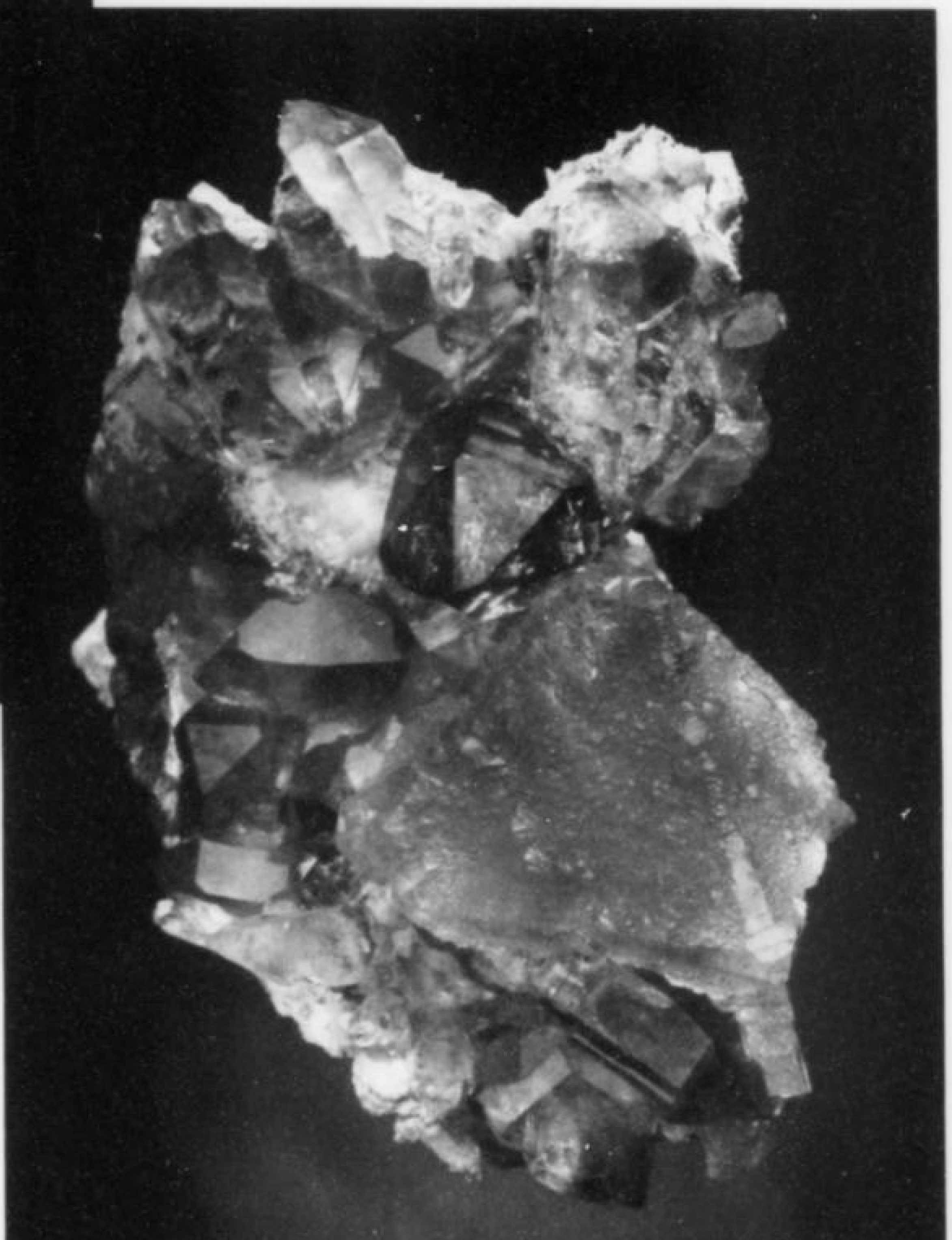


Figure 56. **Pink fluorite on calcite, 6 cm, from the Argentière basin, Mont Blanc massif near Chamonix, France. Wally Mann collection; Jeff Scovil photo.**

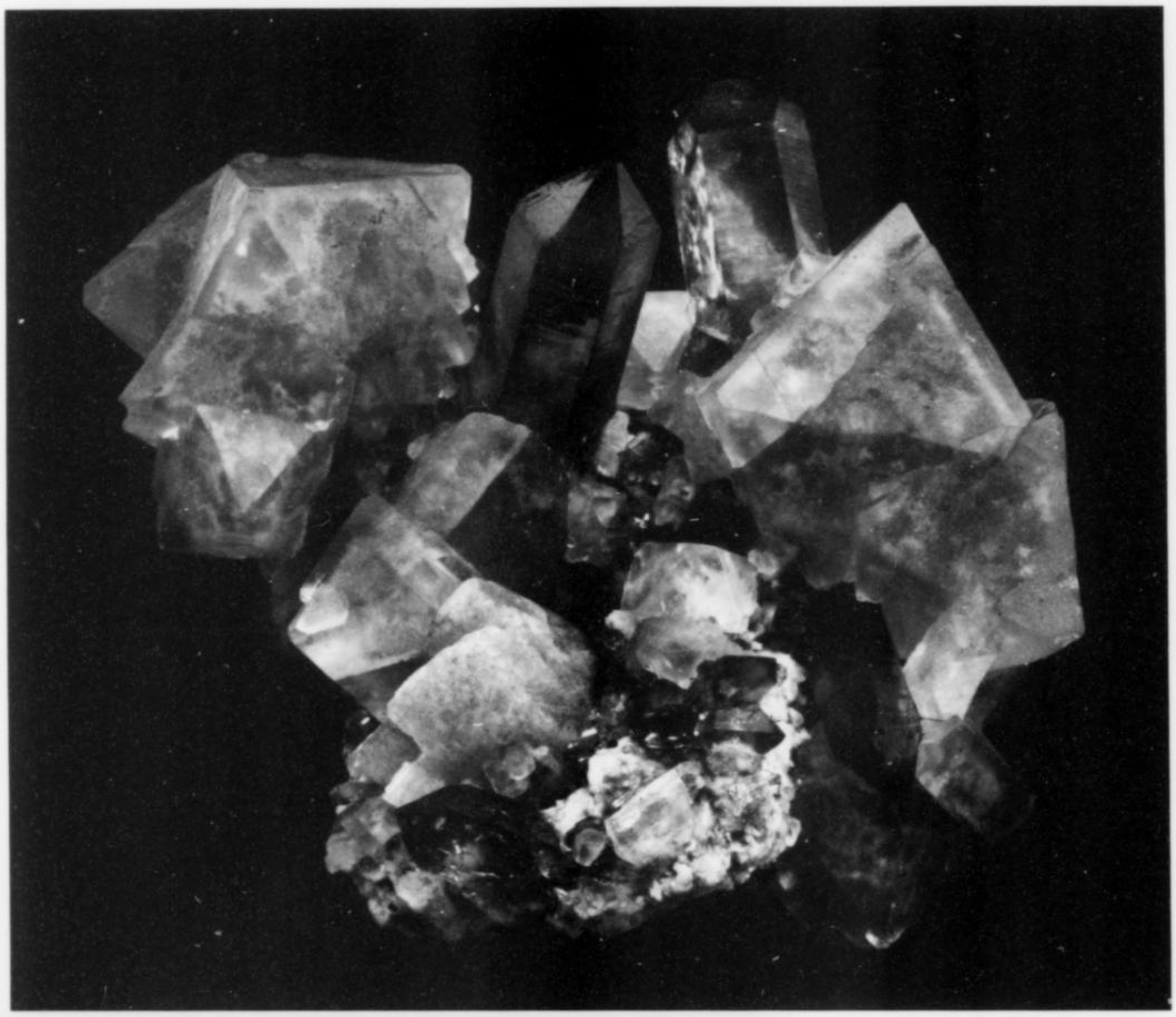
Figure 57. **Pink fluorite with smoky quartz, 8 cm, from the North Face of Les Droites, Argentière basin, Mont Blanc massif near Chamonix, France. Eric Asselborn collection; Jeff Scovil photo.**



but on white granite, and they are a paler pink than in the "great" specimens from Les Droites, but they are transparent and lustrous and sparkle brightly, resembling typical specimens from central Switzerland (see photo in Moore, 1989).

The French Mont Blanc bounty continued through the 1990s, and continues still as the new millennium opens. In the summer of 1995 a cleft yielded matrix specimens to 8 × 10 cm, with gemmy, very dark pink fluorite octahedrons to 2 cm perched on white weathered granite, with gemmy crystals of smoky quartz to 5 cm long (Moore, 1996). In August 1997, at **Tour Noir**, a cleft produced about 25 exceptional specimens, with deep rose-pink octahedrons to 2.5 cm on edge in loose groups, on granite matrix, or adorning groups of gemmy smoky quartz prisms to 6 cm long (Moore, 1998). In the summers of 2003 and 2004, at **Pointe Kurz**, about 30 fine specimens were collected, showing lustrous, transparent, dark rose-pink octahedral crystals to 2.5 cm, some with thin, faintly purple zones around the outside, associated with very thin hexagonal plates of white calcite in little stacks, some of the calcite crystals reaching 5 cm across (Moore, 2005a). In 2005 Jean-Franck Charlet, rappelling from a vertical cliff-face, broke into a cleft 30 cm tall and 3 meters wide, removing hundreds of specimens showing slightly corroded and frosty octahedral pink fluorite crystals to 4 cm; at the 2005 Munich Show, enough specimens from this find were offered to cover two large tables (Wilson, 2006). And in August 2006, Christophe Peray collected a single extraordinary, undamaged, 18-cm floater specimen showing 12 sharp, glowing rose-red fluorite octahedrons, reaching 6 cm, lightly attached to each other in a group which itself is lightly attached to a stout crystal of smoky quartz—Peray named the piece "Laurent" in memory of Laurent Chatel, his best friend, who had fallen to his death on the Argentière glacier a year earlier (Arlt, 2006). The cover of the November 2006 issue of *Schweizer Strahler* shows Peray using both hands to hold this stunning specimen out into sunlight.

Late in 2007 came what Eric Asselborn (personal communication, 2009) terms "the biggest discovery of all time in quality pink



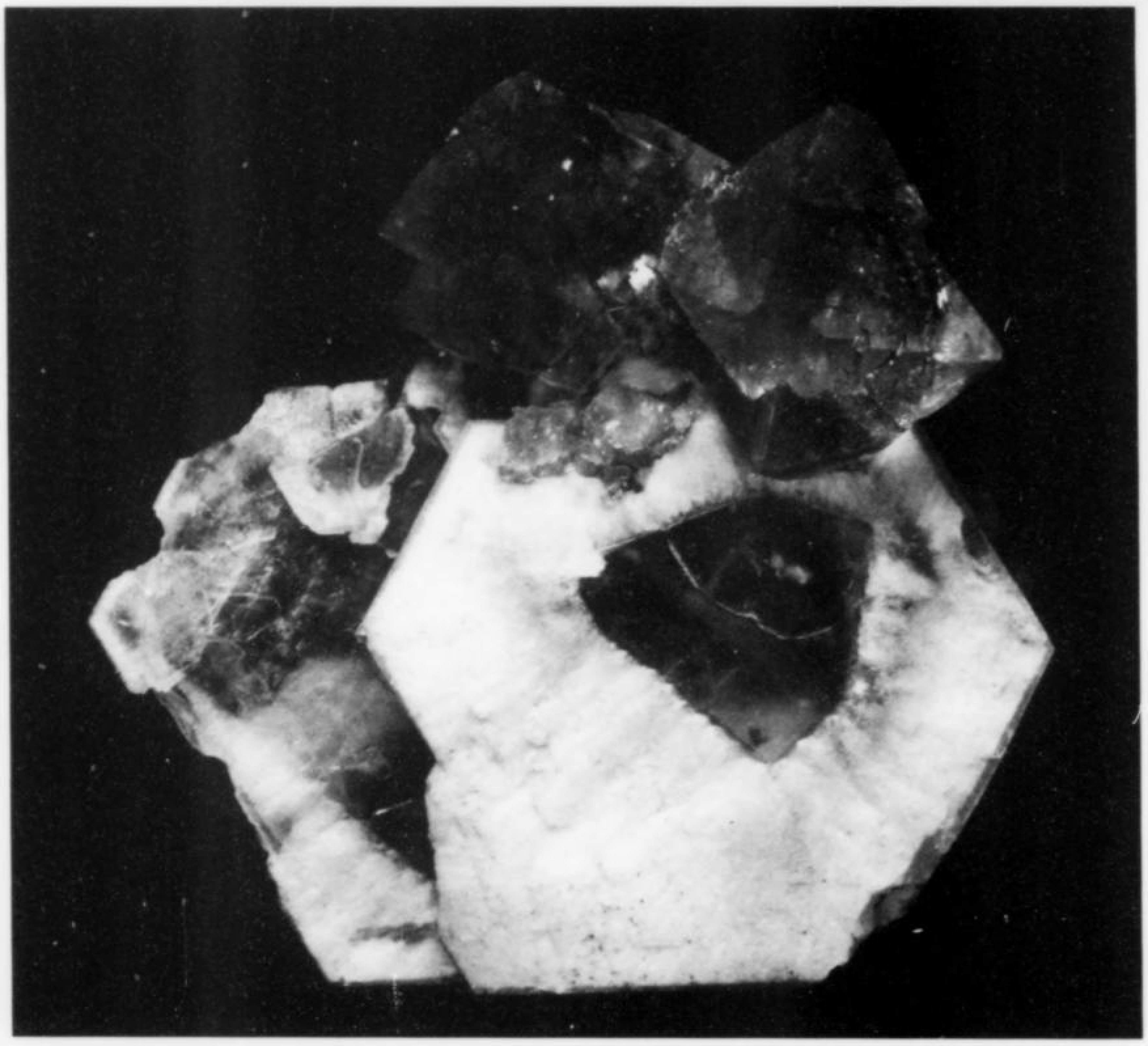


Figure 58. **Pink fluorite with smoky quartz and feldspar, 6.8 cm, from Pointe Kurz, Mont Blanc massif near Chamonix, France. Steve Smale collection; Jeff Scovil photo.**

Figure 59. **Pink fluorite on calcite, 5 cm, from Pointe Kurz, Mont Blanc massif near Chamonix, France. Pierre Bavuz collection; L. D. Bayle photo.**

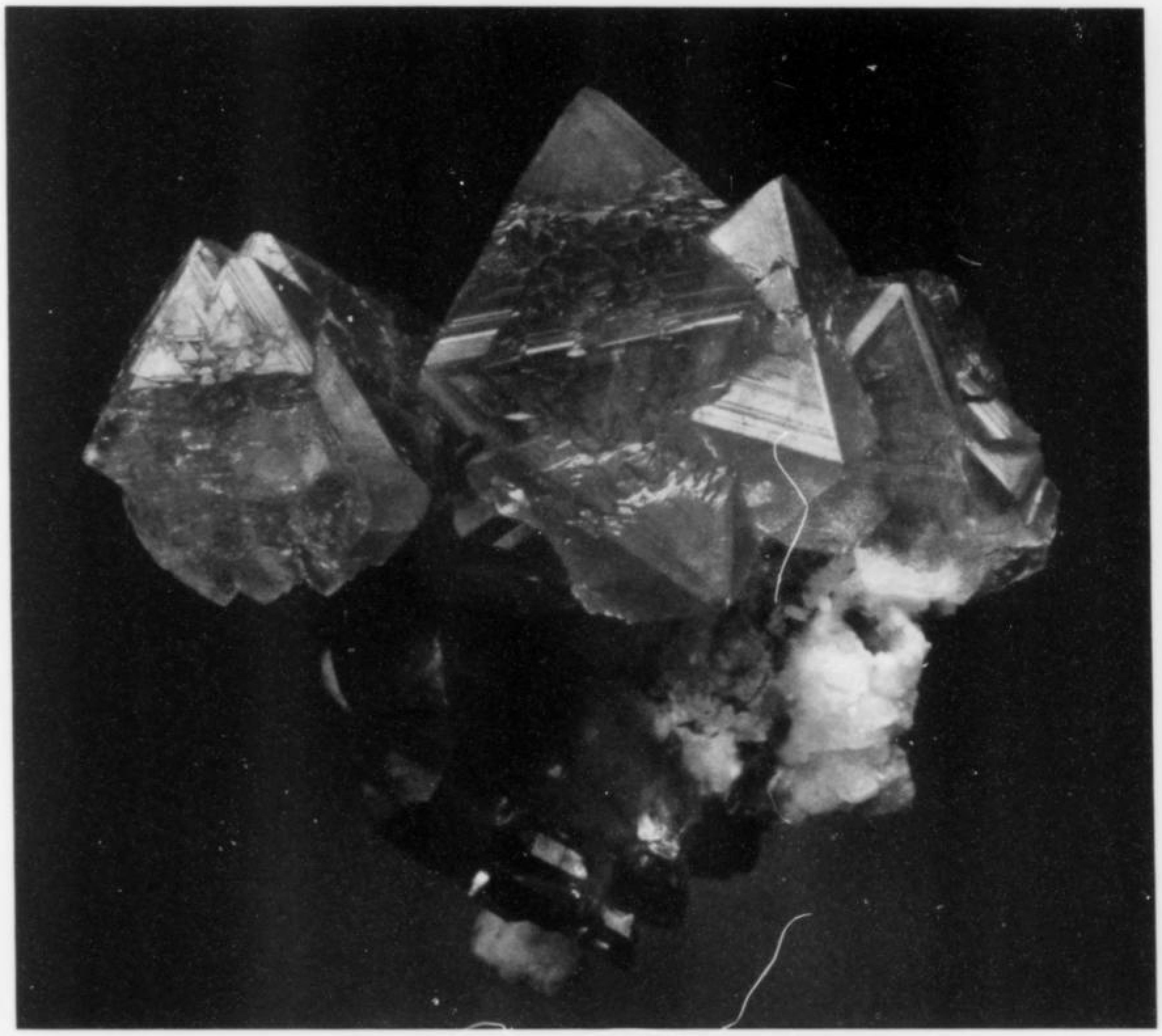
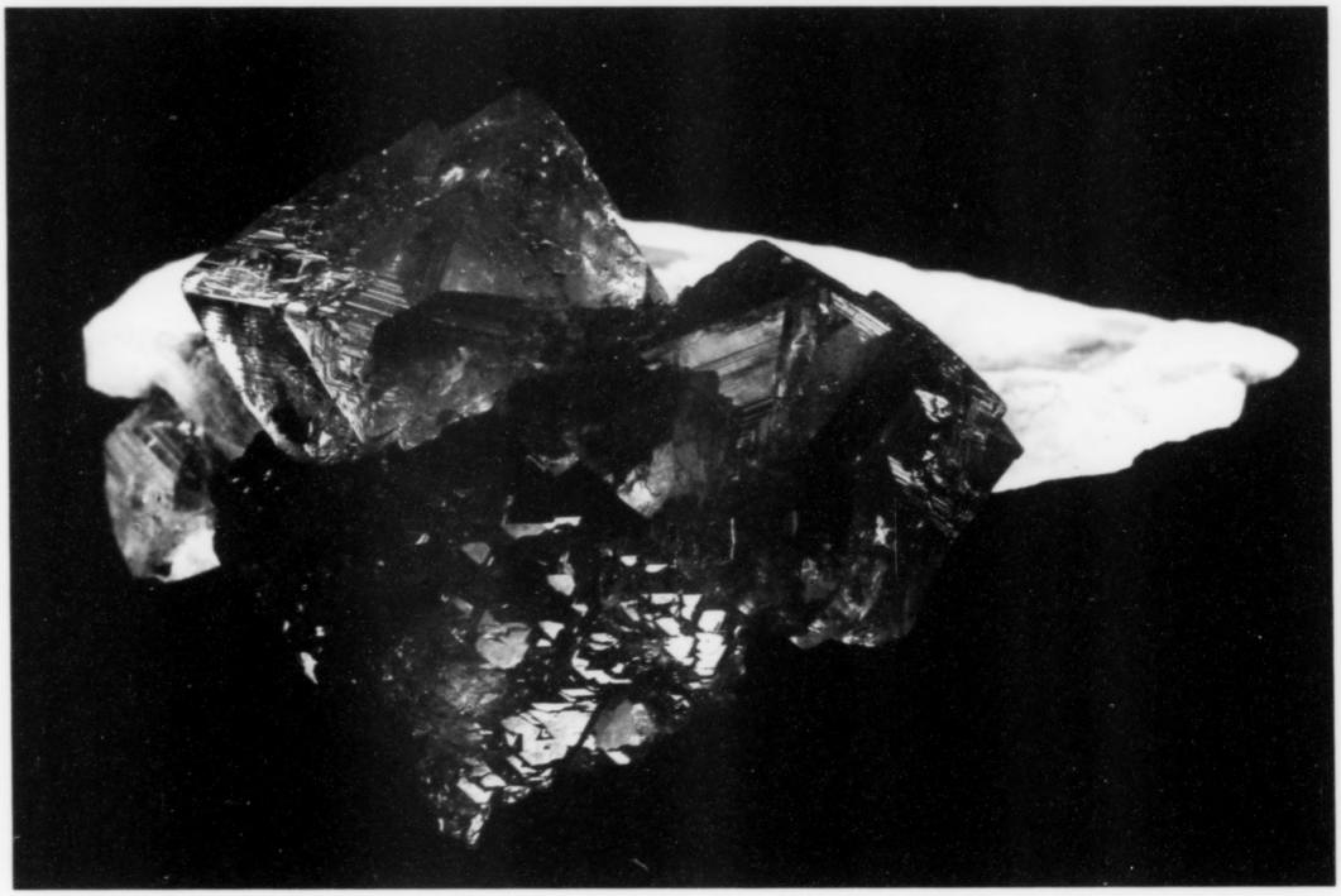


Figure 60. **Pink fluorite with smoky quartz and feldspar, 4.1 cm, from Pointe Kurz, Argentière basin, Mont Blanc massif near Chamonix, France. Francis Benjamin collection; Jeff Scovil photo.**

Figure 61. **Pink fluorite with smoky quartz and calcite, 4.7 cm, from Pointe Kurz, Mont Blanc massif near Chamonix, France. Pierre Bavuz collection; L. D. Bayle photo.**



fluorite in the Mont Blanc massif"—the collecting story is told (excitedly, in French) in the January–February 2008 issue of *Le Règne Minèral*, with a marvelous specimen from the find on the cover. The three cristalliers in question, Christophe Lelievre, Michael Bibollet-Ruches and Frédéric Eva, opened the cleft on **Aiguille Verte** in August 2007; from it came clusters, to almost 10 cm, of gemmy, glowing rose-pink fluorite octahedrons to 6 cm on edge individually, as well as beautiful smoky quartz crystal clusters to large-cabinet size, and interesting specimens showing transparent, colorless, lustrous "paper spar" calcite with free-standing crystals to 6.5 cm (Lelievre, 2008).

Of course the foregoing is only an overview of some important

Figure 62. **Rough pink fluorite octahedron with purple overgrowths, 5.8 cm, from the Mont Blanc massif near Chamonix, France. Eric Asselborn collection; Jeff Scovil photo.**

Figure 63. **Pink fluorite on granite, 6.5 cm, from the Mont Blanc massif near Chamonix, France. Eric Asselborn collection; Jeff Scovil photo.**

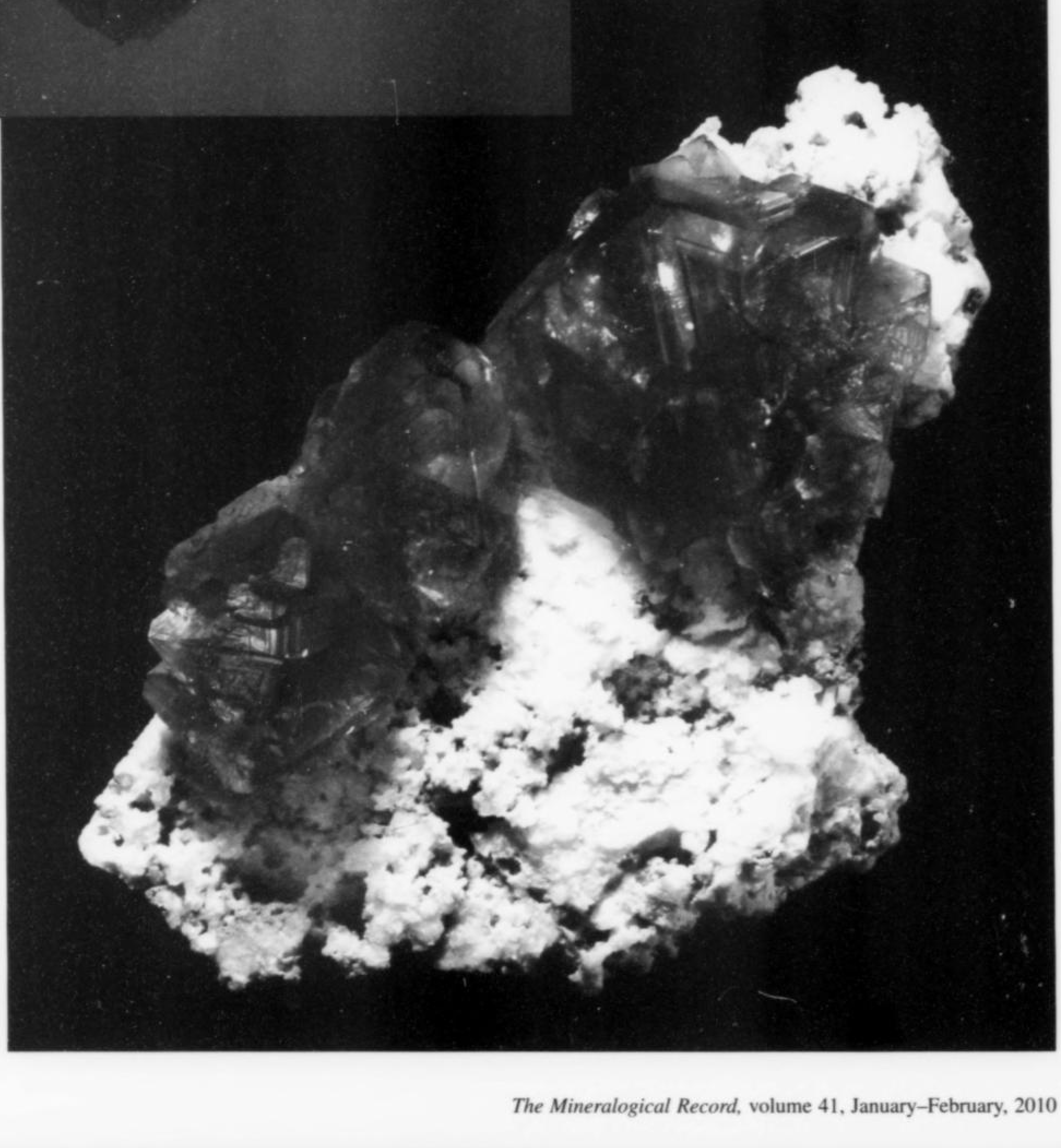


Figure 64. **Pink fluorite on feldspar, 2.3 cm, from the Mont Blanc massif near Chamonix, France. Eric Asselborn collection; Jeff Scovil photo.**

Figure 65. **Pink fluorite with smoky quartz and feldspar, 8.1 cm, from the Mont Blanc massif near Chamonix, France. Eric Asselborn collection; Jeff Scovil photo.**

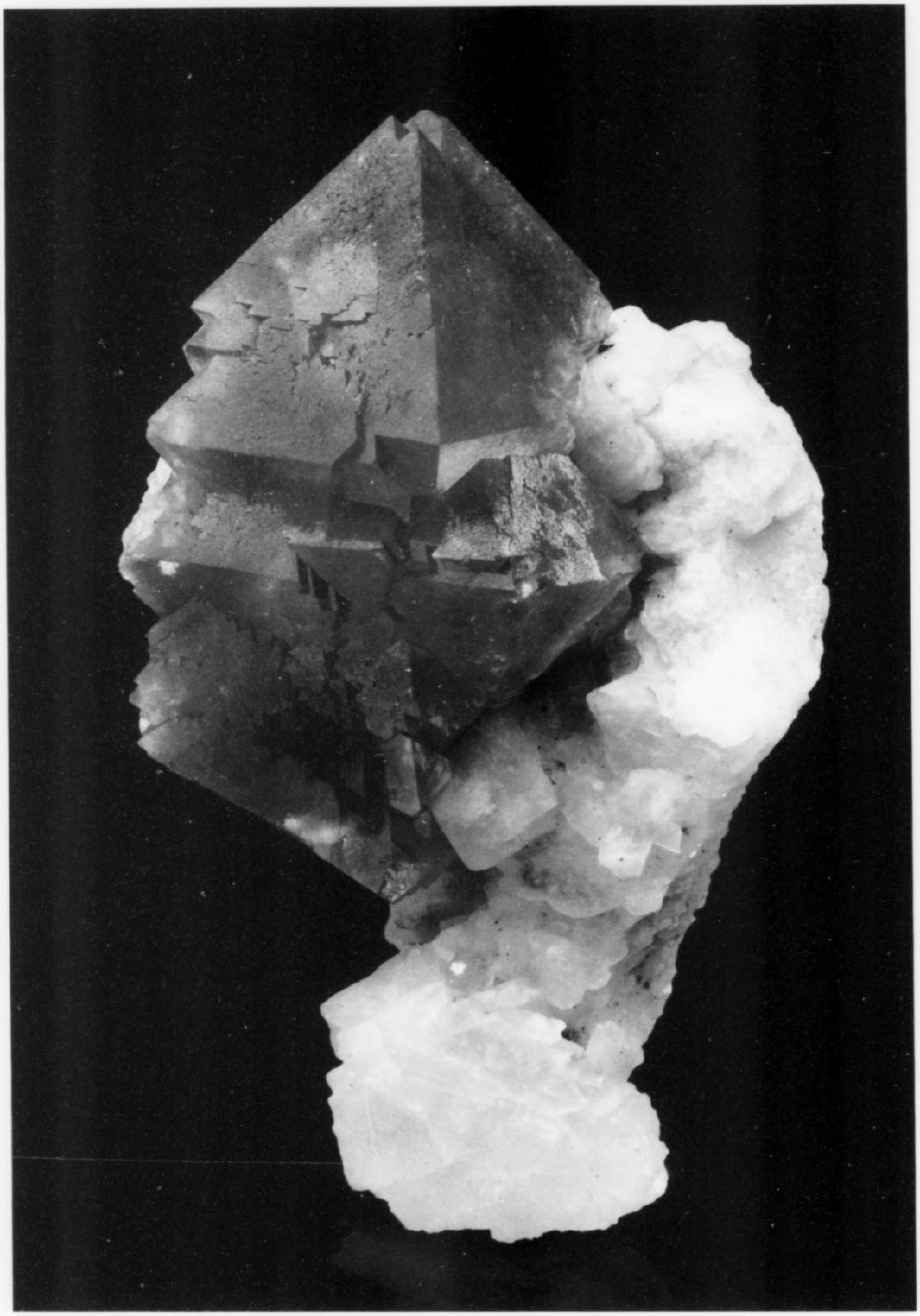


Figure 66. **Pink fluorite on quartz, 6.7 cm, from the Mont Blanc massif near Chamonix, France. Alain Martaud collection; Roberto Appiani photo.**

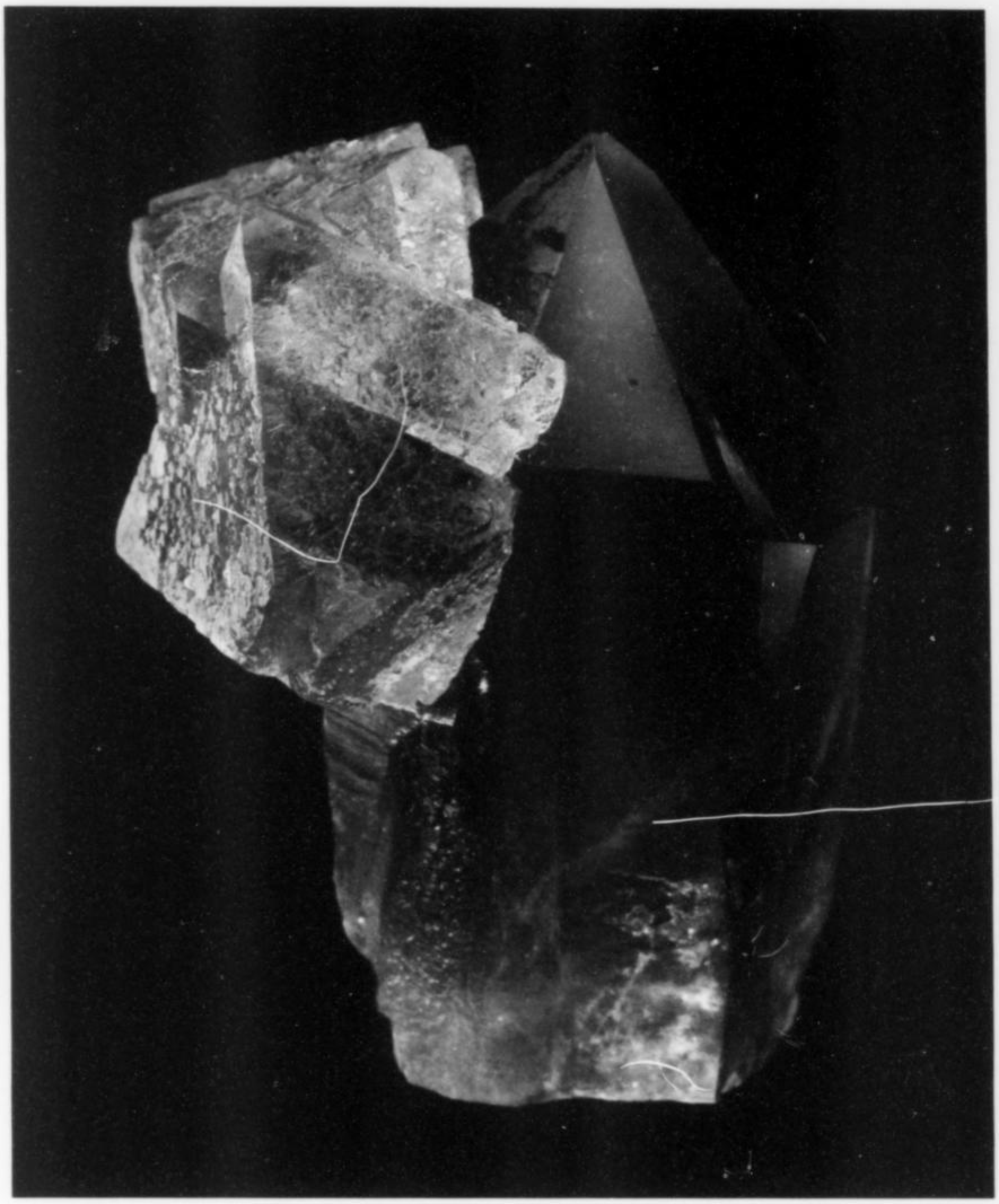


Figure 67. **Pink fluorite on smoky quartz, 4.6 cm, from the Mont Blanc massif near Chamonix, France. Carolyn Manchester collection; Jeff Scovil photo.**

pink fluorite discoveries on French Mont Blanc during recent years. Anyone who can visit the small but exciting show held on the first weekend of August each year in the beautiful cristalliers' town (and skiing center) of Chamonix might see specimens from other, smaller, mostly unpublicized finds made, more years than not, on the Mont Blanc massif. The Chamonix Show, begun in 1965, is exclusively about minerals—no lapidary materials allowed—and hosts 35 to 40 dealers, many of them being French, Italian and Swiss cristalliers who bring fresh material from their latest discoveries. Another attraction in Chamonix is the Crystal Museum, opened in 2006, which is dedicated entirely to the display of Alpine minerals, with special emphasis, naturally, on those from the Mont Blanc massif. The museum exhibits more than 250 fine specimens found over the past 40 years, all donated from several public and private collections and by members of the Chamonix mineral club.

PINK FLUORITE WORLDWIDE

Until late in 2006 it could seem heretical even to fantasize that world-class octahedral pink fluorite specimens could come from mountains anywhere save in Switzerland or France. But at the Munich Show of that year five utterly breathtaking cabinet specimens were displayed from a find which had been made on September 25, 2006, at **Chumar Bakhoor, Gilgit district, Northern Areas, Pakistan**: razor-sharp, medium-pink, pellucidly transparent octahedral fluorite crystals to 9 cm on edge rest on matrix-blanketing crusts of sharp, edge-on muscovite crystals (Appiani, 2007; Moore, 2007b). Only a handful of such specimens emerged from a single pocket near the summit of Chumar Bakhoor (altitude 5,520 meters). The five great pieces shown in Munich had already been sold, but they were the hit, that year, of Europe's premier mineral show, for they are at least as impressive as even the kingly fluorite/smoky quartz specimens found on Mont Blanc in 1989. The Pakistani pink fluorite specimens came, however, not from an Alpine-type cleft (albeit such clefts *do* occur, and yield Alpine-like specimens of other species, elsewhere in Pakistan), but rather from a pocket in a granite pegmatite.

Another granite pegmatite region, that of **Strzegom-Sobótka (formerly "Striegau"), Silesia, Poland**, has produced good specimens of octahedral pink fluorite in crystals exceptionally to 15 cm on edge, associated with good crystals of quartz, microcline, albite, stilbite and chabazite (Praszkier and Siuda, 2008). A beautiful 3-cm "Striegau" pink fluorite specimen is shown on the cover of vol. 1 no. 1 of *Mineralien Welt* (1990).

A very famous but decidedly non-Alpine-type pink fluorite occur-

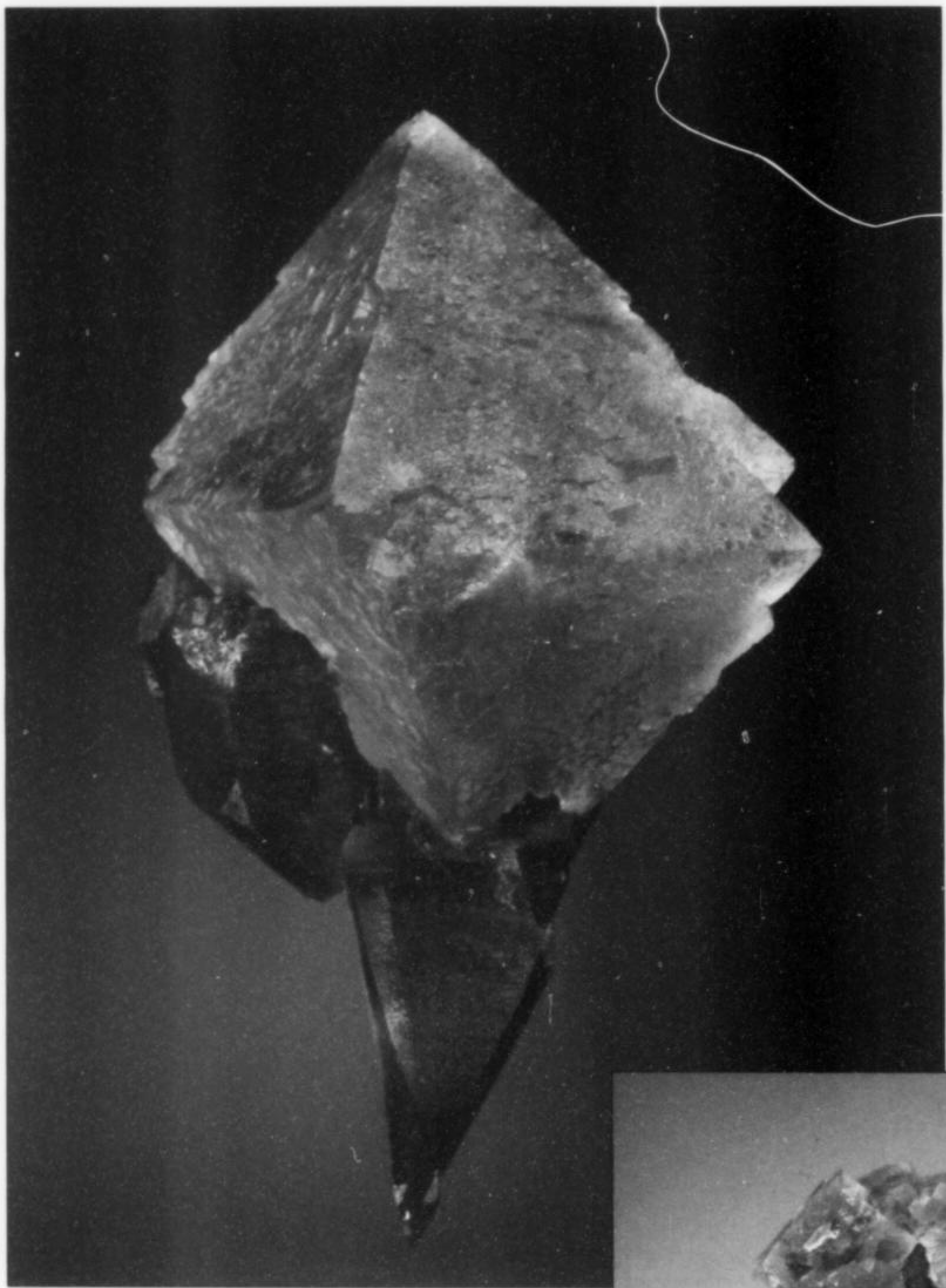


Figure 68. **Pink fluorite crystal on smoky quartz, 4.8 cm, from the Mont Blanc massif near Chamonix, France. Charlotte Sussman collection; Jeff Scovil photo.**

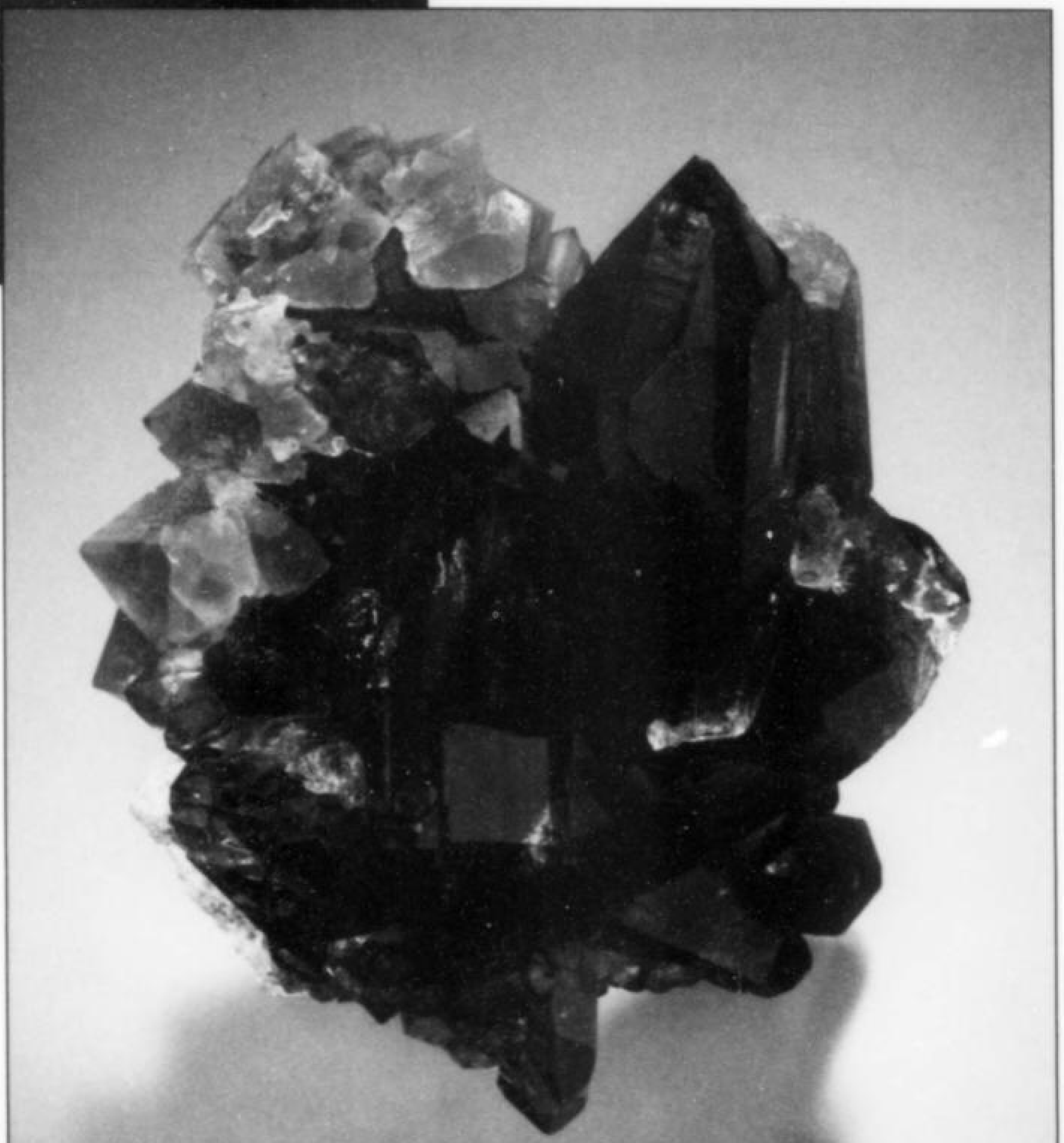


Figure 69. **Pink fluorite on smoky quartz, 7 cm, from the Mont Blanc massif near Chamonix, France. William Larson collection, ex Jeffrey Kent collection; Jeff Scovil photo.**

rence is the one discovered in November 1980 in the **Huanzala mine, Huanuco Province, Peru**—see Belsher (1982), and see the specimen shown on the cover of the "Peru Issue" of the *Mineralogical Record* (July–August 1997). Huanzala mine pink fluorite specimens are very beautiful, and collectors have cherished them and paid high prices for them for nearly 30 years, but the environment from which they come is a hydrothermal sulfide replacement orebody in limestone, and the crystals most commonly seen with the fluorite are not quartz and calcite but pyrite, sphalerite and galena. (Late in 2008 the Huanzala mine began yielding new specimens of pink octahedral fluorite, some spotted with brightly metallic gray, spinel-twinned galena crystals.)

Old specimens showing octahedral pink fluorite crystals from the **Obira mine, Kyushu, Japan**, while they can be impressive also do not represent an Alpine cleft-type occurrence but rather came from a skarn surrounding a metasomatic ore deposit (Belsher, 1982; Komuro, 2006).

It would seem so far that the only significant Alpine cleft-type occurrence of pink fluorite outside the Alps is in the quartz mine exploiting the **Puiva deposit in the Subpolar Urals, Tyumen Oblast, Russia**. Here, quartz and a number of other species characteristic of Alpine-type clefts have crystallized in enormous fissures in quartzite, schist and amphibolite (see Burlakov, 1999). The Puiva deposit, more mineralogically complex than its sister, the nearby Dodo deposit, occasionally has yielded specimens showing sharp, pale pink octahedral fluorite crystals to 1.5 cm associated with well crystallized apophyllite and axinite. Puiva fluorite specimens generally do not appear at U.S. or European mineral shows, and the truth is that they are poor compared even to mid-range Swiss and French pink fluorite specimens.

CONCLUSION

Vagaries of individual taste aside, it seems safe to say that the kind of fluorite specimens dwelt upon at length above will always remain the most cherished of fluorites for most dedicated collectors (and certainly not just for the Europeans among them). This is also to say that Alpine pink fluorite will always remain, probably by a wide margin, the most expensive of familiar types of fluorite. However, a more sanguine thought is that French Mont Blanc seems now to be in a fairly long-term, reliable period of productivity, thanks to the efforts of enthusiastic cristalliers and thanks too, yes, to the effects of global warming. At heart most mineral collectors are cheery optimists, and we are easy to please: show us one fine Alpine pink fluorite, one of the most gorgeous natural objects to be found anywhere on earth, and worries about much weightier matters—say, global warming—are for the moment forgotten.

ACKNOWLEDGMENTS

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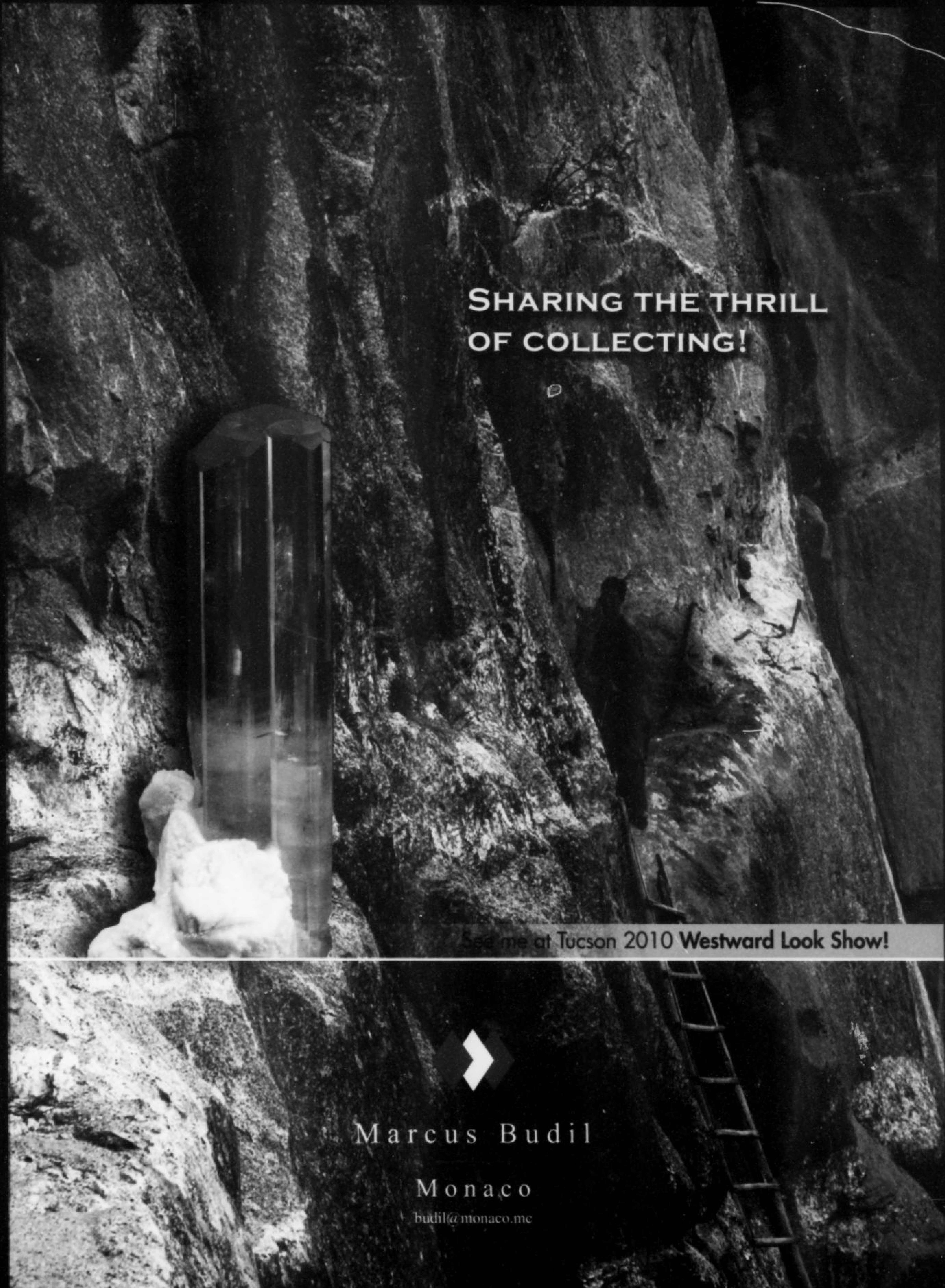
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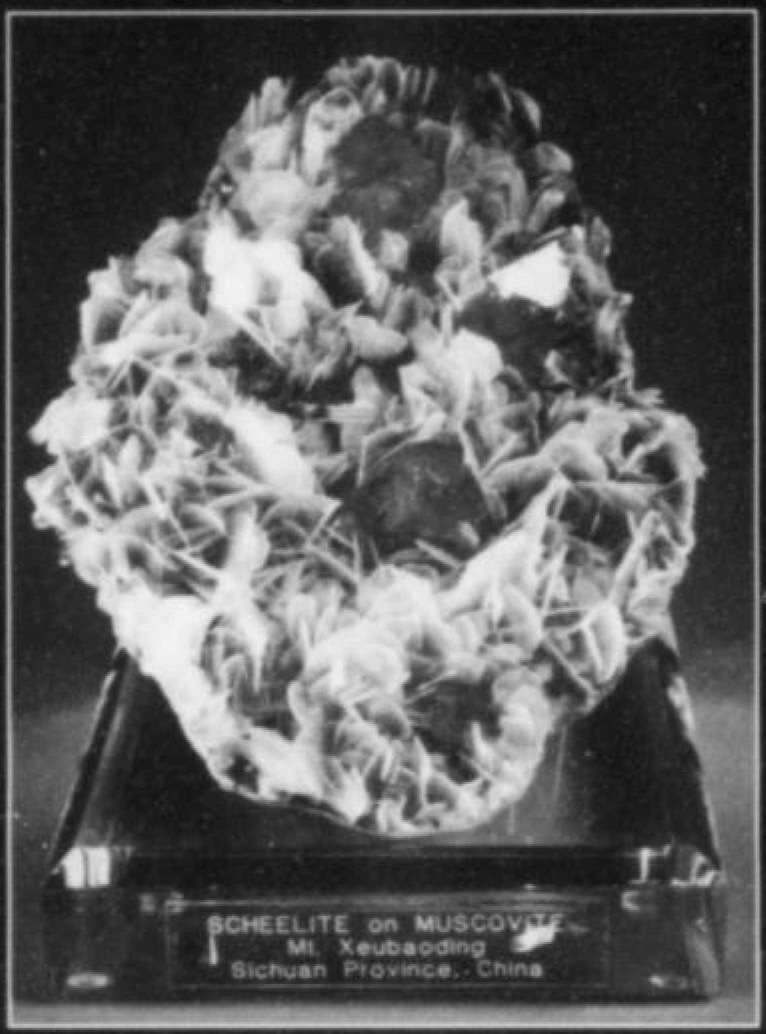
OF COLLECTING!
See me at Tucson 2010 Westward Look Show!
Marcus Budil
Monaco
budil@monaco.mc



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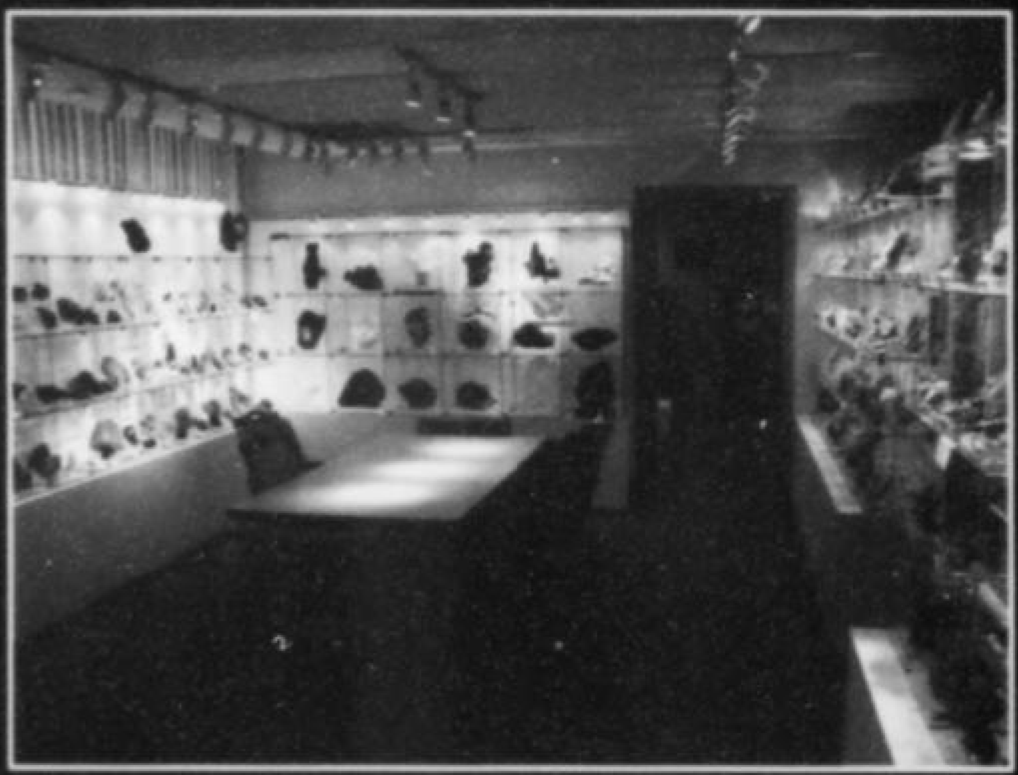

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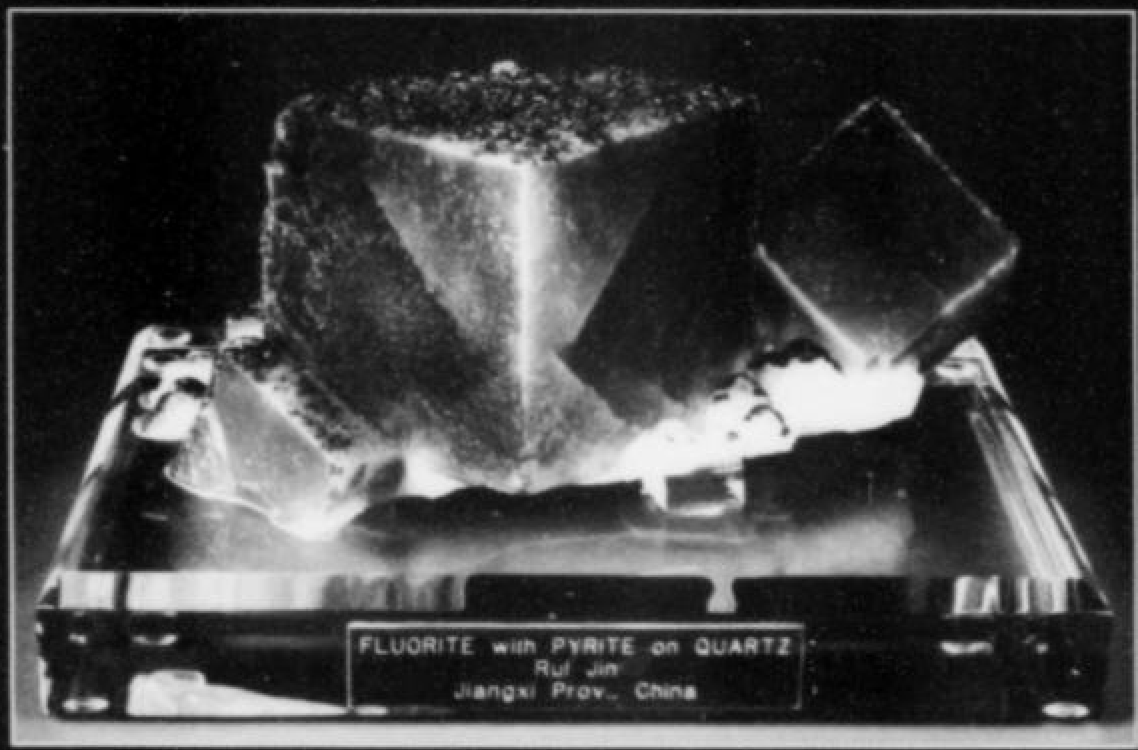

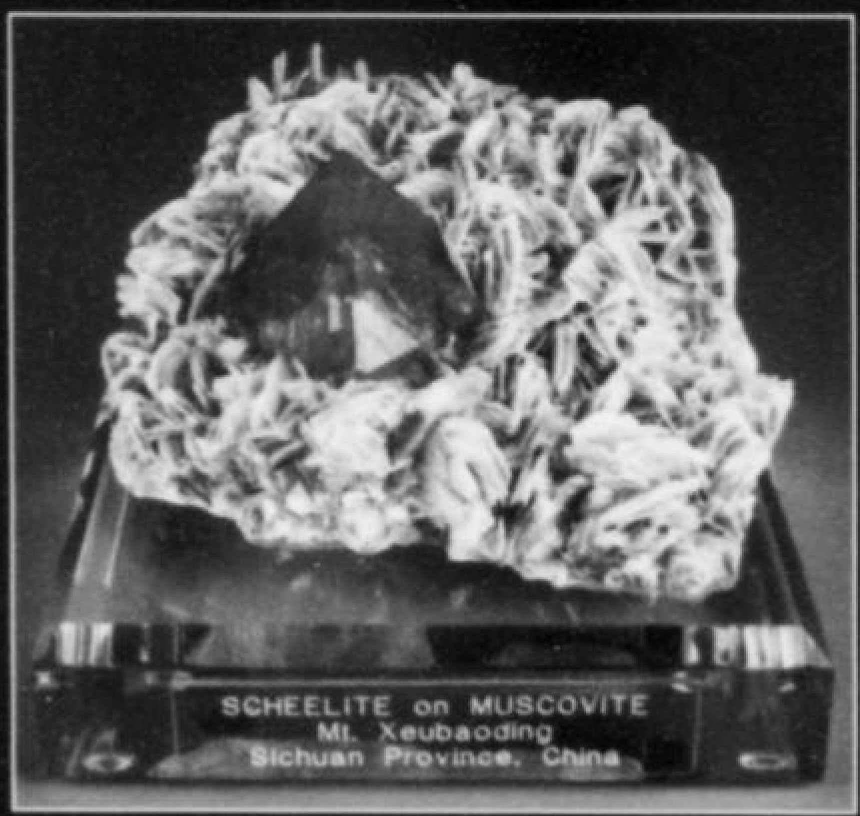

**Recent Additions from
The Sunnywood Collection**

THE KAGEM EMERALD MINE

Kafubu Area, Zambia

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Emeralds have been mined in Zambia since 1928. However, hardly any specimen-quality crystals were saved until 80 years later, when the management at the Kagem mine investigated the possibility of employing a professional specimen recovery and preparation company to carry out the demanding work of freeing the beautiful emerald crystals from enclosing quartz. The resulting specimens, prepared by Collector's Edge Minerals, Inc., made their debut in September 2009.

INRODUCTION

The Zambian emerald deposits are located in the Kitwe district in north-central Zambia, near the Kafubu River in the Ndola Rural Emerald Restricted Area, about 45 km southwest of Kitwe, in the southern part of the Zambian Copperbelt (see Korowski and Notebaart, 1978). Access from Kitwe is via a paved road for 15 km to Kalulushi, then by a poorly maintained gravel road for 30 km to the mine area. Large open-pit emerald-mining operations include the Grizzly, Chantete, Kamakanga and Kagem concessions, together constituting one of the world's largest producers of gem-grade emerald, ranking second in output (by value) only to the Colombian mines (Zwaan *et al.*, 2005). Other operations in the Kafubu area include the Twampane, Akala, Pirala, Miku, Ebenezer and Mitondo mines. Nearly 20% of the world's annual production of emeralds comes from the Kafubu area (Seifert *et al.*, 2004).

The Kagem mine is thought to be the world's largest open-pit mine for colored gemstones. The highly mechanized open pit covers an area of about 1 square kilometer and employs about 400 men; it produces between $15 million and $30 million in emeralds rough annually (Seifert *et al.*, 2004). High levels of groundwater in the area have made underground operations uneconomical in the past because of the attendant pumping expense; hence all operations in the district thus far have been open-pit. However, underground workings are now being developed at the Kagem mine.

Despite the huge production of emerald gem rough, no crystal specimens had been produced until recently, when the operator of the mine, Gemfields PLC, entered into an arrangement with Collector's Edge Minerals, Inc. to prepare and market emerald specimens for collectors and museums.

HISTORY

Emeralds were first discovered in the Kafubu area in 1928 by the Rhodesia Congo Border Concession Company, at what later

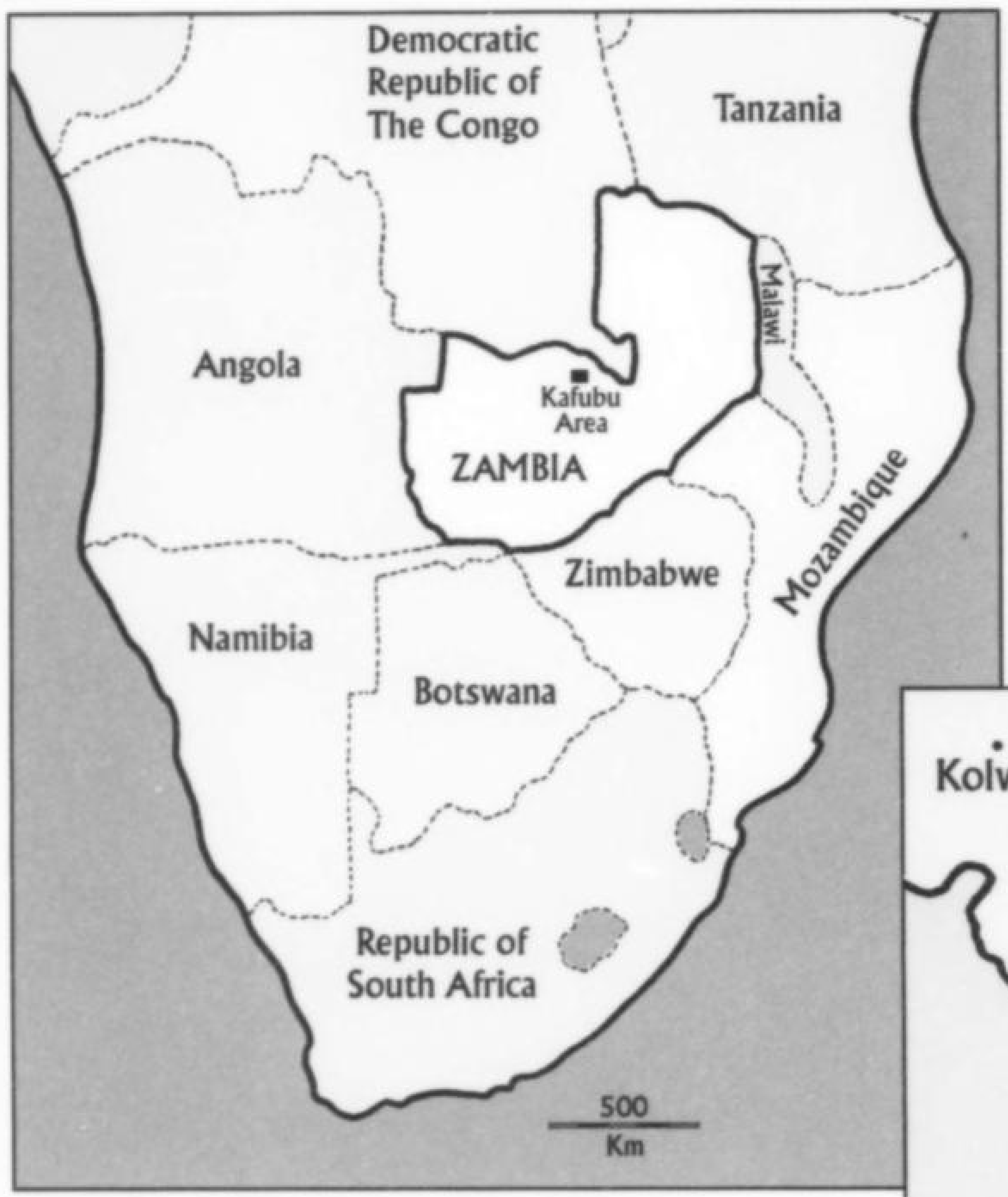

Figure 1. **Location map—southern Africa.**

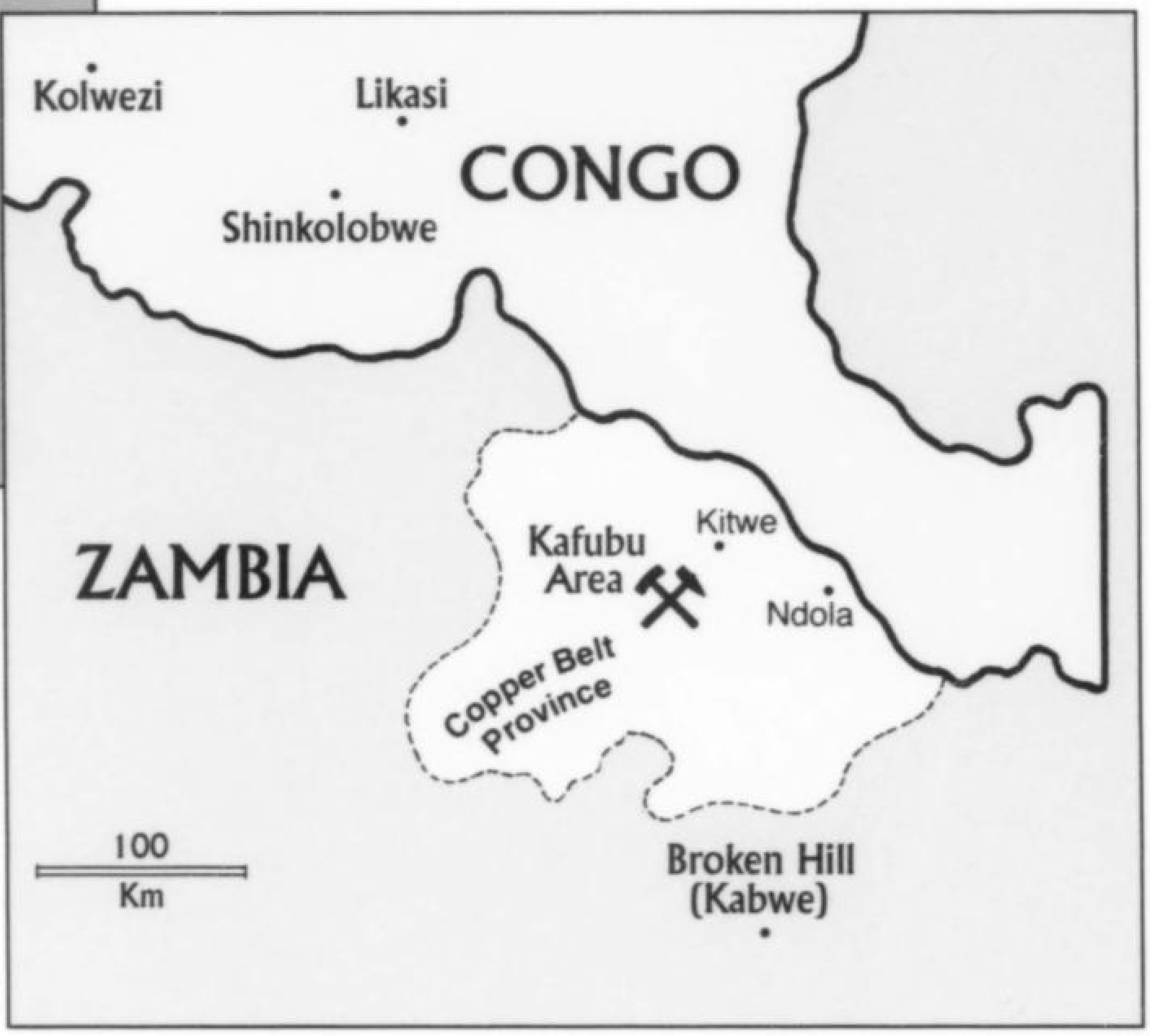

Figure 2. **The Kafubu area within the Zambian Copperbelt.**

became the Miku mine (Sliwa and Nguluwe, 1984; Seifert *et al.*, 2004). Early production was unpromising, but exploratory work was continued in the 1940s and 1950s by the Rhokana Company and the Rio Tinto Mineral Search of Africa Company. After new occurrences were located in the 1970s, gemstone exploration and production expanded radically. Extensive illegal mining in the area soon compelled the Zambian Government to declare the area a "restricted zone" and to expel the local population.

Since that time, only government-sanctioned mining has taken place there—via large-scale commercial mining and by small-scale miners on several hundred small claims. In 1980, Kagem Mining Ltd. (55% owned by the Zambian Government) was authorized to explore and mine the Kafubu concession. In 2004 the United Kingdom-listed Gemfields Resources PLC (controlled by Johannesburg's Pallinghurst Resources) began systematic exploration near the Pirala mine, south of the Ndola River, and discovered significant emerald deposits. By 2007 Gemfields had acquired 100% ownership of two mines in the area and about 60% of the prospective strike lengths of emerald-bearing host rocks in the Ndola Rural Emerald Restricted Area. Mining began at the Kagem mine (actually a group of mines), north of the Ndola River, in 2005, and Gemfields was awarded a management contract there in November 2007. In the following June, Gemfields acquired a 75% ownership in the mine, the remainder being held by the Government.

Emerald production at the Kagem mine for the year ending June 30, 2009, was 27.6 million carats, from an average ore grade of 349 carats per tonne, at an operating cost of about 40 cents per carat (Gemfields, 2009). The emerald rough sells for an average of about 75 cents per carat, but high-quality rough can sell for up to $500 per carat.

Until 2008, all of the emerald-bearing ore produced at the Kagem mine was processed by large-scale crushing, washing and sorting in the adjacent processing plant. However, Gemfields executives suspected that the emerald-bearing quartz veins which are occasionally encountered in the schist might, with proper preparation, yield fine emerald specimens for collectors and museums. The opportunity to test this theory came in late 2008, when an unusually thick zone of emerald-rich quartz was encountered in the pit. This zone yielded five large chunks of quartz ranging from 2 to 35 kg, enclosing a number of gem-quality emerald crystals. Gemfields decided to withhold those boulders from normal processing and see if a specimen preparation company could be enlisted to evaluate their potential.

In February 2009 Gemfields contacted Bryan Lees of Collector's Edge Minerals, Inc. in Golden, Colorado, and together they developed a plan to collect, prepare and market emerald specimens from the Kagem mine. Collector's Edge technicians visited the mine site and introduced Gemfields' employees to advanced mineral specimen collecting tools and techniques which they could use to help maximize the intact recovery of emerald-rich quartz blocks having specimen potential. As it turned out, those tools and techniques proved useful in day-to-day gem mining work as well.

Huge tonnages of emerald-bearing rock are processed annually at the Kagem mine, but only a tiny percentage consists of the emerald-bearing quartz which is suitable for the preparation of specimens. Since March of 2009, approximately 50 kg of the highest-quality emerald-rich quartz have been shipped to Collector's Edge Minerals for preparation. This material had been collected by Gemfields employees over the preceding 18 months. A larger quantity of lesser-quality, carving-grade emerald-in-quartz was also shipped. The first emerald specimens produced by the mine and prepared by

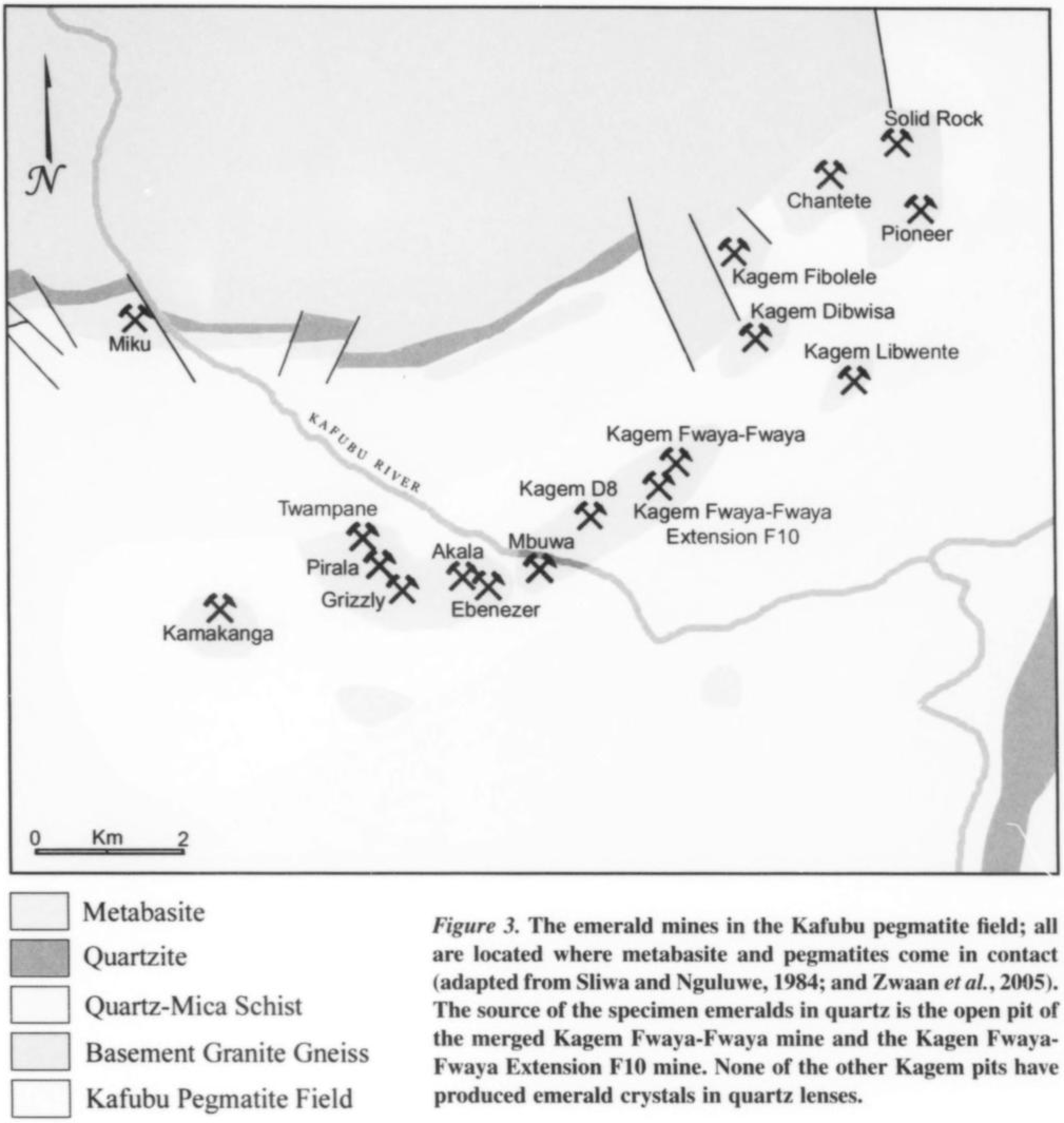

***Figure 3.* The emerald mines in the Kafubu pegmatite field; all are located where metabasite and pegmatites come in contact (adapted from Sliwa and Nguluwe, 1984; and Zwaan *et al.*, 2005). The source of the specimen emeralds in quartz is the open pit of the merged Kagem Fwaya-Fwaya mine and the Kagen Fwaya-Fwaya Extension F10 mine. None of the other Kagem pits have produced emerald crystals in quartz lenses.**

Collector's Edge Minerals were offered for sale at the 2009 Denver Gem and Mineral Show.

GEOLOGY

Three major rock units of the 1.7-billion-year-old metamorphic Muva Supergroup occur in the Kagem mine area (Daly and Unrug, 1983). The uppermost layer consists of mica schist measuring from 30 to 40 meters thick. The top 10 to 20 meters of this schist unit have weathered into soil and laterite. Beneath the mica schist is a layer of amphibolite between 15 to 20 meters thick. Under the amphibolite is metabasite, a magnesium-rich and chromium-rich metamorphosed volcanic rock consisting of talc-chlorite-actinolite schist ± magnetite, which hosts the emerald mineralization (Sliwa and Nguluwe, 1984; Seifert *et al.*, 2004). Light-colored beryllium-bearing quartz-feldspar pegmatites and epigenetic hydrothermal quartz-rich veins associated with the Pan-African Orogeny cut across all three units. Potassium/argon age-dating of muscovite associated with emerald crystals in the reaction zones suggests an age of crystallization of approximately 447–452 million years ago (Seifert *et al.*, 2004).

Emeralds occur at the Kagem mine mostly in metasomatically altered phlogopite-rich zones up to 3 meters wide that rim the numerous pegmatite dikes and quartz-tourmaline veins (genetically related to a granite pluton at depth) cutting through the talc-magnetite schist country rock. They may thus be classified as "schist-type" emeralds, like those from Brazil, Madagascar, Russia and South Africa (as opposed to "non-schist" emeralds from Colombia and Nigeria). The best emeralds occur where the reaction zone is near intersections of the pegmatite veins and quartz-tourmaline veins (Zwaan *et al.*, 2005). The majority of the emerald mineralization took place at temperatures of 360° to 390°C and pressures of 400 to 450 MPa.

The Kagem emerald concession covers an area of approximately 46 square kilometers within a 200-square-kilometer productive zone. Within this area are six known belts of talc-magnetite schist totaling over 13 km in strike length. One of these belts, the Fwaya-Fwaya-Pirala belt, is currently the main focus of emerald production at the Kagem mine. Core-drilling along this belt has established a strike length of 1,720 meters. As of 2005, emeralds had been mined to a depth of about 60 meters, but field surveys, chemical analyses and structural studies indicate that the productive zone extends significantly deeper (Zwaan *et al.*, 2005).

The emerald appears to have formed as a single generation of

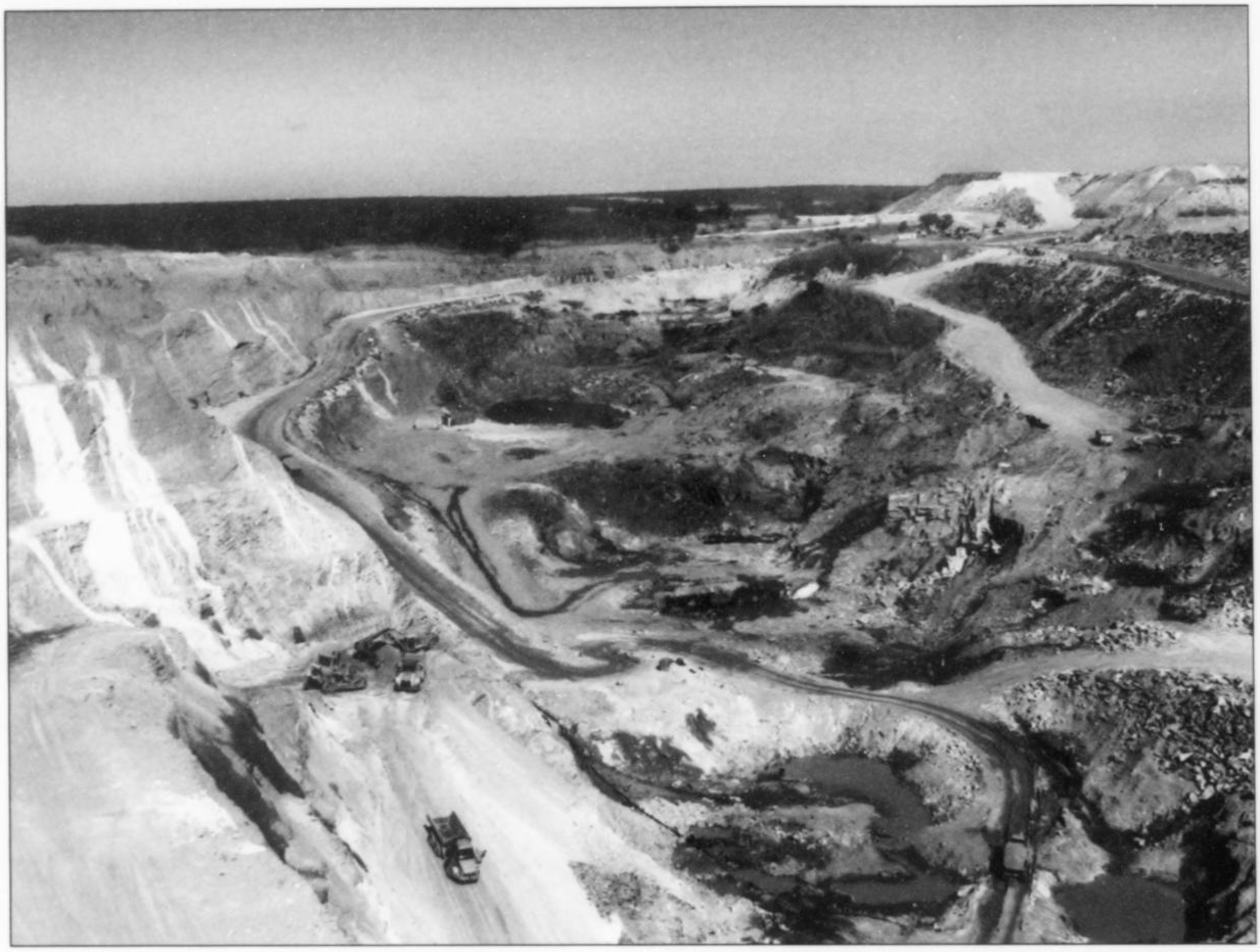

Figure 4. **The open-pit Kagem mine (the merged Kagem Fwaya-Fwaya and Kagem Fwaya-Fwaya Extension F10 pits). Note the white pegmatite veins cutting across the country rock at left. Graham Sutton photo.**

growth within the schist (and not in the pegmatites). The schist and associated Mg-rich metabasic rocks provided the necessary elements for the crystallization of emeralds, including 3000 to 4000 ppm of chromium and a trace of vanadium, these two elements being the source of the emerald-green color. The chromium is concentrated primarily in chlorite (up to 1.5 wt. %) and magnetite (up to 13.6 wt. %) (Seifert *et al.*, 2004).

The majority of the emeralds mined at the Kagem mine occur within the friable schist reaction zones where they are easily removed by crushing and processing of the rock. However, emeralds suitable for preservation as mineral specimens are found predominantly within quartz boudins or lenses within the schist and on or near the contact with the pegmatite. Thus they are unusual (perhaps unique) in being "schist-type" emeralds which are hosted in quartz rather than schist.

At a late stage in the pegmatite emplacement, after free-growing emerald crystals had formed in open pockets in the schist, silica-rich fluids were introduced into the reaction zone. These fluids precipitated quartz in lenses up to 30 cm thick, completely enclosing the free-growing emerald crystals and filling the open pockets. This encapsulation of the emerald crystals in quartz protected them to some extent from further stress and chemical activity. Nevertheless, minor tectonic movements fractured some of the embedded emerald crystals in the thinner quartz lenses, and the fractures were then filled by quartz. The fractures commonly follow a poor (0001) cleavage, but some crystals show a second set of parallel fractures at an angle to the *c* axis. Emerald crystals were best preserved in the larger, more massive quartz lenses (up to 30 cm thick) that were better able to resist plastic deformation under tectonic stress. Unfortunately, quartz lenses thicker than about 10 cm are very scarce, so the opportunities for recovering high-quality emerald crystal specimens are rare.

In many of the quartz lenses the emerald crystals are concentrated on one side of the pod, suggesting that gravity may have caused them to accumulate at the bottom of the cavity. Also, movement of the siliceous fluid may have caused the preferential orientation of some of the emerald crystals, so that they tend to lie flat parallel to the boundary of the pod, and are also aligned along the direction of the flow.

EMERALD

The emerald variety of beryl ($Be_3Al_2Si_6O$) is generally restricted by gemologists to those specimens deriving their color from trace amounts of chromium (and possibly vanadium). Kagem mine emeralds contain 0.26 to 0.86 weight percent Cr_2O_3 (Zwaan *et al.*, 2005), the color intensity of the darker crystals correlating well with Cr content; green beryls with as little as 0.04 weight percent Cr_2O_3 were also identified. Some crystals contain up to 0.23 weight percent

Figure 5. **Sorting belt where emerald rough is hand-picked from crushed schist ore. Gemfields PLC photo.**

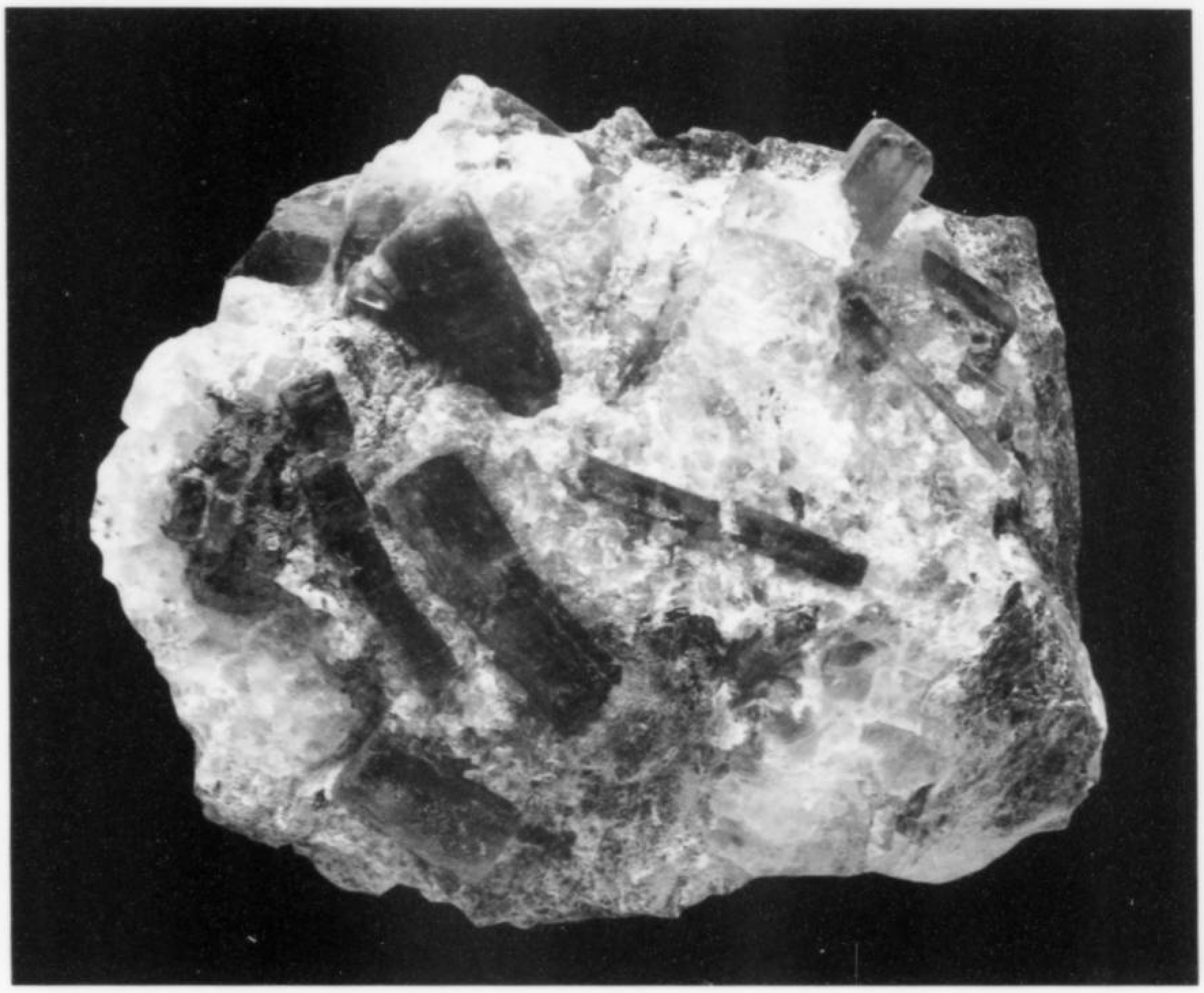

Figure 6. **A block of emerald-rich quartz, 10 × 15 cm, from the Kagem mine before preparation. Collector's Edge specimen; Richard Jackson photo.**

Cs_2O. Vanadium content is uniformly low (around 0.02 wt. %), and thus it is unlikely that vanadium contributes much to the color of the crystals. The best crystals exhibit an intense, classic emerald-green color with a faint bluish tinge. Colorless, pale green, blue-green and blue beryl crystals have also been found. Some crystals are color-zoned, with a paler yellowish green to greenish blue core surrounded by a deep green rim (Zwaan *et al.*, 2005), but other crystals may be deep green all the way through.

The best crystals have a mirror-smooth luster and a high degree of transparency. In other cases, inclusions of black phlogopite render the crystals darker and less transparent. Matrix specimens may show emerald crystals resting on white quartz or on black phlogopite schist.

The sharp-edged, well-formed crystals consist of a simple hexagonal prism terminated by the {0001} basal pinacoid. The habit tends to be elongated: crystals up to 14 cm in length and 2.5 cm in width have been recovered. However, crystals of common beryl up to 30 cm long have been reported from within the pegmatite in the Kagem concession (Seifert *et al.*, 2004), and a local mine manager reported that during the 1980s large emerald crystals up to 60 cm long were found at the Kamakanga Old Pit (Zwaan *et al.*, 2005).

The emerald crystals are found predominantly near the boundaries between the quartz lenses and the schist, often lying parallel to the boundary, with a little quartz between the crystal and the contact with the schist.

A remarkable number of other species have also been identified as inclusions in Zambian emeralds, including actinolite, tremolite, chlorite, dravite, apatite-(CaF), magnetite, hematite, quartz, fluorite, magnesite, siderite, dolomite, calcite, ankerite, niobium-rich rutile, pyrite, talc, zircon, barite, albite, lepidocrocite, glauconite, quartz, chrysoberyl, margarite, muscovite, biotite, brookite, tourmaline and chrysotile (Huong, 2008; Zwaan *et al.*, 2005; Milisenda *et al.*, 1999; Moroz and Eliezri, 1999; Graziani *et al.*, 1983; Koivula, 1982, 1984; Gübelin and Koivula, 1986). One-phase, two-phase and three-phase fluid inclusions are also present (Zachariáš *et al.*, 2005).

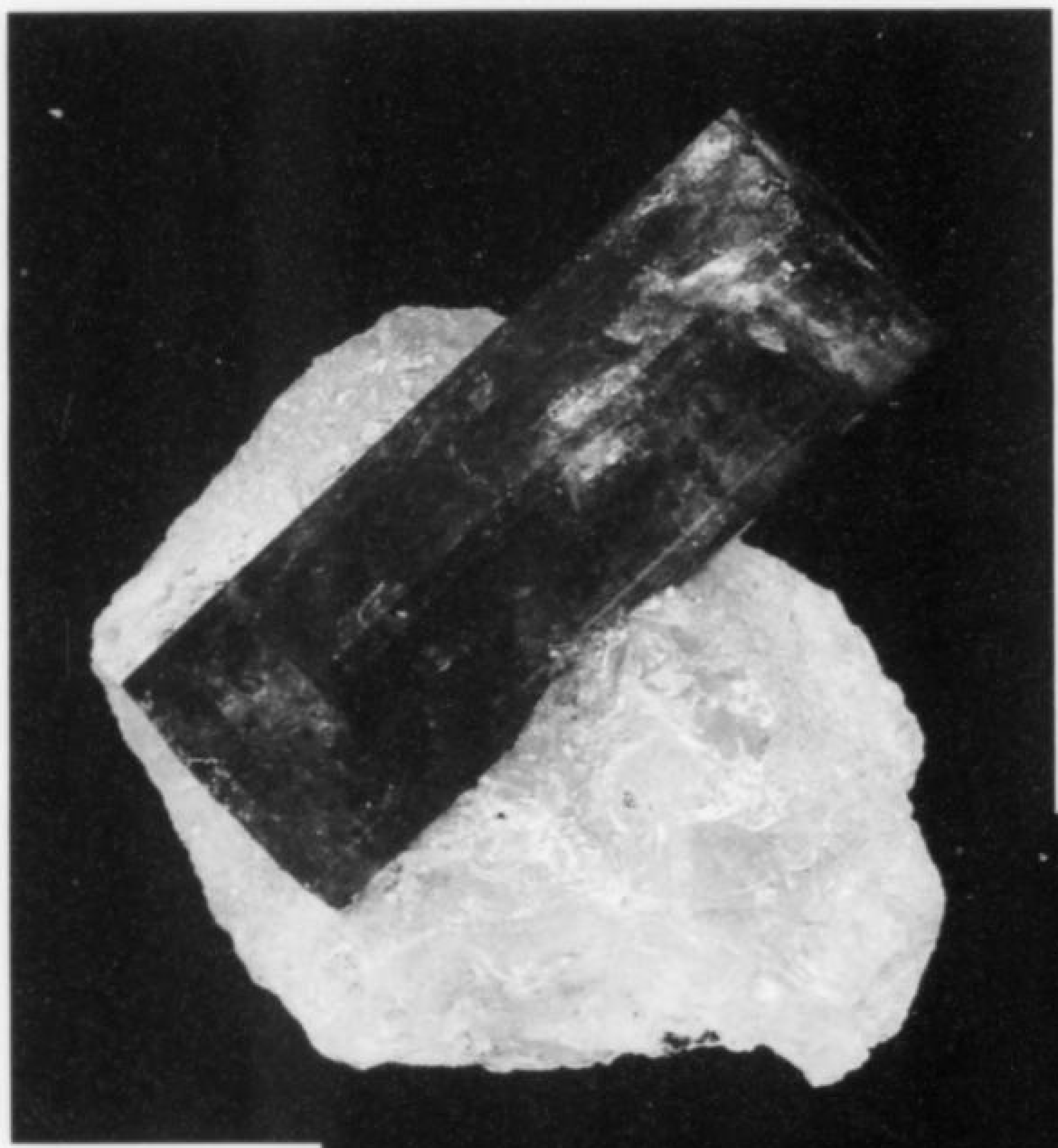

***Figure 7.* Emerald crystal, 3 cm, in quartz, from the Kagem mine. Collector's Edge specimen; Richard Jackson photo.**

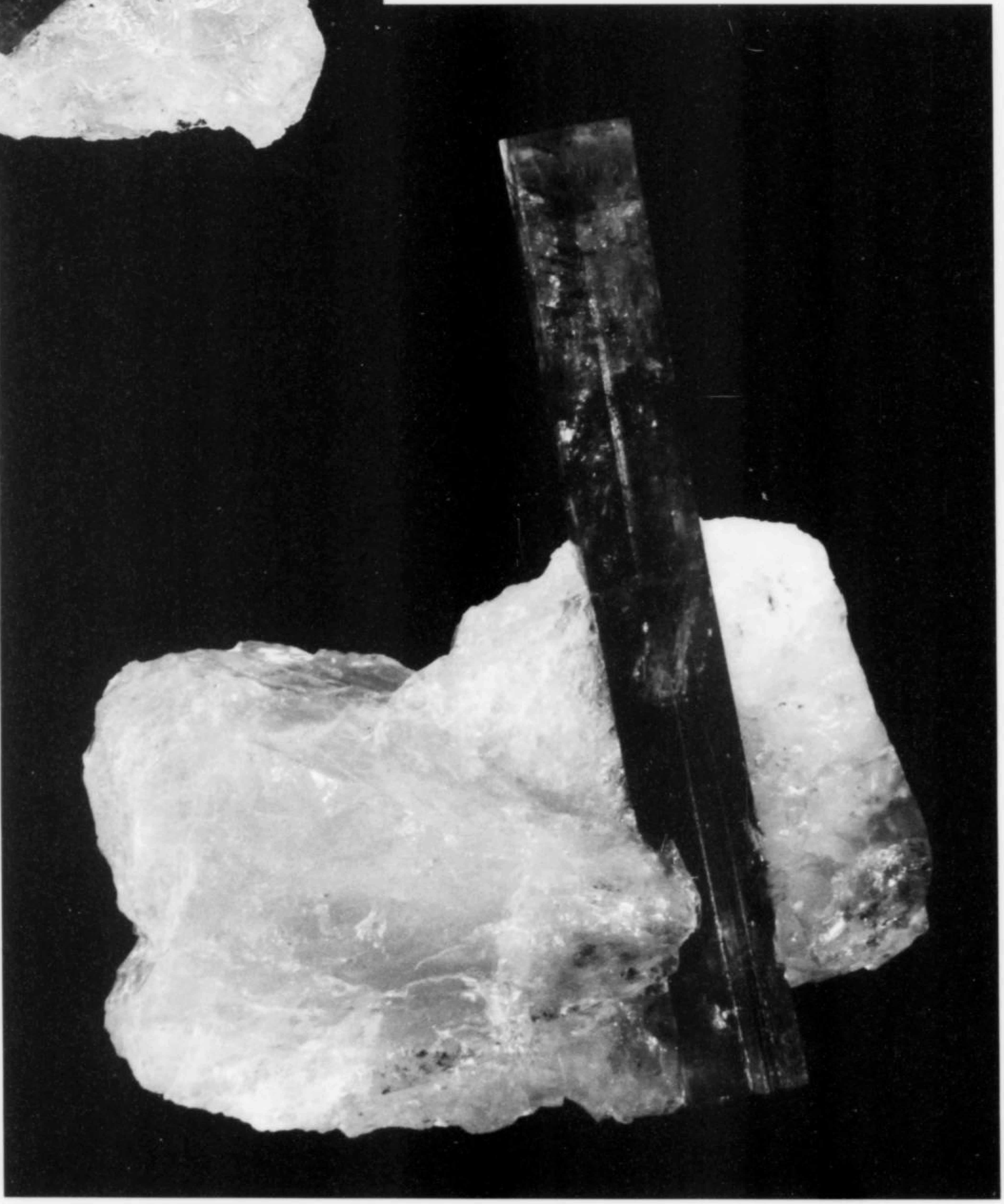

***Figure 8.* Emerald crystal, 10.5 cm, in quartz, from the Kagem mine. Collector's Edge specimen; Richard Jackson photo.**

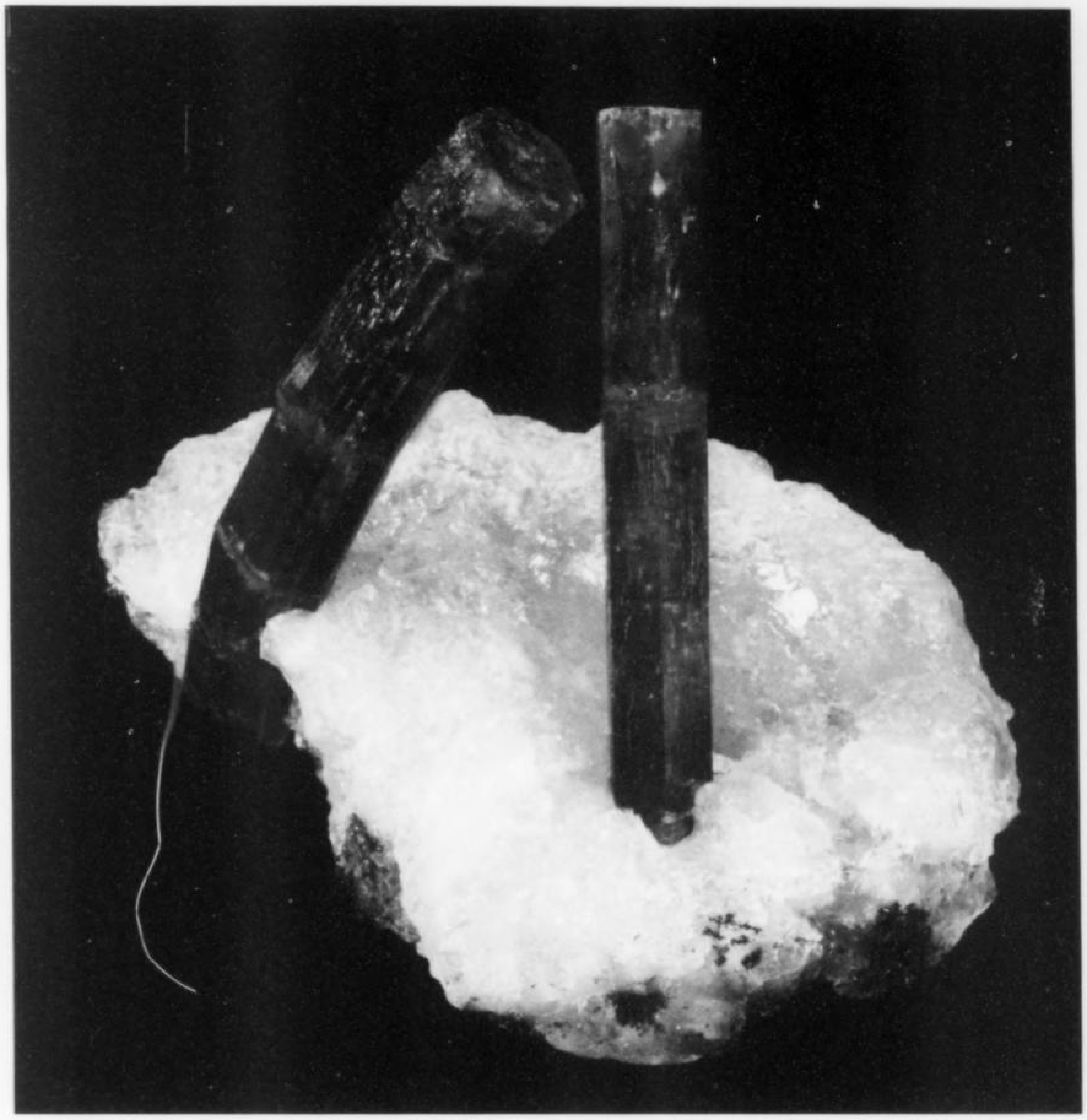

Figure 9. **Two emerald crystals in quartz, 11.5 × 14 cm, from the Kagem mine. The left crystal has been fractured by tectonic forces, bent, and cemented together by quartz. Collector's Edge specimen; Richard Jackson photo.**

Quartz-hosted Emeralds

Crystals found scattered within the largest quartz lenses (up to 30 cm thick) tend to be the finest and best preserved. The emerald crystals that extend into the quartz lens with their bases at the schist contact are typically darkened by phlogopite inclusions near the base and become gemmier as they extend into the quartz. The finest of these found so far is shown in Figure 8.

Emerald crystals of a generally lower quality occur in the more common thin (3 to 8 cm) quartz lenses, which can run 20 to 50 cm in length. The crystals and the surrounding quartz both commonly suffer from extensive fracturing. The quartz has a more granular quality and is more opaque because of the fracturing. The emeralds are also more opaque, both from phlogopite inclusions and from fractures. It is common to see many fine parallel white lines of incipient or rehealed fractures running through the emerald crystals. The luster of these crystals ranges from resinous to bright on the better examples, and waxy to dull on the poorer ones. Yellowish to brownish iron staining is present within fractures throughout the lenses. Elongated gemmy emeralds do exist within these thinner pods, but have usually been fractured into pieces by tectonic forces and cemented with quartz. The fractures vary in thickness from hairline width to several millimeters. Some of these fractured crystals appear bent or curved.

Schist-hosted Emeralds

Emerald crystals occurring within the phlogopite schist range in quality from gem-clear to almost completely filled with phlogopite inclusions. The color of the beryl is still very good, but it is generally darkened by inclusions of black phlogopite, or appears dark because of the dark schist showing through from behind the more transparent crystals. The crystals show a high luster on the well-formed faces, and a waxier luster on undulating faces.

The schist-hosted emeralds occur as single crystal specimens but more commonly as flat-lying clusters showing some preferred orientation, and as radiating sprays. The schist-hosted specimens commonly contain many crystals. Of the specimens received by Collectors Edge there was only one fully transparent schist-hosted emerald. It is unusual that such a specimen was saved, because most of the emeralds in the friable schist have been processed for gem rough. This particular specimen was found in a much harder, sturdier schist matrix and hence was saved as a specimen.

OTHER MINERALS

Schorl is common within the quartz lenses, occurring as thin, elongate black crystals with high luster. The schorl occurs primarily as aligned crystals within the schist and as thick bands at the contact between the schist and the thinner quartz lenses. It is commonly seen intergrown with schist-hosted emeralds. No collector-quality schorl specimens, or combinations of emerald and schorl specimens, have been discovered. The emerald/schorl specimens will most likely be relegated to carving rough.

Other minerals found in the Kafubu emerald area include allanite (small euhedral crystals in rock), amethystine quartz (in a single 10-cm-wide vein), bertrandite (7-mm crystal aggregates replacing beryl), columbite-(Mn), tantalite-(Mn) (prismatic euhedral microcrystals), monazite (euhedral microcrystals), epidote, gahnite, phenakite (crystals to 1 cm enclosed in beryl), plumbomicrolite

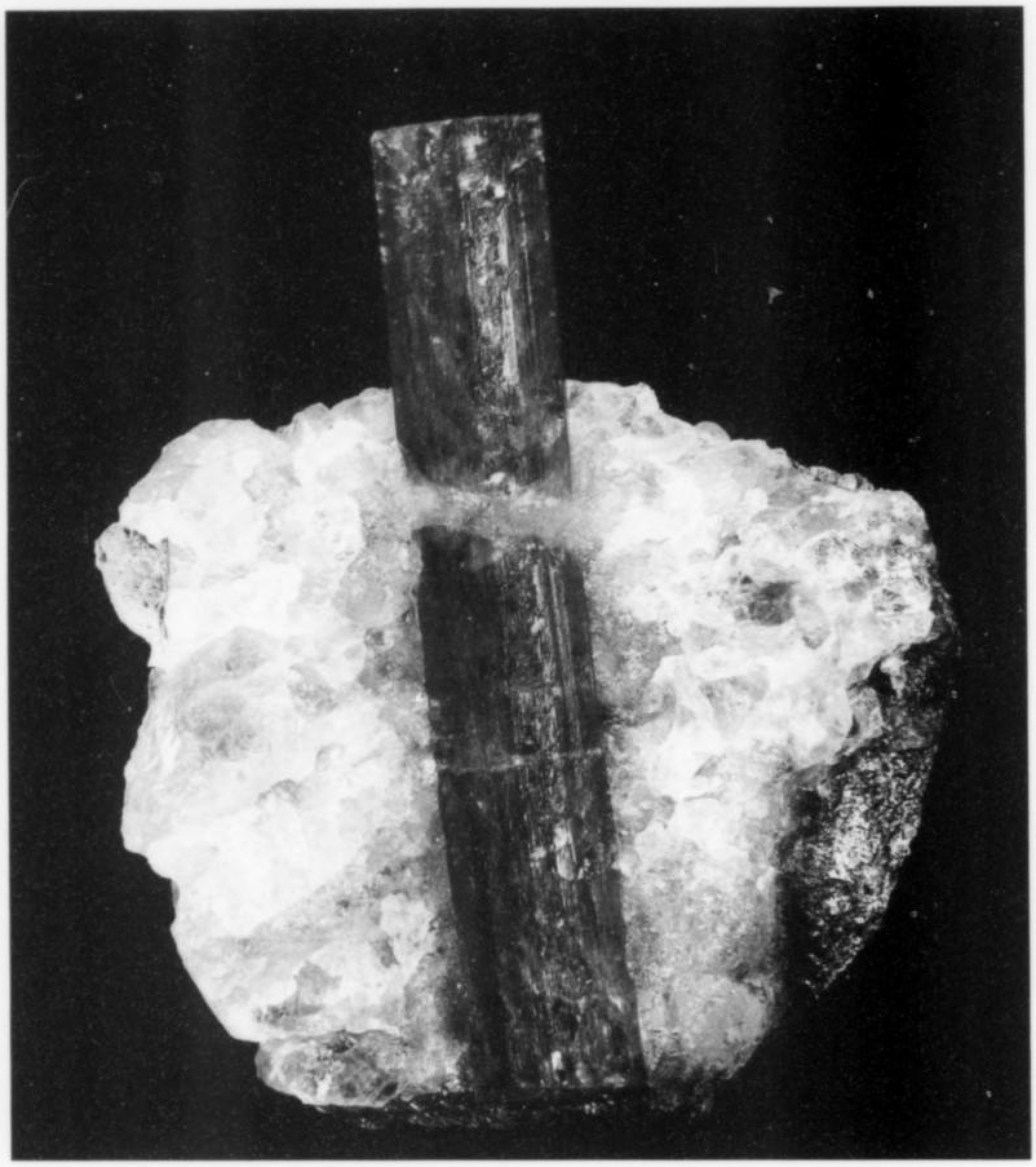

Figure 10. **Emerald crystal (fractured by tectonic forces and cemented by quartz), 7 cm, from the Kagem mine. Collector's Edge specimen; Richard Jackson photo.**

(brownish yellow crystals to 1 mm), and xenotime (euhedral microcrystal inclusions) (Seifert *et al.*, 2004).

SPECIMEN PREPARATION

The preparation process for the emerald specimens is slow and tedious because of the brittle nature of the emeralds and the hardness of the enclosing quartz. A single quartz-enclosed specimen can take several months to prepare. The preparation work is entirely mechanical; no chemicals are used, as any chemicals that could remove the quartz would surely damage the beryl as well.

The first step is a visual assessment of the "raw" quartz/emerald block. Laboratory technicians at Collector's Edge take note of all the emerald crystals exposed at the surface of the sample. Using each exposed emerald crystal as a starting point, an intense light source is focused into the translucent quartz blocks around the area of the crystal. Emerald crystals embedded in the quartz will glow faintly, allowing the technicians to estimate their orientation and approximate length. The presence of emerald crystals not exposed at the surface can also be detected by this "green glow" technique.

The lab technicians then carefully plan the initial diamond saw cuts and mark them on the surface of the quartz boulder with grease pencils. The larger quartz boulders and lenses are then cut up into more manageable sizes, and the trimmed quartz blocks are once again subjected to visual examination with the intense light source. By this method one is only able to "see" 3 to 5 centimeters into the quartz blocks, so when exploring for emerald crystals within the larger quartz pieces it is necessary to trim and re-examine them many times to make sure that none of the terminated emerald crystals are accidentally cut by the diamond saw.

Additionally, during this exploration phase, a decision is made regarding the best, most aesthetic final orientation of the potential emerald specimens. It is important to keep this vision of the final specimen in mind, so as not to saw away any quartz which might later be wanted as matrix for the finished piece. Every effort is made to preserve more than one terminated emerald crystal on a given piece of matrix. Sadly, very few specimens have been encountered which have a geometry that will allow more than one crystal to be kept on the same piece of quartz matrix.

Once all of the potential specimens have been identified, oriented and trimmed into their individual quartz blocks, the painstaking work of removing the enclosing quartz is begun. The Collector's Edge laboratory technicians utilize various micro-pneumatic tools to slowly peel away the quartz, 5 to 10 mm at a time. The impact made by these small power tools can produce unwanted fractures in the quartz matrix, so whenever necessary the quartz is vacuum-impregnated with an optical-grade epoxy to stabilize it.

As the emerald crystals are gradually exposed from the quartz a *temporary* protective coating of epoxy resin is applied to their surface. This coating shields the crystals from the impacts of tiny abraded quartz particles.

Because of the brittleness of the emeralds and the tenacity of the massive quartz, extreme care must be taken during the final stages of quartz removal. The micro-pneumatic tool chosen for the final stage of specimen preparation is more precise, and the removal of the final layer of quartz from the emerald is done under the microscope. The technicians also employ micro-air-abrasive techniques to remove quartz in the final stages.

Once the quartz matrix has reached its final configuration, the

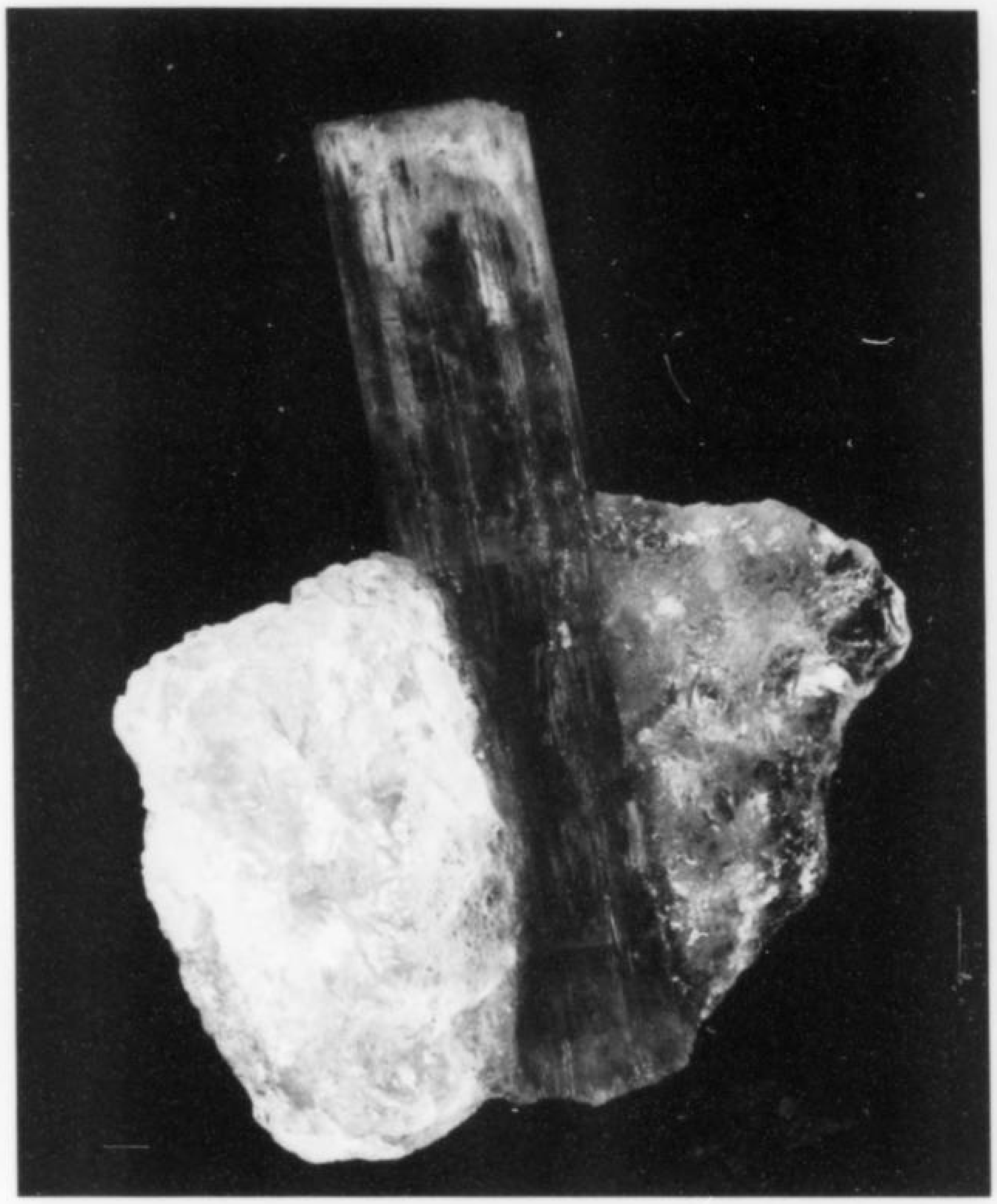

Figure 11. **Emerald crystal, 5.7 cm, in quartz, from the Kagem mine. Collector's Edge specimen; Richard Jackson photo.**

laboratory technicians use air-abrasive techniques to remove all of the visible epoxy resin from the surfaces of the quartz and the emeralds. The specimens are then finished and ready for sale. By agreement with Gemfields PLC, Collector's Edge Minerals, Inc. is the sole world-wide distributor for the Kagem mine emerald specimens.

ACKNOWLEDGMENTS

We are grateful to Robin Rennie of Crystal Classics and Bryan Lees of Collector's Edge Minerals, Inc. for contributing their professional observations about the Kagem mine and its specimens and for assistance with the literature search. Dr. Anthony Kampf, Tom Moore and Tom Gressman kindly reviewed the manuscript. Special thanks must be given to the management and staff of Gemfields PLC, for their eagerness to recover and preserve these superb emerald specimens and for their willingness to share information useful in the writing of this article.

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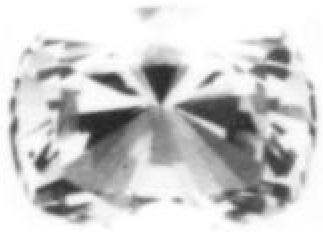
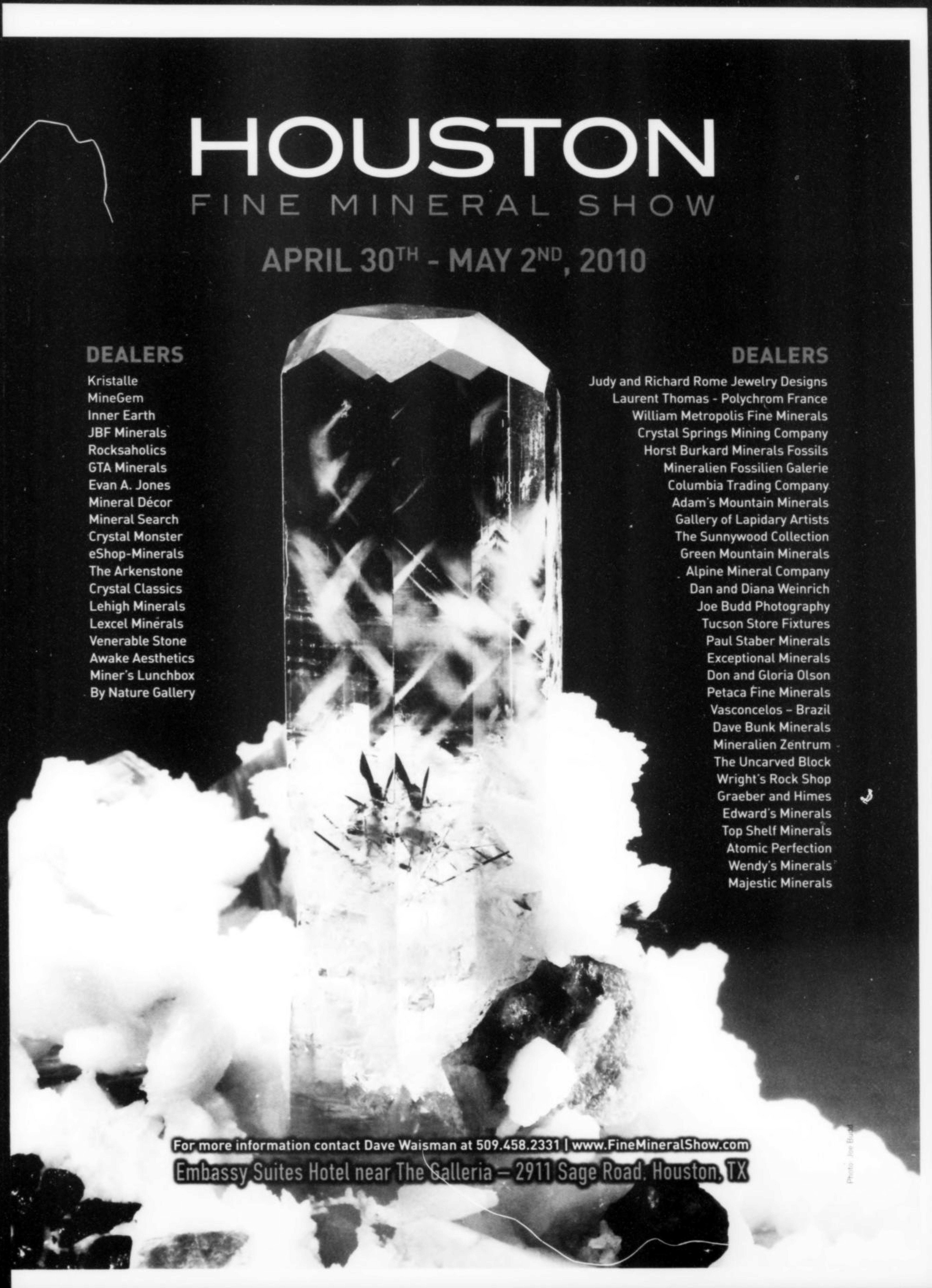


AQUAMARINE ON SCHEELITE. XUEBAODING, PINGWU, SCHUAN CHINA. BILL LARSON COLLECTION. JEFF SCOVIL PHOTO.
AQUAMARINE 20CT AND 13CT. SANTA MARIA, BRAZIL. COURTESY OF PALAGEMS. MIA DIXON PHOTOS.


HOUSTON
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Crystal Classics
Lehigh Minerals
Lexcel Minerals
Venerable Stone
Awake Aesthetics
Miner's Lunchbox
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DEALERS
Judy and Richard Rome Jewelry Designs
Laurent Thomas - Polychrom France
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Photo: Joe Budd

Brazilianite on Quartz, Linopolis, Minas Gerais, Brazil. 3" tall.
wilensky photo

JEFF SCOVIL PHOTO

FORSTERITE (var. Peridot), 4.7 cm, Sapat, Kohistan, Pakistan. From Wayne Thompson (and Sandor Fuss), December 1994. Pictured in *Lapidary Journal* May 1995

THE DUGUPI-MAANSHAN ANTIMONY DEPOSIT

Weishan County, Yunnan Province, China

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Specimens from the Dugupi-Maanshan deposit have been available on the international mineral market since 2004 or earlier, but have been misattributed to various existing and fictitious localities scattered across southwestern China. The mine has produced spectacular aragonite "flos ferri" specimens, large, transparent gypsum crystals with red inclusions, and colorful fluorite-stibiconite combinations.

INTRODUCTION

Localities for valuable Chinese mineral specimens are often a well-kept secret in the Chinese specimen trade. This secrecy is intended to hinder competition and is usually of little importance to Eastern collectors who generally seem more concerned with specimen size and aesthetics than with chemistry and locality. Moreover, small-scale mining in China often operates in an environment where keeping a low profile is advantageous to the mine owners. In other cases the information about the specific locality of origin is simply lost in the process of trading. As a consequence, even in Chinese museums the locality information for domestic specimens is typically quite vague.

So how was the Dugupi-Maanshan locality "discovered?" That is a long story, stretching over four years, most of it taking place in Kunming, the capital of Yunnan Province (several hundred kilometers from the mine). The story contains all of the inevitable ingredients: time, money, luck and a mine owner who needed to be persuaded. Some would call it "investigative journalism."

LOCATION

The Dugupi-Maanshan deposit is located at the southwestern extension of Dali Prefecture of Yunnan Province. Administratively it belongs to Weishan County. The county capital to the east-southeast, Weishan, which is also the nearest major city, can be reached from the mining area by paved and unpaved roads in several hours.

GEOLOGY

Geologically the Dugupi-Maanshan deposit is situated in a region that hosts ore deposits of considerable economic importance. The regional geological background has therefore been extensively studied. Tectonically the deposit is located in the Mesozoic-Cenozoic Lanping-Simao Basin that developed on the Changdu–Lanping–Simao micro-plate between the Yangtze Plate to the east and the Tibet–Yunnan Plate to the west, separated by the Lancangjiang and Jinshajiang–Ailaoshan faults (Yin *et al.*, 1990 in Xue *et al.*, 2007).

The Lanping–Simao Basin is essentially an intracontinental terrestrial basin. Six horizons of evaporites, dominantly of gypsum and halite, and occasionally also sylvite, have been found in the sequence. The total thickness of the evaporite layers may well exceed 2,000 meters in some places. The basin is filled with siliciclastic rocks, except for the lowest part of the sequence, and the Upper Triassic Sanhedong Formation, which consists mainly of marine limestone. There are several sedimentary gaps in the stratigraphic column of the basin (Qin and Zhu, 1991; Xue *et al.*, 2002b in Xue *et al.*, 2007).

Figure 1. **The Dugupi-Maanshan mining area. Chris Schroeder photo, December 2008.**

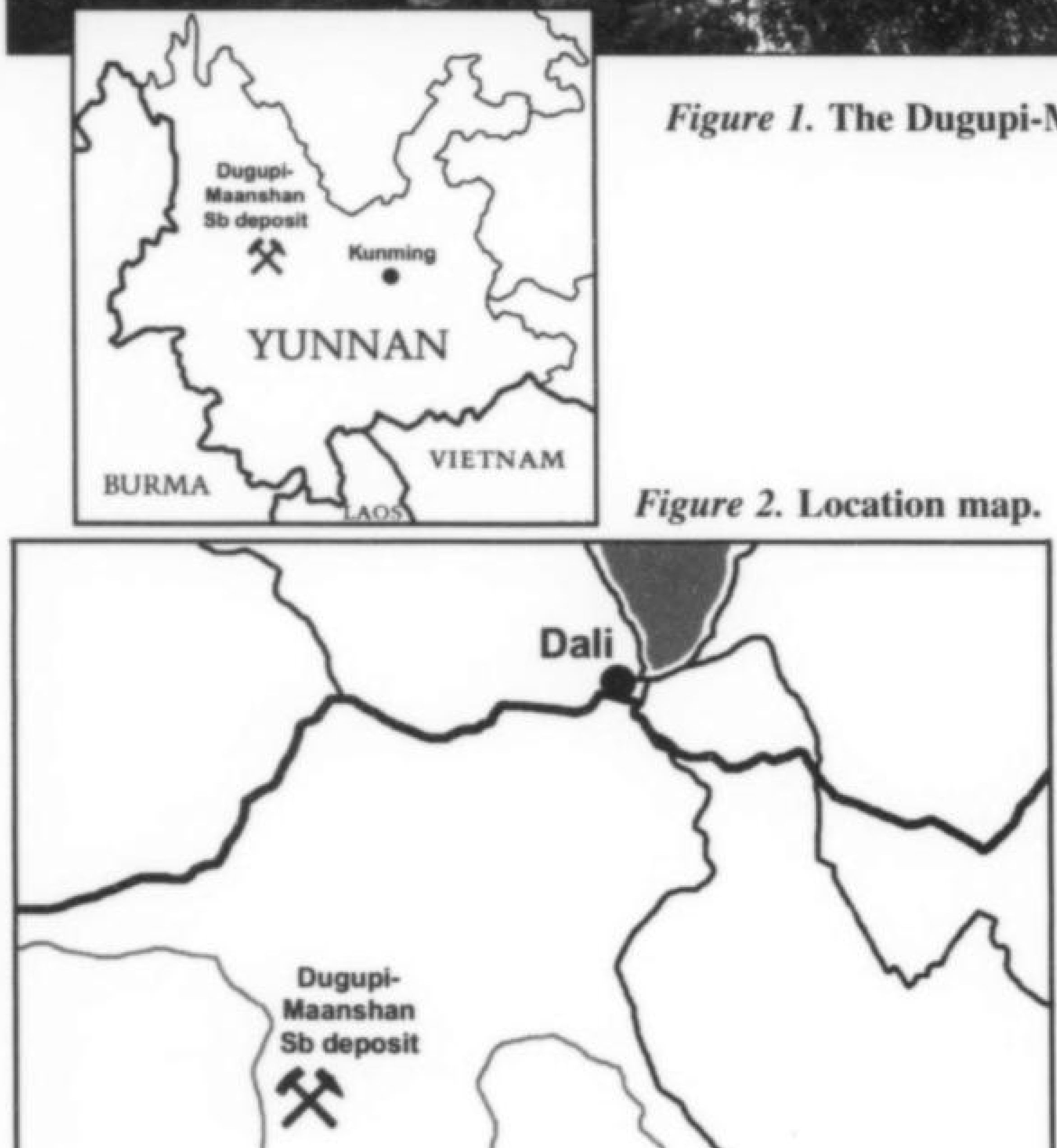


Figure 2. **Location map.**

No direct reference is available for the Dugupi-Maanshan deposit itself; however, it can be assumed that it belongs to the same hydrothermal system as the neighboring Bijiashan antimony mine. Chang (2007) describes the Bijiashan deposit as a medium to low-temperature hydrothermal deposit hosted by upper Triassic limestone of the Sanhedong Formation.

MINING

The Dugupi-Maanshan mining area consists of more than a hundred individual mines scattered over a steep hillside forming the east bank of the Yangbi River. A small tributary of the Yangbi divides the district; the area on the north side is referred to as "Dugupi," whereas the southern section is called "Maanshan." The deposit, discovered in the 1980s, was initially worked exclusively for antimony ore. Specimen mining began much later, not before the late 1990s, in reaction to the development of the Chinese mineral specimen market.

Individual mines in the Dugupi-Maanshan mining area usually consist of a single drift that follows the stibnite vein several hundred to more than a thousand meters into the mountain. Simple mining methods without forced ventilation prevail. Ore beneficiation on site is done manually and by conventional gravity concentration techniques.

Specimen mining makes use of expanding mortar. Large-diameter holes are drilled into the rock matrix around the area of interest and

Figure 3. **Gypsum specimen mining in the Dugupi-Maanshan deposit. Chris Schroeder photo, December 2008.**

filled with expanding mortar, so that the rocks are gently fractured when the mortar hardens. The fragility of the crystal specimens permits no other means of recovery. Large specimens are then carefully trimmed, wrapped and levered onto wooden crates. These are hoisted up the inclined shaft at an angle of 45 degrees and more. Much of the procedure is reminiscent of the methods used in the construction of the great pyramids of ancient Egypt.

PARAGENESIS

The initial stage of mineralization in the orebody consisted almost exclusively of stibnite followed by fluorite and calcite. Both stibnite and calcite were subsequently heavily altered. Almost all of the stibnite was oxidized to secondary antimony minerals, and much of the calcite was dissolved. The resulting fluid, rich in calcium, carbonate and sulfate ions, later precipitated in the cavities to form aragonite, secondary calcite and gypsum.

MINERALS

Aragonite $CaCO_3$

The spectacular coralloidal *flos ferri* specimens are the "cash cows" of specimen mining at Dugupi-Maanshan. In size and aesthetic appearance they compare favorably with *flos ferri* specimens from any other locality in the world. Because of this high level of quality, large specimens can be quite expensive. The collecting of aragonite specimens is highly labor-intensive and does not permit concomitant ore mining. Some workings in the "aragonite zone" in the lower levels of the deposit are now operated exclusively for aragonite specimens—once discarded as worthless gangue.

The filigreed stalks and branches may reach more than half a meter in length. They are often too fragile to be retrieved as matrix specimens. Other habits have an irregular "etched" appearance or show crystal faces and can be difficult to distinguish from calcite. The aragonite is usually pure white and rarely pale bluish green. Surface coatings, often on one side only, may be yellow, brown or gray.

Aragonite from this locality is typically quite fluorescent in various hues ranging from yellow to shades of green, blue and pure white. Occasionally, different colors appear on the same specimen. The fluorescence almost always differs under different wavelengths of ultraviolet light.

Calcite $CaCO_3$

A common mineral, early-stage calcite is found as pale brown to yellow scalenohedral crystals which are translucent to opaque, commonly with black inclusions and colored surface coatings. Various stages of corrosion and partial replacement by aragonite, gypsum and other minerals is apparent, including possible pseudomorphs after calcite. Rarely, corroded specimens, inconspicuous in daylight, exhibit a deep green fluorescence under shortwave ultraviolet light.

Late-stage calcite seems to be less common at this locality and can typically be found in the aragonite zone. It forms crusts of white opaque or colorless to yellow transparent scalenohedrons and other crystal habits, usually less than 2 cm long and commonly exhibiting an orange fluorescence.

Gypsum $CaSO_4 \cdot 2H_2O$

Cavities in the upper levels of the deposit are commonly filled with masses of gypsum and are sometimes lined with large transpar-

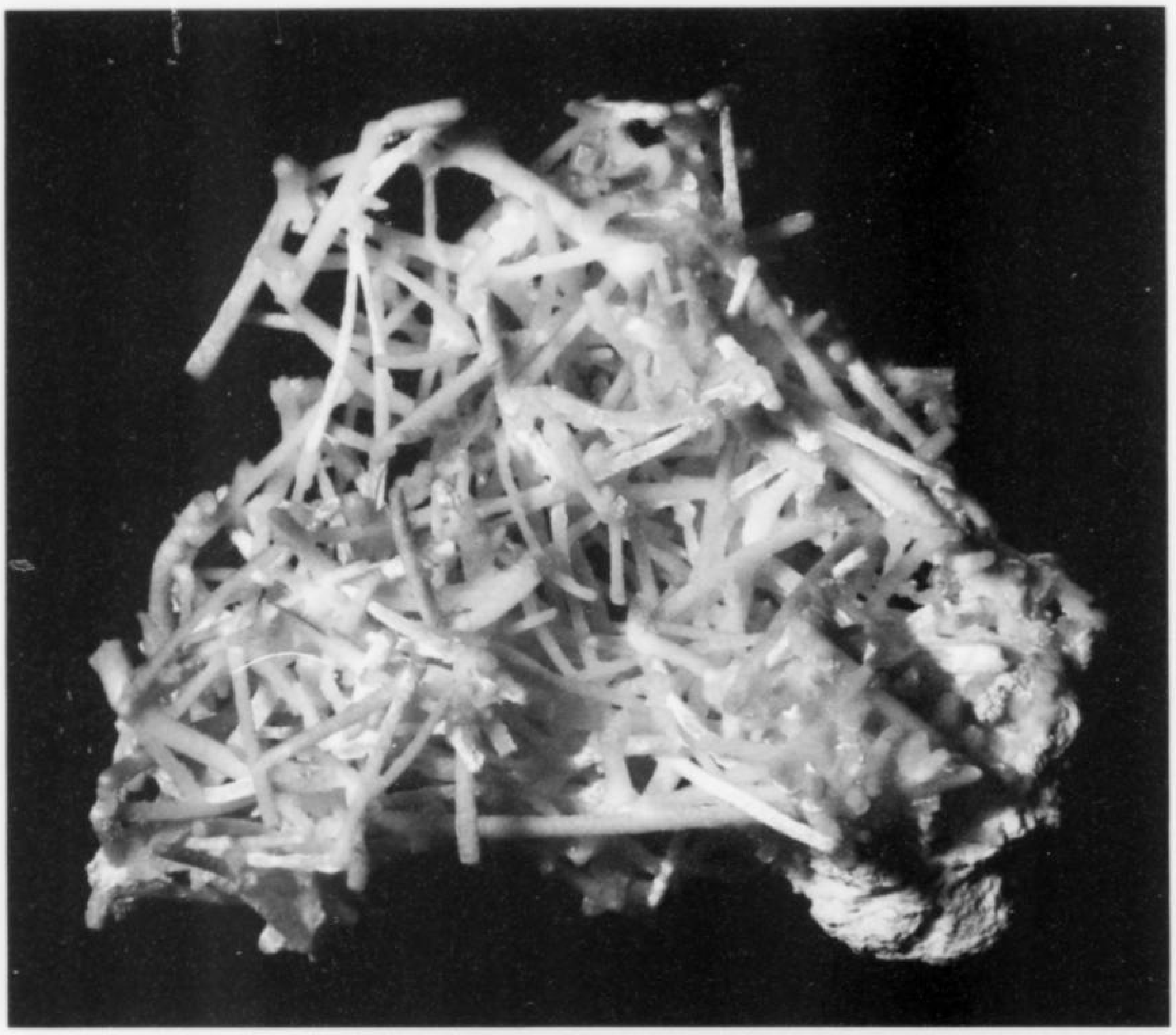
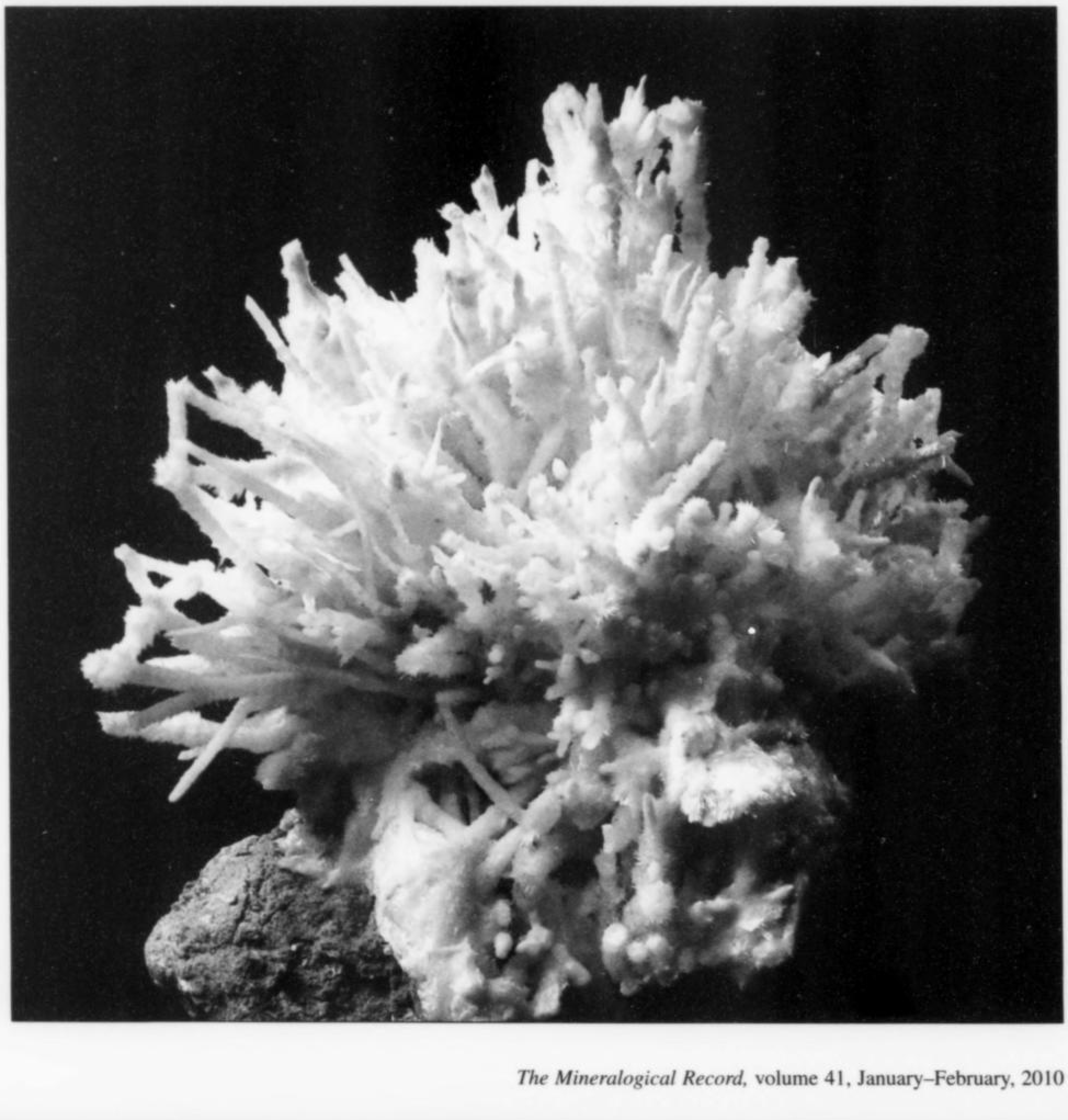


Figure 4. Aragonite, 9 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.

Figure 5. Aragonite on matrix, 20 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.



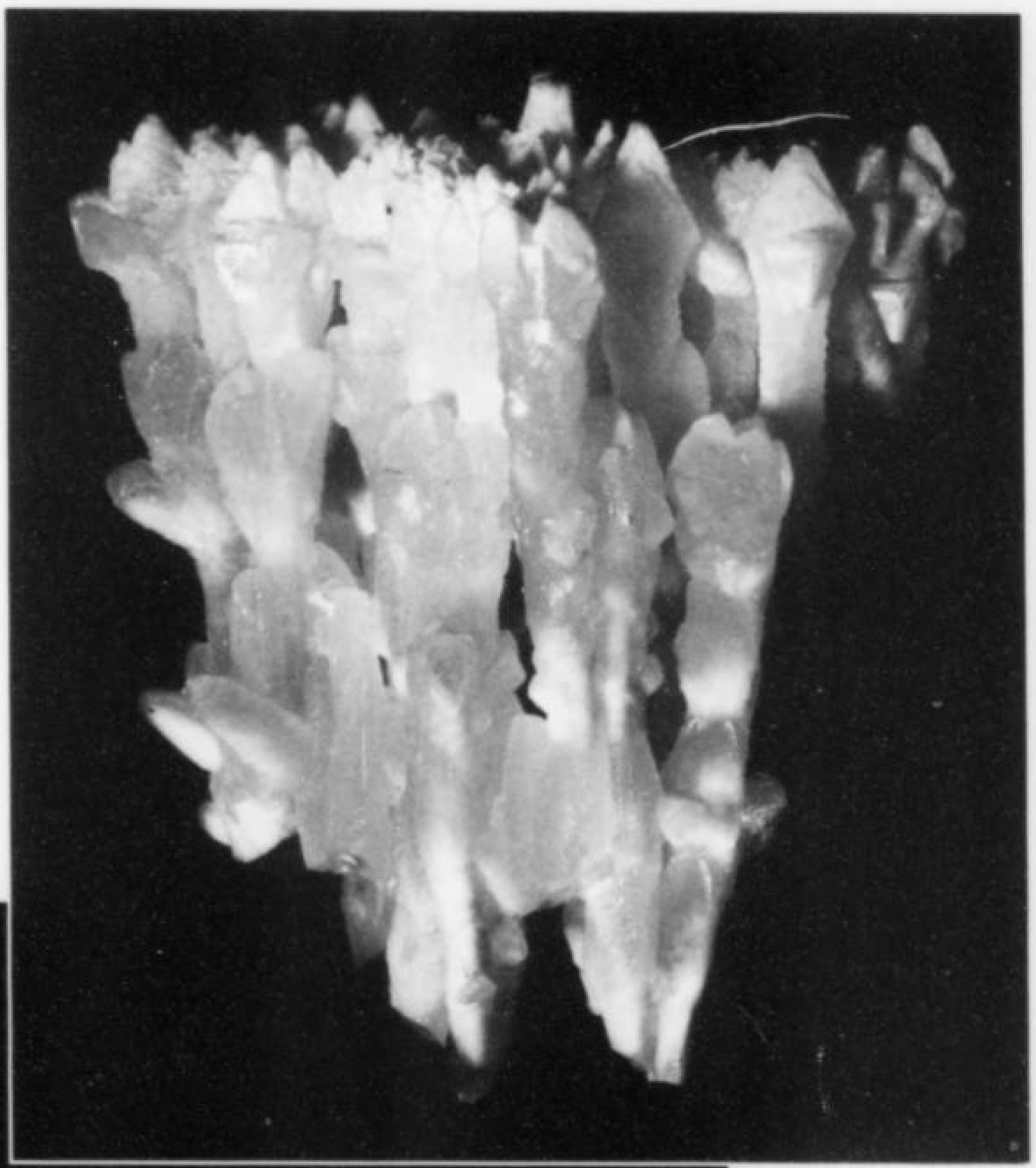


Figure 6. **Calcite, 9 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**

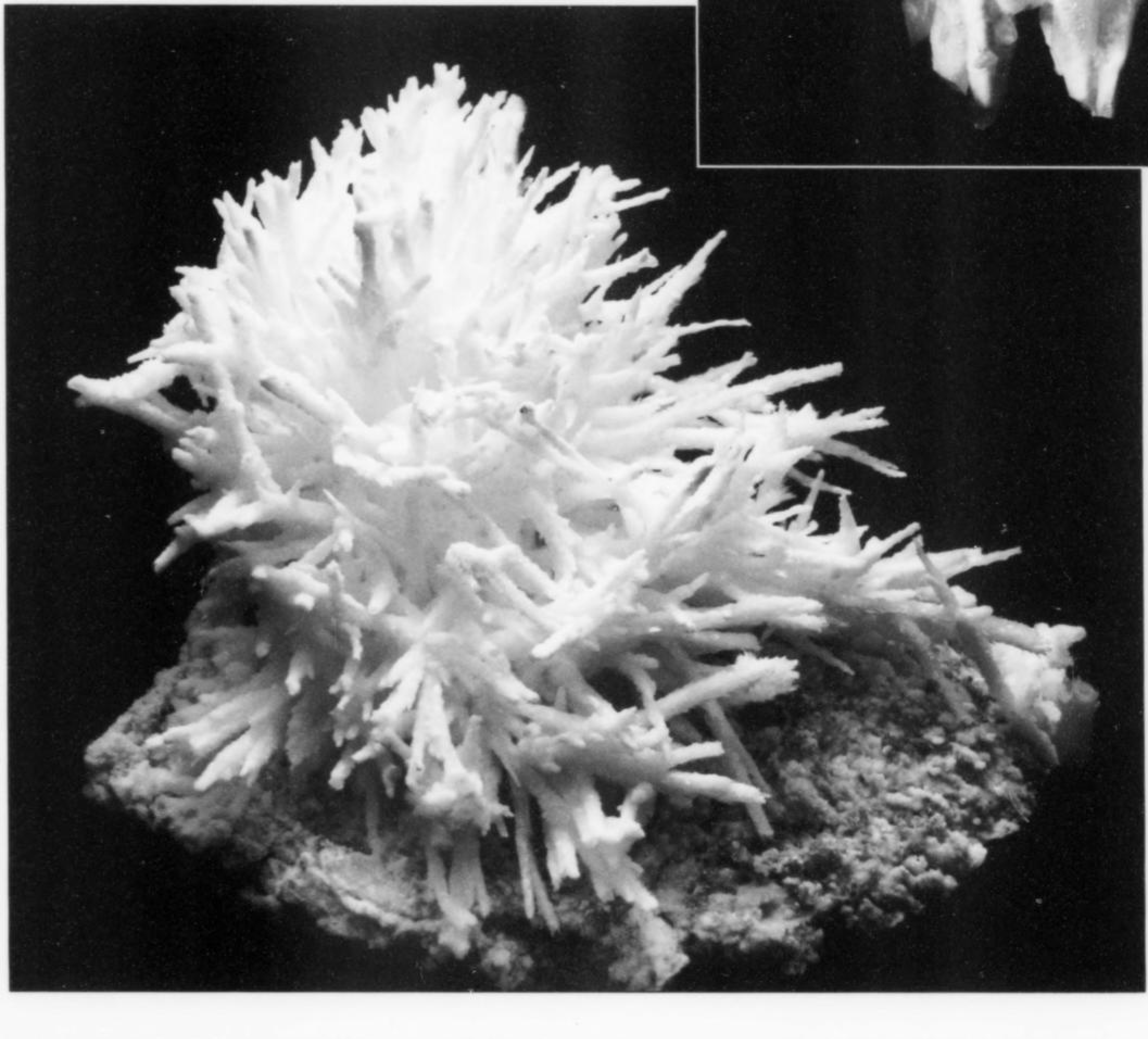


Figure 7. **Aragonite on matrix, 15 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**

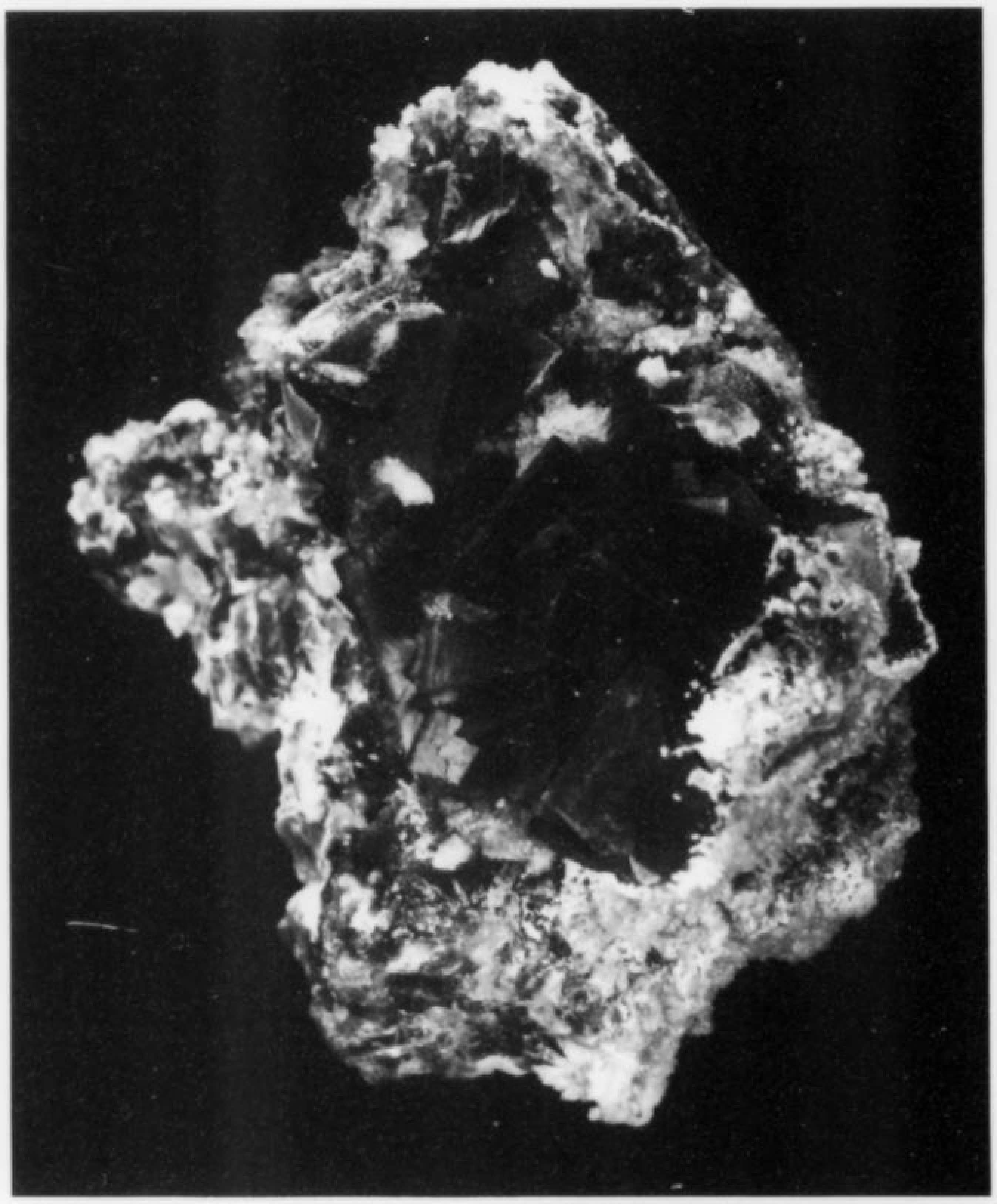
ent crystals ("selenite") that reportedly can reach up to 3 meters in length. Usually they have colorless to pale yellow, very transparent interiors whereas the surfaces may be matte or lustrous.

The source of these large, transparent gypsum crystals (many showing characteristic red to black inclusion phantoms) had long been a subject of speculation, but may now be considered confirmed. The identity of the red inclusions remains to be determined, though. Some have been described as cinnabar or realgar, but an antimony oxysulfide or metastibnite seems more likely.

As with aragonite specimen mining, some mines at Dugupi-Maanshan specialize in selenite specimen mining. Sections of cavities, some quite large, are meticulously separated from the host rock by use of expanding mortar and hand tools.

Selenite crystals from Dugupi-Maanshan commonly exhibit yellow or orange fluorescent zones, and some show fluorescent phantoms. Occasionally, fluorescent phantoms and inclusion phantoms occur in the same crystal at different depths. Inclusions of gases, liquids and other minerals are relatively common.

Figure 8. **Fluorite with secondary antimony minerals, 11 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**



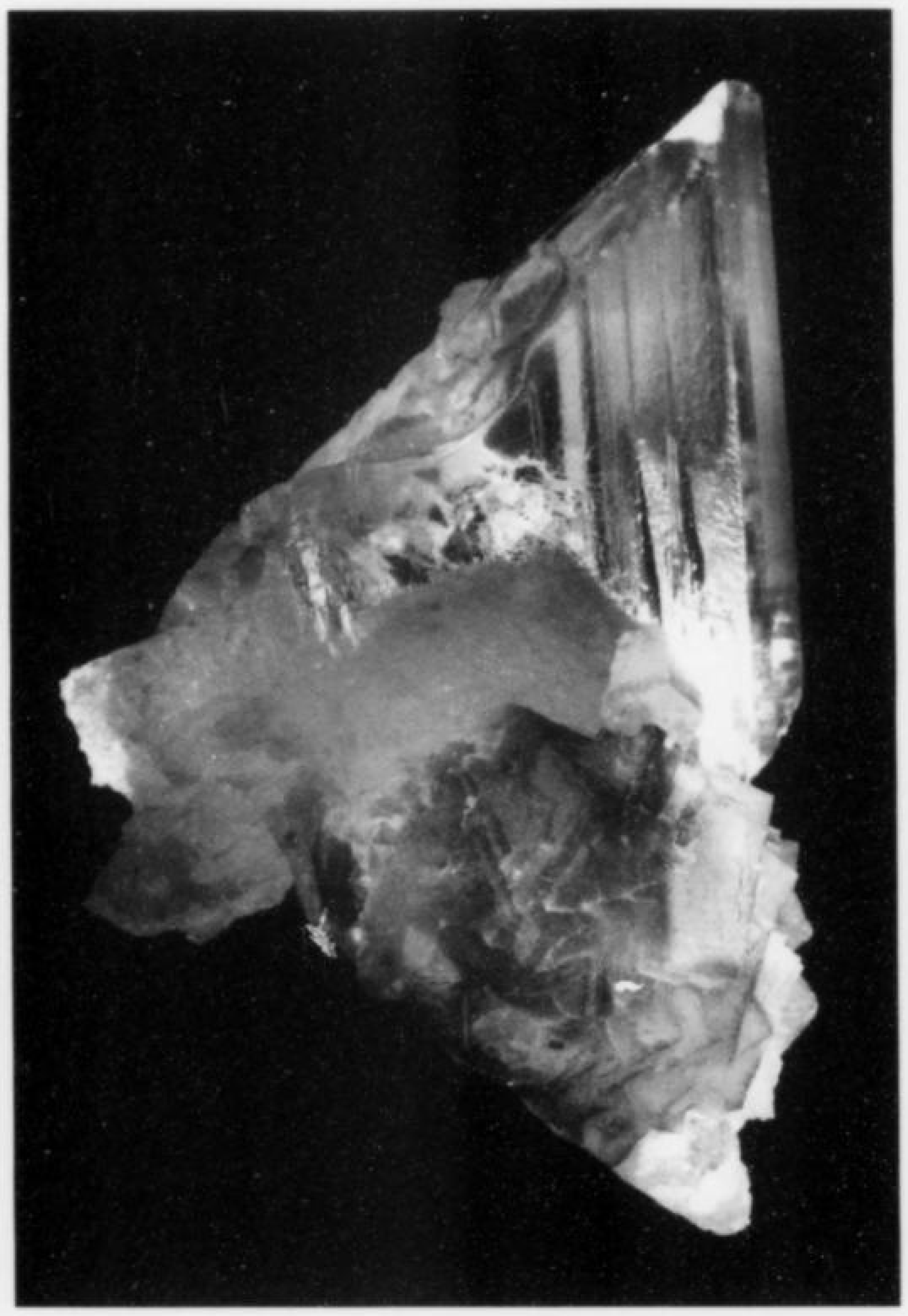


Figure 9. **Gypsum with fluorite, 12 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**

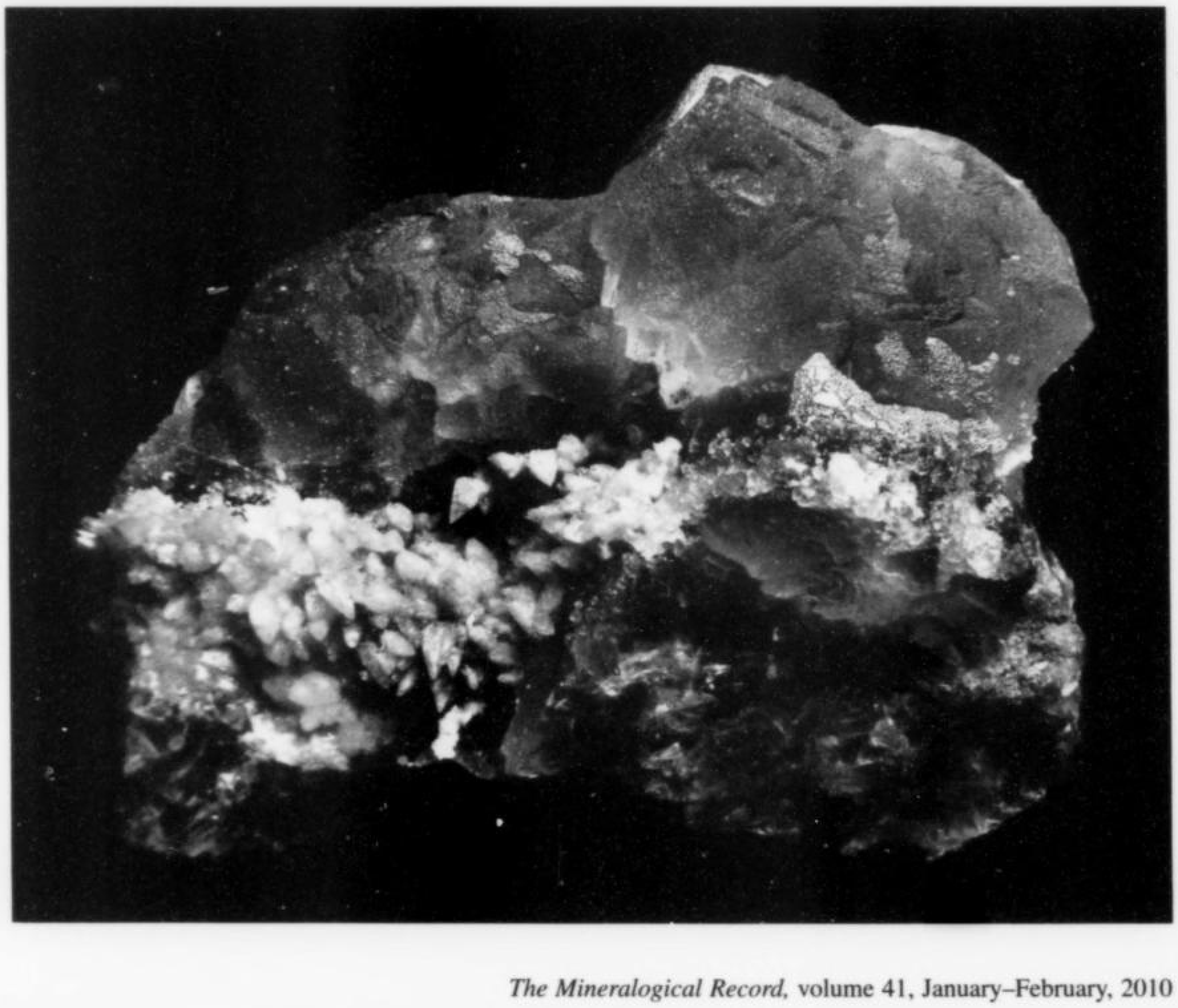


Figure 10. **Fluorite with calcite and secondary antimony minerals, 11.5 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**

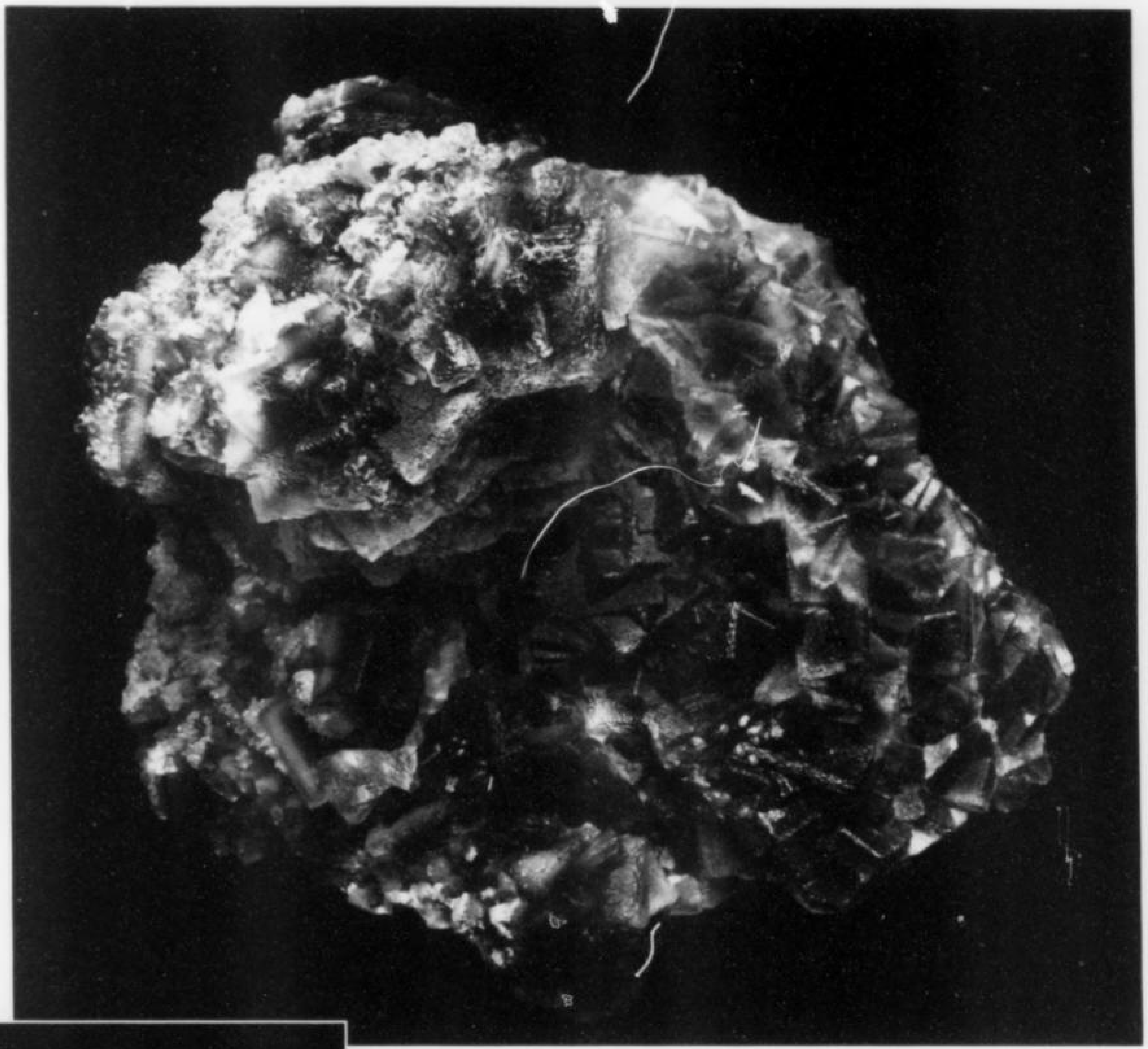
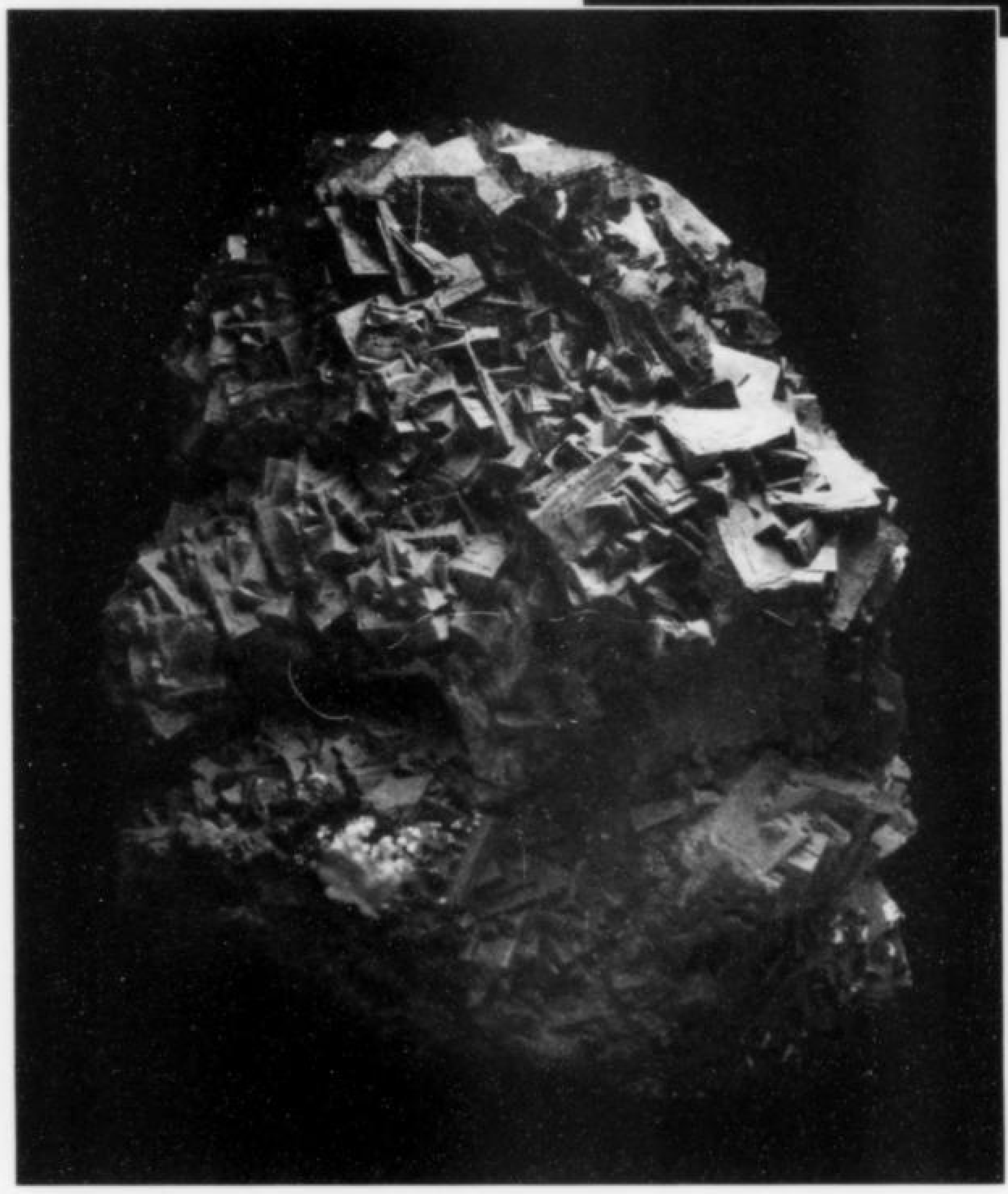


Figure 11. **Fluorite with calcite and secondary antimony minerals, 14 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**

Figure 12. **Fluorite, 29 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**



Fluorite CaF_2

Fluorite is ubiquitous in the deposit, in all shades of purple and blue, sometimes in alternating purple and blue bands. Freestanding crystal clusters usually consist of tightly intergrown cubes, occasionally modified by dodecahedron faces. The resulting specimens show thick, colorful crusts without conspicuous reflections because of the absence of large crystal faces. The fluorite typically has good transparency, and phantoms in different colors are common. Crystals with smooth faces are rarely larger than 1 cm on edge and fetch high prices when of deep color and good transparency. Disseminated crystals, if present at all, tend to be small and colorless.

Also noteworthy are pale blue to almost colorless "botryoidal" crusts of fluorite crystals showing abundant twinning and edge modifications. This peculiar habit is similar to that of fluorite from Mogok, Burma.

Some of the lighter colored varieties exhibit a noticeable color change from blue under diffuse sunlight to pale purple under incandescent light.

Most fluorite at this locality is completely overgrown by calcite, aragonite, gypsum or antimony minerals.

Stibnite Sb_2S_3

Practically all freestanding stibnite crystals from this locality have been thoroughly oxidized. Intact stibnite occurs as intergrown crystal cores that have little appeal to the collector. Some or all of the red antimony minerals may in fact be metastibnite, the rare amorphous polymorph of stibnite.

Secondary Antimony Minerals

Stibiconite is a characteristic mineral of this locality and occurs as yellow or greenish, brittle pseudomorphs after stibnite in various states of decay. White, brown, yellow and red secondary antimony minerals commonly occur in the vicinity of the stibiconite. In combination with purple fluorite and silvery stibnite remnants, this assemblage can be quite colorful. Most secondary antimony minerals at Dugupi-Maanshan are found as earthy masses and microcrystalline crusts. Analyses of secondary antimony minerals to determine the exact species have not yet been performed, but there are strong indications that rare species such as coquandite may be present.

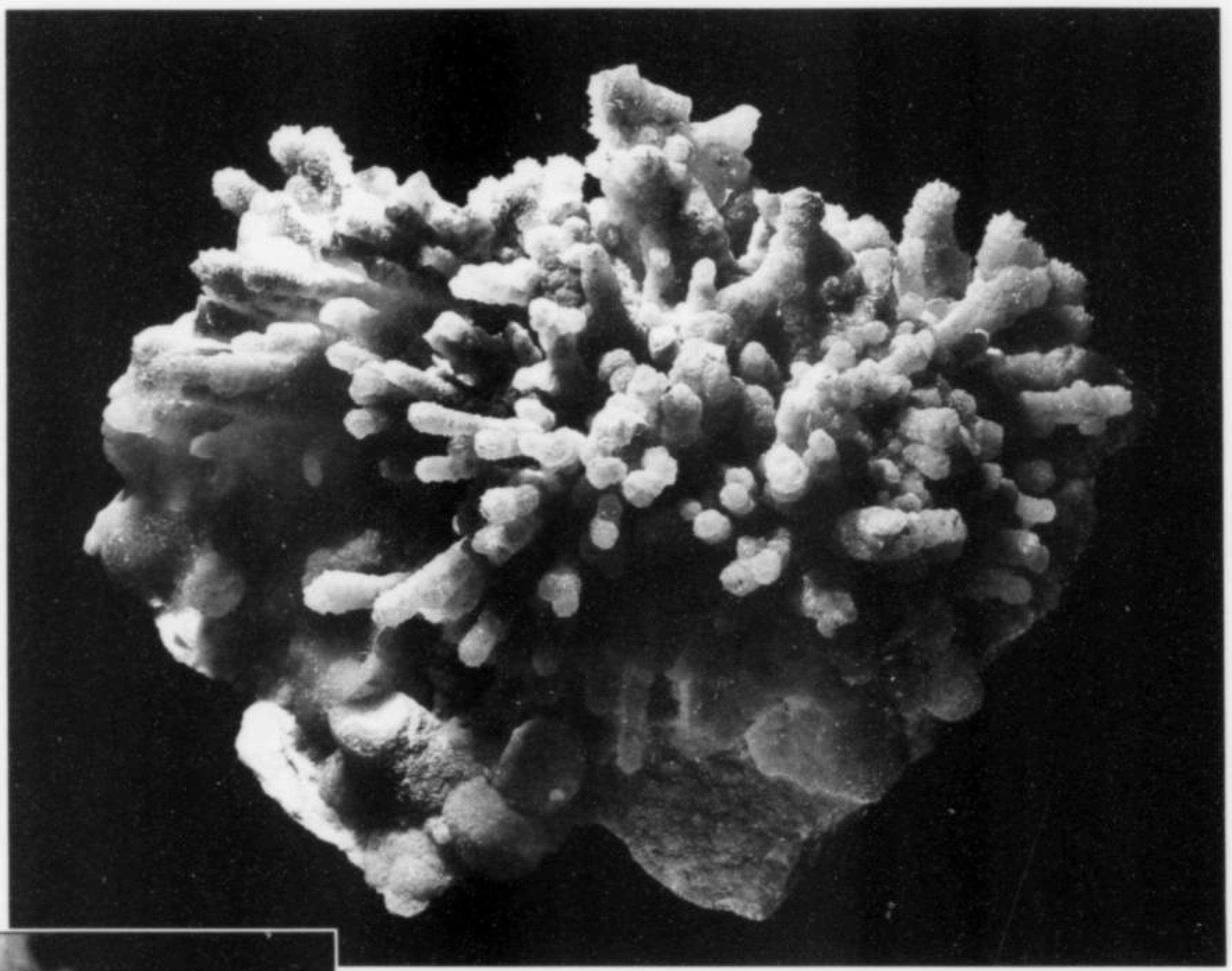


Figure 13. **Calcite perimorph after stibnite, 24 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**

Figure 14. **A secondary uranium mineral, possibly autunite, field of view 4 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**

Other Metals

According to local miners, white to yellow zinc oxide and sulfide minerals are found in the southern section of the deposit. Specimens show unidentified greenish yellow crusts associated with calcite.

A secondary uranium mineral has been found on corroded calcite and as inclusions in gypsum. It occurs as thinly disseminated, highly fluorescent, platy yellow crystals to 3 mm.

Trace element analysis (Chang, 2007) of the orebody at the neighboring Bijiashan mine shows a 50:1 ratio of antimony to the next most abundant analyzed elements, namely zinc and arsenic. Gold seems to be the only other heavy element occurring in commercial quantities at this deposit. It is unclear whether the gold occurs in native form.

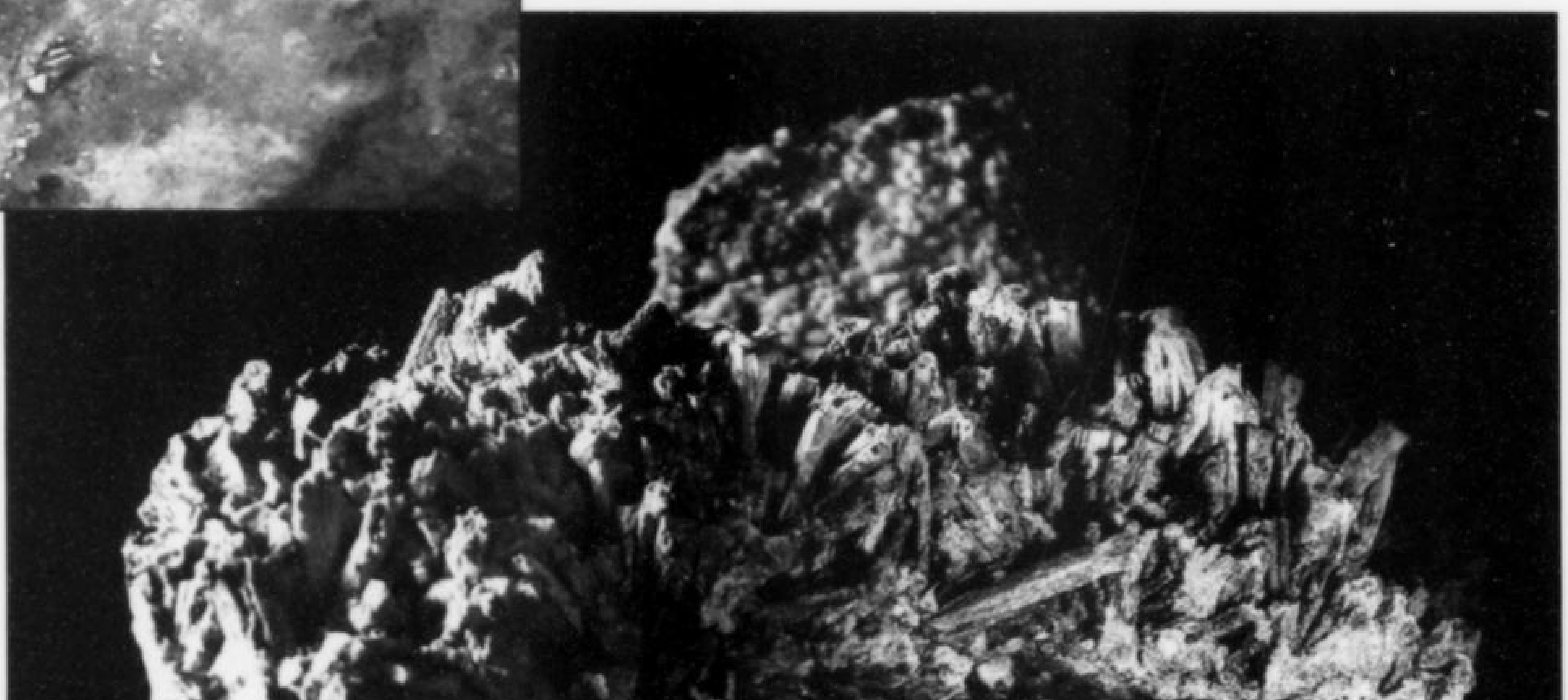
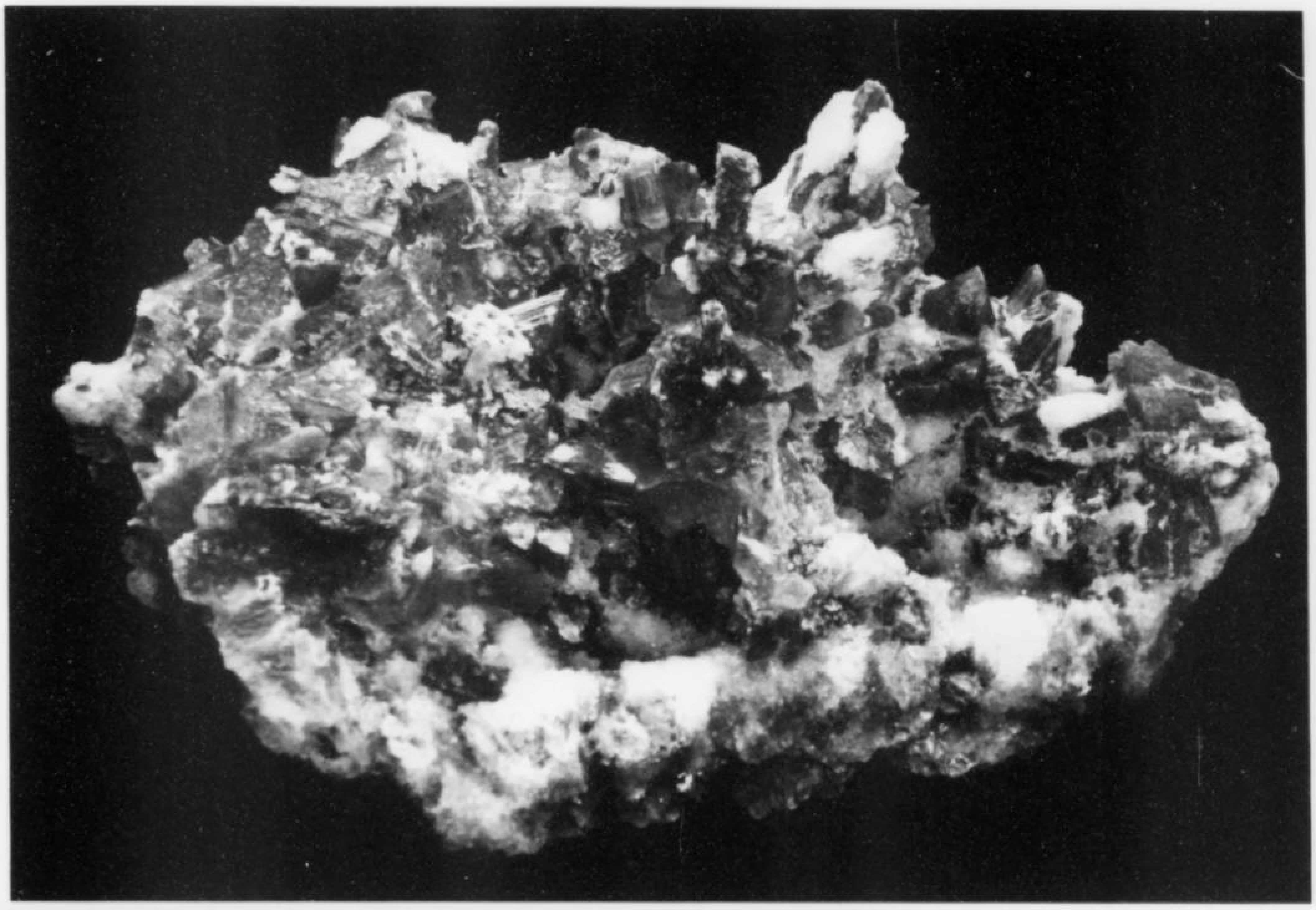


Figure 15. **Stibiconite pseudomorphs after stibnite on fluorite, 16 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**



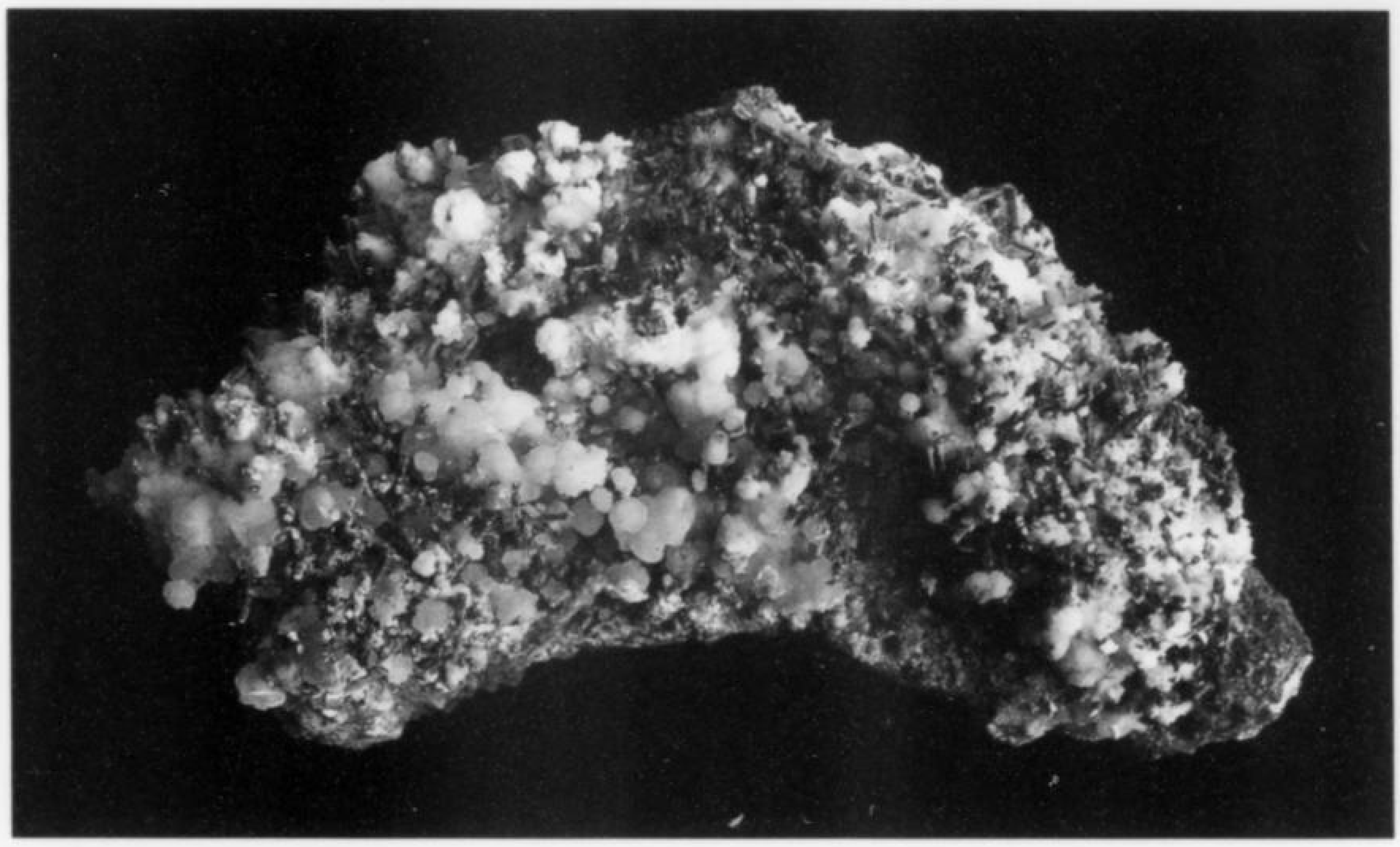


Figure 16. **Gypsum containing inclusions of what is probably metastibnite (red), with stibiconite pseudomorphs after stibnite (yellow), 31 cm, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**

Figure 17. **Purple fluorite, 30 cm across, completely overgrown by secondary antimony minerals and aragonite, from the Dugupi-Maanshan deposit. Rare-X.com specimen; Chris Schroeder photo.**

Fluorescent Minerals

The presence of patchy, bright yellow-green fluorescence, under shortwave ultraviolet light, on surfaces of species that are inherently non-fluorescent is fairly common. The fluorescence may be caused by thin crusts of hyaline opal.

The principal secondary minerals from this locality (aragonite, calcite and gypsum) show a rainbow of fluorescence colors, usually with medium intensity, frequently with several colors occurring on the same specimen and commonly with different colors at different ultraviolet wavelengths. This type of fluorescence is typically caused by impurities and crystal lattice defects, in contrast to the fluorescence exhibited by inherently fluorescent compounds.

Some fluorite specimens from this locality exhibit zones of fluorescence other than the "usual" blue. This may be caused by surface coatings or inclusions.

ON-SITE COLLECTING

Small specimens of fluorite, calcite and antimony minerals can be found on the mine dumps, but the quality is insufficient to justify either the physical danger involved or the tedious trip to the mine. Good specimens leave the mining area very quickly through the established specimen market channels.

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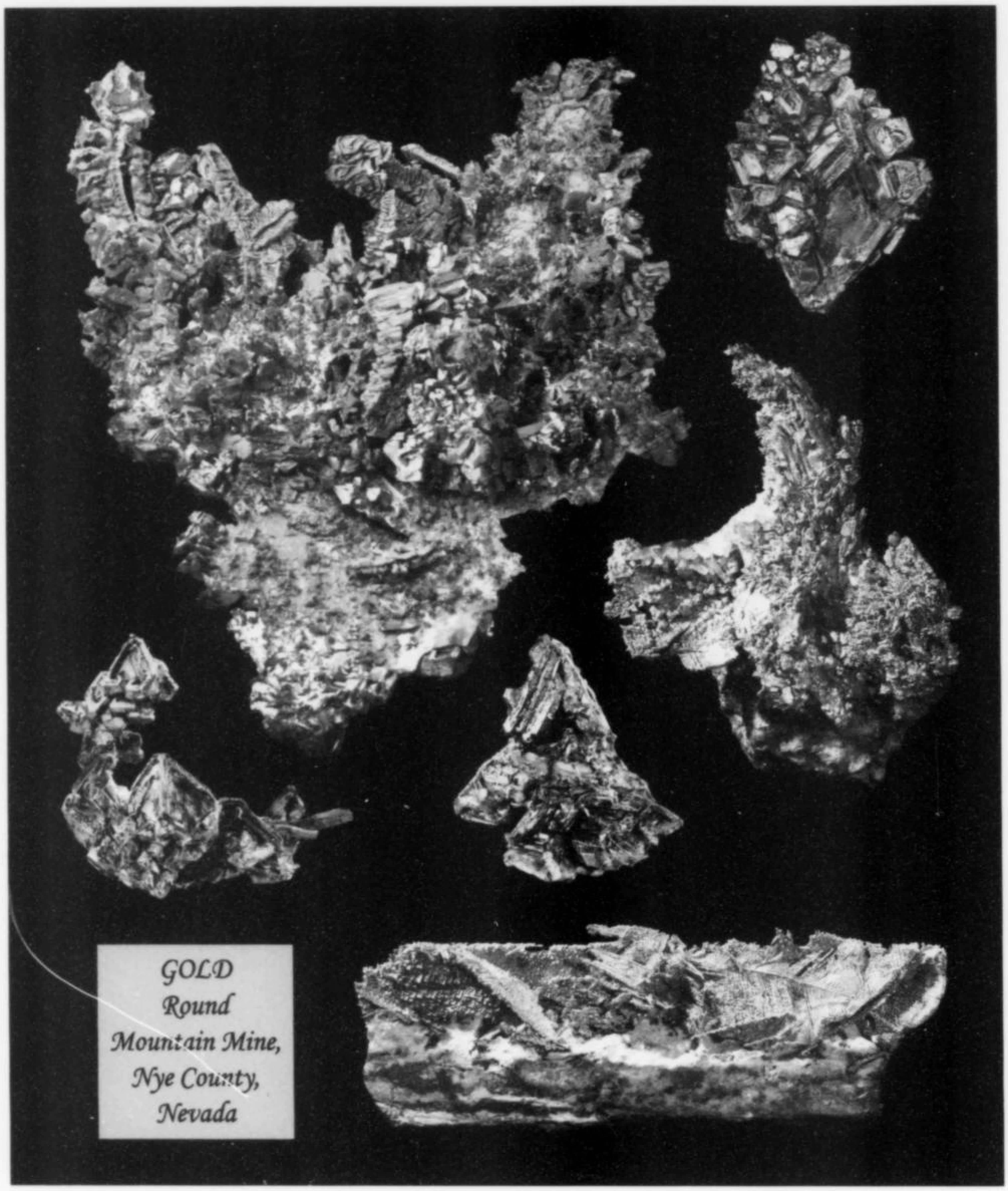

GOLD
Round
Mountain Mine,
Nye County,
Nevada

What's New

New Jersey Show 2009 — by Joe Polityka

[*April 25–26, 2009*]

Like most mineral collectors I am a big fan of mineral shows (regardless of size) and an equally big fan of natural history museums, especially those that have good mineral exhibits. There are few regions on the face of the earth that have a good mineral show, two great mineral museums, mine dump collecting, an underground mine tour, history, and beautiful scenery available to the mineral fanatic on a mineral show weekend, and all within a one-hour drive of one of the world's greatest cities. Such a place is the Franklin-Ogdensburg region of Sussex County, New Jersey with all of this mineral excitement taking place twice a year, in late April and late September, in a three-square-kilometer area.

In April the New Jersey Earth Science Association puts on its annual extravaganza while in September the Franklin-Ogdensburg Mineral Society puts on its show. Both shows are must-sees if you are ever in northern New Jersey at the appropriate time.

There is so much to do at these shows: first, there are the outdoor and indoor mineral sales at the main show and there are the mineral sales at the Franklin Mineral Museum and the Sterling Hill Mining Museum. You have to schedule your day carefully so as to squeeze in as much as possible, as early as possible. My own schedule begins with getting out of bed very early on Saturday; after a quick breakfast I make the 90-mile trip up to Franklin using the scenic back roads of Eastern Pennsylvania and Northwestern New Jersey.

My first stop is the main show, with its indoor dealers and outdoor swapping/selling area. After I complete phase one of my plan (checking out what's new) I drive down the road a short distance to the Franklin Mineral Museum and then shoot over to the Sterling Hill Mining Museum in Ogdensburg to check out the mineral sales tables. This year there were thousands of one-of-a-kind specimens from everywhere and anywhere, with heavy emphasis on localities in New Jersey. You just have to visit personally to get an idea of how diverse the selection can be from year to year. Later in the day, after I got my fill of looking at minerals for sale, I slowed down and revisited the museums in Franklin and Ogdensburg so I could unwind and browse at a more relaxed pace.

Both museums, of course, have exhibits of museum-quality Franklin and Ogdensburg minerals; in addition, they also have exhibits of worldwide minerals (both classic and contemporary) ranging from small in size and average in quality to large, top-quality pieces.

The Franklin Mineral Museum offers a tour of the museum building, and collecting on the famous Buckwheat dump; also at the museum is the Wilfred Welch Mineral Exhibit, with over 6,000 mineral specimens from many classic worldwide locations. In the same building is an exhibit housing Native American artifacts from the many tribes that occupied New Jersey and surrounding states in pre-European times. In addition, there is a special cabinet of donated specimens of the highest quality, from classic localities such as Bisbee, Arizona and Tsumeb, Namibia. (Their website: www.franklinmineralmuseum.com.)

The Sterling Hill Mining Museum in nearby Ogdensburg has Zobel Hall, a comprehensive museum in the old miners' changing house which includes mining memorabilia, equipment and fine mineral exhibits. Two exhibits stand out at this museum: the gold exhibit (housed in an antique safe) and the Oreck Mineral Gallery. According to the website, "A large upright safe in the Zobel Exhibit Hall houses a collection of gold specimens from worldwide mines. More than 8.5 pounds of gold is contained in these specimens in the form of sheets, wires, crystals, and nuggets." The Hauck brothers' sense of humor is on view here. One side of the safe contains gold specimens, while the other side is filled with "fool's gold,"—pyrite and other minerals that all too commonly are mistaken for real gold by hopeful prospectors. According to the Haucks, many collectors are fooled and can't distinguish between the pyrite and gold specimens. "Near the safe are large glass display cases containing dozens of specimens of native (naturally occurring) silver and copper, two other metals that have a multitude of uses in modern society." (Their website: www.sterlinghillminingmuseum.org.)

The website goes on: "Housed in the main exhibit hall, the Oreck Mineral Gallery contains more than $2,000,000 of fine mineral specimens in fifteen custom-designed glass display cases with fiber-optic lighting. This is the finest display of minerals in the State of New Jersey. Special exhibits include pegmatite minerals, the minerals of China, Russia and Africa, and displays of individual mineral species such as quartz, fluorite, calcite, stibnite, barite, celestine and copper." This display is a must-see because it contains many world-class specimens of the highest quality. Imagine a pyromorphite specimen from China over 30 centimeters in diameter, covered with clusters of lime-green crystals without any damage. This specimen is quite a spectacular sight to see and is just an appetizer leading up to the main course of many worldwide specimens of equal quality.

More from the website: "Thomas A. Edison was heavily involved in the mining industry in New Jersey and from 1890 to 1900 ran a large iron-mining operation a few miles east of here [Sterling Hill] that employed 400 people. The Zobel Exhibit Hall contains numerous items invented by Edison, including phonographs, telephones, early light bulbs, batteries, and miners' electric cap lamps. Also on display are specimens of iron ore from Edison's mines, and photographs of Edison's iron mining and concentrating works when they were in full operation."

Finally, the quarter-mile underground mining tour passes through the "Rainbow Room" where you can see minerals fluorescing in-place as the miners did. Let's face it, no matter what your interests (mining, history or geology) you can get your fill here on show weekend and still have plenty of interesting sights left over for many subsequent visits. In late April or late September the Franklin-Ogdensburg District in New Jersey is the place to be for mineral collectors.

Springfield Show 2009 by Joe Polityka

[*August 7–9*]

Every year, before heading out to the Springfield show, I make plans to see or do something that is not show-related. When our daughter was young, planning was simple: we would usually spend a day or two at an amusement park before or after our visit to the show. With the passage of time, as tastes changed and our daughter matured, we made side trips to the Basketball Hall of Fame, the Harvard Mineralogical Museum or one of the New England states for a mini-vacation. After last year's failed attempt to find the geologic fault known as Cameron's Line, I decided this year to do something interesting, yet different: visiting several New England restaurants that I'd seen featured on the Food and Travel Channels so I could sample their signature menu items. Because my wife and daughter had prior plans, I was on my own; it was just me and my Chihuahua, Butterbean, two wild and crazy guys on their way to a mineral show. Little did I know (at the time) that my little dog, all nine pounds of him, would give me quite a scare, after we checked into our hotel, by running out of my room and into the lobby, then through two sets of automatic opening doors and into the parking lot (don't worry, he's still with us).

On the way to Springfield, in keeping with this year's tourist theme, I decided to stop at Louis' Lunch in New Haven, Connecticut to sample their hamburgers (Louis' is where the hamburger was invented circa 1900). At Louis' the burgers are served in the original fashion—on toasted slices of white bread with cheese, tomato or onion and without any condiments (mustard, ketchup or mayonnaise). I suggest you stop at Louis' whenever you are in New Haven, so you can sample their burgers and make a side trip to Yale University to view the mineral display there.

Eventually I arrived at the Eastern States Exposition Center on Thursday around 1:00 PM (the day before the show opened) and found that most of the dealers were already setting up. Each year Marty Zinn and his staff kindly allow me to review dealers' stock on set-up day, giving me the opportunity to evaluate what's available before the masses rush in on opening day. This year there were some noteworthy new finds but most of the excitement centered on the dispersal of two prominent collections—Don Olson was selling specimens from the collection of the late Ernie Schlichter, and Rob Lavinsky was selling pieces once owned by (the still very much alive) Robert Whitmore.

The Ernie Schlichter specimens, as offered by *Donald K. Olson and Associates* (donaldkolson@netscape.net), were mostly things which Ernie collected over a 50-year period from localities in the eastern United States. Prominent on the shelves was a suite of minerals from the Warren Brothers quarry in Acushnet, Massachusetts. This Alpine-type deposit produced fantastic specimens of **apatite-(CaF), titanite, feldspar** and **quartz.** Also offered was a suite of Maine minerals which included a fabulous slab of transparent watermelon **elbaite** from Mount Mica, Paris, Oxford County, Maine. Singular specimens of **amethyst** from Maine and Rhode Island, along with a choice miniature of Bristol, Connecticut **chalcocite,** encouraged dealers and collectors to rummage (à la Tucson) through flats of specimens.

Rob Lavinsky of *The Arkenstone* (www.irocks.com) was likewise selling U.S. East Coast specimens, these from the Robert Whitmore collection. Prominent on the display shelves were Maine **elbaites** and two top-quality Russell, Massachusetts **almandine** specimens, respectively miniature and large-cabinet size.

Several weeks before this show I received an email from Mike Walter of *Geologic Desires* (www.geologicdesires.com) announcing the discovery of choice **danburite** crystals at the classic Dana locale of Russell, St. Lawrence County, New York. According to Mike, an upstate New York collector got permission to collect on the property for about five weeks earlier this year (2009). The result was a bonanza of specimens not seen since the deposit was discovered in the 1880s. The pale brown, opaque to translucent crystals were found in a gray pyroxene-rich rock; Mike's specimens are thumbnail-size single crystals and crystal groups on miniature-size matrix. The largest crystal measures about 2 × 5 cm.

Figure 1. **Danburite crystals in matrix, 5 cm, from Russell, St. Lawrence County, New York. Mike Walter specimen and photo.**

Kevin Downey's dealership called *Well Arranged Molecules* (www.wellarrangedmolecules.com) was offering red **wulfenite** in thumbnail, miniature and small cabinet-sizes from a locality he gave as "Tuokexun, Tulufan Prefecture, Xinjiang, Uygur Region, China"—almost certainly these specimens are from the remote mine in the Kuruktag Mountains of Xinjiang Uygur Autonomous Region, as described by Wilson and Origlieri in January–February 2007. The tabular crystals (some with epitactic coatings of cerussite) average 1 cm wide and are quite dramatic.

I bumped into John Veevaert of *Trinity Minerals* who directed me to several dealers who had new and interesting minerals. One of these was Dudley Blauwet of *Mountain Minerals International* who had his usual fine inventory of specimens from Pakistan and Afghanistan, including some specimens from Fargon Meeru, Kokscha Valley, Badakhshan, Afghanistan, showing sharp greenish blue **diopside** crystals averaging 2.5 cm. The glassy, somewhat rounded crystals rest in white marble matrix; some have transparent areas with blue-green highlights.

Texas dealers John and Maryann Fender of *Fender Natural Resources* (fenderminerals@yahoo.com) had some fine specimens from the Ojuela mine, Mapimi, Durango, Mexico. Of note were some richly colored specimens of copper-rich **austinite.** From dates on the old newspapers in which they were wrapped, John Fender concluded that they were found in the late 1970s. The crystal aggregates sit on the typical Mapimi limonite gossan matrix, their colors varying from beige to vivid green, with crystals averaging about 5 mm in size. The specimens (thumbnails and miniatures) are very clean and attractive and were selling quickly, but of course you can contact the Fenders to see what they might have left in their inventory.

Scott Wershky, Proprietor of *Miner's Lunchbox,* (www .minerslunchbox .com) had some crystals of the rare **rutile** variety called "struverite" from Tsaratanana, Madagascar. According to John Veevaert (who bought all of Scott's stock), "struverite is a varietal name for the tantalum and niobium-rich form of rutile. These crystals have a very high percentage of tantalum (actually higher than their percentage of titanium) and a substantial percentage of niobium in the chemical formula." Struverite was originally described as a species in 1907, but in 2006 the IMA ruled that it is a tantalum-rich rutile. The loose, dark gray crystals in Scott Wershky's stock average over 4 cm; they are reasonably sharp, but have minor edge wear as is typical of rutile in general. Scott picked up the specimens at the 2009 Sainte-Marie-aux-Mines show.

Here I would like to digress for a moment and bring your attention to an email I received after the show from Tony Albini, an active East Coast field collector. In 2008 Tony gained permission to collect at the famous Spinelli prospect in Glastonbury, Connecticut. Tony and Fred E. Davis surveyed the site with a portable gamma scintillometer and jointly discovered two previously unknown dumps. Their efforts were rewarded when they found **samarskite** as dark terminated crystals up to 2.5 cm. The best specimen, now in Tony's collection, sports two terminated, 2.5-cm samarskite crystals which sit in a matrix of red feldspar, with grains of columbite. A description of the Spinelli prospect, including accounts of its history and the details of Tony and Fred's investigation, will be presented at the Rochester Mineralogical Symposium in April 2010.

Every year some "new faces" sign on as dealers at the Springfield show. One of these new dealerships, with fine minerals, was John and Debbie Whitney's *Rocks to Gems,* 31 North Chester Road, Chester, Maine 04457. What makes John and Debbie's specimens special is the fact that they own the Trenton and Alice Staples quarries in Maine. As a result, they had gemmy **aquamarine** and **heliodor** beryl from the Trenton quarry and green **elbaite** (crystals and slices) from Mount Mica, Oxford County, Maine.

Excalibur Mineral Corporation had several flats of **grossular** from a new site in the Nightingale district, Pershing County, Nevada. The brownish crystals were discovered in July of 2009 by a local prospector, are up to 2.5 cm across and are associated with milky quartz crystals to 2.5 cm. Most of the crystals sit on matrix of massive grossular and/or milky quartz.

Ted Johnson of *Yankee Mineral and Gem Company* (yankeeminerals @comcast.net) has a knack for coming up with specimens from classic locations. This year Ted was offering a variety of classic Colorado specimens, prominently including minerals from Pikes Peak and sulfides from various old mines in Colorado. Contact Ted if you are interested in, or specialize in, the minerals of Colorado.

Finally, at the show there were enough unique specimens to satisfy every collector's needs, wants and urges. Specimens were available in the retail and wholesale sections at every price and on every aesthetic and quality level. Of course, in any given year you will only know what's available if and when you attend the show. I suggest that my friends from Maryland and Virginia make an effort to get to the show; you will not be disappointed. If you live too far away to drive, you can always fly into Springfield or take Amtrak, which makes several stops each day in Springfield.

Every year, as most readers of the *Mineralogical Record* are aware, Mary Zinn recruits a private collector or collectors to exhibit at the Springfield Show. This year the collection of Jim and Gail Spann of Rockwall, Texas was featured and the display was set up at the show's main entrance. In the four years that the Spanns have been collecting minerals, they have built a collection that contains over 3,700 pieces, including many world-class specimens. The Spanns are active members of the Mineralogical Association of Dallas (MAD) and Gail is the current coordinator for the Association. Over 50 cases of mineral specimens from the Spanns' collection were on display, with every case containing impressive one-of-a-kind pieces. My favorite was a case of specimens which previously were featured on the covers of prominent mineral magazines. On display in this case was the famous Bristol, Connecticut **chalcocite** that appeared on the cover of *Matrix*, and the fine pink **fluorite** from Peru that appeared on the cover of the *Mineralogical Record's* vol. 28 no. 4—"Mines and Minerals of Peru." The central case, at the entrance to the Spanns' exhibit, contained one fine specimen from each of the continents, excluding Antarctica. Here was a huge amethyst group from Guerrero, Mexico, a fantastic pink fluorite from Pakistan, and equally impressive specimens from Brazil, Australia, Europe and Africa.

The Spanns are to be congratulated for building such a fine collection in so short a time. In Springfield this year, as in past years, Dave Bunk was responsible for coordinating and helping to set up the exhibit. Next year Bill Larson of *Pala International* will be the featured exhibitor. I am looking forward to seeing a myriad of gem crystals, especially from antique and classic locations. And I very much hope that Bill will bring along some of the classic east coast tourmaline and beryl specimens that he has in his collection!

Well, another Springfield Show is down in the books. I am very happy to say that I have attended the Show every year, from its inaugural date in the late 1980s until this year. On the way back to Pennsylvania I decided to continue the non-mineral theme by making another stop in New Haven, Connecticut. This time I was going to visit Pepe's and Sally's, two pizzerias that were featured in the Travel Channel's episode involving a search for the best pizza in America. Pepe's and Sally's have been friendly rivals since 1938 (Pepe's is the older establishment, having opened in 1925), with each pizzeria having its loyal followers, some of whom refuse to eat in that "other place." Over the years, celebrities such as Frank Sinatra, Bill Clinton, John McCain and cartoonist Gary Trudeau have dined at both restaurants, and the restaurants have the pictures to prove it. Both restaurants bake their pizza in the traditional Neapolitan style (crust, sauce and fresh buffalo mozzarella) but allow you to add your favorite toppings. Before I left New Haven I sat in my car and polished off four slices of pizza, two from each restaurant. I shared the crust with Butterbean, who licked his lips and barked out his approval. As far as I'm concerned, both products were equally tasty, which clearly means that I should visit Pepe's or Sally's whenever I'm in the New Haven area.

Don't forget: the guest exhibitor next year will be Bill Larson; so mark your calendar if you want to see over 50 cases filled with fine minerals, gem crystals and faceted stones.

Denver Show 2009

by Thomas P. Moore

[Sept. 14–20]

This year I got to the Denver Show the long way, albeit the wonderfully scenic way: Tom Gressman, our new Associate Publisher, and I *drove* his van full of books and magazines up to Denver from Tucson, and Wendell Wilson followed two days later by plane. Good weather prevailed throughout the road trip—a 16-hour-long, granola-bar-fueled, gawp-out-the-windows experience, starring the most luminous, glamorous jubilee arc of a double rainbow I've ever seen, vaunting over the plains somewhere in New Mexico. We rolled up at last to the Holiday Inn (Denver Central) at 2:00 o'clock on Tuesday morning, and just a few hours later were cruising Marty Zinn's "hotel" show at the Inn. Some dealers had opened their doors on the previous Sunday, and the traffic of visitors was already at full tide despite the fact that the show was not scheduled to open "officially" until Wednesday. In subsequent days at the Holiday Inn and at the "Main Show" in the Denver Merchandise Mart, substantial crowds held sway, and Mr. Bones, the famous skeletal dinosaur who prowls the Main Show every year, found a target-rich environment of schoolchildren's heads to pretend to chomp off.

In both show venues the prices of mineral specimens seemed in general to have leveled off or even declined a bit from what they had been in Tucson in February and in Denver in 2008. As in Tucson, some dealers complained of slow sales while others boasted of breaking sales records; no overall trends regarding market dynamics could be made out. But on my last night in the Holiday Inn, gazing out through the dusk at the nearby expressway and its highly motivated rush-hour traffic, I savored the feeling that in general this had been an excellent show, and that the mineral-collecting world continues in good health, and will come through the present economic hard times just fine, thank you.

All aboard, now, for the Denver 2009 what's-new tour:

Steve Perry (www.steveperrygems.com) had two flats of nice thumbnail and small-miniature specimens of California **axinite-(Mg)** (formerly magnesio-axinite) at his stand at the Main Show, and John Veevaert now is offering more specimens from the same find on his website (www.trinityminerals.com). It seems that back in the 1960s, roadwork on Highway 70 exposed a small area of Alpine cleft-type mineralization near Yankee Hill, Butte County, California. It was at that time that the axinite-(Mg) specimens now being sold were collected—the find has long since been exhausted, so now is *the* time to procure a piece from Steve or John. Analysis by Bart Cannon has shown that the crystals have slightly more than 4% MgO, and since any axinite with more than 3.6% MgO qualifies as axinite-(Mg), the California specimens are, for sure, representatives of this rare member of the axinite group. Steve Perry's specimens are clusters, on and off matrix, of sharp, lustrous, partially gemmy, typically axe-blade-shaped crystals, with individuals reaching 2 cm; some matrix specimens show associations of tiny albite and quartz crystals, and sparse fibers of palygorskite. The axinite-(Mg) crystals are weakly fluorescent red in shortwave ultraviolet light, and change color from pale beige in sunlight to pale plum-purple in incandescent light.

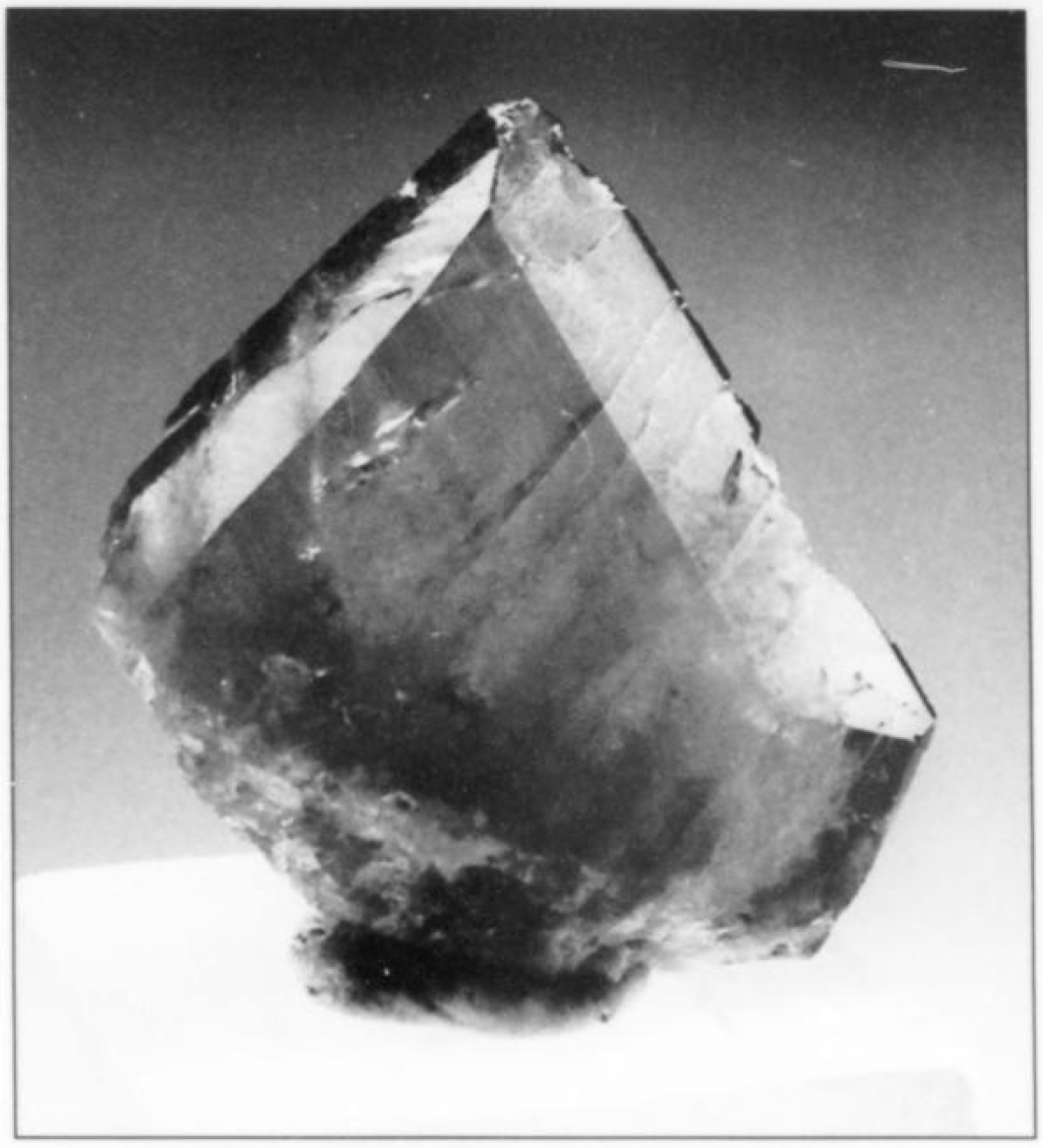


***Figure 2.* Axinite-Mg crystal, 2.2 cm, from near Yankee Hill, Butte County, California. John Veevaert specimen and photo.**

The glory days of collecting at the 79 mine, Gila County, Arizona, came in the late 1960s and early 1970s, but in May 2009, George Godas and John Callahan hit a large and exceptional pocket of green **smithsonite** on the old mine's 470 level, and spent about two months taking out fine specimens ranging in size from small-miniature to large-cabinet. The botryoidal matrix coatings of smithsonite are strikingly two-toned, with lustrous, wet-looking, pale green to dark forest-green regions, in bands to 2 cm thick over grayish limestone. At the Main Show, Evan Jones (evanabbottjones@gmail.com) had about 20 pretty specimens, from 4 to 10 cm across.

The late Ernie Schlichter of Massachusetts was an expert field collector (and cabinetmaker) who amassed a fine private collection, mostly of thumbnails, the greater part of which is now being marketed by Don and Gloria Olson (donaldkolson@netscape.net). In their room in the Holiday Inn the Olsons were offering many good ex-Schlichter thumbnails of worldwide provenance, as well as most of Ernie's large stash of self-collected **albite ("pericline")** specimens from the Aggregate Industries (Tilcon, Bluestone) quarry, Acushnet, Bristol County, Massachusetts. In this old quarry just northeast of New Bedford, a series of Alpine-type clefts produced fine specimens of titanite, apatite, feldspars and other things for a brief period in the late 1970s and early 1980s, but in 1983 the quarry was declared off-limits to collectors, and no further significant finds have emerged since then. The albite specimens now with the Olsons are miniature and small cabinet-size clusters of thick, sharp, twinned crystals to 4 cm, all coated uniformly with chlorite, hence glitteringly dark green (although, come to think of it, there are also a couple of uncoated specimens which are ivory-white). More of Ernie's Acushnet material is "in reserve" with the Olsons, and will be appearing at later shows.

It is pleasant to note that very fine specimens of **azurite** and pseudomorphous **malachite** are still coming at intervals from the Milpillas mine, Sonora, Mexico (see the article in our "Mexico V" issue, November–December 2008). A Mexican dealer, Jesus Valenzuela (licetyenyhu@hotmail.com), filled a whole room in the Holiday Inn with Milpillas mine specimens, and Evan Jones, at the Main Show, had some outstanding Milpillas azurite specimens, with lustrous bladed crystals to almost 3 cm. Also, promisingly, Evan had a couple of Milpillas specimens showing brilliant red crystal druses of **cuprite**, with individual crystals pushing 1 cm. And bright **copper** crystal clusters to small-cabinet size from Milpillas are no longer as uncommon as they once were.

Not by any means "new," but entirely distinctive and always dramatic, are the great spherical groups of transparent, colorless (but invariably brown-orange stained) **creedite** crystals from the Navidad mine, Durango, Mexico. Three weeks before the Denver Show, a mighty strike of creedite specimens took place in an ore chimney in the Navidad mine, and Mike New says that this lode is already exhausted. In their big white tent in the courtyard of the Holiday Inn, Mike and his son Jason, of *Top Gem Minerals* (www.topgem.com) offered *humongous* (Durangese for "very large") creedite specimens from the Navidad mine, with bristling spheres to 12 cm in diameter lightly attached to make specimens reaching 60 cm across; individual creedite crystals are lustrous, transparent, and sharply terminated. By the time of the Main Show, some of the new creedite pieces had migrated to the booth of Rob Lavinsky's *The Arkenstone* (www.irocks.com).

Excited updates on new finds at the Ojuela mine, Mapimí, Durango, Mexico have become regular features of these show reports, as the great locality, where Spanish mining dates back to 1598, is still yielding beautiful mineral specimens. An upper level of the old workings has lately been producing **fluorite**, in transparent deep purple crystals, with wulfenite, barite and calcite. Unlike many earlier Ojuela mine purple fluorite crystals, these are simple cubes (not cubo-dodecahedrons), and they reach 4.5 cm on edge; the best person to see about them in Denver was Dennis Beals of *Xtal* (www.xtal-dbeals.com). Another zone of the mine, now being exploited for copper ore, has been turning out lovely baby-blue to turquoise-blue specimens of **calcite included by aurichalcite**, with sharp rhombohedral crystals to 3.5 cm on dark brown gossan matrix. The best selection of these in Denver was Rob Lavinsky's—a shelf-full of snazzy small miniatures. Specimens showing dusty green, smooth-surfaced **malachite** blobs reaching 3 cm in diameter have recently been offered by Mike New and our new Tucson neighbor Isaias Casanova of *IC Minerals* (www.icminerals.com). Outstanding **wulfenite** from the Ojuela mine, with caramel-colored, blocky crystals to 3 cm on beds of green mimetite, may now be seen at dozens of dealerships. And exactly four specimens of the very rare copper hydroxyl chloride **claringbullite**, with deep blue, micaceous claringbullite crystals to 3.5 cm rising from massive red cuprite, have recently emerged as well. The best of the four went to Tom Loomis of *Dakota Matrix* (www.dakotamatrix.com), and it is pictured in the August 3 installment of "What's new in the mineral world," at www.MineralogicalRecord.com. In the same small zone in the Cumbres *lugar* of the Ojuela mine which produced the claringbullite, a few specimens of tenorite pseudomorphs after **paramelaconite** were found as microcrystals, as well as **brochantite**.

In the 2009 Tucson Show report (May–June 2009 issue), I mentioned the single pocket of **nifontovite** crystals discovered early in 2008 at Charcas, San Luis Potosí, Mexico—and Peter Megaw's superb 5.2-cm specimen from the strike is pictured. Well, this year in Denver, Marcus Origlieri of *Mineral Zone* (www.mineralzone.com) offered several loose crystals of nifontovite from a new pocket, opened in summer 2009 on Level 16 of the Rey y Reina mine, Charcas. These are elegant, lustrous, totally colorless and transparent prisms with sharp, sloping terminations, to 6 cm long. And Marcus also had an amazing platy specimen, 22 cm across, composed almost entirely of nifontovite crystals to 5 cm suffused by a gray, sandy or clay-like material, on a bit of sandy gray matrix.

Gemmy blue **euclase** crystals from the emerald mines of Colombia also are not "new," but who can resist taking note of any hoard, however small, of these gorgeous objects? In the Holiday Inn, Thomas Nagin of *Crystal Springs Mining Company and Gallery* (www.crystalspringsmining.com) had five loose crystals of euclase, all between 2 and 3 cm, from the La Marina mine, Boyaca Department, Colombia; they are gemmy, pale to medium-blue, highly lustrous, and (best of all) not cleaved along their sides as euclase crystals tend to be.

Count on Brian and Brett Kosnar of *Mineral Classics* (www.minclassics.com) to come up with interesting minerals from the Bolivian Andes. This time the brothers had, for starters, some excellent specimens of **siderite** from the Siete Suyos mine, Atocha-Quechisla district, Sud Chicas Province, Potosí Department, Bolivia. The short-prismatic, face-rich, vaguely barrel-shaped siderite crystals, reaching 2 cm, are gemmy and yellow-brown, and rest on brassy yellow, discoidal crystals of pyrite pseudomorphous after (a first generation of) siderite, with lustrous black crystals of **stannite** to 3 mm around the points of attachment—making for impressive toenail and small miniature-size specimens. Then, from the Himalaya mine, just outside the city of La Paz, there was **hübnerite**, as loose, compound, bladed crystals from 5 to 12 cm, bright shiny black, with red flashes infrequently showing (these crystals have been verified as hübnerite, not ferberite, and as such are a rarity for Bolivia). Finally, most collectors are familiar with the long-time occurrence of blocky sixling **copper pseudomorphs after aragonite** from the Corocoro district, Pacajes Province, La Paz Department—the loose twins resemble coppery, green-stained lug nuts. But have you ever seen these pseudomorphs *on matrix*? Neither had I, until just now in Denver, when Brian Kosnar showed me some pieces recovered in summer 2009. The ten or so small-cabinet specimens feature fairly sharp pseudomorphous copper sixlings to 3.5 cm on thin, flat sheets of tarnished native copper to 15 cm across.

Surprisingly, neither Brazil nor any country in Europe had much of anything mineralogical to say for itself at Denver this time . . . but Africa shone seductively in the dark, flashing diverse, dazzling treasures. Let's begin with the newly discovered occurrence of **dyscrasite**, in spiky, metallic tin-white crystals enclosed in white calcite, from the Bouismas mine, Bou Azzer district, Morocco. As late as our special issue on Bou Azzer (September–October 2007), dyscrasite had not been known to occur there; however, earlier this year, members of the Spirifer group of Warsaw, Poland brought back a few specimens of the silver antimonide which had just been found in the Bouismas mine, in the district's center (see my August 3 online report). Thus I had come to Denver looking, hoping, to find some Bou Azzer dyscrasite specimens, and, sure enough, experienced Morocco hand Horst Burkart (Dornheckenstr. 20, D-53227 Bonn, Germany) was there to provide. The specimens are lumps of white calcite from 4 to 6 cm, their etched surfaces about half covered by branching groups of distorted, lustrous dyscrasite crystals with individuals to 2 cm. If discoveries continue, Bou Azzer dyscrasites may very well equal or surpass the famous ones found in the mid-1980s at Příbram, Czech Republic (during the very last days of the centuries-long history of mining there), and at the two or three antique German occurrences of the rare species.

Loose, heavily etched and rounded but totally gemmy crystals of colorless **phenakite** are now emerging from pegmatites somewhere near Jos, Plateau State, Nigeria. Jos is a central Nigerian town long known as a "locality" (more accurately it's a marketing center) for gemmy topaz, elbaite and blue to green beryl crystals, but phenakite had been unknown from the region until August 2009, when Bill Larson encountered some of the newly dug crystals.

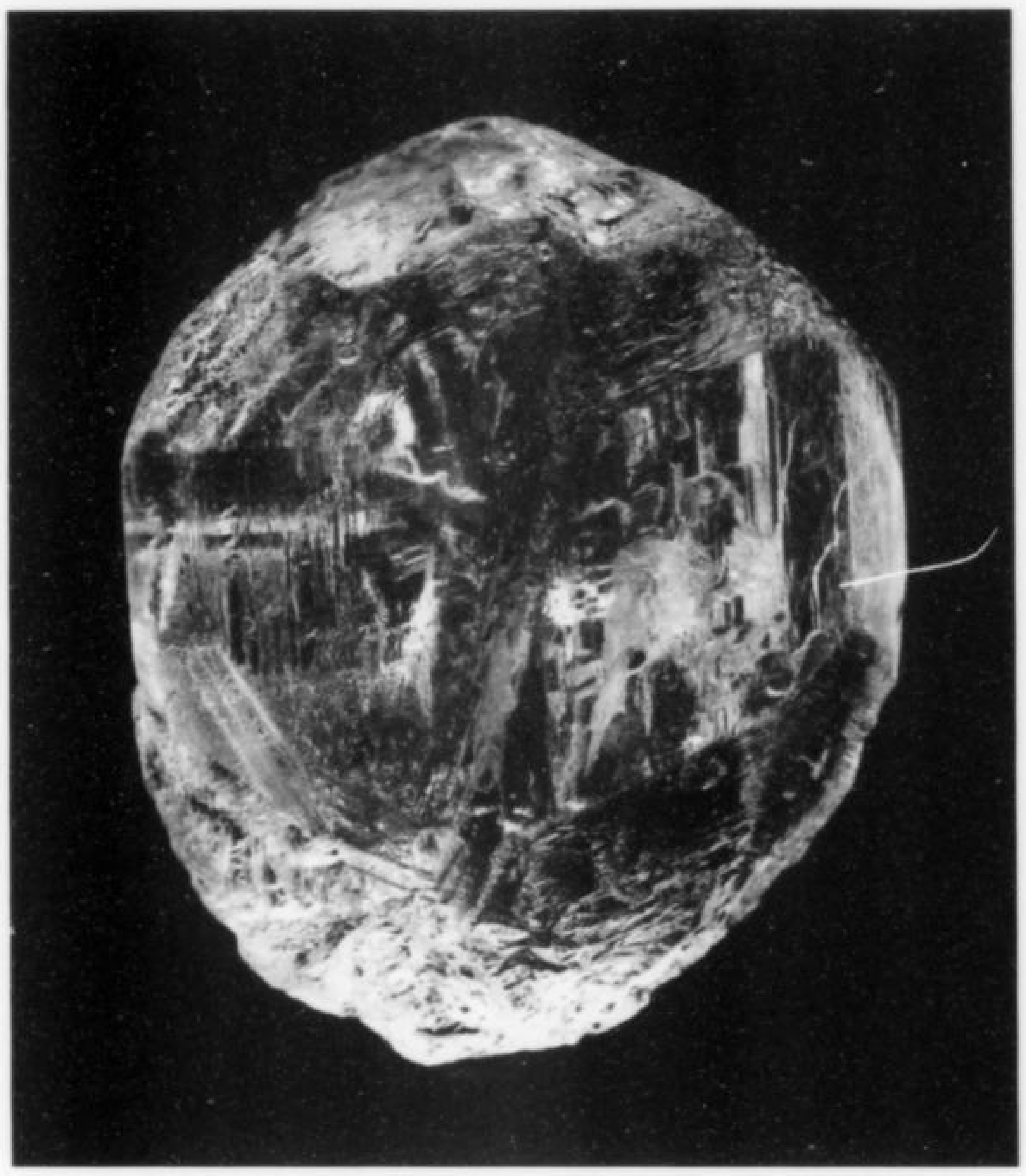


Figure 3. **Phenakite, 6 cm, from Jos, Nigeria. Herb Obodda specimen; Jeff Scovil photo.**

Actually Bill came across them in Thailand, whence they had been sent for cutting; he rescued a small handful and brought them to Denver, where, meanwhile, Herb Obodda was scoring the champion crystal, a wonderful, colorless, totally gemmy floater about 6 cm across and about 100% complete, with mirror-smooth faces and no chips or points of attachment. Then there was the Nigerian dealer who came to Denver to sell the phenakite as gem rough, but was persuaded to release a flat of about 30 crystals, each around 3.5 cm, to Rob Lavinsky, who'd also picked up Bill Larson's stock (any questions so far?) to offer at the Main Show. Anyway, these are fine and unusual phenakite specimens, like sparkling lumps of colorless glass with smooth plane faces in alternation with etched areas. Bill Larson thinks that he may soon be able to offer more precise locality information.

Thomas Nagin of *Crystal Springs Mining Company and Gallery* (see above under Colombian euclase) has just begun gathering **amethyst** specimens at his new open-pit working in Kenya, two hours' drive east of Nairobi, called the Baobab mine, Kitui, Kitni Province. Thomas and his Kenyan partner have thus far taken out about 450 kg of amethyst, from thumbnail-size single crystals to singles and groups reaching 25 cm, and specimens of these and all intermediate sizes sold briskly throughout the time of the hotel show, in one of the tents in the Holiday Inn courtyard. The stout amethyst crystals (terminal rhombohedron faces dominating) are medium-lustrous and color-zoned, with the best, gemmiest purple tones near their tips. Many show "fenster" growth (thin faces covering hopper-growth voids), and many show amethystine scepters topping short prisms of quartz of pale-smoky color.

Hardly for the first time, *Collector's Edge Minerals* (www.collectorsedge.com) staged a major debut in their booth at the Main Show. The spotlighted mineral was something new: large **emerald** crystals protruding from white quartz matrix from the Kagem emerald mine, Kafubu district, Copperbelt Province, Zambia. Gem-quality emeralds have been found in the Kafubu district since 1928, and mining has been energetic since the 1970s, with

the result that Zambia now ranks second in the world (behind only Colombia) in the production of gem emeralds. The Kagem mine is one of the newer and most important of several mines in the district (others include the Miku, Kamakanga, Pirala, and Chantete mines), but neither it nor any of the other mines has ever before yielded important emerald specimen crystals for the collector market.

As a running video in the *Collector's Edge* booth in Denver kept explaining to all who would stop to watch, the Zambian emeralds are found in mica-rich reaction zones along contacts between pegmatites and quartz-tourmaline veins within host belts of talc-magnetite schist. The crystals are of two types: "mica schist-hosted" crystals are heavily infused with dark phlogopite and tend to be blackish, at least in their outer zones, resembling old Russian emerald crystals; "quartz-hosted" emeralds occur in very rare pockets and, more commonly, in boudin structures which have been flooded with silica. Emeralds of the latter type are enclosed and protected by white quartz, and consequently tend to be gemmier. The emerald crystals (of both types) attain lengths to 10 cm and thicknesses to 2.5 cm; the crystals are sharp-edged with medium luster and a deep green color with a very slight bluish tint. The best of the "quartz-type" matrix pieces offered for sale by *Collector's Edge* measure between 3.5 and 15 cm or so; typically they show gemmy green, long-prismatic emerald crystals with lower terminations still embedded in white quartz and upper parts rising free. Of course, a frightful amount of work has gone into mechanically chipping

Figure 4. **Amethyst crystal, doubly terminated, from the Baobab mine, Kitui, Kitni province, Kenya. Thomas Nagin specimen and photo.**

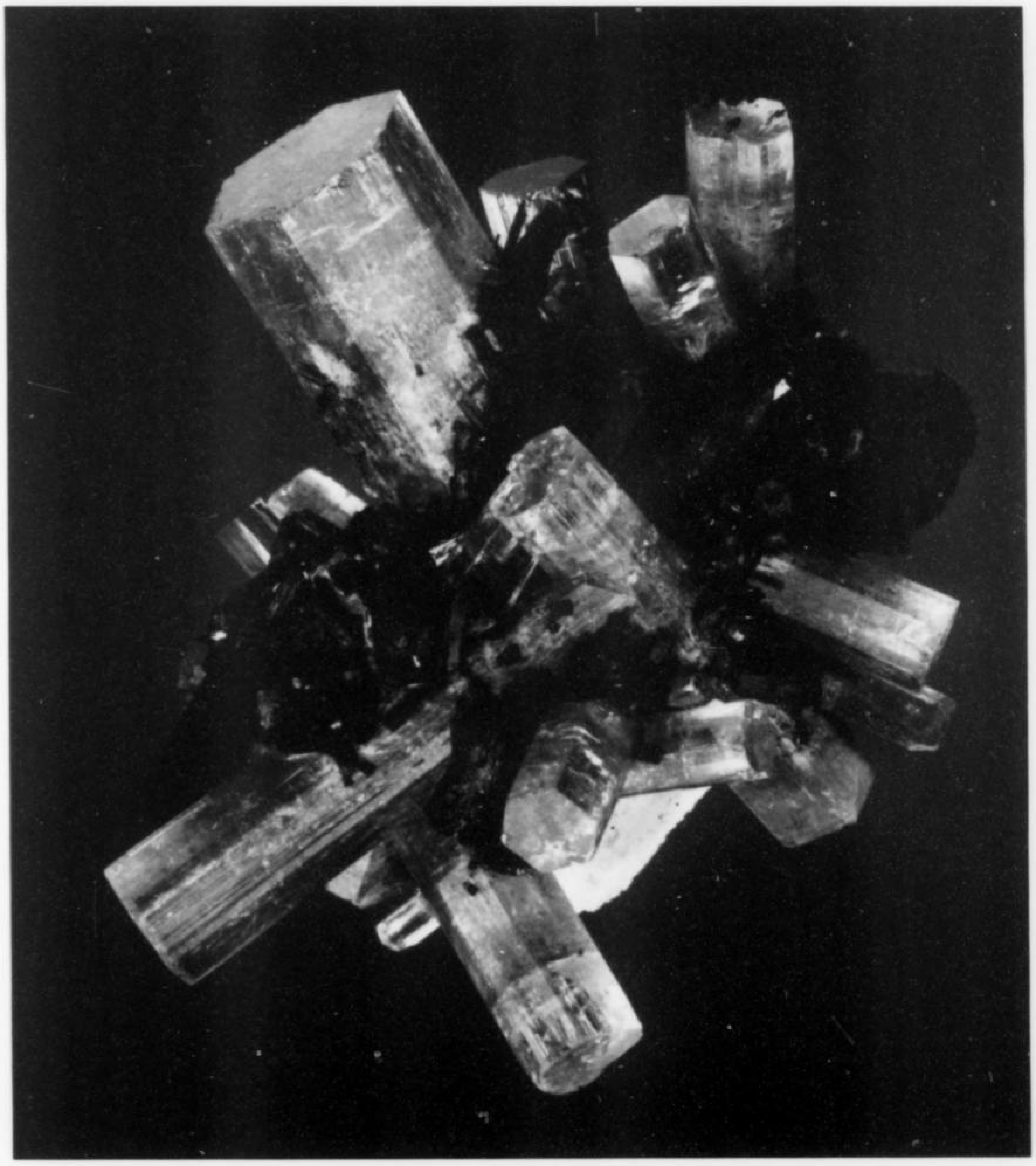


Figure 5. **Aquamarine beryl with black schorl, 10.5 cm, from the Erongo Mountains, Namibia. Steve Neely collection; Jeff Scovil photo.**

away the quartz from around the upper parts of the crystals, and for most of this work we have to thank Rob Lorda, presiding wizard of the *Collector's Edge* lab, for his skill and phenomenal patience in preparing the specimens.

Present plans are for *Collector's Edge* to continue assisting the mining company, *Gemfields PLC*, in its commendable effort to preserve and market emerald specimens from the Kagem mine. In June 2008, *Gemfields PLC* acquired a 75% stake in the mine, and to all appearances this was a good investment: during the year ending June 30, 2009, the company extracted an average production of 2.3 million carats of emerald rough per month, primarily through heavily mechanized mining and crushing of the emerald-bearing schist. The occasional emerald-riddled white quartz boulders encountered are turned over to *Collector's Edge* for preparation and sale.

Another blockbuster new item from this show was on view in the third-floor Holiday Inn room of Tsumeb collector Marshall Sussman—now a Tucson resident. Just in time for the show, Marshall received a shipment of about 20 flats of beautiful specimens of **aquamarine/schorl/feldspar**, newly dug from miarolitic cavities in the granite of the Erongo Mountains, Namibia. Erongo aquamarines have been familiar enough for about a decade now, but Marshall's best specimens set new records for size, aesthetics and sheer spectacular beauty. The gorgeously sharp, gemmy, medium-blue crystals of aquamarine to 12 cm stand up at all angles from clusters of blocky, glossy black schorl crystals and chalky white, partially corroded (but still quite clean-looking) K-feldspar crystals. For prices ranging from $200 to $15,000 or so, one could pick up from Marshall a true "killer" specimen in almost any size one might want, from toenail to very-large-cabinet. A portion of the new Erongo lot later showed up with Rob Lavinsky at the Main Show, and selections have appeared on Rob's www.irocks.com website.

Nor were the aquamarine super-specimens the only new Namibian items offered by Marshall Sussman: two new prospects now being worked by Charles Key in the north of the country have begun yielding modest but promising specimens of secondary lead and copper species. From a prospect begun in summer 2009 at Onderra, Kaokoveld, comes **wulfenite** in thick, tabular orange and yellow-orange crystals to 4 cm with prominent pyramid faces (in some cases almost obliterating the normally dominant basal pinacoid faces). Loose single crystals and small crystal clusters of this wulfenite are of thumbnail and small-miniature size. Most of the wulfenite crystals unfortunately are chattered around the edges, but this ought to change once Charlie succeeds in educating the more impatient of those local folk who are doing the digging.

From the Christoff prospect, Kaokoveld—also inaugurated by Key in summer 2009—come loose, sharp V-twins of **cerussite** measuring from 2 to 4 cm, with medium luster and translucency, rendered silky gray by sulfide inclusions. The same prospect also produces clusters of very bright green **dioptase** crystals, with individuals to 5 cm. These crystals are elongated, i.e. prismatic in habit, with sharp rhombohedral terminations, and some, when backlit, are seen to be transparent near their tips. Marshall had several dozen thumbnails and miniatures of cerussite and dioptase (no specimens in his lot show the two species together) from the Christoff prospect.

For an attractive new item from South Africa we return again to Rob Lavinsky's *The Arkenstone*. In his Main Show booth Rob had a single flat of miniature-size specimens of **aragonite** collected about 20 years ago from a cave near Sterkfontein in Guateng Province. The specimens consist of gleaming white sprays of pointed crystals, to 2 cm individually, rising like hungry anemones from the tips of thicker, stalk-like aragonite crystals. These lustrous, bristling specimens reach 7 cm in longest dimension.

Leaving the African treasure-chest and heading for Asia by way of Madagascar, we pause to note the very exciting new **andradite** specimens (marketed as the variety "demantoid") now being gathered from open-pit workings in skarn rock near the village of Antezambato, near the town of Ambanja, in Antsiranana Province. The locality lies near Madagascar's northwesternmost coast, and the pits are often flooded by waters from a coastal mangrove swamp, but soon after the first specimens were discovered by fishermen in late 2008 a "garnet rush" commenced anyway, and now hundreds of people are busy digging beautiful green gem rough for the—hrrumpf!—gem-cutting community. Nevertheless a fair number of crystal specimens have been saved: Jordi Fabre has already offered

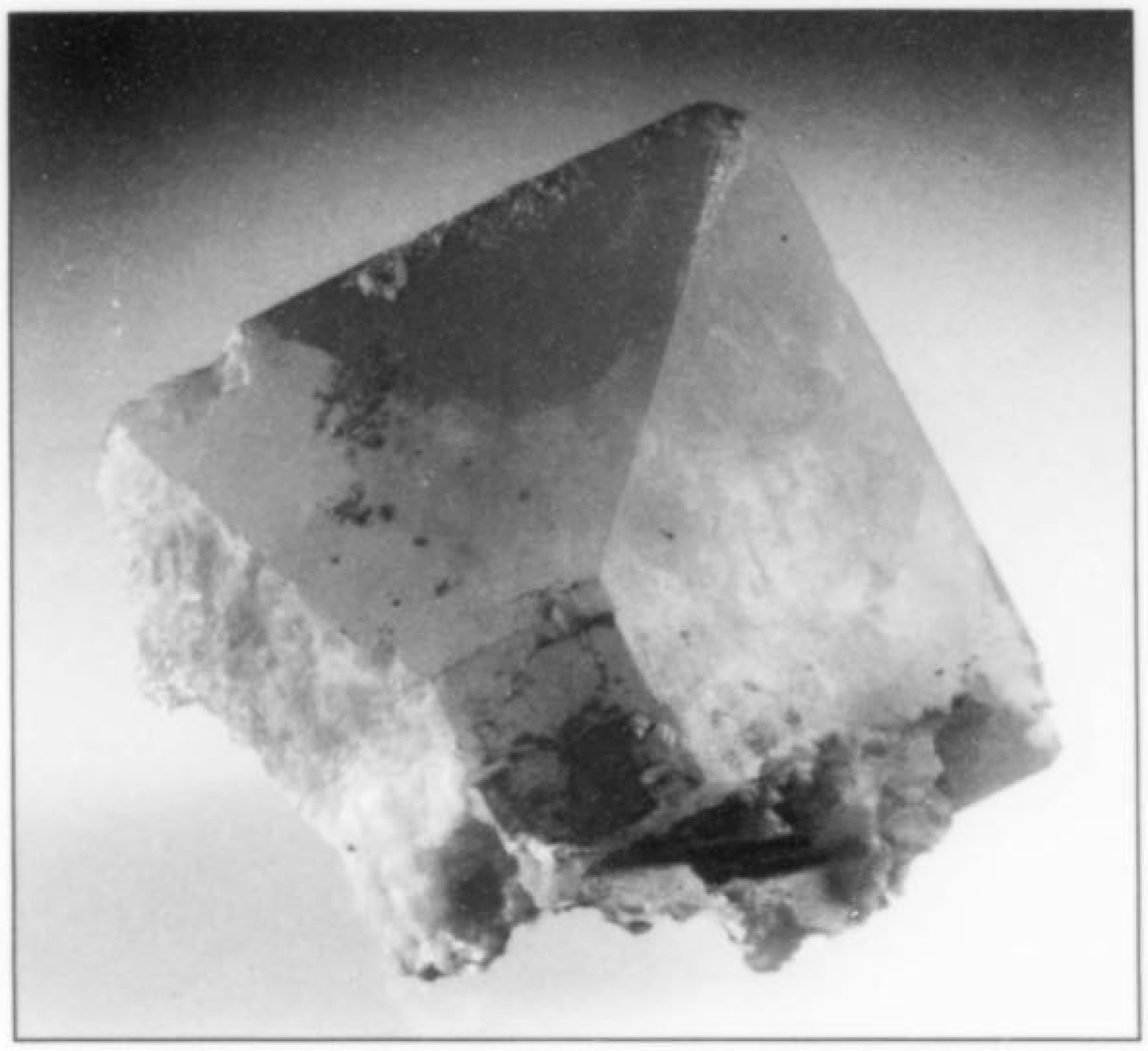


Figure 6. **Wulfenite crystal, 3.5 cm, from Onderra, Kaokoveld, Namibia. Marshall Sussman specimen; Wendell Wilson photo.**

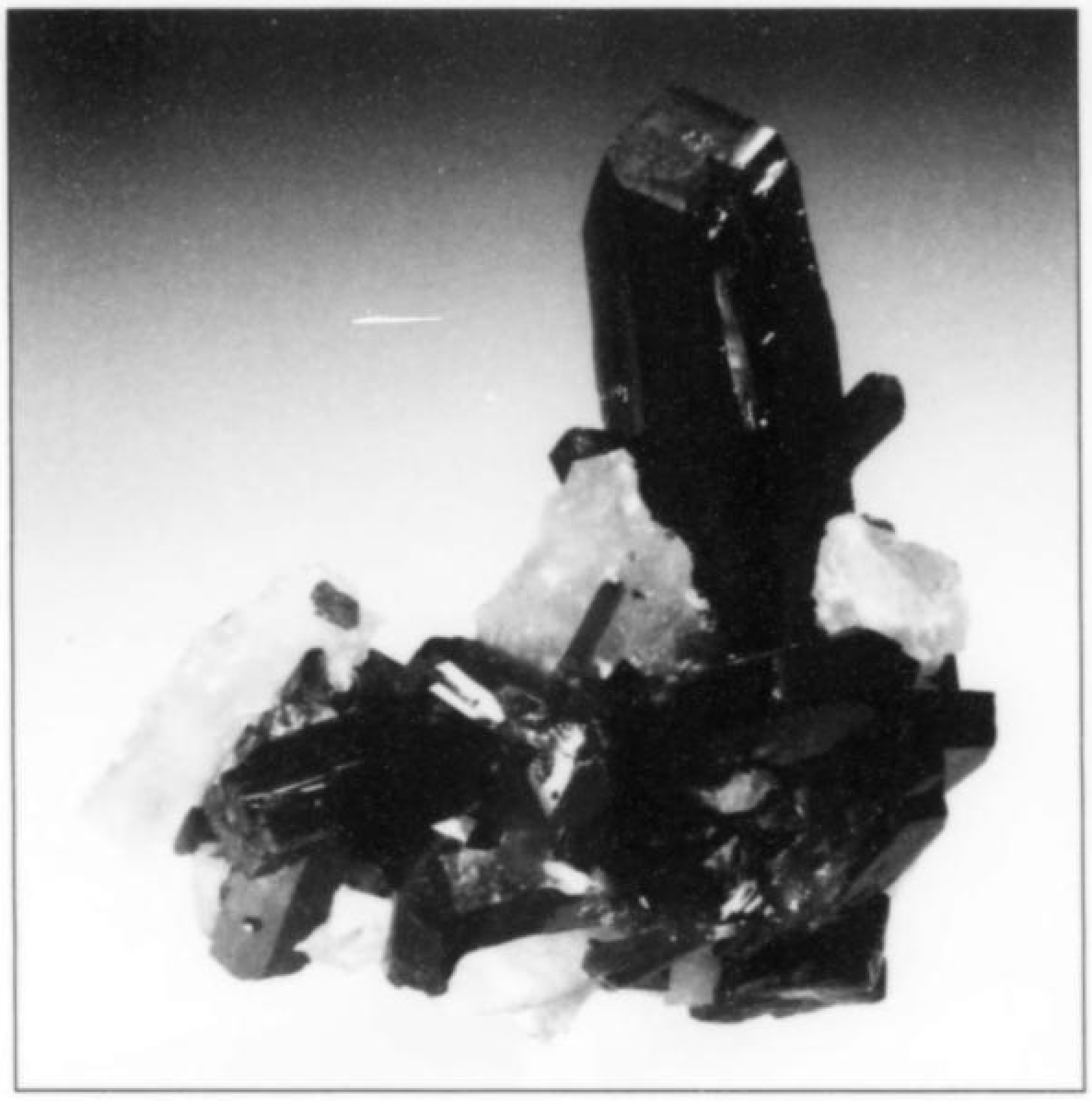


Figure 7. **Dioptase with quartz, 4.5 cm, from the Christoff prospect, Kaokoveld, Namibia. Marshall Sussman specimen; Wendell Wilson photo.**

***Figure 8.* Andradite ("demantoid") crystals on matrix, 4.5 cm, from Antetezambato, Ambanja, Antsiranana, Madagascar. John Veevaert specimen and photo.**

some on his website (as noted in my August 3 online report), and two dealers came quite well-stocked to Denver. At the Main Show, Daniel Trinchillo of *Fine Minerals International* (DanielTr@FineMineral.com) had a shelf-full of top-quality andradites from Madagascar, while at the Holiday Inn, Frédéric Gautier of *Little Big Stone* (littlebig.stone@netclub.mg) was proudly displaying hundreds of specimens, mostly superb thumbnails and miniatures but also some cabinet-size matrix pieces, to 20 cm across, studded liberally with the bright green gem crystals. Brilliant dodecahedral, trapezohedral and combined-form andradite crystals to 3 cm occur as sparkling blankets and isolated individuals on pale green matrix consisting mostly of massive andradite. A few of the matrix specimens show associations of quartz, calcite and stilbite. For the most part the andradite crystals are gemmy and of a luscious grass-green hue, although a few are greenish brown to yellowish brown. Of course, the specimens are not exactly cheap—M. Gautier would want from $250 to $400 for one of his best crystal clusters of thumbnail or toenail size—but they amount to a major garnet discovery, and supplies should continue for at least as long as the "garnet rush" lasts, and the—ghraaack!—gem cutters stay interested.

The excellent **cuprite** and **copper** specimens from the Rubtskoye copper mine, Altayskiy Kraj, western Siberia, Russia, provided one of the hits of the 2009 Tucson Show (see my report in May–June 2009), and good supplies of these specimens showed up in Denver in 2009 as well. Big, bright, well crystallized specimens of native copper, very dark red octahedral crystals and crystal clusters of cuprite, and beguiling specimens wherein the cuprite crystals hang like fruit on "trees" of copper were offered by nearly all Russian dealers on hand, and by some Westerners also, with honorable mention for Very Best Specimens and/or Largest Selections going to Mikhail Anosov's *Russian Minerals Company* (www.rusmineral.ru); The Fersman Mineralogical Museum (www.fmm.ru); and the Czech dealership *KARP Minerals* (karp@iol.cz). In the *KARP* room in the Holiday Inn, Ivo Svegeny showed me some decent **azurite** specimens which are also now coming from the Rubtskoye mine, with sharp, lustrous blue crystals to 1 cm lining vugs in gossan. Mikhail Anosov had some chalky blue azurite nodules to 8 cm in diameter from this locality, and on some of these nodules are powdery yellow-green patches of microcrystals of the rare copper iodide species **marshite**. Segue here to Marcus Origlieri's *Mineral Zone*, and some 5 to 10-mm loose clusters of subhedral marshite crystals from Rubtskoye. A one-page article on the Rubtskoye mine appears in the latest issue (vol. 14 no. 3) of the Russian publication *Mineralogical Almanac*, with pictures of sharp, translucent, waxy yellow-brown crystals of marshite reaching 3 cm that were recently found in the Rubtskoye mine. This is a locality to keep an eye on, especially for rare species.

The early 1990s are over and done with, but we have not yet seen the last surprises from remote localities in the former Soviet Union. Dmitriy Belakovskiy of the Fersman Museum had a fine selection of **chalcopyrite** and **epidote** specimens from the huge open-pit Dashkesan iron mine near Gyanzha in the southern Caucasus Mountains, Republic of Azerbaijan. The chalcopyrite specimens are loose clusters of sharp crystals, compound and face-rich, with individuals to 4 cm—all tarnished dull greenish black and thus more notable for form than color. Epidote from the Dashkesan mine forms lustrous, pistachio-green fan-sprays of prismatic to acicular crystals, and some of the Fersman specimens on hand at Denver are sturdy plates to 10 cm of such sprays tightly intergrown.

In the Holiday Inn, Ivo Svegeny of *KARP* had a few fine specimens from a new pocket of **tennantite** opened in spring 2009 in an unnamed mine in the great and famous Dzhezkazgan, Kazakhstan copper-mining district. Very sharp, lustrous, metallic gray tetrahedral crystals of tennantite reaching 2 cm sit up well on drusy quartz and calcite coatings on pale gray matrix. Tennantite (and/or tetrahedrite) is rare at Dzhezkazgan, and probably these are the best specimens yet recovered.

Other, entirely different, even more exotic little pieces of Kazakh-

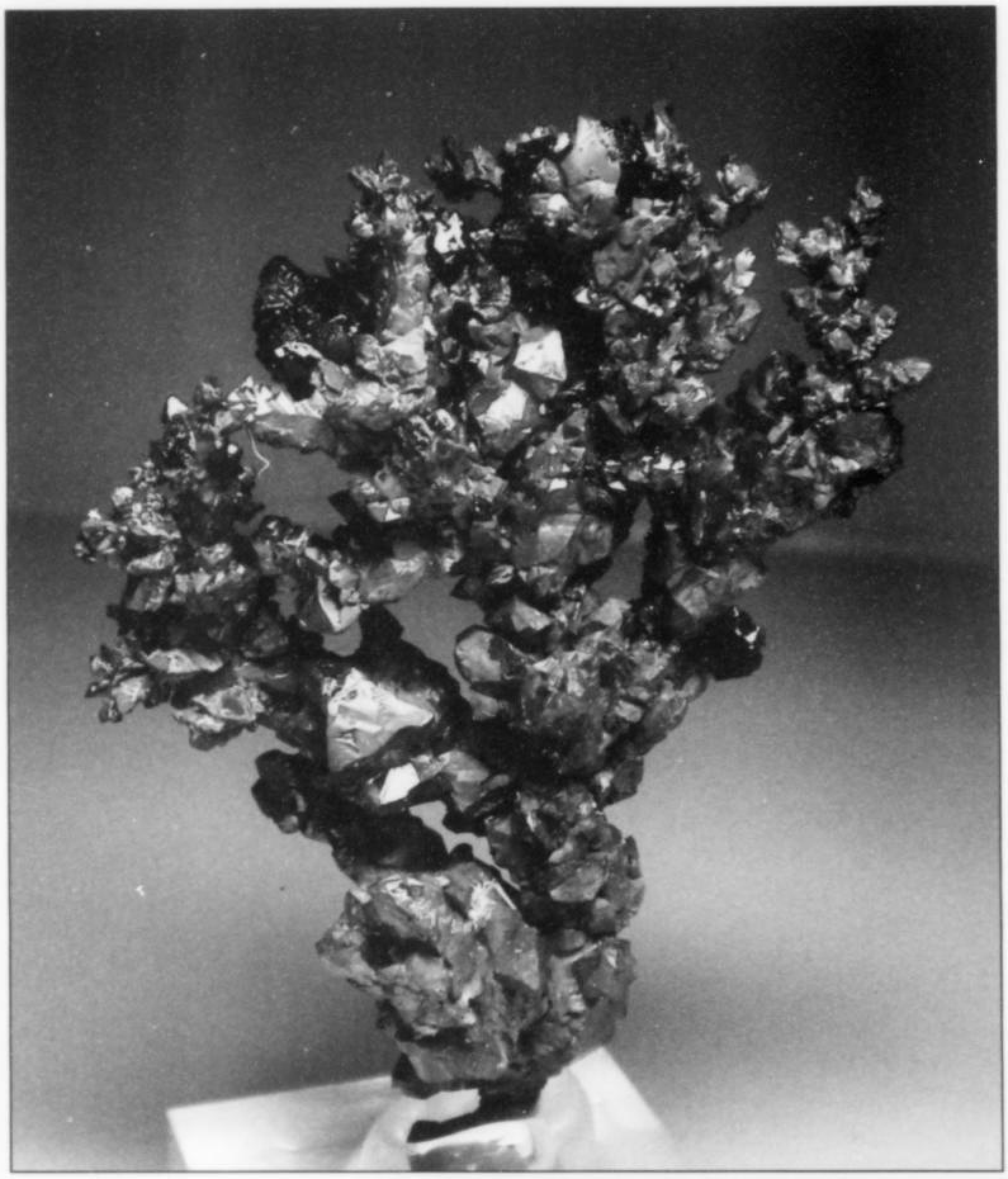


Figure 9. **Native copper with cuprite, 6 cm, from the Rubtskoye copper mine, Altayskiy Kraj, western Siberia, Russia. John Veevaert specimen and photo.**

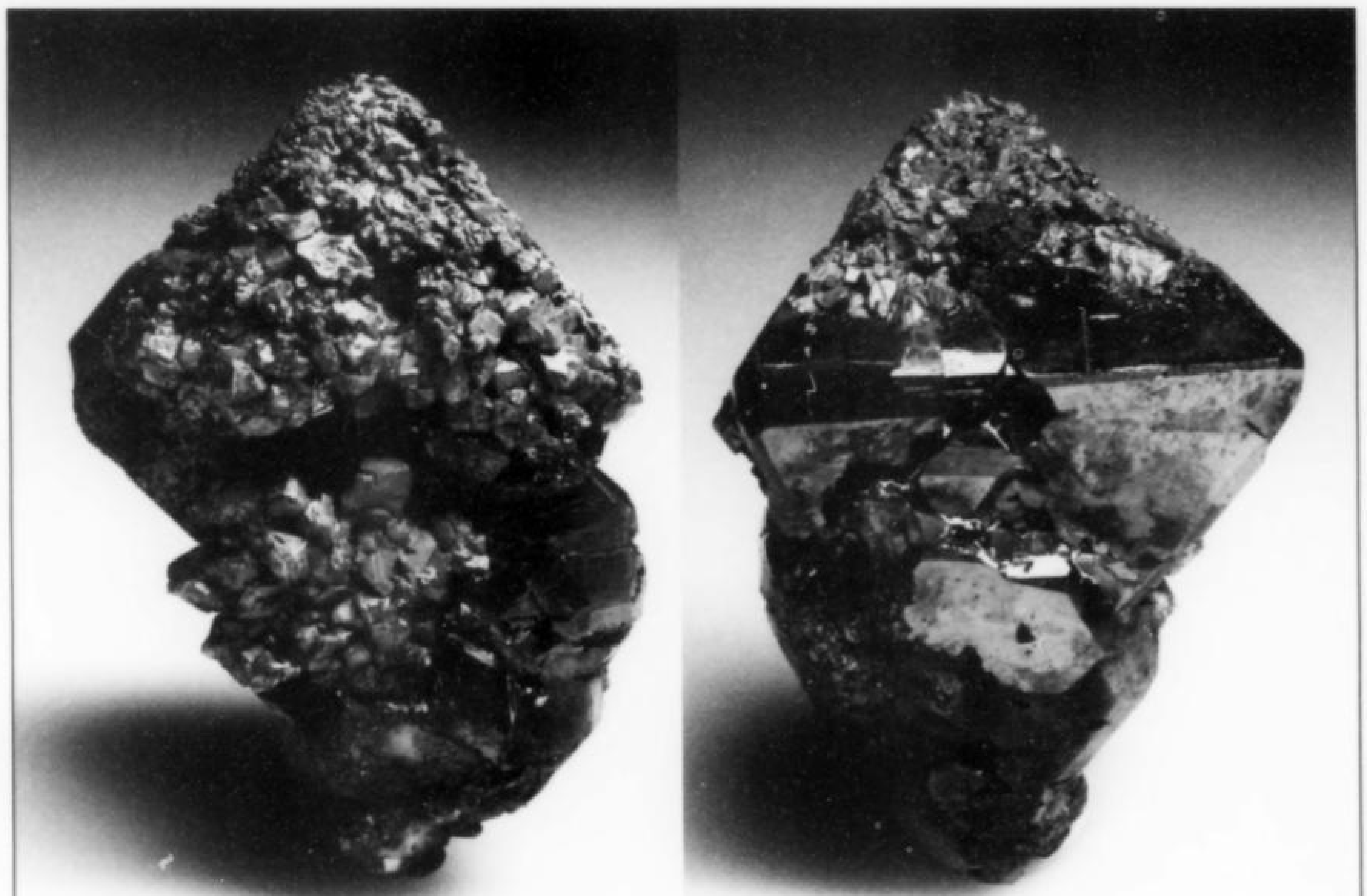


Figure 10. **Cuprite altering to native copper (front and back views), 2.5 cm, from the Rubtskoye (Rubtsovsk) copper mine, Altayskiy Kraj, western Siberia, Russia. John Veevaert specimen and photo.**

stan appeared at the Main Show, some in the keeping of Alfredo Petrov (alfredopetrov@earthlink.net), others with Howard and Janet Van Iderstine of *Cardinal Minerals* (www.cardinalminerals.com). These are thumbnail-size loose crystals of the complex rare-earth oxide **davidite** (whether davidite-(Ce) or davidite-(La) or davidite-(Y) no one seems to know), hailing from what is said to be a new prospect in a rare earth-bearing pegmatite at Bektau-Ata, Karaganda, Kazakhstan. The tabular, incomplete davidite crystals are opaque tannish brown and actually fairly lustrous; they reach 2.5 cm. Beige-colored spots and films on some of their surfaces are probably the remains of feldspar crystals blasted by radiation from the uranium in davidite.

Two weeks before the 2009 Denver Show, a prospect pit in a forest near Aurangabad, Maharashtra, India yielded about 400 very attractive specimens of what the Indian dealers were quite sure was thomsonite, although some eyeballing experts (e.g. Rudy Tschernich) were inclined to guess natrolite. X-ray and Raman analyses by Bob Downs at the Universty of Arizona have just recently shown the material to be **mesolite.** In these large-cabinet specimens, pale yellow-brown spherical aggregates of radiating acicular crystals rest, singly and in clusters, on basalt matrix. The spheres reach 10 cm in diameter, and the matrix specimens reach 30 cm across; some specimens are lightly intergrown groups of two or three spheres without matrix, reaching 10 cm or so. Very thin, silky white whiskers of mesolite can be seen reaching between some of the mesolite spheres, as if trying to bind them together. Unlike Indian specimens showing dirty white, smooth-surfaced thomsonite spheres which appeared a few years ago, these specimens are quite pretty. The radiating acicular crystals are coarse enough to have terminal faces, and thus the spheres sparkle gaily, in creamy yellow, besides being set off nicely by the white mesolite filaments spanning between them. Several Indian dealers had specimens of this material, but the best and largest selection resided with K. C. Pandey's *Superb Minerals India* (www.superbminerals.com).

Somewhere near Karur, Tamil Nadu State, southern India, at least three impressive specimens of **scapolite** have recently come to light. I was shown the three loose crystals in a Holiday Inn room harboring the wholesale stock of Dudley Blauwet's *Mountain Minerals International* (mtnmin@attglobal.net). The loose, thin, singly terminated scapolite crystals (with rehealed bottoms) have a pale yellow color and are completely gemmy. They reach 10 cm long and are dichroic, appearing much deeper yellow when viewed down the *c* axis.

Figure 11. **Scapolite crystal, 3.8 cm, from Karur, Tamil Nadu, India. John Taylor collection; Jeff Scovil photo.**

In his booth at the Main Show Dudley had even more interesting—and utterly different—**scapolite** specimens, not from India but rather from Iszkazer, Badakhshan, Afghanistan. He is proud of the miniature to small cabinet-size pieces of typical (for the area) white marble matrix from which rise totally gemmy, pale lavender, well terminated prismatic crystals of scapolite to 4 cm long, with some of the same matrix pieces also bearing rounded, translucent pine-green **diopside** crystals, also to 4 cm. Until now it has been highly unusual to see so many specimens of gemmy Afghan lilac scapolite crystals *on matrix*, and the association with excellent diopside crystals constitutes a bonus.

From Ladjuar Madan, Sar-e-Sang district, Badakhshan, Afghanistan, Dudley had about 30 matrix specimens, 5 to 12 cm across, in which the standard white marble is richly bedecked by fairly sharp blocky crystals, to 2.5 cm, of **nepheline**. These unusually well-formed nepheline crystals are colorless and transparent within, but they are coated nearly completely by films of blue to white sodalite, and thus are opaque and mottled blue/white—like little swatches of sky laid over the white matrix background. According to Dudley the specimens were found between fall 2008 and summer 2009 in northern Afghanistan's "lapis country."

At a new locality called the Gowinggo mine, Kail Azad, Jammu and Kashmir, in the Pakistani-occupied part of disputed Kashmir (talk about a dangerous place to dig rocks!), about 20 superb compound crystals of partially gemmy pink **elbaite** have lately been found, and Rob Lavinsky had three of them at the Main Show. Respectively 8, 12 and 14 cm tall, the crystals are well developed, trigonally terminated and lustrous, and they may be harbingers of dramatic things (other than war) which Kashmir may soon have to offer.

Coming down into Myanmar (Burma), let us salute the generous pegmatite exploited by the Paleini mine, Khetchel (or Khat Che) village, Molo quarter, Momeik Township, Mogok area, Mandalay Division. During the 2000s this mine (sometimes incorrectly referred to as the "Khat Che" or "Khat Chay" mine) has given the world superb and distinctive crystals of phenakite, petalite and hambergite; white to colorless though they are, these species from the Paleini mine can be quite beautiful. At this Denver Show, *KARP Minerals* had some excellent loose crystals of **hambergite** from the Paleini mine. The selection ranged from splinters of rough piled into sandwich bags to sharp, terminated crystals, milky white to colorless and transparent, reaching 3 cm long (the very best of the latter priced at $300). But really I'm bringing up the Paleini mine because I'm still regaining sensory equilibrium after viewing the extraordinary Paleini **phenakite** that Ohio collector Carolyn Manchester acquired at the show. The specimen is a cluster of connected, brilliantly glassy, totally colorless and transparent phenakite crystals, all *doubly terminated* and without visible damage, with about five crystals, all around 2 cm, attached at varying angles to prism faces of a central crystal more than 4 cm long. There is no matrix, and the terminations bear only the tiniest re-entrant angles as evidence of the penetration twinning that produces the appearance of a hexagonal prism. This is far and away the finest example of Paleini mine phenakite I have ever seen, and must certainly be one of the finest phenakite specimens in existence.

China was pretty quiet this time around—although I must not neglect to mention that Evan Jones and Marcus Origlieri had many spectacular cabinet-size plates of red-orange **wulfenite** crystals, newly brought in from the still mysterious mine in the Kuruktag Mountains, Xinjiang Uygur Autonomous Region, noted in an article in our "China II" issue (January–February 2007). The specimens, reaching 30 cm across and sporting thin, tabular wulfenite crystals to 3 cm, are all from the original find and had been kept in storage in China until just recently.

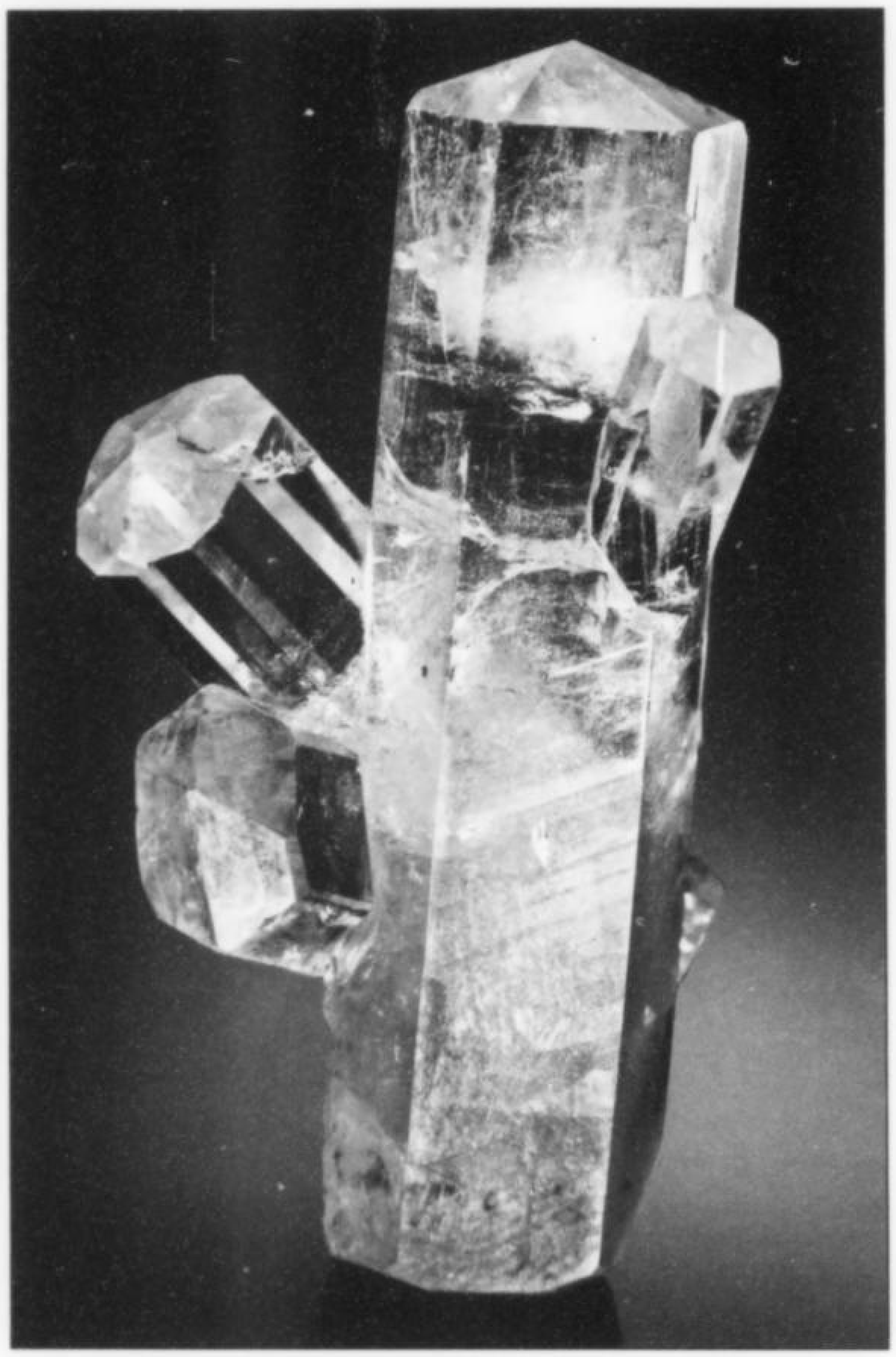


Figure 12. **Phenakite crystal cluster, 4 cm, from the Paleini mine, Khetchel village, Momeik Township, Mogok area, Mandalay, Myanmar (Burma). Carolyn Manchester collection; Jeff Scovil photo.**

The only noteworthy *new* Chinese item I saw was with a dealership in the Holiday Inn: *Tan Li Mineral Firm* (www.mineralangel.com), operated by Mr. Xu Ning of Alhambra, California. That gentleman's shelves were graced by about 15 very beautiful **barite** specimens which (he told me through a translator) came about one year ago from a mine, most likely somewhere in Hunan Province, whose name is being kept secret. The specimens were first marketed in the dedicated mineral-marketing city of Chenzhou, Hunan. Transparent and colorless, lustrous barite crystals to 4 cm, with chisel terminations on both ends, form bristling or towering groups to almost 30 cm. The groups, clean and pristine, fat and beautiful, show no species besides the barite. There are two or three modest matrix specimens wherein the colorless barite crystals rest on a tan-colored, fine-grained sandstone.

The HQLP (High Quality-Low Price) Report

Perhaps you'll recall the HQLP Principle, first aired in last year's Denver report: if you know what you're doing it is quite possible, and very much fun besides, to go to a major mineral show *without* major money and locate excellent, tasteful specimens (HQ) that you can purchase for $200 or less (LP). The HQLP specimens you bring home will always be special friends.

When dealers at shows market collections that were amassed by people whose names we don't recognize, we can often sense kindred HQLP sensibilities that functioned happily in past times. In my own case the reverberation is strongest when the older collector specialized, as I do, in thumbnails—and so it was that in Denver this year I kept coming back and back again to the Holiday Inn room of John and Linda Stimson of *Rocks of Ages* (www.rxofages.com), where there were about 15 flats of thumbnails which had once belonged to one Ernie Davis of California and Iowa. In about 1970 Mr. Davis began to collect worldwide thumbnails, and eventually gathered about 2,500 of them, of which about 800 had been carefully cataloged before he suffered a disabling stroke in 1991. Now he's in a rest home, and the Stimsons are selling off, piece by piece, the collection that Mr. Davis quite clearly loved. The qualities and "true" values of the Davis specimens vary considerably, of course, but the species representation is wide and knowledgeable, not everything is simply pretty or splashy, all of the specimens are mounted intelligently in Perky boxes, and nearly all are in good condition; a fair number were self-collected (John Stimson told me) by Mr. Davis during his days of roaming about the western United States. As I say, I couldn't stop coming back, and the superb ex-Davis specimen pictured here is now mine: a razor-sharp crystal of axinite-(Fe) from a late-1980s find on Mt. Catogne, near the village of Sembrancher, in the Swiss part of the Mont Blanc massif, Canton Wallis. Price $75. Indeed, no single specimen from the Ernie Davis collection

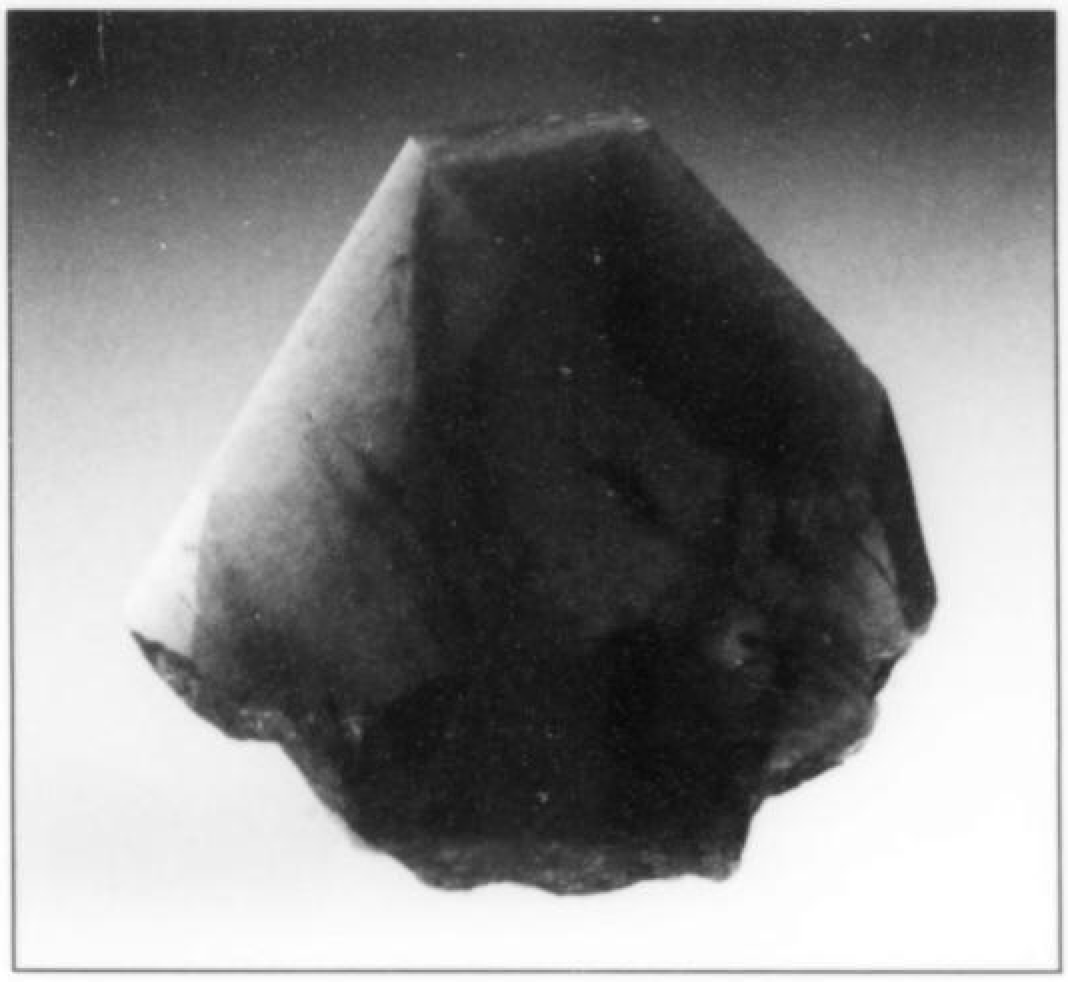


Figure 13. **Axinite-Fe crystal, 2.6 cm, from Catogne, Wallis, Switzerland. Ex Ernie Davis collection, *Rocks of Ages* specimen; Wendell Wilson photo.**

was priced at more than $100—without significant markup from prices that Ernie Davis himself had paid as much as four decades ago. HQLP shopping down the ages . . .

From among this show's many examples of specimen-lot-scale "deals," I jotted down just a few:

In one of the ballrooms of the Holiday Inn, *Crystal Classics* and *Kristalle* (www.kristalle.com) had an offering which included a spread of the new and beautiful green **fluorite** from Riemvasmaak, South Africa, in thumbnail to cabinet-size specimens that were priced far below the previous standard for this material. Fine and essentially perfect specimens for under $200 could easily be found.

Beautiful yellow-green, transparent **prehnite** in spheres, hemispheres and "crests" on matrix of graphite-infused rock, from the Merelani mines, Arusha, Tanzania—see the photos in the recent "Tanzanite Issue" (September–October 2009)—has sold for rather high prices in some quarters during the past three years or so, but excellent toenails and small miniatures of the material could be had for $15 to $45 from *The Crystal Circle, LLC* (www.crystalcircle.com).

As already mentioned, the new cuprite, copper, and cuprite/copper specimens from the Rubtskoye mine, Russia, were seen at several dealerships around the show, and prices for comparable specimens varied quite widely—some might say crazily—from place to place. Excellent floater groups of sharp, deep red octahedral **cuprite** crystals, as well as groups of bright, sharp **copper** crystals, both to around 5 cm across, could be had from some of the Russian dealerships for $100 to $200.

Some would say that the world's most attractive specimens of **goethite** are the fan-sprays of lustrous, brownish red bladed crystals from miarolitic cavities in the granite of the Pikes Peak batholith, Colorado. At Denver, Mike Wild of *Atomic Perfection* (www.atomicperfection.com) had a group of goethite specimens just dug in April 2009 from the "Dreamtime mine," near Lake George; in these, crystals of the transparent, goethite-included quartz that the locals call "onegite" are surrounded by blooms of goethite crystals, making for gorgeous miniatures which would set you back no more than about $100.

At the Main Show, Isaias Casanova of *IC Minerals* had Erongo Mountains, Namibia beryl specimens of a very different sort than those *brobdignagian* (Jonathan Swiftish for "very large") specimens of aquamarine/schorl/feldspar brought in by Marshall Sussman. Isaias's specimens are miniatures—from about 4 to about 7 cm across—showing lustrous, transparent, entirely colorless prismatic crystals, to 3 cm, of **goshenite beryl** perching lightly on sleek black schorl crystals; some specimens harbor tiny colorless topaz crystals as well. Fine examples of these very "cute" goshenite/schorl specimens were asking around $200.

Ron Anderson of *Prospector's Choice Minerals* (phone 303-790-9280) had several pristine floater clusters, to 6 cm diameter, bristling all over with lustrous, transparent, palest yellow bladed crystals of **gypsum**: these classic items from the Red River Floodway, Manitoba cost around $50 apiece.

Rick Kennedy of *Earth's Treasures* (www.earthstreas.com) continues to work the new pegmatite prospect (owned by Dave Schmidt) called the California Blue mine, in San Bernardino County, California. In Denver, Rick had some new material from there which included gemmy, pale blue, somewhat etched but very pretty crystals of **aquamarine**, with a 5-cm crystal costing $200; gemmy, colorless to palest blue **topaz** crystals to 2.5 cm, for around $50; and very respectable specimens of **microcline** and **smoky quartz** to cabinet size, mostly under $100.

Displays

This year, the theme of the Denver Gem & Mineral Show had nothing to do with either gems or minerals: the theme was *Fossils—Windows to the Past*. Yes, fossils are cool. But those of us who gravitate toward displays of minerals had fewer spots than usual around which to form huddles of conversational awe.

As in most recent years, two big cases in the hall's center were filled with magnificent specimens from the Scott Rudolph/Keith Proctor collection. Another big, centrally located case contained many superlative pieces from the collections of members of the MAD (Mineralogical Association of Dallas) group, including a fantastic, small cabinet-size, Thomas Range, Utah topaz specimen field-collected by Doug Wallace.

And, as fairly frequently at the Denver Show, Denver resident Ralph Clark put in a case of selections from his fabulous thumbnail collection—with the Montana veszelyite, Tsumeb mimetite, Chilean proustite, Swiss anatase, etc., etc., of one's dreams.

The National Museums of Scotland set up two cases previewing future galleries, with antique classics from Leadhills plus a breathtaking Cornwall bournonite specimen about 40 cm across.

The American Museum of Natural History (New York) had a learned case on the clinopyroxenes, and the Smithsonian Institution showed a few new acquisitions including an unearthly fine, 4-cm, complete, transparent, colorless crystal of phenakite from Sugarloaf Mountain, New Hampshire, from the recently dispersed collection of Robert Whitmore (who, by the way, is still alive and well). This turned out to be quite a show for world-beating phenakite, was it not?

In his customary *Mountain Minerals International* case, Dudley Blauwet had set out some mind-expanding specimens, mostly from Pakistan and Afghanistan.

A very pretty case of Colorado pyrite specimens put in by David L. Roter was dedicated to the late expert collector Hal Miller (died March 2009).

An array of "killer" calcite specimens filled a case put in by the Cincinnati Museum Center.

Finally, there was a case explicitly dedicated to the HQLP theme, put in by Rob Lavinsky, Wally Mann, Jeff Starr and Karl Warning. The title says it all: "$100 and a little work could have gotten you any one of these beauties at recent Denver and Tucson shows."

Amen to this last in particular, and so long from Denver 2009.

Munich Show 2009 — by Thomas Moore

[October 30–November 1]

For my late-autumn 2009 pilgrimage to the Munich Show, all of the friendly old scenes and images were still there, still highly civilized and *gemütlich* ("homey, comfortable" is the best one can do with this nearly untranslatable word). There, just where I'd left them, were the *Marienplatz, Isartor, Viktualienmarkt*, the *gemütliche* Pension discovered last year and stayed in again this year . . . spiffy shops, ebullient street life, efficient *U-Bahns* . . . and say, when you make it to Munich, do try the fine and authentic Bavarian food at the *Frauenhof* restaurant on Frauenhoferstrasse. So impressed with this establishment was my traveling companion, Tom Gressman, that we skipped the Indian-style banquet generously offered to guests on Friday night at the mineral show, to return instead to the *Frauenhof* for another oniony-luscious *Zwiebelrostbraten*, enjoyed at a stout wooden table, shared with convivial locals, below the great stuffed heads of wild boar and deer (sounds a lot like "why not more beer?").

However, the dollar had reached a new low—it took $1.50 to buy a Euro—and it seemed that there were fewer American dealers and shoppers attending the show than in 2008. Too bad, for this is still clearly the Number Two mineral show in the world, and even Tucson cannot match some of its distinctive features. First among these, of course, is an educational plentitude of "local" mineral finds, especially Alpine ones; but the Munich Show also has going

***Figure 14. Apatosaurus janahpin*. Tom Moore photo.**

for it the fact that all of its wares are gathered in one place, and that place thoroughly trafficable on foot in a single day if it comes to that. (Take care, though, to wear good shoes, for all day you'll be stomping around the crazy-jammed *Hallen* with their colorful mineral goods, and the trek can be tiring much beyond what you might expect).

A slight change had been made from last year's show layout: the gemstone and lapidary dealers had two big halls all to themselves while mineral dealers occupied all of *Halle 6* and part of *Halle 5*. The remaining space of the latter was given over to fossils, including two complete dinosaur skeletons, one of them a gargantuan herbivore, *Apatosaurus janahpin*. There was also the carnivorous *Allosaurus fragilis*, along with the very rare remains of an *Archaeopteryx*, the world's oldest known bird. The show catalog, for its erudite part, offered fine articles on *Archaeopteryx* fossils, Darwinian evolution, and the history of work in Jurassic dinosaur habitats in Europe and in the Wyoming badlands.

The chief show theme was India: its minerals, its lapidary materials, its jewelry ancient and modern, and (not to neglect) its food—exotic spices were on sale at tapestried booths in a mini-bazaar which stretched between the enclosed display pavilion and a snack area where simple curried dishes (with *Neumarkter Lammsbräu* beer) kept selling briskly. Back in the pavilion, case after wide case held wonderful specimens of Deccan Plateau minerals: a highlight was a mesolite specimen from near Pune, with great white sprays of acicular crystals covering a matrix plate nearly a meter wide, in one of the several cases put in by K. C. Pandey's Gargoti Museum. Terry Huizing contributed a lovely case of Indian calcite specimens; the Natural History Museum of Paris had a wall case on the histories of some large blue diamonds from India; Hans Weihreter of

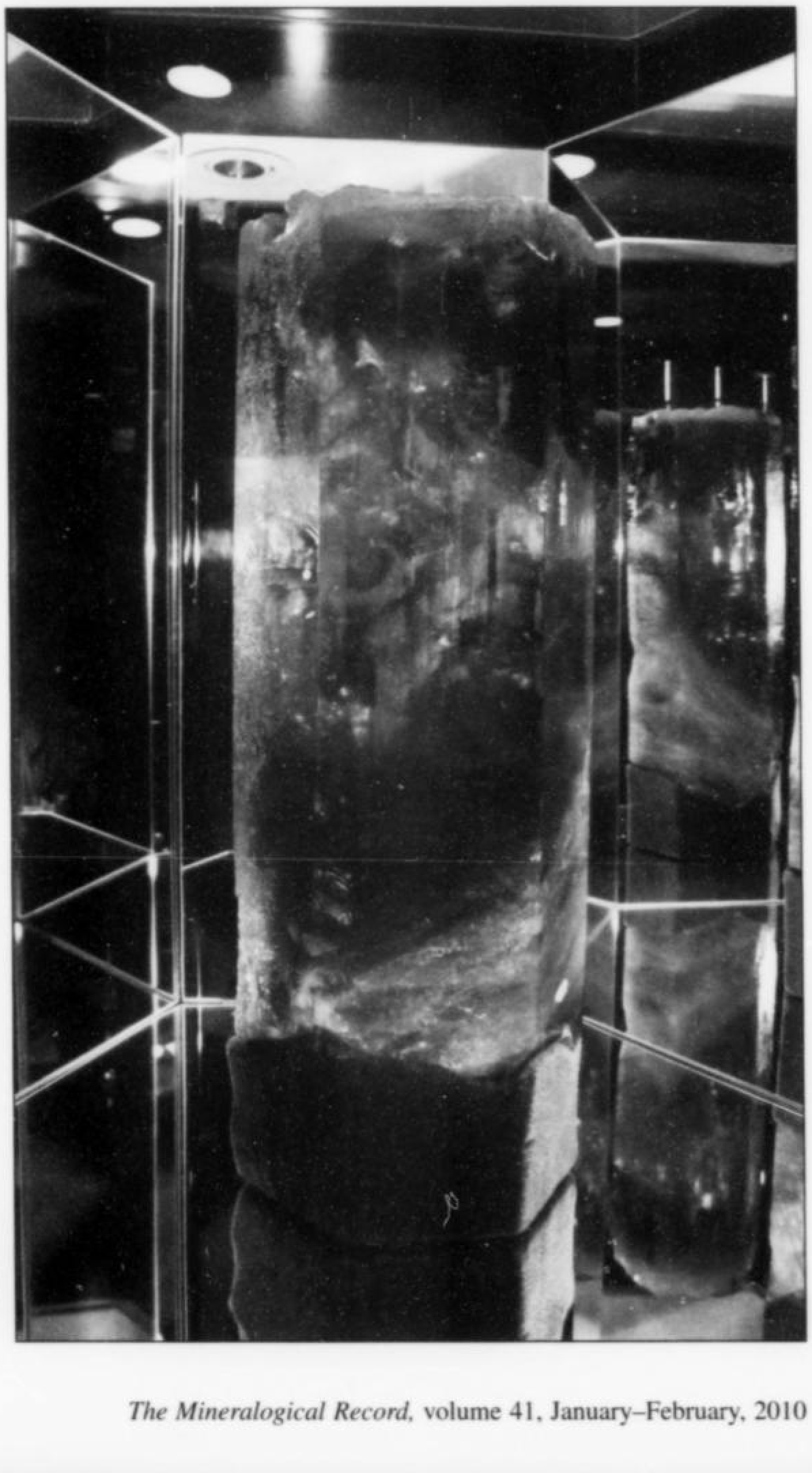


***Figure 15.* Largest known gem-quality Indian aquamarine crystal, 32 cm, from Paplam Patti, Karur district, Tamil Nadu, India. Tom Moore photo.**

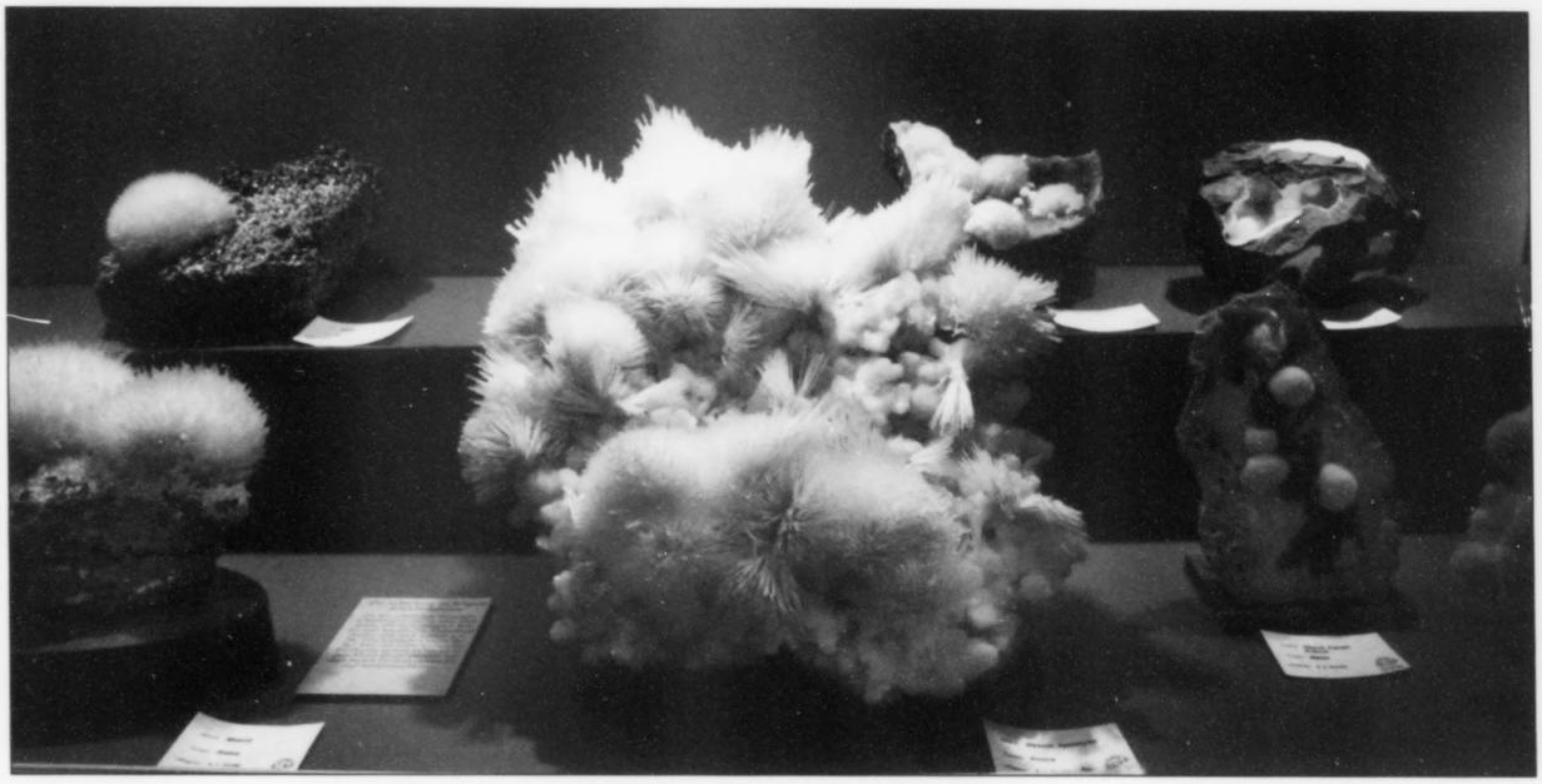


Figure 16. **Exhibit of minerals from India selected from the collection of the Gargoti Museum. Tom Moore photo.**

Augsburg had some vertical cases displaying "The Jewels of the Maharajas"—ancient, ornate, mostly red-and-gold items including inlaid brooches and breastplates, chains of little gold Hindu-deity heads, body ornaments all of filigreed gold, and so on. An innermost area of the pavilion, presided and brooded over by a translucent-glass carving of the elephant god Ganesh, displayed just two great specimens from the collection of Adalberto Giazotto. One of these is a quartz crystal group, with two colorless, pointed, wavy-faced crystals displaying the "Tessin habit," measuring 28 × 47 cm; the other is the largest known gem-quality crystal of Indian aquamarine, a sharp, blue-green, 16 × 32-cm prism from Paplam Patti, Karur district, Tamil Nadu state, southern India. The show catalog pitched in with (among other things) a long article by Berthold Ottens on the minerals of the Deccan Plateau and on recent developments at the Gargoti Museum in Shirdi.

The "Alpine Strahler" area is by now a dependably permanent feature of the Munich Show. On its outside one finds, first, the Tyrolean nibble-station where roseate, dirndled women and girls and slightly surly young men in leather aprons dispense cheese and smoked sausage samples, free of charge to the tourist. Moving around the perimeter, one sees a good number of extremely fit-looking Strahlers with interesting specimens, as if just popped from their collecting sacks, on sale at "tailgate"-style prices. In the Alpine display area proper, this year, the South Tyrolean Mining Museum had put in a big, multi-case display showing minerals typical of the intrusive igneous rocks, contact-metamorphic rocks, sedimentary rocks, Alpine clefts and ore veins of the Alpine regions; whoever took time to work slowly around this alcove of cases could learn a great deal. Then, courtesy of two expert Strahlers, Franz von Arx and Elio Müller, there were four vertical cases of smoky quartz and pink fluorite specimens from central Switzerland and from Mont Blanc, France (see the pertinent article in this issue). But the real crowd-grabbers were several enormous clusters of transparent, colorless, highly lustrous quartz crystals dug by von Arx and Müller last year on the Planggenstock, Göscheneralp, Uri, Switzerland, all backlit very effectively on their carpeted platforms. Each of these radiant objects measures more than a meter across, and Michael Wachtler's article in the show catalog tells the story of their discovery.

The 2009 Munich Show was quite rich in "local"—i.e. European, especially German—discoveries of interest. Two German dealers had about 100 specimens each from a **mimetite** discovery made, just a month before the show, in an "old classic" locality in the southern Black Forest, namely the Haus Baden mine at Badenweiler, Baden-Württemburg. Exploitation of lead ore veins around Badenweiler began during Roman times, and between about 1750 and final cessation of mining in 1926 many fine specimens of mimetite, pyromorphite, galena, cerussite, fluorite and other minerals emerged from the district. In early fall 2009 a hitherto unnoticed vein in a still-accessible part of the Haus Baden mine yielded about 500 specimens of mimetite, from miniature to large-cabinet size. The mimetite forms perfect, smooth-surfaced spheres of a pleasant silky orange color, to 1 cm in diameter, which lie spotted or intergrown on matrix plates and in some cases piled high like bunches of little orange grapes: even the best of these attractive, vaguely Mexican-looking mimetite specimens could be had for under 100 Euros from Carsten Slotta (slotta-schumacher@gmx.de) or from *Wendel Mineralien* (www.wendel-mineralien.de).

At the latter dealership, friendly Herr Wendel also had a few beautiful cabinet-size **barite** specimens recently found in the old mines near Annaberg, Sachsen, in the former East Germany. In recent times these mines have chiefly been known for their specimens of "black" (really very dark purple) fluorite, but the new barite specimens are even nicer than most of the fluorites. Lustrous, bladed, translucent orange-pink barite crystals form parallel groups and "crests" reaching 25 cm; yellow fluorite crystals are associated, and there are golden dustings of microcrystals of chalcopyrite.

In fact, before I move on from *Wendel Mineralien* I must acknowledge this dealership's dazzling selection of German and other "old classic" specimens, mostly of thumbnail and miniature sizes, which Herr Wendel has been garnering from old collections. A multi-tiered array, with the specimens sitting up temptingly on

Figure 17. **Smoky quartz specimens found by French *cristalliers* on Mont Blanc near Chamonix during the past year. Tom Moore photo.**

their plastic bases, included outstanding galenas from the Ramsbeck, Siegerland and Freiberg regions; copper from Bad Ems; azurite from Altenmittlau; calcite from Andreasberg, Harz Mountains; silver from the Pöhla mine in the Erzgebirge; and plenty more. There were also annabergite from Laurium, Greece; kermesite from Pezinok, Slovakia; sphalerite from Banská Štiavnica (Schemnitz), Slovakia; chalcocite and olivenite from Cornwall, England; some top-class vanadinite specimens of recent vintage from Mibladen, Morocco; and a few dozen of the new mimetites from Badenweiler. This was the most impressive shopping-selection of small specimens from "old" places I've seen in years.

But Steffen Michalski of Leipzig (info@sm-mineral.de), over in *Halle 5*, had, as he does every year, many flats full of *more* German oldies, such that this stand almost matched Herr Wendel's for interest. Actually many of Steffen's specimens are not so old, having been found by modern collectors scavenging dumps and old workings in the mine-riddled central Erzgebirge ("Ore Mountains") of the former East Germany. Let one example stand for the rest: Steffen had some excellent specimens of **safflorite pseudomorphs after silver** dug from the huge dumps surrounding Shaft 186, near the village of Alberoda. Dull black but of excellent dendritic form, the pseudomorphic "trees" range from thumbnail to small-cabinet size, and some have sharp cubes of acanthite and/or skutterudite reposing on them. My thumbnail cost me all of 20 Euros (about $30).

A final German item of note was brought to the show by one of the few American dealers on hand, Rob Lavinsky of *The Arkenstone*. Rob had a few recently collected specimens of **autunite-uranocircite** from the Streuberg quarry, Bergen, Vogtland, Sachsen—known since the 1970s for such specimens, and intermittently productive of them to the present day. Rob's miniatures show typical sheaf-shaped aggregates of autunite-uranocircite crystals to 2 cm or so, of a brilliant yellowish green hue; they are probably the most richly colored specimens of this material yet found.

In the August 3, 2009 installment of the online "what's new in the mineral world" (at www.MineralogicalRecord.com) I spoke favorably of a new dealership, that of the brothers Anton and Rudolf Watzl of Linz, Austria—check out their fine Alpine (and other) offerings at www.watzlminerals.com. At Munich this year, the small but elegant *Watzl Minerals* booth was graced by about 10 superb specimens of **epidote** collected during the past 10 years from the great cleft at Knappenwand, Untersulzbachtal, Salzburg, Austria, where collecting again is possible now that the researchers from the Vienna Natural History Museum have finished their work at the site. Most of these new epidote specimens are repaired (in fact, the majority of *all* extant Untersulzbachtal epidote specimens are repaired), but the reassemblies have been done well and the crystal groups, from 6 to 15 cm, are no less beautiful for the rescuing. The highly lustrous, well terminated epidote crystals reach 10 cm individually, and the groups show, in varying combinations, typical associations of sharply crystallized albite, apatite-(CaF), and fibrous actinolite ("byssolite" or "amianthus"). Prices range from 1000 to 4000 Euros. Also the Watzls had a few specimens, found in 2003, of another Austrian classic: **strontianite** from the magnesite mine at Oberndorf-an-der-Laming, Styria. The Watzls' pieces, from 8 to 12 cm across, are parallel groups of stout, translucent, pale yellow-brown strontianite crystals in cauliflowerhead-like arrangements, and they are excellent representatives of the Oberndorf occurrence—perhaps the world's best for the species.

At a long table at the edge of the "Alpine Strahler" section, Dominique Feray (cathy.feray@wanadoo.fr) was selling hundreds of beautiful **smoky quartz** specimens from a 2-meter-wide cavity which was discovered in July 2008 at Les Periades, Mont Blanc, France; it had taken a team of expert French strahlers (*pardonnez-moi*, in France they are called *cristalliers*) more than a year to clean out this bountiful cleft. The lustrous, totally gemmy, medium-smoky quartz crystals range in size from a few millimeters to 30 cm. There are thumbnail-size stacks of crystals showing distinct white faden lines (for just 7 Euros apiece); there are gleaming, super-sharp "open" gwindels to 8 cm, totally gemmy in medium-brown; there are giant clusters of fat prismatic crystals (one especially nicely arranged, with a central, towering crystal 25 cm tall); and there are plates of granitic matrix covered with crystals, the plates to 40 cm across. One could hardly imagine a finer selection of Alpine smoky quartz.

Unfortunately, the Mont Blanc quartz cleft just described contained no octahedral pink **fluorite** crystals—but many other recently opened Mont Blanc clefts apparently did. I saw more of these beauties at this Munich Show, I believe, than I've seen at any past show. Many of the pink fluorite crystals are luster-challenged and most are loose and incomplete, but we still should be glad for the bounty. To name but one example, Peter and Janet Wittur (peter.wittur@web.de) enjoyed an especially good summer on the Talefré glacier, Mont Blanc, and thus had about 30 nice pink fluorite thumbnails: sharp, transparent, pale pink octahedral crystals to 2.5 cm, most of them loose but a few perched well on white shards of feldspar, with tiny smoky quartz crystals.

In the show's "Alpine Strahler" domain (again), Chianale Franco (Via Osasco 71, 10141 Torino, Italy) put out some flats of fine **epidote** specimens from Val di Viu (northwest of Torino) and of **vesuvianite** from Bellecombe, Aosta. Both of these are long-known Italian occurrences whose specimens are but seldom seen nowadays. Signore Franco told me that all collecting at Bellecombe is now forbidden (as the collecting area lies within a protected nature park), whereas Val di Viu is still collectible though with great difficulty. The best of the epidotes from Val di Viu are clusters of brilliantly mirror-faced, blocky, blackish green crystals which reach 1.5 cm individually (miniatures cost up to 50 Euros); the best of the Bellecombe vesuvianites show brilliant, dark greenish brown, edge-transparent, flat-topped prisms to 2 cm (50 to 100 Euros for a good miniature in this case). Add some good selections of **gold** from Brusson and of **grossular/clinochlore** from Val di Susa and you have a first-rate array of beautiful, classic Italian minerals, smallish in size but flashing at you alluringly from many meters away.

Jordi Fabre (www.FabreMinerals.com) had his usual clutch of noteworthy new items, including a couple from his Spanish homeland. First, he had 18 tiny nuggets and groups of rounded, subhedral crystals of **gold** from a placer occurrence first found in 2004 in the Sierra de la Chimenea, Talarrubias-Casas de Dom Pedro, Badajoz, Spain. These are hardly world-class gold specimens but they show promise, and who ever heard of gold from Spain, anyway? The best of the waterworn crystal groups reach 8 mm. Jordi also offered some specimens from a new find of **barite** at the Concessión Beltraneja, Minas del Cortijuelo, Bacares, Almería, Spain (you can count on Jordi to get these localities *right*). Very thin, medium-lustrous, platy barite crystals, ranging in color through pale blue, colorless and (iron-stained) yellow-brown, are arrayed edge-on in jumbled groups from 5 to 28 cm across; Jordi had about 40 of these pieces, mined in 2002–2003.

We shall now leave Europe and sojourn to Morocco, but we'll keep Jordi Fabre as guide/host for one more what's-new. The busy Barcelonan has scored about 30 miniatures of the new **dyscrasite** from the Bouismas mine, Bou Azzer district, Morocco, which I mentioned in the last Denver report and in my August 3 online installment. Bright metallic white, elongated and splintery crystals of the rare silver antimonide (Ag_3Sb) are shot through massive white calcite, and stand revealed after the calcite has been judiciously acid-etched away. Jordi says that there is currently only a single supplier of these specimens, and let's hope that more emerge—they are quite pretty in their way, reminiscent of old silver-in-calcite specimens from Batopillas, Mexico.

Tempting as it may be to linger indefinitely in the parts of the *Halle* where "elite" dealers from Western countries hang out, one should not neglect to spend serious time in the regions where folks from Peru, Morocco, Mali, China, Pakistan, India, etc. spread litters of unlabeled specimens out in enamel trays and spongy brown cardboard boxes, or simply on bare tabletops. Most of the merchants are

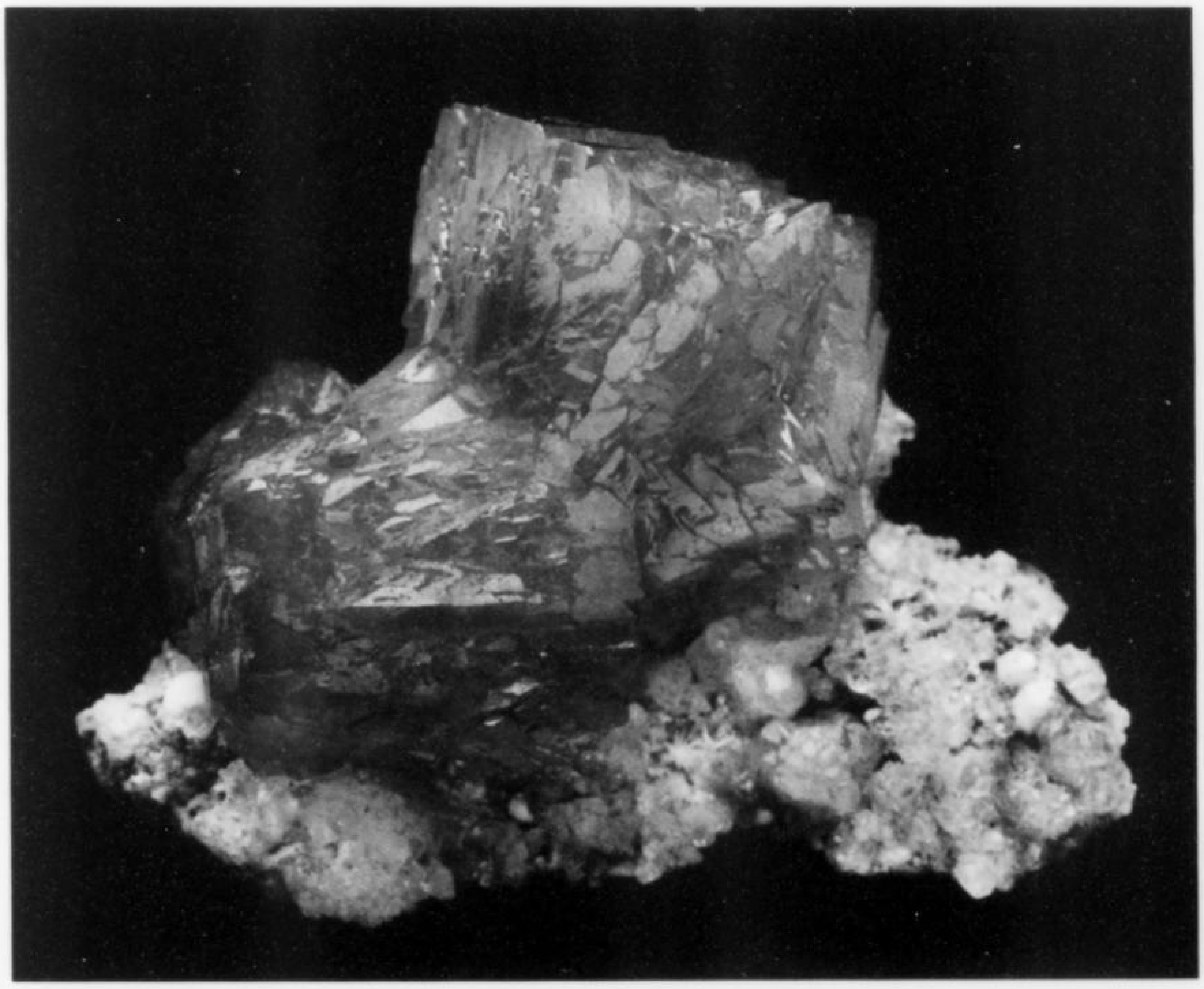


***Figure 18.* Olmiite crystals on matrix, 3.5 cm, from the N'Chwaning II mine, northern Cape Province, South Africa. Kalahari Mineral Adventure specimen; Jeff Scovil photo.**

English-challenged (never mind German); some are hyperaggressive, and some are a little sad-looking—but the flea-market ambiance is stimulating, and, of course, Who Knows What You Might Find? This year, some busy fellows from *Bougafer Minerals & Fossils* (bougafermaroc@hotmail.com) of Midelt, Morocco had a single flat in which thumbnail and miniature-size specimens of **limonite pseudomorphous after pyrite** rolled and jostled about; these were found in August near Imilchil, Morocco, and are a new item from that increasingly important locality. No, limonite pseudomorphs after pyrite are nothing rare, being found in plenty of places all over the world, but the Imilchil specimens are unusually attractive. Razor-sharp cubes to 3 cm occur singly and in tightly intergrown clusters of two or three, all free of matrix: think of good, clean pyrite from La Rioja, Spain, but make it medium-lustrous and mahogany-brown. The specimens are rather heavy, and probably still consist largely of unaltered pyrite within—the fact that I didn't spot any telltale edge-chipping testifies to the good condition of these specimens, none of which (the Moroccan guys said) would set you back more than 15 Euros.

We don't often see good minerals from Tunisia, but Laurent Gautron of *3G Environnement* (3genvt@wanadoo.fr) had about 15 nice specimens of **cerussite** from the Ressas Touireuf lead-zinc mine in that country: they are antiques out of an old collection Laurent bought, the mine having closed during the 1930s. Sharp, thick, lustrous cerussite single crystals and V-twins to 5 cm are available as loose specimens, and there is one 18-cm matrix plate thickly covered with cerussite crystals. The cerussite is mostly milky white and translucent, but there are some transparent, colorless areas. These specimens are bargains at between 12 and 35 Euros (except for the 18-cm matrix piece, which Laurent is holding onto for now).

An important newsflash from Munich last year was the find of beautiful pinkish orange **olmiite** in a new pocket in the N'Chwaning II mine, Cape Province, South Africa. French prospector Paul Balayer of *Kalahari Mineral Venture* (palomu@africa.com) was the finder, and in August 2009 he did it again, pulling out about 30 superb thumbnails and toenails from yet *another* new pocket in the N'Chwaning II mine, and these new specimens, besides being gorgeous, are distinctly different from all older olmiites both in habit and in color. Equant, smooth-sided, compound but sharply individualized olmiite crystals to 2.5 cm rest lightly on druses of colorless calcite; the diamond-shaped crystals resemble short fans just beginning to open. They are highly lustrous, and their orange-pink color is more vivid than that of the olmiites offered last year. A few larger specimens—to 10 × 15 cm—have olmiite crystals scattered on a matrix of dull black hausmannite, with little spheres of chalky white calcite. Top thumbnails of this material were selling for around 150 Euros. And Paul (assisted by Professor Bruce Cairncross) was also marketing 12 nice small-cabinet-size specimens of **celestine** found in July 2009 in a single pocket in the new N'Chwaning *III* mine. Lustrous, crisp sprays, all around 10 cm, of milky white to transparent and colorless, prismatic celestine crystals were available either loose or resting on an earthy brown-black matrix material, the matrix specimens reaching 15 cm across.

The 2009 Denver Show (see report in this issue) was graced by abundant supplies of the lovely new **andradite ("demantoid")** specimens now coming from diggings in a mangrove swamp at Antezambato, Antsiranana Province, on the northern coast of Madagascar. These fine, gemmy garnets also appeared in Munich at numerous dealerships, a special hat-tip going to *Demineralia* (www.demineralia.com), whose proprietor, Emanuele Marini, had filled a whole standing case with excellent demantoid specimens in a wide range of sizes. A humbler but more surprising offering from Madagascar was **richterite,** in sharp, complete, lustrous, opaque greenish black crystals to 4 cm, from a small prospect somewhere in Toliara Province, in the extreme south of the country. Calcite lenses in high-grade metamorphic rocks at this site gave up the richterite crystals when Laurent Thomas came by about five years ago with his digging equipment; at Munich, eight of the crystals were available (see Laurent's website for *Polychrom Minerals* at www.polychromfrance.com).

Mikhail Anosov of *Russian Minerals* (one of our new advertisers; anosminfod@mail.ru) had about 20 very good miniature specimens of the fairly rare zeolite **thomsonite**, found in summer 2009 in a basalt exposure somewhere on the Amudiha River, 300 km north of Tura, Siberia. Access to this scarily remote place is achieved only by helicopter, and, according to Mikhail, 1994 was the last year in which the region produced specimens that were marketed in the West (see the mentions of thomsonite and other zeolites from "Yakutia" and "the Tura region" in show reports in September–October 1992 and May–June 1993 respectively). Thomsonite from the Amudiha River forms lustrous white, spherical, flowerlike aggregates of bladed crystals, some aggregates with a very pale peach-colored blush in their centers, to 4 cm in diameter. Some "flowers" came out loose; others have small crystals of heulandite, stilbite, analcime or calcite attached to their bases.

The *Russian Minerals* stand at Munich could also boast a few intriguing specimens showing **quartz pseudomorphs after apophyllite**, these collected in June 2009 from the Krutoye mine, Tunguska River, Siberia—a roadfill quarry which went inactive in 2003. The pseudocrystals, to 3.5 cm, are dull milky white but textbook-sharp, composed about equally of a tetragonal prism and a tetragonal bipyramid, with small basal pinacoid faces topping (and bottoming) off the shape. They are extremely impressive examples of pseudomorphism, and Mikhail was letting them go for about 15 Euros apiece.

From 2001 to 2003 the market briefly saw offerings of exceptional **chevkinite-(Ce)** specimens from a discovery in the Tangir Valley, Diamar district, Northern Areas, Pakistan. The very sharp, bladed, wedge-terminated crystals of this complex silicate of Fe, Mg, Ti and the rare-earth elements reach many centimeters long, and occur in heavy groups of jet-black color and almost metallic luster, putting to shame all earlier known chevkinites from localities in Norway and Russia. I'd thought I had long since seen the last of any marketed lots

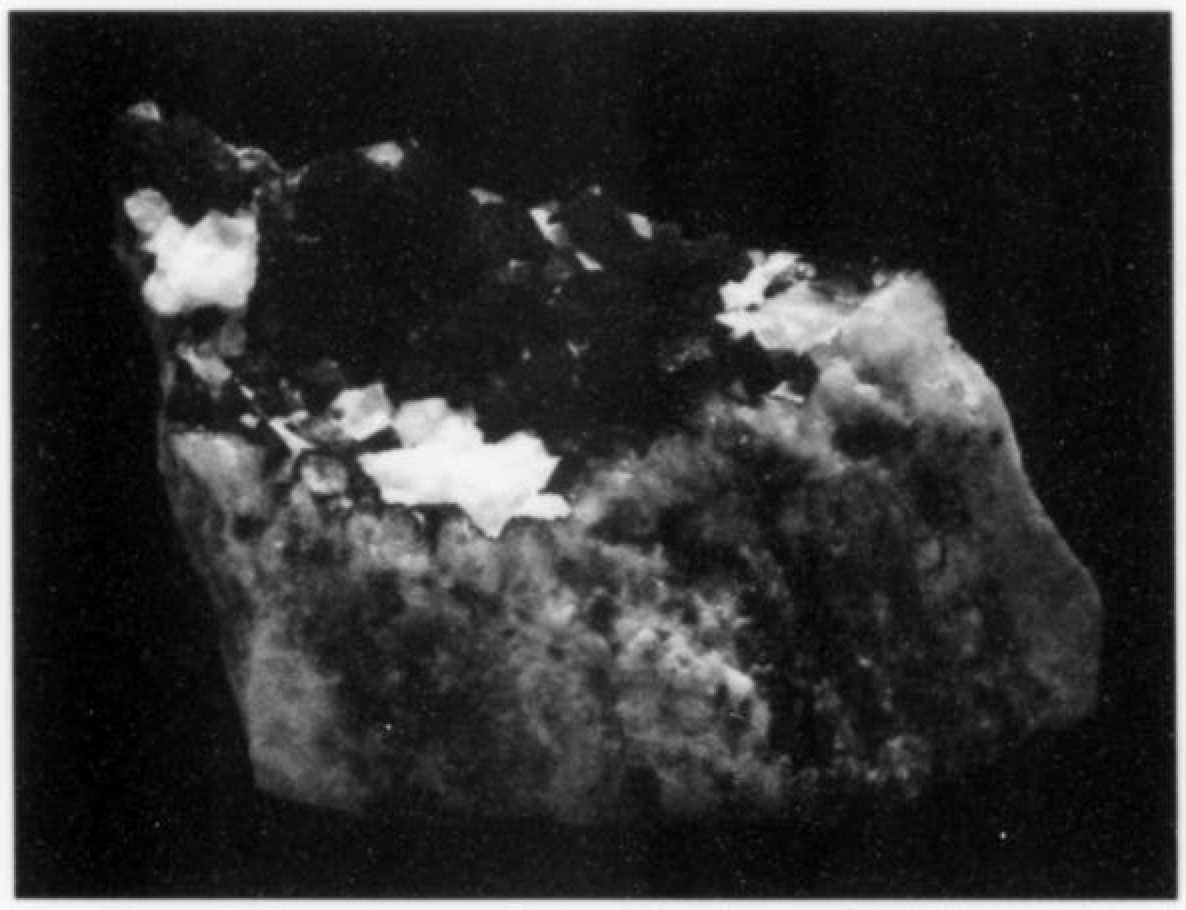


Figure 19. **Sodalite epitactic over nepheline crystals, about 5 cm, from Lajuar Madan, Sar-e-Sang district, Badakhshan, Afghanistan. *Mountain Minerals International* specimen; John Veevaert photo.**

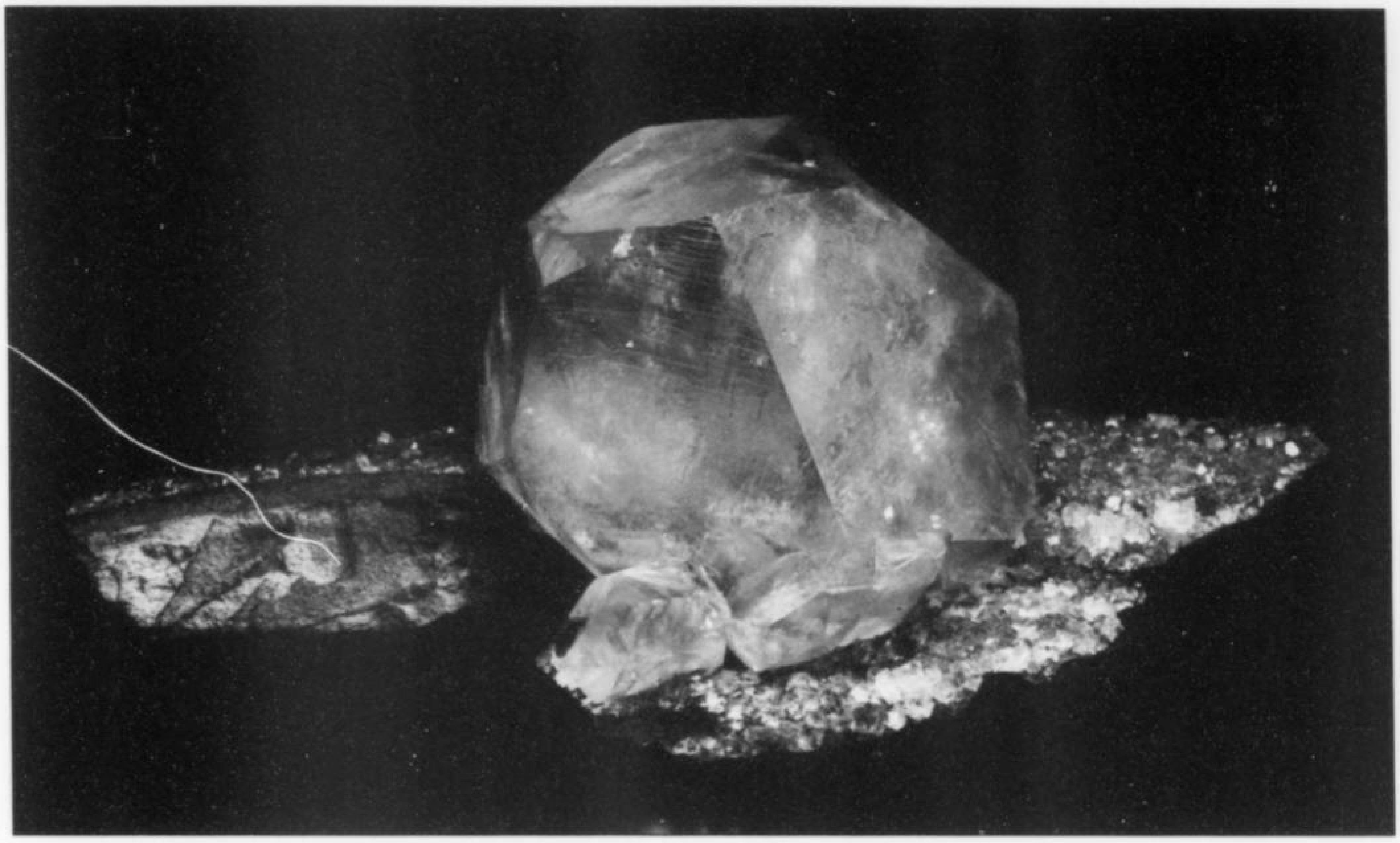


Figure 20. **Calcite crystals on matrix, 13.5 cm, from the Daye mining district, China. Marcus Budil specimen; Jeff Scovil photo.**

of Pakistan chevkinite specimens, but lo! in Munich in 2009, Pierre Clavel (min.pro@wanadoo.fr) had about 50 specimens of it—great black shining groups, from 6 to 30 cm across, with chevkinite-(Ce) blades to 6 cm individually. Pierre said that he had just acquired these specimens from a Swiss laboratory which had acquired them for study in 1991 (interestingly, ten years before the earlier stashes were seen on the market). He added that the part of Pakistan where the locality lies is now Taliban-controlled: it may be a while, indeed it may be never, before we see fresh selections.

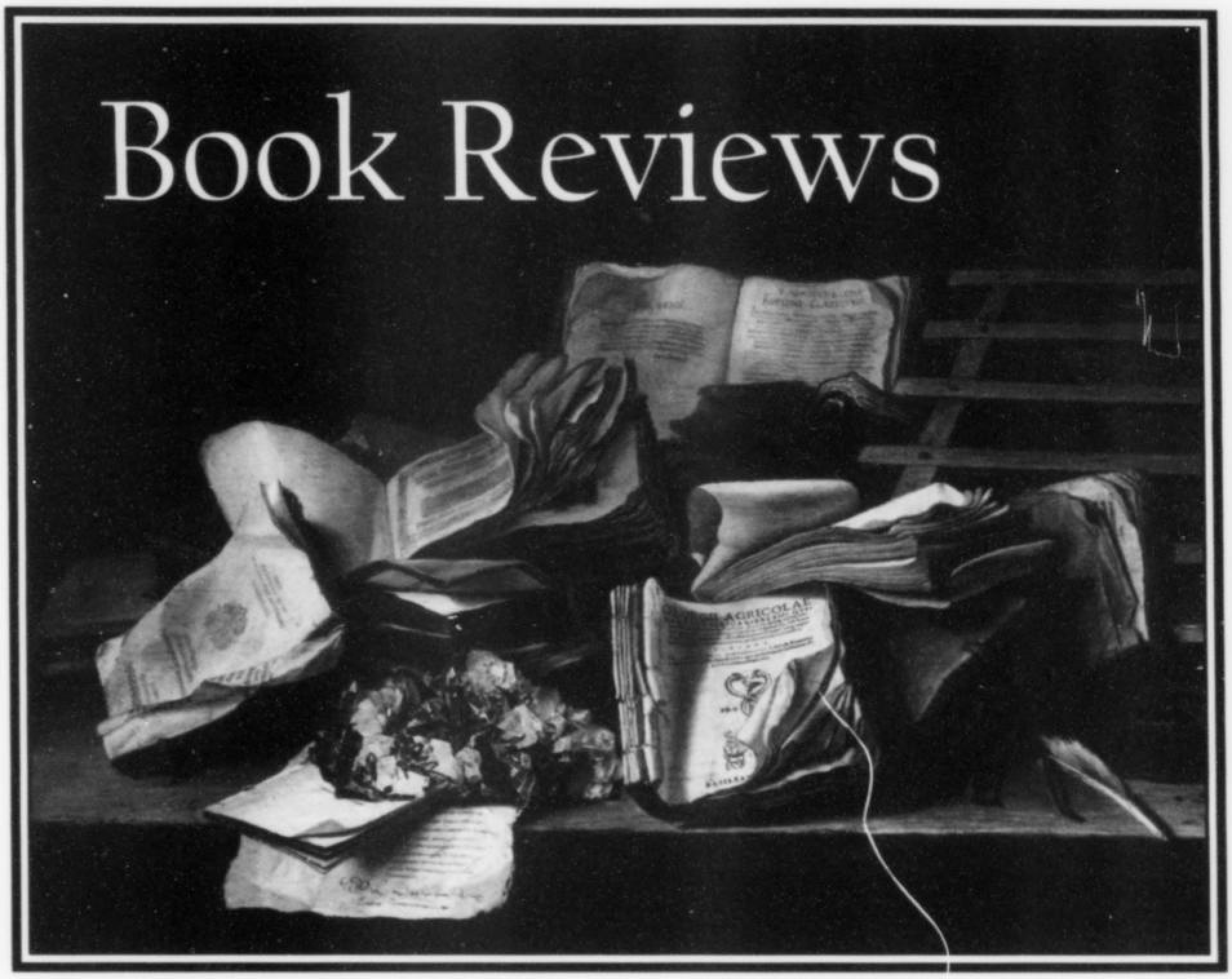
Andreas Weerth (Hochfeldstr. 37, 83684 Tegernsee, Germany) has just returned from Pakistan with five superb thumbnails of **monazite** from Zagi Mountain, Northwest Frontier Province: check out the thorough article on the locality in May–June 2004 and you'll see that this species is not among those reported from the rare earths-rich alkaline granite prospected sporadically at Zagi Mountain. Andreas's specimens are loose clusters of gemmy, lustrous red-brown monazite crystals to 2 cm, found, he said, just three weeks before the show. And Andreas was even more pleased to flash at me a couple of specimens from the Kokcha Valley, Badakhshan, Afghanistan on which super-sharp, equant, deep blue and highly lustrous crystals of what has been verified as **sodalite** rest on pyrite-infused white marble. These crystals, to 1.5 cm, are darkly colored and mirror-faced enough to suggest linarite, and are most surely not to be confused with the new sodalite-*coated* crystals of nepheline from the Kokcha Valley, these latter being baby-blue and not lustrous. I saw a couple of the flashy new Afghanistan sodalites in Denver, too, so perhaps we are in for some mind-broadening as concerns this species.

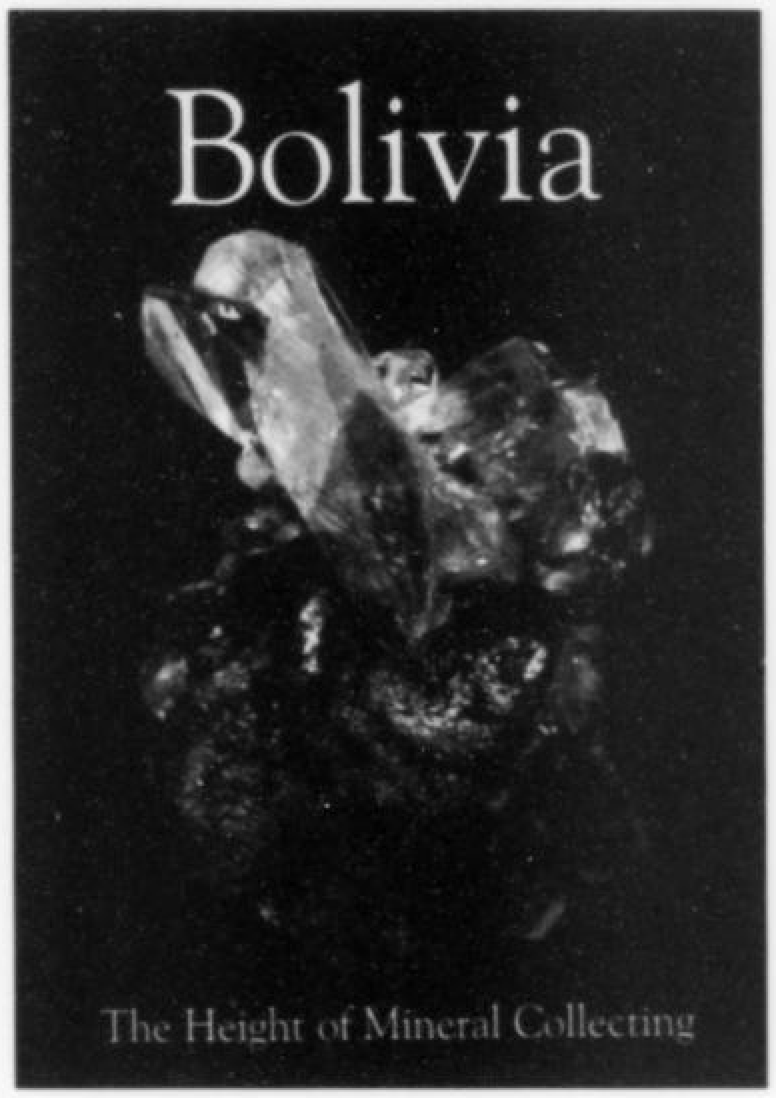
What is a mineral show these days without at least one new Chinese occurrence of pretty **calcite**? The Daye mining district in Hubei Province turns out many collectible minerals, among them calcite, whose crystals, chiefly from the Tonglushan and Tieshan mines, are usually white or colorless but can sometimes be dramatic. In summer 2009, an unspecified mine in the Daye district began giving up calcite specimens showing gemmy, lustrous, butterscotch-orange crystals reaching 7 cm, some in loose groups and some on a dark gray, shaly matrix; the calcite crystals are flattened rhombohedrons with secondary trigonal faces, and they are quite beautiful. Several dealers offered these pieces in Munich, but perhaps the best selection was with Zheng Jianrong, "curator" of the China Changsha Natural Mineral & Gem Museum (zhengjianrong5@sina.com), who had loose calcite crystals mostly around 5 cm and matrix plates to 20 cm across, well spattered with the glowing orange forms.

The tour will end in Brazil, site of two significant renaissances of earlier-known items. First, from a mine at Coronel Murta, Minas Gerais (5 km east of the famous Barra da Salinas tourmaline mine), come nine superb specimens of gleaming black **cassiterite**, found during the first week in October and brought to Munich by well-known Brazilian dealer and author Luiz Menezes (lmenezesminerals@uol.com.br). Very sharp, highly lustrous cassiterite crystals to 4 cm, all with "visor"-style contact twinning, cluster together in tight groups all measuring between 5 and 6 cm.

And finally, a gemmy climax: Jordi Fabre had 18 loose crystals, 1.5 to 3.5 cm long, of **copper-rich elbaite** from near São José de Batalha, Seridó pegmatite province, Paraíba state, Brazil. The crystals of what is generally referred to as "Paraiba tourmaline" are etched and skinny, but lustrous and wholly transparent, and they do show the "electric" blue color, so treasured and so rare, that is characteristic of this exotic material—see the thorough article by Wendell Wilson in March–April 2002. Jordi has been told that these are newly mined crystals—and for about 1000 Euros ($1500) you could have one.

And so, as the sun sinks slowly over the Hofbräuhaus, it's time to say *auf wiedersehen* from Munich 2009. Of course it was a fine show, and that fact, plus my duty and my ceaseless nostalgia, and let's not forget the *Kartoffelsuppe* at the *Frauenhof*, will certainly call me back again next year. Some things (blessings be unto them) never change.





Bolivia: The Height of Mineral Collecting

by Jaroslav Hyršl and Alfredo Petrov; edited by Robert B. Cook, Suzanne Liebetrau, Günther Neumeier and Gloria Staebler. Published (2009) by Lithographie, LLC. ISBN # 978-0-9790998. Available from the Mineralogical Record's online bookstore at www.MineralogicalRecord.com; or by regular mail: P.O. Box 35565, Tucson, AZ 85740; or by e-mail order at tgressman@comcast.net. Stiff softcover, 8.25 × 11.7 inches, 108 pages. Price $30.00 plus shipping.

They have done it again—"they" being, of course, the industrious "ExtraLapis English" editing team of Günther Neumeier and Gloria Staebler, assisted this time by Robert B. Cook and Suzanne Liebetrau—and "it" being another fine, colorful monograph, loaded with beautiful specimen photos and authoritative short chapter-texts, aimed knowledgeably at the serious mineral collector. To date, the majority of the *ExtraLapis English* productions have taken particular species or gem varietals for their themes, but this one, Number 12 in the series, joins Madagascar (#1), Pakistan (#6) and Elba (#8) in surveying a mineral-rich *place* instead. The place in question is an entirely landlocked, mountainous, somewhat mysterious-seeming *country* which boasts a long mining history and has a secure reputation for turning out world-class specimens of—oh, let's see—metallic species (andorite, pyrargyrite, stannite, franckeite, cylindrite), other primary ores (cassiterite, ferberite), and glamorous phosphates (phosphophyllite, paravauxite, vivianite, ludlamite) such as we have long admired and lusted after. Most of the chapters of *Bolivia: The Height of Mineral Collecting* offer short tours through the polymetallic mining districts which lie on or near the great elbow-bend of the Andes in the country's southwestern part, where enormous mine workings for silver, tin, bismuth, copper etc. have been in intermittent business since the time of the Spanish Conquistadors.

Readers of the *Mineralogical Record* have long been aware that two of the best people to go to for collector-oriented accounts of these mines (and of similar, neighboring ones in Peru) are Jaroslav Hyršl and Alfredo Petrov, the book's two chief authors. Valuable accounts of mining districts are offered also by Robert Cook and Terry Wallace, and there's a reprint of Alfredo Petrov's and Bill and Carol Smith's *Bolivian Locality Index* which was first seen in the November–December 2001 issue of the *Mineralogical Record*. What with the chapter texts, the Petrov/Smith/Smith index, and several helpful, sharp-focus, up-close maps prepared by Günther Neumeier, we no longer have excuses for vagueness regarding the geographical locations, mineral suites and even the present conditions at Huanuni, Oruro, Llallagua, Colquechaca and Viloco—terms which heretofore have confused and even intimidated fair numbers of label-fiddling collectors in the "developed" world.

By now it is traditional for the monographs in this series to offer informal accounts of historical, cultural and political backgrounds, plus insider stories concerning collecting and dealing, for the roads-lesstraveled in question. Here, Alfredo Petrov leads off the volume with a chapter called "Bolivia: a Land of Extremes"; Suzanne Liebetrau follows with "Mining, Politics, and Tumult: a Brief Look at Bolivian History"; Rock Currier recaps his favorite "Road Trip Bolivia"; and Petrov addresses would-be entrepreneurs with "Buying and Collecting: Local Customs and Practicalities." Later—after ten chapters devoted to specific mining regions in Potosí, Oruro, La Paz and Cochabamba Departments—Petrov steeps us in some "Thin Air and Coca Leaves," then informs us concerning "Vivianite: Fleeting Beauty and an Absorber of Evil" (don't ask; just read). After four more locality chapters we hit the Bolivian locality index mentioned earlier, and finally a Bibliography with 94 titles. Back on page 10, don't neglect to check out the sidebar by Lauren Megaw on Butch Cassidy and the Sundance Kid, where this self-assured teenage author tells you more about the careers of the outlaws, ambushed and killed by the Bolivian Army in 1908, than the Robert Redford/Paul Newman movie ever did (or cared to).

The specimen photos, by about 25 people, are predictably excellent; many, of course, have been published before, but who can complain about seeing, all over again, such magnificent things as the 3.6-cm Oruro andorite/stannite on page 26; the 9.2-cm Tasna bismuthinite on page 45; the 3.1-cm spherical Llallagua vauxite on page 50; the thumbnail-size Colquechaca canfieldite on page 67; the surprising 8.2-cm Corocoro copper on page 79; the stunning cassiterites, ferberites, wavellites and apatites on several pages; and of course the great phosphophyllites, including Andy Seibel's breathtaking 5.2-cm matrix specimen on the front cover? Among the work's most gratifying features is that the *collecting dates* are given for a great number of the pictured specimens, and in the texts of the locality chapters, too, much helpful data is offered regarding the times of particular finds—right up to 2009, when a boulangerite/jamesonite/zinkenite specimen, shown resting in someone's hand and still shedding its needles, was taken from the San José mine in Oruro. What's more, this experienced proofreader found very few errors in the figure captions or text, and most of these eminently forgivable—e.g. the misspelling of "franckeite" as "frankeite" (page 29).

A strong new player, then, in the Lithographie LLC lineup of softcover volumes for dedicated mineral collectors awaits your attention.

Thomas P. Moore

Italian Type Minerals

by Marco E. Ciriotti, Lorenza Fascio and Marco Pasero. Published (2009) by Edizioni Plus, Università di Pisa, Lungarno Pacinotti, 43, I-56126 Pisa, Italy. ISBN 978-88-8492-592-3, softcover, 21 × 29 cm, 360 pages, price 40€.

This surprisingly interesting book devotes one large-format page each to 264 mineral species that were first described from type localities in Italy between 1546 and 2008. Another 28 species from outside of Italy but named after Italian individuals and institutions are also included, all arranged alphabetically by species for easy reference.

Introductory text addresses such issues as the current definition of a mineral (not as simple as it used to be), discussions of species that were excluded but might have been included. (Does niter have an Italian type locality? Is iodine from Vesuvius a sublimate or merely an exhalation?) For each species the basic mineralogical data are listed (chemical formula, type locality, space group symmetry, physical properties, geological environment, references, etc.) and in nearly all cases at least one specimen photo is included—sometimes several good photos—plus a photo or portrait of the person after whom the mineral was named, or a very small locality photo. It is these extra touches that make the presentation so appealing, beyond the dry recitation of technical parameters.

There is also a list of the number of type localities in each of the 26 most prolific countries: The U.S. leads the pack with 699 species; however, if you take *country size* into account, the winner is Switzerland, with 1.659 species per 1000 square kilometers. Six appendices round out the coverage, listing the species in chemical order, chronological order, geographical order by regions and by mineralogical districts, a selected bibliography broken down by regions, and a tabulation of the authors of the descriptions—Paolo Orlandi leads with 37 new species descriptions to his credit. The book is printed in color throughout, and the printing quality is excellent.

Wendell E. Wilson

The Minette Collection (DVD)

by Wendell Wilson and the Mineralogical Record, released (2009) by BlueCap Productions, 120 minutes, USD $19.99 plus shipping, order from: www.BlueCapProductions.com.

I never had the privilege of knowing Jim and Dawn Minette personally, but as an avid thumbnail collector I have been well aware of their name and influence for years. Their names may be unfamiliar to some collectors, but anyone who attended the 2008 Tucson Gem and Mineral Show instantly received a profound introduction. There, the Minette collection created a frenzy when it was sold by dealers Dan and Diana Weinrich and Dave Bunk. And creating such a fury is saying something, since that year's show hosted the incredible "American Mineral Treasures" exhibits which should have had no competition whatsoever.

Connoisseur collectors agree that the Minette collection was one of the finest mineral collections ever assembled. Among the minerals they collected, they put together a thumbnail collection that was of such incredibly high quality that it became legendary. The Minettes exhibited frequently, and prior to the collection's sale a promotional website was created at www.theMinetteCollection.com in order to showcase some of the top pieces and to some extent help to document this historic array. But Wendell Wilson, editor of the *Mineralogical Record*, had the foresight in 2002 (shortly after Jim's death) to shoot a documentary video of the collection. Every serious collector—regardless of the specimen sizes he or she collects—owes a great debt to Wendell for his effort and for this DVD.

Historic collections are instructive on many levels and thus they need to be documented; great examples have included the F. John Barlow and Miguel Romero collections, as well as institutional collections like the Academy of Natural Sciences in Philadelphia. DVDs are in line with a new era of visual documentation that nicely complements the printed page. BlueCap Productions has set the standard with its "What's Hot in Tucson" DVD series, whereas mineral collectors and community websites (like The Vug and Mindat) frequently publish less formal show reviews and commentaries in streaming video formats. Video presentations are even featured by some dealerships like The Collector's Edge and Jeff Fast's Mineral Movies.

The Minette Collection DVD is an object lesson itself. What we learn from this presentation is a hint or glimpse into the diversity and quality of the collection, which reveals elements of the collectors themselves. The Minettes clearly had an unsurpassed eye for quality, rarity, aesthetics and historical significance. Together, they demonstrated an outstanding balance between artistic appeal and scientific relevance. That comes across well to educated viewers in the DVD, as Wendell shows a strong cross-section of the collection up close and in good focus. The camera's eye nicely examines the mounted specimens as he rotates them by hand (and then shows the label). I appreciate this "360 degree" approach, since it gives a kind of 3D effect and it reinforces an important tip for selecting specimens. Connoisseur collectors in particular often strive to find pieces with aesthetics and freedom from damage from all angles—not simply from the "display side."

What we don't learn in this DVD is the specific collecting philosophy and the Minette's approach to the care, handling, storage and display of the specimens. Because the video concentrates primarily on recording most of the thumbnails we are shown only a cursory view of the miniature and cabinet pieces. Furthermore, we do not learn how Jim and Dawn worked together as a couple to build this world-class array—to be sure, "couple collecting" is well known in the hobby as Si and Ann Frazier, Cal and Kerith Graeber and Paula and Les Presmyk can attest. My background in psychology is probably a bias, but to me it would have been quite interesting and noteworthy to understand all of the motivations that helped Jim and Dawn achieve what they did. Individual specimens come about by geological forces, but collections derive from psychological, emotional or intellectual forces—a grand vision. I feel that collectors at all levels could benefit from studying the "visions" of top collectors. But I accept that these wider objectives were not the goals of this DVD. At the time Wendell had no thought of creating a publishable DVD; he merely wanted to record for his own reference as many of the top specimens as time allowed before the opportunity passed to ever document them like this again. That may sound melodramatic, but the sad reality is that great specimens are lost more often than perhaps we care to admit. It seems unlikely that such a fate could befall the Minette collection, which was incredibly vast with specimens still available on the market as of this writing. But I know of at least one thumbnail specimen (vanadinite, variety endlichite) shown in this DVD that was reportedly destroyed in the mail after the 2008 Tucson Show. And who knows how many of the top Minette pieces will end up in private collections where they might never be seen again?

I must note that it was physically difficult for me to watch the entire DVD straight through. Wendell filmed the specimens as best he could, but the set-up was not as sophisticated as what someone like Jeff Scovil or Bryan Swoboda would use. And several times I had to pause the presentation because I felt motion-sick from watching so many rotating specimens, one after another. Of course, I might have felt faint over seeing so many exquisite thumbnails in a row (I honestly lost count how many are shown in the DVD!)

Seriously, I do recommend watching the program in phases. The smorgasbord of visual delights that bombards the viewer makes this DVD one that can be enjoyed and appreciated time and again. In fact, the thought occurs to me that a showing and discussion of this DVD would make a great group activity for a mineral club meeting. The understandable limitations to the recording format aside, this DVD should be in everyone's library. It is well worth the small investment, and the program serves as a strong "call to action." Significant collections should be documented, with the stories behind special specimens and the collectors' motivations saved for posterity. All of the elements of important collections have the potential for teaching new and seasoned collectors alike.

It is only fitting to mention that this DVD was the impetus for a new project that aims to build on Wendell Wilson's efforts here. It has been my privilege to work with Bryan Swoboda, BlueCap Productions, on a systematic and professional effort to document important collections (starting with thumbnails), as well as capture in-depth interviews with the owners so the stories and philosophies that define these arrays can be enjoyed and studied by future collectors. Given this DVD and all of the events that surrounded it and are being inspired by it, I believe Jim Minette would be proud of the lasting legacy he and Dawn bring to the hobby.

Jim Houran

THE MUSEUM DIRECTORY

Colburn Earth Science Museum

Curator: Phillip M. Potter
Tel: (828) 254-7162
Fax: (828) 257-4505
Website: www.colburnmuseum.org
Pack Place Education,
Arts & Science Center
2 South Pack Square
Asheville, NC 28801
Hours: 10–5 Tues.–Sat.
1–5 Sun. Closed Mondays
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Curator: Dr. Richard Berg
Tel: 406-496-4172
E-mail: dberg@mtech.edu
Assistant Curator: John Foley
Tel: 406-496-4414
E-mail: jfoley@mtech.edu
Website: http://www.mbmg.mtech.edu/museum/museum.asp
Montana Bureau of Mines and Geology
Montana Tech of U. of Montana
1300 W. Park St.
Butte, MT 59701
Hours: Memorial Day to Labor Day:
9–5 daily
Rest of year: M–F 9–4
Specialties: Butte and Montana minerals, worldwide classics

Additional listings welcome!

Send vital information, as shown, to the editor. There is a modest annual fee (lower than our regular advertising rates).

The Gillespie Museum of Minerals, Stetson University

Curator: Dr. Bruce Bradford
Tel: (386) 822-7331
E-mail: bbradford@stetson.edu
Associate Director: Dr. Karen Cole
Tel: (386) 822-7330
E-mail: kcole@stetson.edu
234 East Michigan Avenue
DeLand, FL 32730
[mailing: 421 N. Woodland Blvd., Unit 8403]
Hours: 10:00 AM–4:00 PM, Monday-Friday (closed during university holidays)
Specialties: Worldwide, comprehensive mineral collection; Florida minerals, rocks and fossils; historic fluorescent collection.

Colorado School of Mines

Museum Director: Bruce Geller
Tel: (303) 273-3823
E-mail: bgeller@mines.edu
Website: www.mines.edu/academic/geology/museum
Golden, Colorado 80401
Hours: 9–4 M–Sat., 1–4 Sun.
(closed on school holidays & Sundays in the summer)
Specialties: Worldwide minerals; Colorado mining & minerals

A. E. Seaman Mineral Museum

Website: www.museum.mtu.edu
Curator & Professor of Mineralogy:
Dr. George W. Robinson
E-mail: robinson@mtu.edu
Tel: 906-487-2572; Fax: 906-487-3027
Electrical Energy Resources Center
Michigan Technological University
1400 Townsend Drive
Houghton, MI 49931-1295
Summer Hrs (July-Sept.): M–F: 9–4:30, S–S: 12–5
Winter Hrs (Oct–June): M–F: 9–4:30
Specialty: Michigan minerals, Lake Superior region & Midwest U.S. minerals

Houston Museum of Natural Science

Curator (mineralogy): Joel Bartsch
Tel: (713) 639-4673
Fax: (713) 523-4125
1 Herman Circle Drive
Houston, Texas 77030
Hours: 9–6 M–Sat., 12–6 Sun.
Specialty: Finest or near-finest known specimens

Natural History Museum of Los Angeles County

Fax: (213) 749-4107
Website: http://www.nhm.org/site/research-collections/mineral-sciences
Curator (Mineral Sciences):
Dr. Anthony R. Kampf
Tel: (213) 763-3328
E-mail: akampf@nhm.org
Collections Manager:
Alyssa R. Morgan
Tel: (213) 763-3327
E-mail: amorgan@nhm.org
900 Exposition Blvd.
Los Angeles, CA 90007
Hours: 9:30–5:00 Daily
Specialties: Calif. & worldwide minerals, gold, gem crystals, colored gemstones, micromounts
Support organization:
The Gem and Mineral Council

California State Mining and Mineral Museum

Curator: Darci Moore
Tel. (209) 742-7625
Fax: (209) 966-3597
Website: www.parks.ca.gov
Mailing: P.O. Box 1192
Mariposa, CA 95338
Hours: May 1–Sept. 30, open daily 10–6
Oct. 1–April 30, open 10–4, closed Tuesdays
Closed Christmas and Thanksgiving
Specialties: California & worldwide minerals, gold, gems, and mining

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THE MUSEUM DIRECTORY

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E-mail: slfitz@udel.edu
Penny Hall
Newark, DE 19716
Tel: (302)-831-8037
E-mail: universitymuseums@udel.edu
For information: www.udel.edu/museums
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E-mail: pfeifferfnd@centurytel.net
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Piggott, AR 72454
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Carnegie Museum of Natural History

Head: Section of Minerals: Marc L. Wilson
Tel: (412) 622-3391
4400 Forbes Avenue
Pittsburgh, PA 15213
Hours: 10–5 Tues.–Sat., 10–8 Thurs., 12–5 Sun., closed Mon. & holidays
Specialty: Worldwide minerals & gems

W. M. Keck Earth Science & Engineering Museum

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Letters

Fake Golds

I received my copy of the [May–June] *Mineralogical Record* today and was very pleasantly surprised to find your note about our work on gold crystals. Thank you for that. As you conclude in your note, without reasonable evidence of pseudomorphic replacement of pyrite by gold, a logical conclusion is that the Russian crystals are cast.

One bit of information that I left out of the *Rocks & Minerals* article is an observation regarding the surface microtopography. There are striations on most of the cube faces of the Russian golds that are inconsistent with what would exist on pyrite, further indicating that this is not a pseudomorph.

I would also like to mention that I have really enjoyed the breadth of articles that have appeared in the *Mineralogical Record* in the last few years. I have particularly enjoyed some of Tom Moore's articles (gwindels, John White collection, etc.) and the series by Rock Currier.

John Rakovan
Miama University
Oxford, Ohio

Merelani Issue

Firstly, congratulation on your wonderful publication on Merelani; the photographs of the specimens brings tear to one's eyes.

Your account of the discovery of tanzanite, however, repeats an error published in the May 1969 issue of *Life* magazine. The author, Thomas Thompson, wrote that my father, Manuel de Souza, did not personally discover the tanzanite deposit, but rather was led to it by four unnamed men from Mtakuja who had previously known of it but had no interest in it. The truth is that on the day he discovered the tanzanite deposit, my father had indeed hired four men from Mtakuja, but only as porters, not as guides. One was a mKamba man named Ndululu. I do not recall the names of the other three, but I do remember that they were not local Masaai and were in no sense familiar with the area, so they could not have had foreknowledge of the deposit. I was pleased that the remainder of the article seemed to me to be right on target.

Marcal "Angelo" de Souza
Arusha, Tanzania

I received my copy of the [September–October] Merelani Issue of the *Mineralogical Record* yesterday. I'm still breathless. What a wonderful issue. Congratulations on an excellent article. I really appreciate all the detailed historical and scientific research that went into it. (breathe . . . breathe . . .)

John Jaszczak
Houghton, Michigan

You did it again! It's my birthday today (I'm 84 and still going strong), and I get your Tanzanite Issue—What a birthday present! I don't see how you can come up with any better issue. Thank you. I look forward to every issue and I read every word.

Maurice McKinney
Glendale, Oregon

Thank you for the wonderful article on Merelani, Tanzania! Photographs and color rendition are marvelous and I particularly like the extensive coverage and research into the original finds of tanzanite.

Peter Lyckberg
Luxembourg

On our way home from the Denver Show, my father [Ed Swoboda] was able to catch up on some of his reading. He absolutely *loved* the latest issue on the Merelani mine. I was thinking how cool it would be to go down there and film a movie on it. Then I read the "Visiting Block D" part and said to myself, nah . . . the written article is just fine. LOL!!!

Bryan Swoboda
BlueCap Productions

I am writing an abstract on your Merelani article for *Gems & Gemology*. It is a fabulous issue and I am very happy Brendan Laurs assigned me to abstract the paper—how in the world to sum it up in less than 300 words though! It will be harder than most.

Elise Skalwold
Gems & Gemology

We were unable to locate it by press time for the Merelani issue, but here (finally) is the first mention in print of the name "tanzanite"—in the *Wall Street Journal* for October 14, 1968.

Wendell Wilson
Tucson, Arizona

Tiffany Discloses Finding What May Be a New Gem

By a WALL STREET JOURNAL *Staff Reporter*

NEW YORK—Tiffany & Co. disclosed discovery of a rare gemstone that the firm's vice president, Henry B. Platt, has named tanzanite.

The gem, discovered last year in Africa's Tanzania, has the blue coloring and relative transparency of a sapphire but also has reddish-purple highlights around its perimeter, Mr. Platt said. The gem is a variety of the mineral Zoisite, he said.

According to an official of the Gemological Institute of America in Los Angeles, a trade group, discovery of new minerals is a frequent occurrence but only rarely do they have qualities of beauty that would classify them as gems.

"Tanzanite is a very beautiful material that has an excellent chance of success," the official, Glenn R. Nord, said.

The public will get its first glimpse of the gemstone Nov. 20 when a collection of 24 cut pieces, set in diamonds, will be displayed at Tiffany's Fifth Avenue store with price tags from $3,000 to $50,000, Mr. Platt said.

The prices are slightly higher than for aquamarine but less than for sapphires, he added.

Art Smith

Art Smith from here in Houston passed away Thursday, November 12, one day before the start of the Houston mineral show to which he contributed so much time and effort during the 27 years I knew him. Some people deal in minerals to make a profit, and some to support their mineral hobby, while others do research, write technical papers, curate museum collections, and enjoy field collecting for pleasure. But too few contribute to the mineral field in the overall manner that Art did, out of love for minerals and devotion to the hobby, never for self-serving purposes or recognition. Our hobby, the Houston Gem and Mineral Society and the youngsters in this region in particular, lost a fine friend and someone of great value with Art's passing.

Cecil Cosse'
Houston, Texas

Errata

The Milpillas malachite pseudomorph shown on page 242 of the May–June issue belongs to Peter Megaw, not Jordi Fabre.

Regarding the Chinese aquamarine on the cover of the July–August issue, we were given incorrect ownership information. The correct owner is the Houston Museum of Natural Science.

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