CALIFORNIA PEGMATITES

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THE MINERALOGICAL RECORD

September–October Volume Thirty-three, Number Five

Articles

Columns

COVER: ELBAITE on quartz, 20 cm, one of the famous "blue cap" tourmalines discovered at the Tourmaline Queen mine, San Diego County, California, by Ed Swoboda and Bill Larson. The story of their find is recounted in this issue. Canadian Museum of Nature, Ottawa Collection; photo by Harold and Erica Van Pelt.

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notes from the EDITORS

THE "PASADENA SHOW" IS REBORN!

The Mineralogical Society of Southern California has held a Gem & Mineral show annually for the past 54 years. Since the late 1970's it was held in Pasadena Center, and was considered to be one of the most important shows of the year after the Detroit Show (back when that show carried national significance in the mineral world) and later after the Denver Show rose to importance. In recent years it has been shuffled around to some different locations, under different organizers, sometimes not always on the same weekend as before, and sometimes not even in Pasadena. Thus it lost some of its traditions and its old and fondly remembered word-of-mouth name—somehow "The MSSC Show" never sounded quite as evocative of the pleasures of visiting the Los Angeles area!. For the last several years, however, the Show has been back in Pasadena and has once again been called "The Pasadena Show," replete with wonderful exhibits from fine Southern California private and public collections, and a solid list of important mineral dealers and interesting speakers.

But, life is change, and it happens that the Pasadena Center will not be able to accommodate the MSSC Show for the foreseeable future. For that reason, the society contacted the Natural History Museum of Los Angeles County to ask whether the Museum and its Gem and Mineral Council would be willing to host the show for 2002. A precedent already existed in the form of The Carnegie Museum Show in Pittsburgh. With tremendous enthusiasm, the museum and council administrators said yes, they would love to! The change should prove refreshing and revitalizing. The Museum environment is an excellent venue for a show, and will certainly enhance the show-going experience.

The show will henceforth be officially known as **The Southern California Gem and Mineral Show;** collectors will have to decide whether this long name will suit verbal discussions, or whether it will become informally known as "The L.A. Show," "The L.A. County Museum Show," or something else. Calling it "The Southern California Show" might suffer some ambiguity relative to the important Costa Mesa Show (also in Southern California). Personally I think I would prefer "The L.A. Show" as simple, short and geographically specific.

The show will be "presented by the Mineralogical Society of Southern California," and "hosted by the Natural History Museum of Los Angeles County and its Gem & Mineral Council." Date for 2002: Saturday, **December 7** and Sunday **December 8**, 10 am to 5 pm each day. The Natural History Museum of Los Angeles County is located at 900 Exposition Boulevard, Los Angeles, California 90007. Admittance to the show will be free with paid admission to the museum, which is a bargain since you would certainly want to view the museum's collections anyway. The show theme for 2002 will be, appropriately, **Gems and Minerals of California**. For more information check out the Society's website at *www.mineralsocal.org*. You may e-mail the Society at *msscshow2002@mindspring.com*. This year's Show Chairman will be Carolyn Seitz, P.O. Box 265, Altadena, CA 91003-0265; Telephone: 626-345-1233; Fax: 626-345-1255.

The show will be set up with dealer booths in the two large mammal halls on the first floor of the Museum—African Mammals and North American Mammals. The displays set up by exhibitors of gems, minerals and artifacts will be in the circular hallway around the main foyer, outside of the two large mammal halls. The foyer area itself, around the T-Rex and the Stegosaurus, will be home to educational exhibits. Of course, these activities will be just a few steps away from the **Hall of Gems and Minerals** in the Museum and that portion of its magnificent collection that is beautifully displayed there.

As usual, there will be lectures (speakers to be announced) and special activities for children, as well as lots of free rocks for kids.

On Saturday evening, December 7, after the close of the Museum and Show, there will be a fund-raising event for the benefit of the Gem and Mineral Council of the Natural History Museum, held in the Museum, in its beautiful rotunda. The Hall of Gems and Minerals at the Museum—containing one of the finest collections of minerals west of Washington, D.C.—will be open during the event. The activities of the evening will include a program (speaker to be announced), a silent auction, an open auction and refreshments. Tickets will be available for sale to the public.

Some of the details have yet to be filled in, but everyone involved is very excited by the prospect of this united effort between the Museum, its Gem and Mineral Council and the Mineralogical Society of Southern California.

E-MAIL VIRUS PROTECTION

Just a reminder: our Circulation Office's e-mail address is *minrec@aol.com*, whereas the Editorial and Advertising Office e-mail address is *minrec@earthlink.net*. It's easy to confuse them.

These days we are doing most of our correspondence with authors and advertisers by e-mail. The obvious danger is receiving a computer virus from someone, especially since we often receive messages from people we don't know. We do have Norton Anti-Virus protection, and a good thing, too, because on some days we've received as many as eight separate viruses in the mail! For our own protection, we must insist on a couple of things from our correspondents: (1) make sure that your "Subject" description makes sense and plainly applies to our usual kind of business, and (2) always send a *message* or cover letter along with any attachments. Any e-mails we receive that have an incomprehensible or unusual subject line, or which contain an attachment but no message, will be promptly deleted unopened.

BACK ISSUES

Every year we add six issues to our stock of back issues, and every year we sell out of some of the old ones. When I first became editor, and exhorted people in this column to stock up on back issues while they still had the chance, *every issue* in volumes 1 through 7 was still available at the original cover price! The situation is not entirely dissimilar now. We still have in stock a lot of fascinating back issues, full of good reading and invaluable data for the collector, with no guarantee for how long they will remain available. In addition, your purchase of back issues will go toward supporting the production of current issues. All of the currently available back issues are described on page 443, so please take this opportunity to fill out your collection, acquire some good reading, and support your favorite mineral magazine!

GEM AND RARE-ELEMENT PEGMATITES *of Southern California*

Jesse Fisher
380 Pennsylvania Avenue
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The gem-bearing and rare-element-bearing pegmatites of Southern California have been the most prolific source of fine elbaite, morganite, kunzite, and other pegmatite minerals in North America since their discovery over 100 years ago. The province ranks among the major gem-producing and specimen-producing pegmatite regions in the world. Specimens from mines such as the Himalaya, Tourmaline Queen, Stewart, Pala Chief and Little Three mines are found in collections, both public and private, the world over.

INTRODUCTION

The pegmatite mines of Southern California are noted mainly for producing magnificent specimens of colored tourmaline, but other species have also contributed to the region's fame. The first recognized occurrence of lavender spodumene (given the varietal name *kunzite*) was from mines in the Pala district, and notable occurrences of pink beryl (*morganite*), blue-green beryl (*aquamarine*), topaz, spessartine, and many other pegmatite minerals are also found throughout the province.

Since the beginning of organized gem mining in Southern California near the end of the 19th century, production in the various districts has been sporadic, the intensity of exploitation depending largely on the economics of the gem and specimen

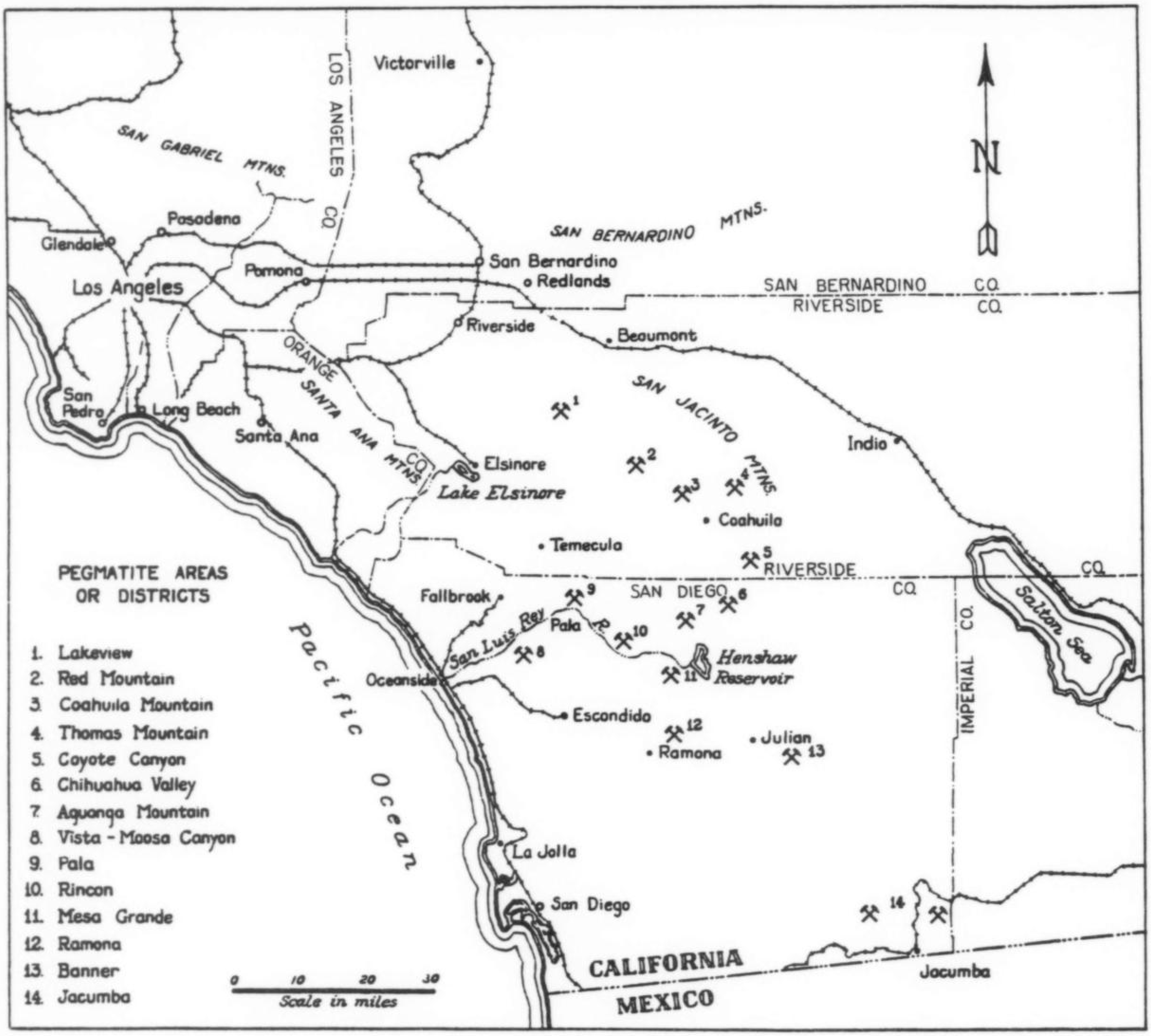


Figure 1. **Map of Southern California showing location of pegmatite districts in San Diego and Riverside counties (from Jahns and Wright, 1951).**

market. Over the years, hundreds of mines and prospects have been established on pegmatites throughout the region. Despite the occasional spectacular find, only a few of these mines have ever proven to be economically viable.

The Southern California pegmatite province is located within the mountainous, semi-arid Peninsular Ranges of Southern California, and contains numerous individual pegmatite districts. The entire province extends from the San Jacinto Mountains in western Riverside County southward through San Diego County, into the northern portion of the Baja Peninsula of northwestern Mexico. Hanley (1951) identified 14 separate pegmatite districts in Riverside and San Diego counties. The total number of individual pegmatites within these districts is in the thousands, if not tens of thousands. Jahns and Wright (1951) estimated that the Pala district alone contains more than 400 pegmatite dikes. Of these, only a small percentage have ever produced any gem or specimen material, and fewer still have ever produced material in any quantity. The focus of this article will be on those mines and districts that have historical significance or have produced major finds of gem or specimen material in recent years.

Compositionally, most of the Southern California pegmatites belong to the LCT (Lithium and Cesium enriched, and Tantalum > Niobium) category according to the classification proposed by Cerný (1991). Many are distinctly enriched in boron, as evidenced by the abundance of tourmaline. Alkali-enriched beryls (*morganite* and colorless *goshenite* varieties) are generally more common than aquamarine, and lithium enrichment is represented by the abundance of lepidolite, and to a lesser extent, spodumene in pegmatites throughout the region. The phosphorous content of the pegmatites appears highly variable. Some pegmatites, such as the Stewart, the Elizabeth R, and the Katerina in the Pala district and the Pack Rat in Jacumba, have an abundance of both primary and secondary phosphates, whereas others, such as the Himalaya mine in Mesa Grande, have very few phosphates. The occurrence of primary Li-Al silicates—principally spodumene—is likewise highly variable. Spodumene is abundant in many pegmatites in the Pala district, including the Pala Chief, Vandenberg, Katerina, and Stewart, but is rare or totally absent in pegmatites in the Mesa Grande and Ramona districts.

A few pegmatites show anomalous geochemical signatures. The Main Little Three dike in Ramona and some of the pegmatites on Aguanga Mountain are fluorine-enriched and are the only major sources of topaz in the region. The Hercules and several other dikes in the Ramona district are manganese-enriched, producing spessartine garnet and manganaxinite. A few of the pegmatites in Riverside County, most notably the Fano on Cahuilla Mountain, tend to produce aquamarine rather than morganite, and in the pocket zone schorl rather than elbaite.

PREVIOUS STUDIES

Numerous mineralogical and petrological studies have investigated the Southern California pegmatites over the past 100 years. Early investigations of the mineralogy and mining activities were done by U.S. Geological Survey mineralogist Waldemar T. Schaller and by George F. Kunz, a gemologist with Tiffany and Company. Schaller's manuscript "The Tourmaline Field of Southern California" was, unfortunately, never completed, but Kunz's report "Gems, Jeweler's Materials, and Ornamental Stones of California" was published by the California Division of Mines in 1905 and remains the most important work available on the early history of gem mining in Southern California. More recently, Weber (1963) published a survey of mining activity in San Diego County, and Jahns (1979), Shigley *et al.* (1986), and Foord *et al.* (1991) have published field trip guidebooks to several of the mining districts. Sinkankas (1959, 1976, 1997) gives much historical information on many of the major mines and districts in his three-volume series, *Gemstones of North America*. An autobiographical book by Rynerson (1967), a miner and lapidary who worked in many of the San Diego mines, gives an interesting personal narrative of his involvement in early mining and the gem cutting businesses in the region.

A number of important works have focused on individual districts or mines. Perhaps the most thoroughly studied is the Mesa Grande district. Jahns and Hanley (1953) produced an unpublished survey of the entire district, and Foord (1976) did a thorough examination of the mineralogy and petrology of the Himalaya dike system. Foord (1977) and Fisher *et al.* (1998) have published important studies of the Himalaya mine. A detailed study of the Pala district was published by Jahns and Wright (1951), and one of the Rincon district by Hanley (1951). Important articles on recent finds at the Little Three mine in the Ramona district have been published by Stern *et al.* (1986) and Foord *et al.* (1989). Less technical articles recounting various mining activities in the Southern California pegmatites include Carnahan (1960), Szenics (1970), Larson (1972, 1977), Marcusson (1985), Gefner and Fisher (1997), and Fisher (1999).

In addition, the Southern California pegmatites have served as a model for the understanding of how complex granitic pegmatites form. Field investigations involving these pegmatites, particularly in the Pala district, have formed the basis for a number of important studies including Jahns and Tuttle (1963), Jahns and Burnham (1969), and Webber *et al.* (1997).

LOCATION and GEOLOGICAL SETTING

Most of the gem-bearing pegmatites of Southern California have been intruded into rocks of the Cretaceous-age Peninsular Ranges Batholith—formerly referred to as the Southern California Batholith. These granitic rocks form the core of the Peninsular Ranges, which extend from Riverside County to the southern tip of the Baja Peninsula (Foord *et al.*, 1991). The batholith consists of numerous individual plutons ranging in size from <10 to 40 km across; it has been divided by Todd and Shaw (1985) into two sections based on chemical, physical, and lithologic differences. A younger, more felsic, late post-tectonic zone lies to the east, while an older, more mafic, syntectonic zone lies to the west.

Potassium-argon cooling dates for biotite and hornblende have given ages ranging between 143 and 101 Ma (million years) for the rocks of the Peninsular Ranges Batholith (Krummenacher *et al.*, 1975). Foord (1976) reported two K/Ar ages from micas associated with the Himalaya dike in the Mesa Grande district. Muscovite from a pocket in the San Diego mine yielded an apparent age of 98.4 ± 4 Ma, while biotite which had formed at the time of dike emplacement in the host norite yielded a similar age of 97.1 ± 4 Ma. More recently, Snee and Foord (1991) have reported $^{40}Ar/^{39}Ar$ dates of 95.4 ± 0.3 Ma for muscovite and a range of 93.1 ± 0.3 Ma to 93.4 ± 0.3 Ma for compositionally zoned lepidolite from the Himalaya mine.

The emplacement of pegmatites within the Peninsular Ranges appears to have been strongly controlled by the lithology of the host rock. While a few pegmatites—notably those in the Jacumba district and around Cahuilla Mountain in Riverside County (Geffner and Fisher, 1997)—are hosted by pre-batholithic schists, the majority have been intruded into the San Marcos Gabbro, a mafic unit in the western subsection of the batholith. $^{40}Ar/^{39}Ar$ dates from hornblende and biotite from the San Marcos Gabbro adjacent to the Himalaya dike system in Mesa Grande were reset to 100 Ma by the emplacement of the pegmatites (Snee and Foord, 1991).

HISTORY

The first reported find of gem tourmaline in California occurred at the site of the Columbia mine on Thomas Mountain in central Riverside County in 1872 (Kunz, 1905a). The discovery is credited to a local prospector, Mr. Henry Hamilton. This find apparently received little publicity, perhaps because of secrecy on the part of the miners. The next report of colored tourmaline in California was in 1892, when pink elbaite was discovered embedded in massive lepidolite at the Stewart mine, in Pala. The mine was being worked at the time for lepidolite as a source of lithium and, as the tourmaline discovered was not of gem quality, it again attracted only minor attention among mineral collectors of the time.

The first major find of gem material in Southern California occurred in 1898 at the Himalaya mine in Mesa Grande. American Indians probably knew about these deposits for some time prior to this, however, as elbaite crystals have been discovered in Indian graves in the area (Kunz, 1905b). The Himalaya pegmatite immediately began producing large quantities of pink and green elbaite and, when word got out about the discovery, a flurry of prospecting activity began throughout the region. As a result, within the next several years most of the important gem-producing pegmatites in the region had been discovered. Numerous mining claims were established in the Pala, Rincon, Aguanga Mountain, and Cahuilla Mountain districts in 1902 and further south at Ramona and Jacumba during the following year.

During the first decade of the 20th century, Imperial China was a major consumer of California elbaite; the Dowager Empress, Tz'u Hsi, was especially fond of the pink and red varieties (Bancroft, 1995). The Chinese demand was principally for carving-grade material rather than facet-grade elbaite, and China was therefore an important market for material that was not of sufficiently high gem grade to be salable in the United States. Only pink

Figure 2. **Antique Chinese snuff bottles carved from California tourmaline. Cal and Kerith Graeber collection; Jeff Scovil photo.**

elbaite was desirable to the Chinese; multi-colored crystals were usually broken up and the unwanted blue or green portions discarded. Rumors still circulate about large hoards of unsalable gem-green elbaite supposedly buried on certain mining properties or forgotten in New York warehouses. As a result of this practice, relatively few specimens of elbaite from this early period of mining survive today. However, Chinese artifacts from this period, such as snuff bottles carved from California elbaite, can still occasionally be found on the antiques market.

The other important gemstones produced by the Southern California mines during this period were kunzite and morganite. Prior to its discovery in the pegmatites of Hiriart Mountain in the Pala district during late 1902, the lilac-colored variety of gem spodumene was unknown. The gem was quickly popularized by George Kunz, a gemologist with Tiffany and Company, who is credited with first identifying it (there is some dispute over this, however; see Sinkankas, 1976). Morganite, while previously known as "rose beryl" from a few locations such as Madagascar and Brazil, had not been found anywhere before in abundance. The name "morganite" was given to this pink variety of beryl by Kunz in 1910, in honor of American banker and mineral collector J. P. Morgan, who also happened to be one of Kunz's best customers (see Conklin, 1988).

When the Imperial Chinese aristocracy was overthrown by Sun Yat-Sen in the Revolution of 1911–1912 [Note—this was *not* the same as the Boxer Rebellion of 1900–1903], the demand for California gemstones in China quickly dried up. The loss of this market, combined with a domestic oversupply of gemstones, resulted in a collapse of the local gem market and by 1913 most gem mining operations in Southern California had ceased because of bankruptcy. Gem prices remained depressed for several decades thereafter; between 1913 and the early 1950's mining activities throughout Southern California were small-scale and sporadic.

By the early 1950's gem prices had begun to rise. This, along with an increasing interest in mineral collecting, led to renewed attempts at organized mining, particularly in the Pala, Mesa Grande, and Ramona districts, and such efforts have continued through to the present day. Mines which have been successfully reopened include the Stewart, Tourmaline Queen, White Queen, Vandenberg, Elizabeth R, Pala Chief and Katerina in the Pala District, the Himalaya in Mesa Grande, and the Little Three and Hercules in Ramona. In addition, a number of new mines have produced gem and specimen material, particularly in Riverside County and Northern Baja California. Although the more recent mining activities have not produced the same volume of gem and specimen material as was recovered at the beginning of the 20th century, many spectacular finds of elbaite, kunzite, morganite, spessartine, and topaz have been made.

MAJOR PEGMATITE DISTRICTS

Riverside County

The pegmatite districts of Riverside County, which make up the northern limits of the Southern California pegmatite province, are not as well defined as those farther south in San Diego County, and little has been recorded about their mineralogy and history. Much of the area is still remote and sparsely populated, and the exact location of many older mines and prospects is today far from certain. To further complicate matters, some mining claims have been renamed by new owners, making it difficult to know if published descriptions are referring to the same or different properties.

Fano Mine

Perhaps the best-known pegmatite mine in Riverside County is the Fano (or Fano-Simmons) mine. Originally claimed by Bert Simmons in 1902, the Fano mine is a patented claim consisting mostly of surface excavations on a pegmatite dike that lies on top of a ridge located on the north flanks of Cahuilla Mountain (also spelled Coahuila) near the town of Anza. Kunz (1905a) reports that the pegmatite initially produced kunzite, colored tourmaline, and lepidolite. Little evidence of lithium-bearing minerals is seen in current exposures of the pegmatite, and the mine is now better known for its somewhat limited production of well-crystallized aquamarine and schorl in recent years. Commercial attempts to work the mine appear to have been limited to the first decade of the 20th century; the mine has since been operated, for the most part,

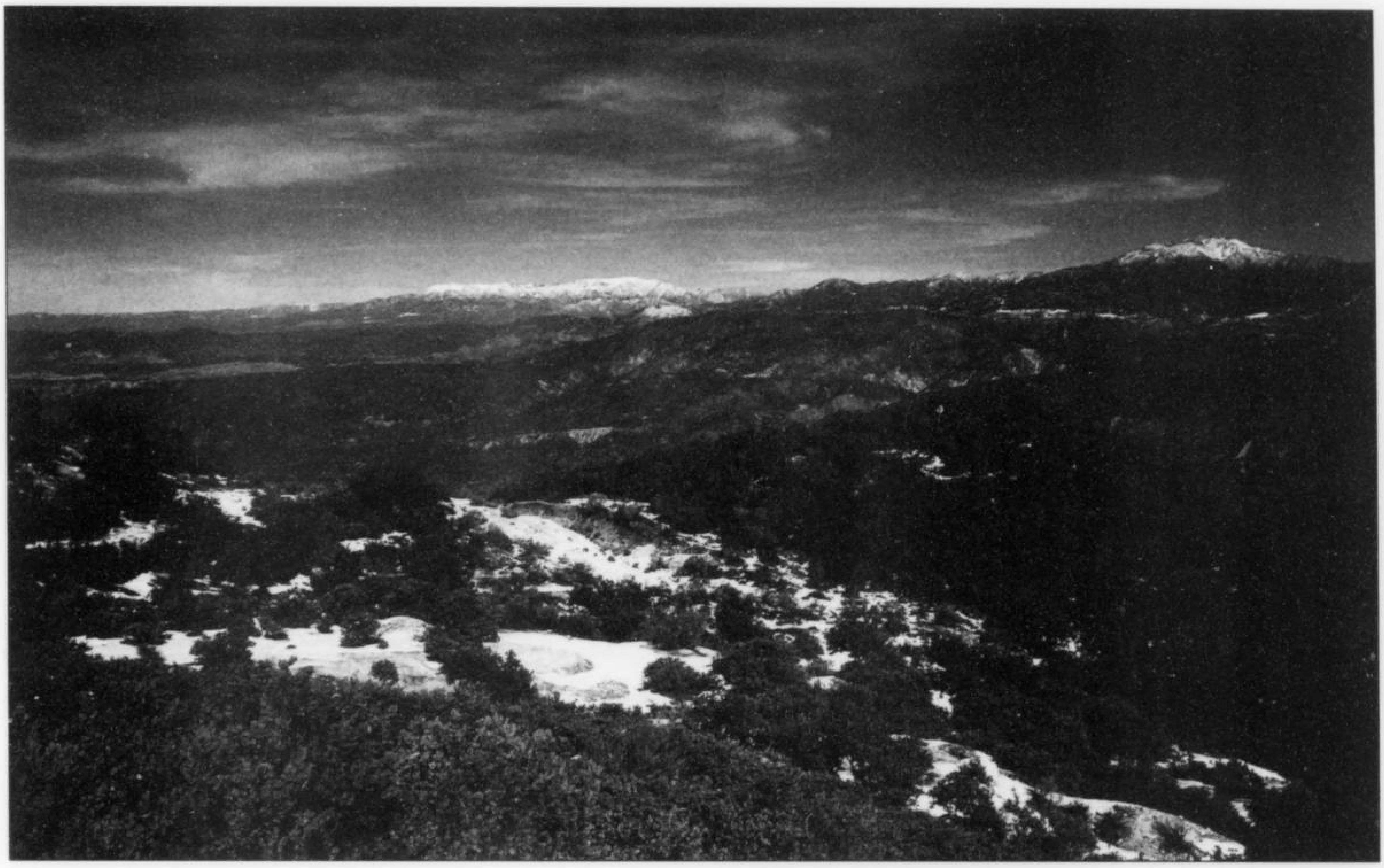


Figure 3. **The Fano mine, foreground, and a view of the San Jacinto Mountains, Riverside County, January, 1997. Jesse Fisher photo.**

by hobbyists and highgraders. Digging by the latter has, in recent years, produced a series of debris-filled pits that now obscure much of the pegmatite.

Schindler Mine

Located near the Fano is the Schindler mine. According to Tucker and Sampson (1945) this mine produced pink and green tourmaline, beryl of unspecified color, columbite, and quartz crystals sometime prior to World War II. The mine does not appear to have been worked in recent years and its present status is unknown.

Lithia Dike

Two more recently discovered pegmatites have produced limited amounts of gem and specimen material during the last few decades. The Lithia Dike, an unpatented claim located on the southeast flank of Cahuilla Mountain, encompasses at least two separate pegmatite dikes, intruded into the Paleozoic schists which blanket the mountain. The property was originally discovered by local miner Phil Osborne in the early 1970's. Osborne, along with partners Bill Magee and Ed Link, periodically worked the lower of the two dikes on the claim for around ten years. During this time they found several pockets containing pink, green, and bicolored elbaite. One pocket uncovered by Magee in late 1983 yielded a number of well-formed specimens of green elbaite and morganite, associated with cleavelandite, microcline and smoky quartz. Several specimens from this find are now in the collection of the Los Angeles County Museum of Natural History. Another pocket uncovered at about this time produced around 75 gemmy, bicolored elbaite crystals which, according to witnesses, may have been some of the finest ever found in the region (C. Graeber, personal

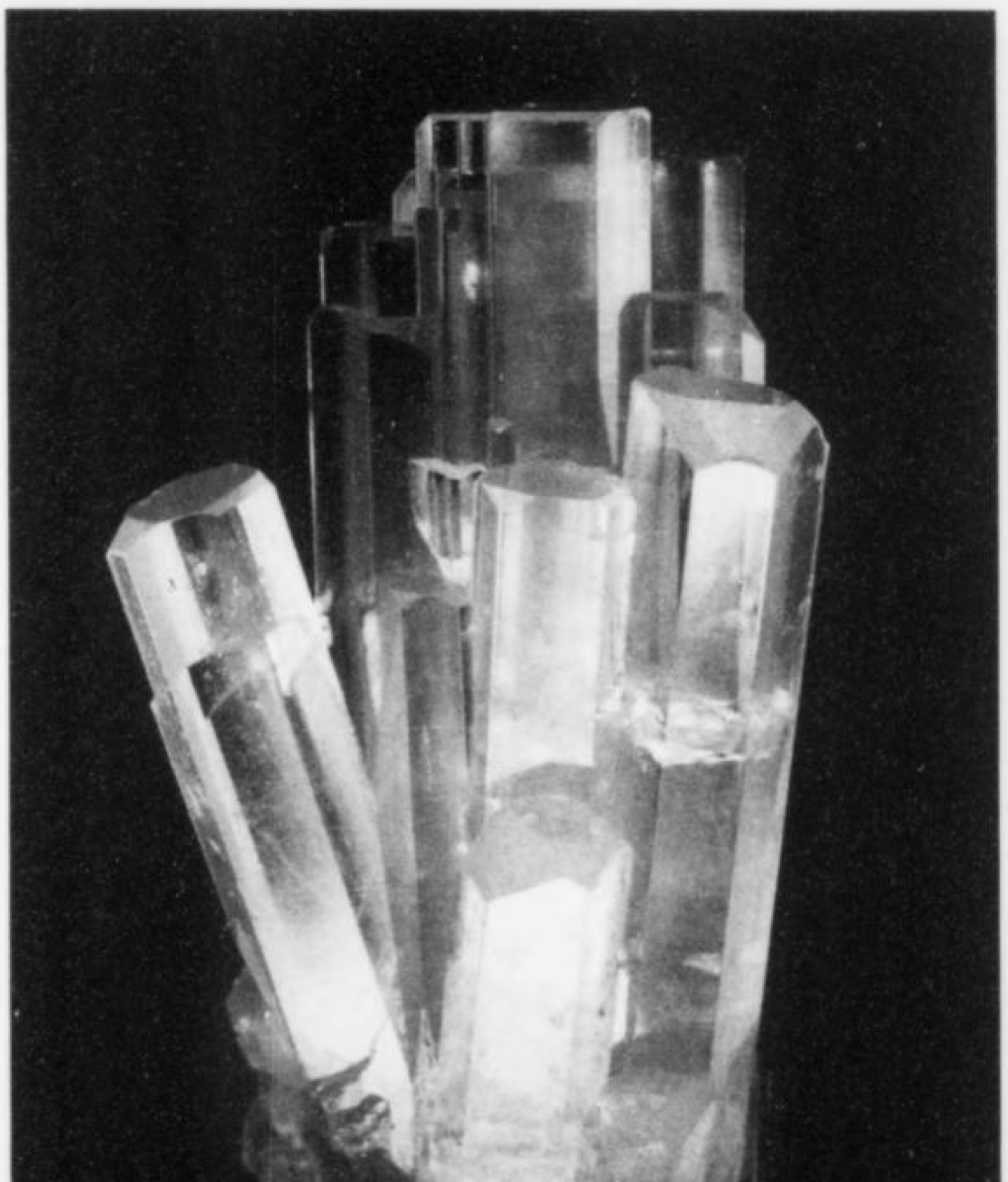


Figure 4. **Aquamarine, 7.1 cm high, from the Fano mine. Al Ordway collection; Jeff Scovil photo.**

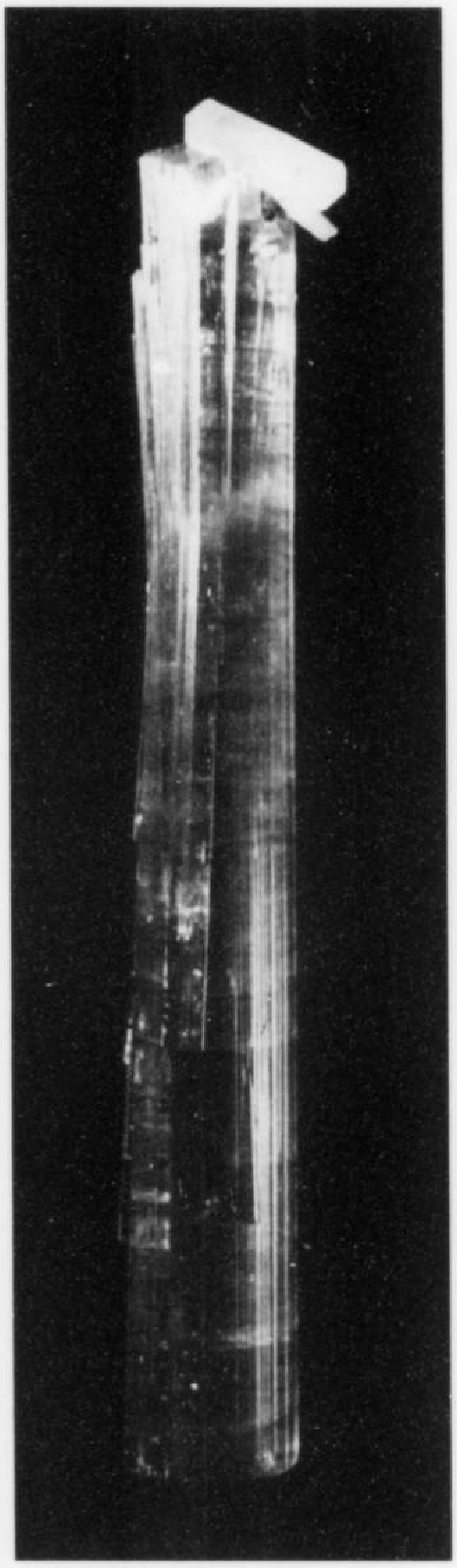
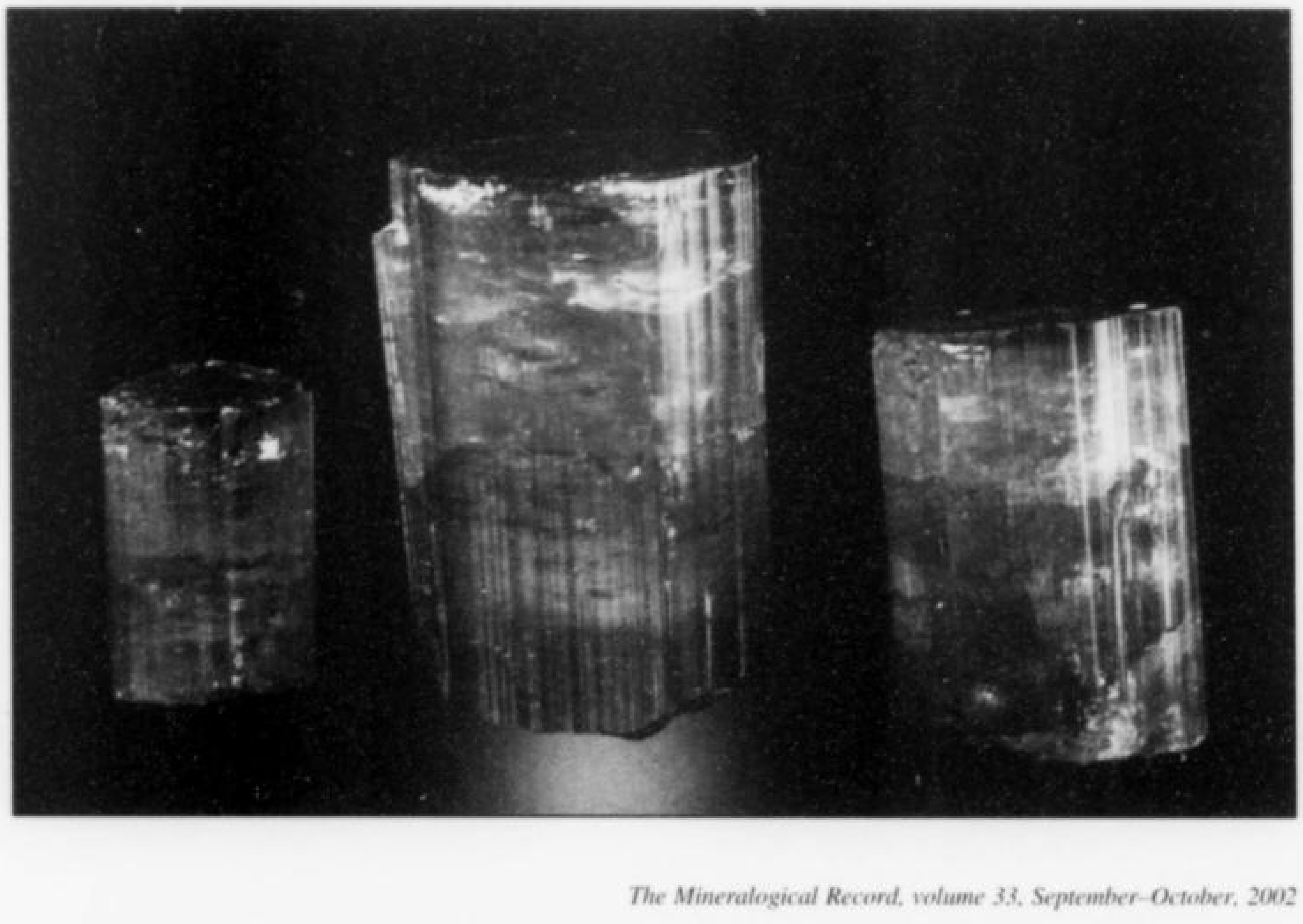


Figure 6. **Elbaite with quartz, 7.4 cm, from the Lithia Dike claim. Paul Geffner collection; Jeff Scovil photo.**

Figure 5. **The Lithia Dike claim, Cahuilla Mountain, Riverside County, during most recent excavations, May, 1996. Jesse Fisher photo.**

Figure 7. **Elbaite crystals; the center crystal is 3.7 cm tall, from the Lithia Dike claim, recovered July, 1996. Paul Geffner collection; Jeff Scovil photo.**



communication, 1994). Unfortunately, most were used for lapidary purposes, and consequently few specimens from this period of mining survive.

The claim was purchased from Osborne by Paul Geffner in 1989. In 1996, after resolving problems with access rights to the property, he and several partners began several months of full-time mining. Work focused on the relatively untouched upper dike, and a deep trench was excavated into the hillside, following the dike down dip. A number of pockets were encountered, producing some excellent pink, green, and bicolored elbaite crystals and gem rough, along with some schorl, morganite, kunzite, and small etched gemmy fragments of spessartine. The overall amount of material found, however, was not enough to justify the cost of a mechanized mining operation, and the property has been idle since. For a more detailed description of this mining venture, see Geffner and Fisher (1997).

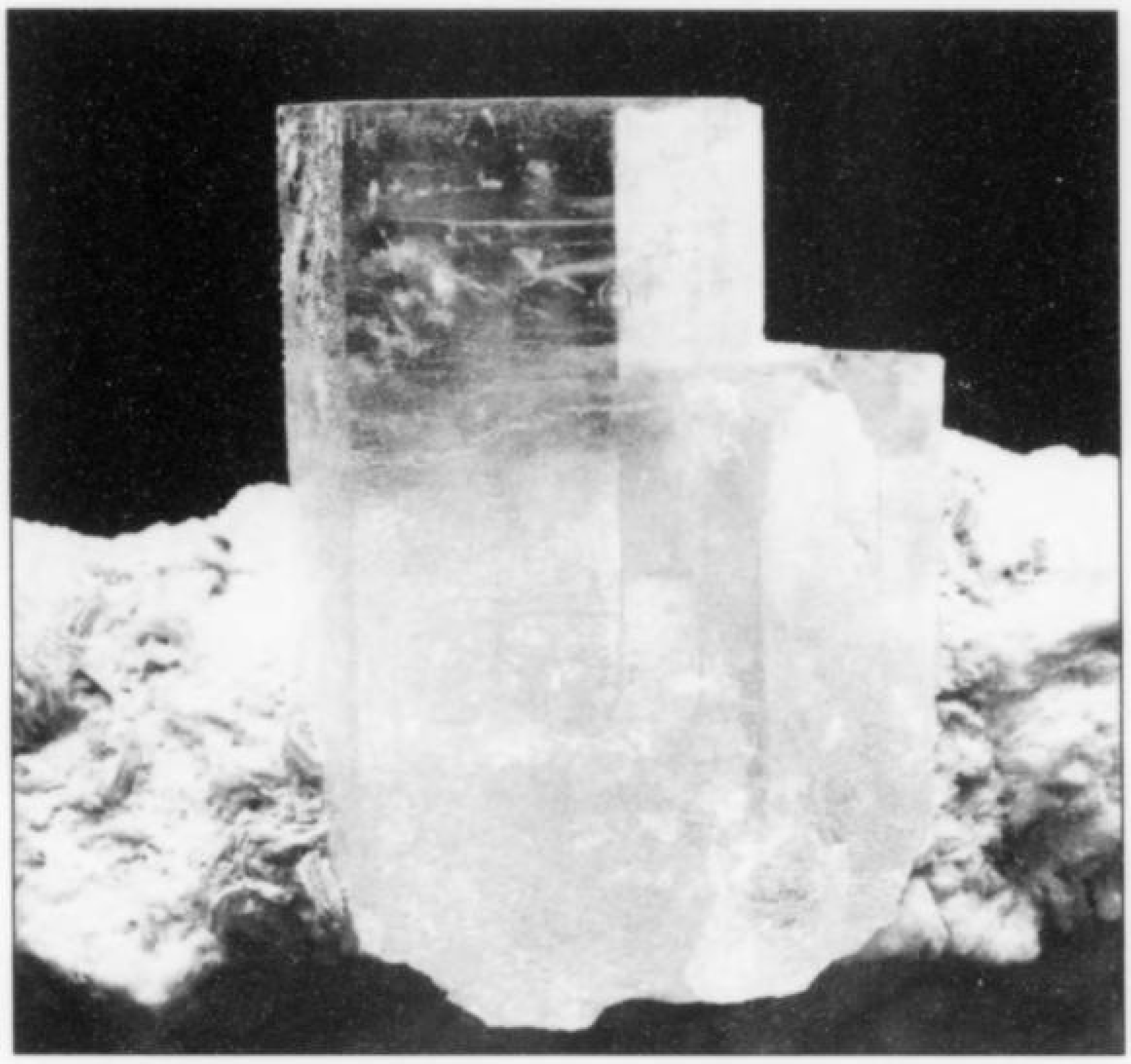


Figure 8. **Aquamarine on feldspar, 10.4 cm across, from the Audrey Lynn claim, Cahuilla Mountain, Riverside County. Jesse Fisher collection; Jeff Scovil photo.**

Audrey Lynn Mine

The Audrey Lynn, an unpatented claim, is located on the northwest flank of Cahuilla Mountain near Juan Diego Flats. The deposit was discovered by Phil Osborne and worked by him for several years in the late 1980's and early 1990's. This prospect produced a limited number of well-formed aquamarine crystals (both on feldspar matrix and as single crystals), lustrous and often large schorl crystals, and smoky quartz. Specimens of spessartine, cassiterite and columbite-group minerals were also recovered. This deposit appears to be exhausted and no further work has been done for a number of years.

Columbia Mine

To the east of Cahuilla Mountain lies Thomas Mountain, the site of the first reported find of gem tourmaline in California. Located on the southeast ridge of Thomas Mountain is the historically important Columbia mine (also known as the Belo Horizonte). According to Kunz (1905a) the Columbia produced some large green and pink tourmaline crystals of excellent color around the turn of the century, but more recent attempts to work the mine have had only limited success (Sinkankas, 1959). The mine consists of a series of four claims, which are currently owned by Matt Taylor, a geology student who works it on a part-time basis, mostly as a research project. The main elbaite-bearing pegmatite is unusual in that it contains almost no mica of any kind (Taylor and Foord, 1993).

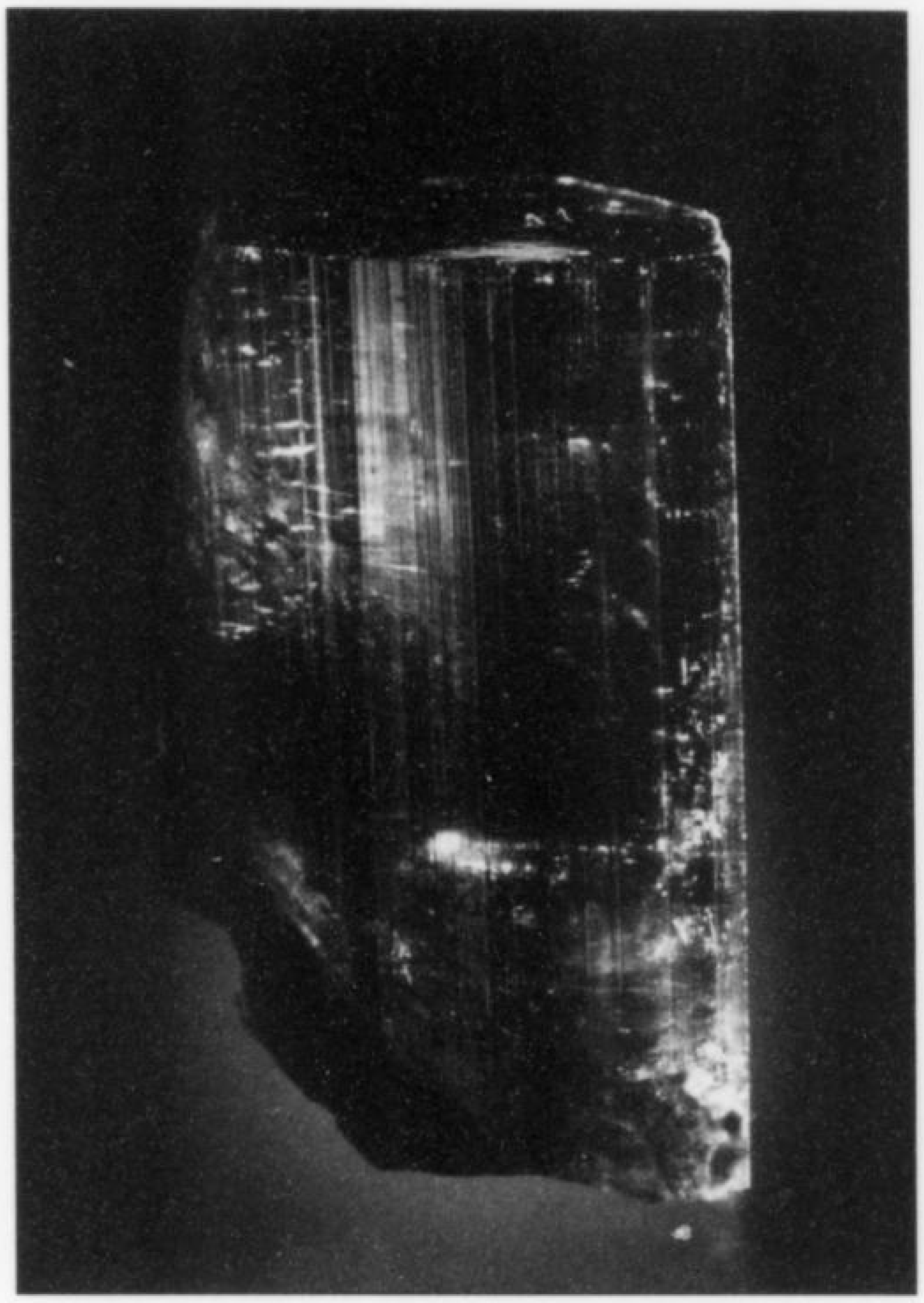


Figure 9. **Elbaite, 2.7 cm high, from the Jensen quarry, Riverside County. Nick and Jan Rose collection; Jeff Scovil photo.**

Jensen Quarry

Perhaps the northern-most reported occurrence of a gem-bearing pegmatite in Southern California is in the Jensen quarry, just west of the city of Riverside. In the early 1980's a dike known as the J27 pegmatite, exposed in the quarry wall, was excavated by a group of mineral collectors. A number of good specimens of bicolored elbaite and schorl were recovered, along with a number of other rare and interesting minerals including clinobisvanite, stibiotantalite, danburite, hambergite, pyrochlore, and synchysite (DeVito and Ordway, 1984).

Chihuahua Valley

Blue Lady Mine

The Chihuahua Valley district is located in a sparsely inhabited area of north-central San Diego County, just south of the Riverside County border. The district contains numerous pegmatite dikes, none of which have ever been successfully worked on a commercial basis. The most important mine in this district is the unpatented Blue Lady claim (also known at various times as the Blue Bell, Blue Tourmaline, or Pearson mine).

The Blue Lady pegmatite was discovered in 1905 by Bert Simmons, who briefly worked it for gem tourmaline. A few years later the pegmatite was prospected for cassiterite as a source of tin,

Figure 10. The Blue Lady mine, Chihuahua Valley, San Diego County, June, 1994. Jesse Fisher photo.

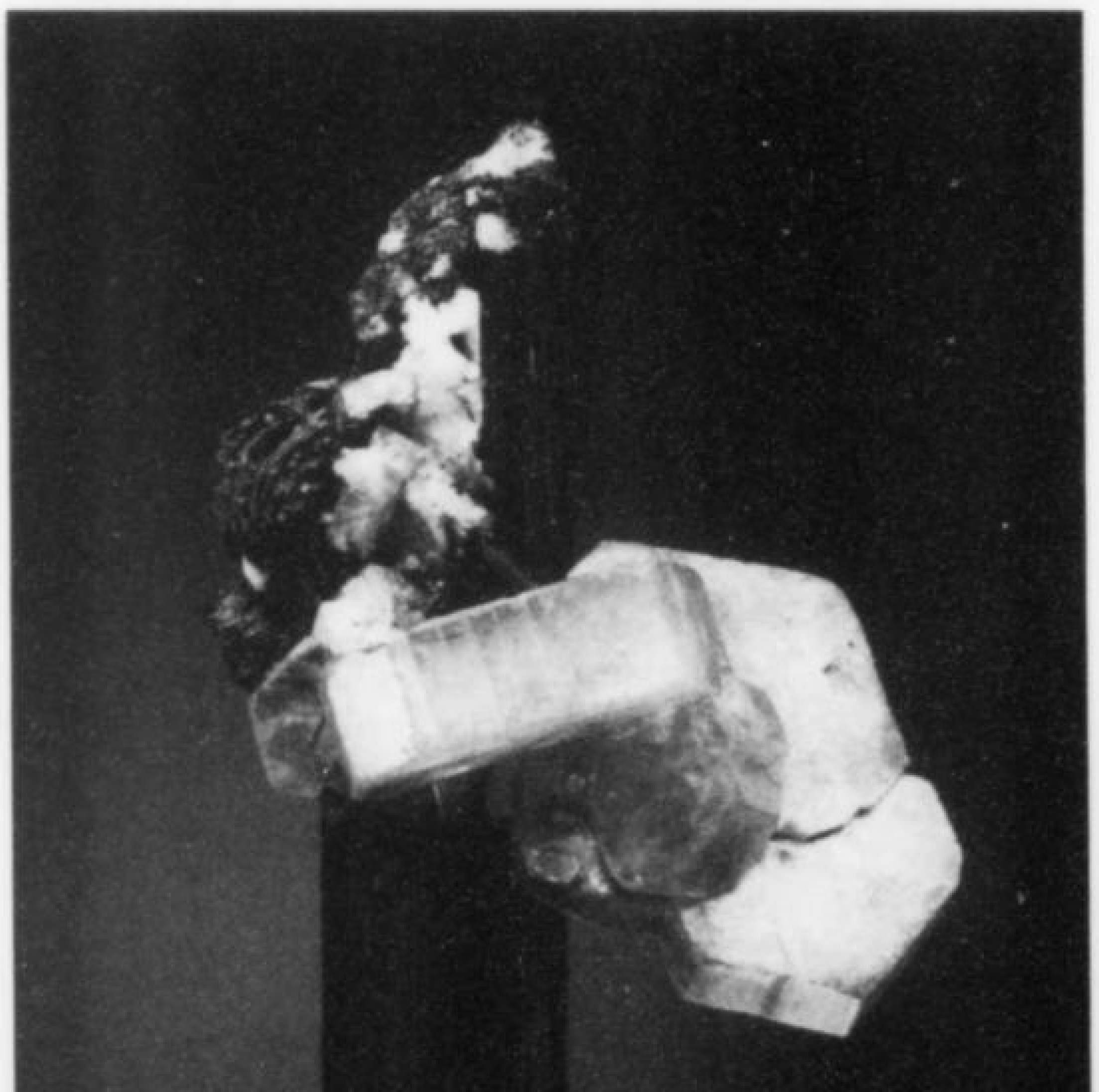


Figure 11. Fluorapatite and schorl, 8.2 cm high, from the Blue Lady mine. Byron Weege collection; Jeff Scovil photo.

Figure 12. Beryl (var. morganite) with quartz, 17.7 cm across, from the Blue Lady mine. Los Angeles County Museum of Natural History collection; Jeff Scovil photo.

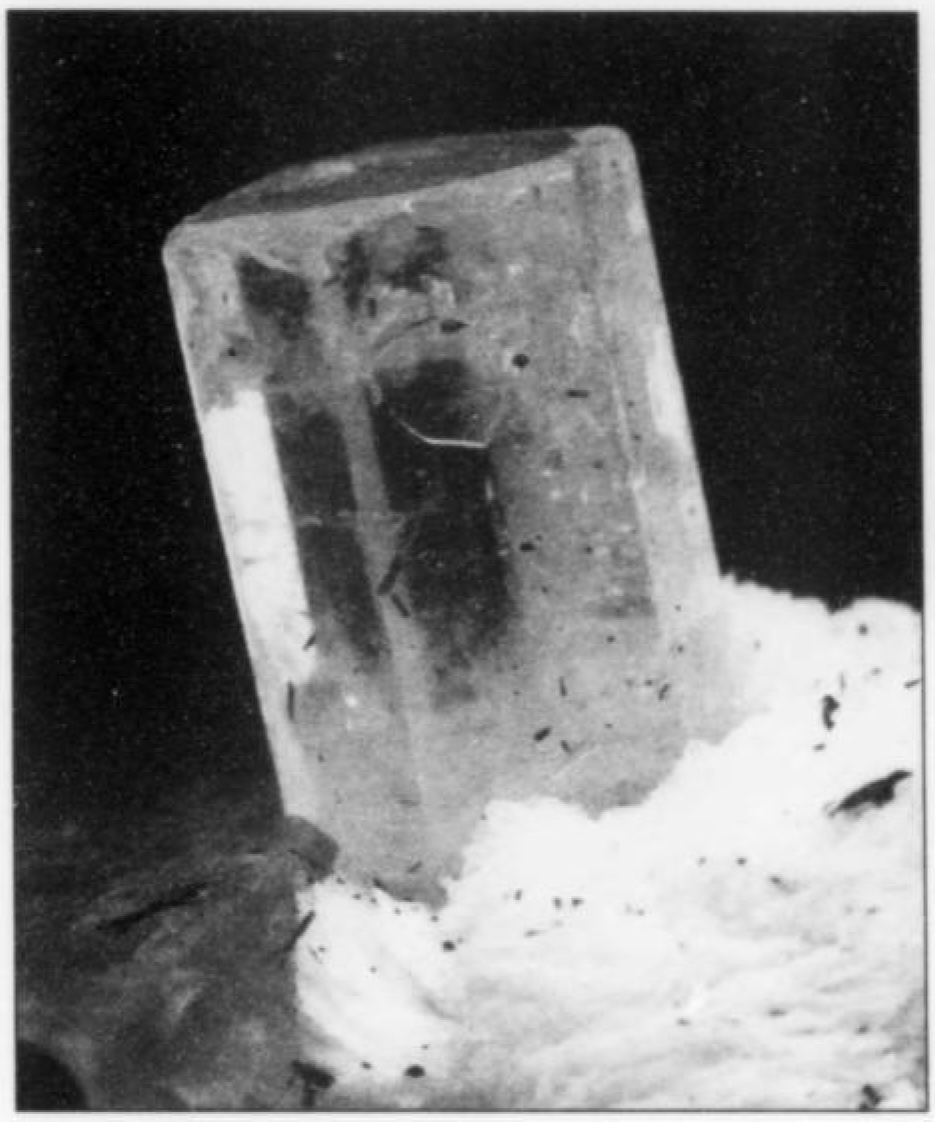


Figure 13. **Beryl (var. aquamarine) crystal, 1.8 cm high on cleavelandite, from the Blue Lady mine. Bill Larson collection; Jeff Scovil Photo.**

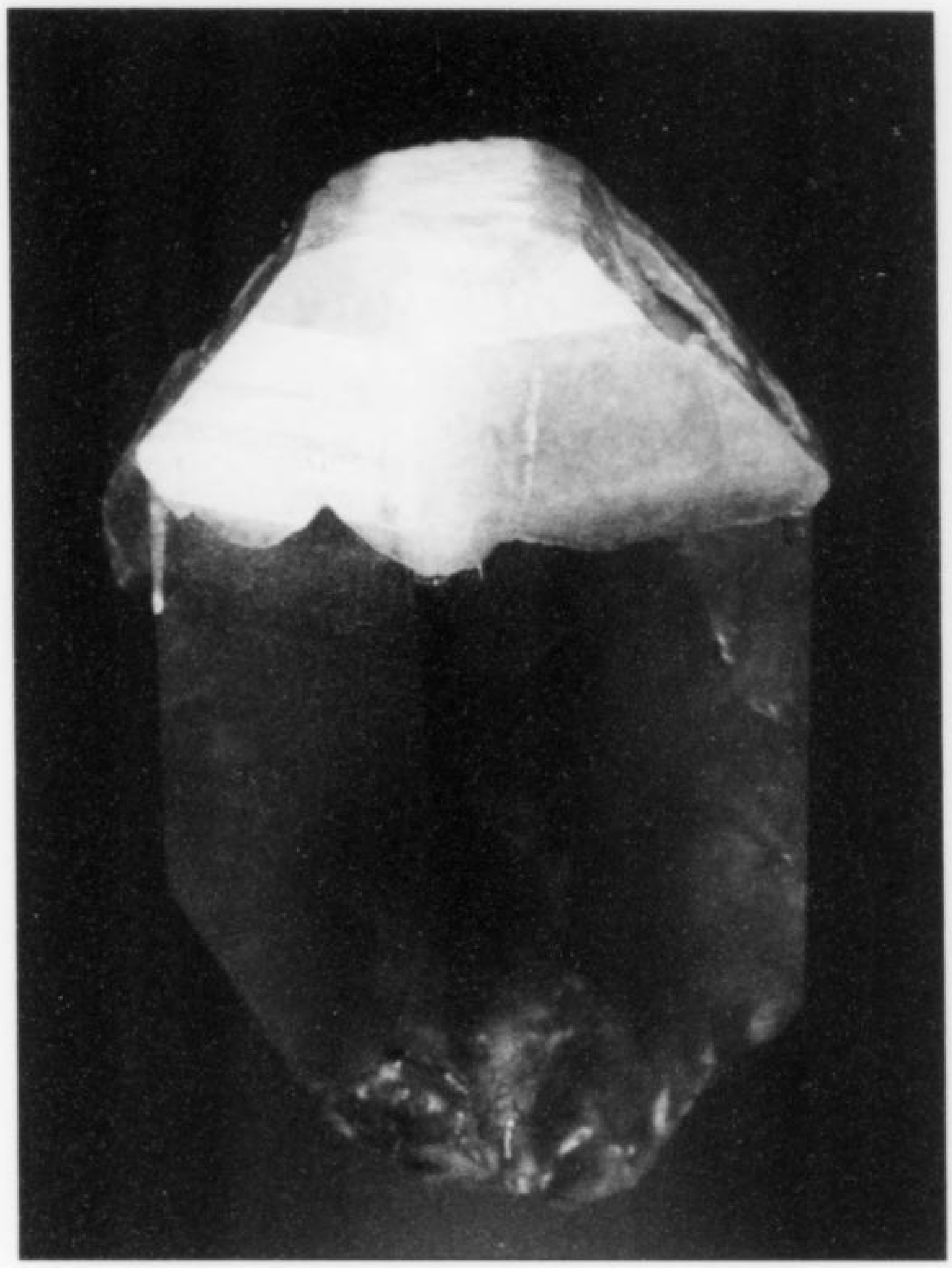


Figure 14. **Hydroxylherderite, 3.1 cm high, from the Blue Chihuahua mine, Chihuahua Valley, San Diego County. Cal Graeber collection; Jeff Scovil photo.**

but has since been worked solely by mineral collectors. The workings at the Blue Lady mine currently consist of a number of pits and open cuts, along with one short tunnel on the dike, which is exposed along the north side of the valley.

The mine is known largely for its output of well-formed pencil-like crystals of dark blue tourmaline (schorl-elbaite?), which occur abundantly in the dike, often associated with quartz and feldspar. However these tourmaline crystals are rarely, if ever of gem quality. The mine also occasionally produces specimens of both aquamarine and morganite beryl, spessartine, topaz, apatite, and large, well-formed crystals of perthitic microcline. A number of excellent specimens, including a particularly large and well-formed crystal of peach-colored morganite associated with smoky quartz from the mine are in the collection of the Los Angeles County Museum of Natural History.

Blue Chihuahua Mine

The Blue Chihuahua claim is located a little to the east of the Blue Lady, on the same side of the valley. During the late 1960's a group of collectors including Josie Scripps and Bryant Harris worked this pegmatite, recovering some very good herderite and microcline specimens, along with some topaz, schorl, and cassiterite. The pegmatite was largely removed during the mining operation and little, if anything, has come from this claim since.

Aguanga Mountain District

About 10 kilometers southwest of Chihuahua Valley, near the town of Oak Grove lies Aguanga Mountain, which is actually a ridge running southeast from Palomar Mountain, site of the famous astronomical observatory. Two mines in this district, the Maple Lode and the Ware (also known as the Emeralite no. 2, Mountain Lily, or Gem Mine no. 1) have produced specimens of note.

Ware Mine

The patented Ware mine is located on the northeast side of the ridge, near its crest, and exploits a pegmatite that dips gently to the southwest, into the hillside. The current workings consist of an open cut of approximately 100 meters along the pegmatite, and at least two tunnels, one of which has completely collapsed. The extent of the underground workings is unknown. The mine was originally discovered in 1903 by Bert Simmons and named the Gem Mine no. 1 (Weber, 1963). According to Kunz (1905a) the mine produced a modest amount of tourmaline ". . . nodules of beautiful coloring, deep blues, reds, and an almost emerald green predominating."

The mine is currently named after its most famous owner, John W. Ware, a San Diego jeweler who operated the mine during the 1920's and 30's. During this period, Ware worked the mine primarily for pale blue topaz, which he marketed through his jewelry shop. More recent attempts to work the mine have seen only limited success. During the early 1980's the mine was worked briefly by local collectors Bill Magee and Ed Link. Little material appears to have been found, but one gemmy pale blue topaz crystal recovered by Magee is now in the collection of the Los Angeles County Museum of Natural History.

Maple Lode Mine

Directly south of the Ware mine, on the opposite side of the ridge, is the Maple Lode mine. This mine is an unpatented claim consisting of two bench cuts along the pegmatite and at least two largely collapsed tunnels following the dike northward into the hillside. The pegmatite dike is highly fractured and broken up, possibly as a result of slumping of the hillside where the dike is exposed. From the geometry of the ridge, it appears that the Ware and Maple Lode mines may actually work the same dike from opposite sides of the ridge.

Weber (1963) states that the Maple Lode was probably first

Figure 15. **The Ware mine, Aguanga Mountain, north-central San Diego County, June, 1994. Jesse Fisher photo.**

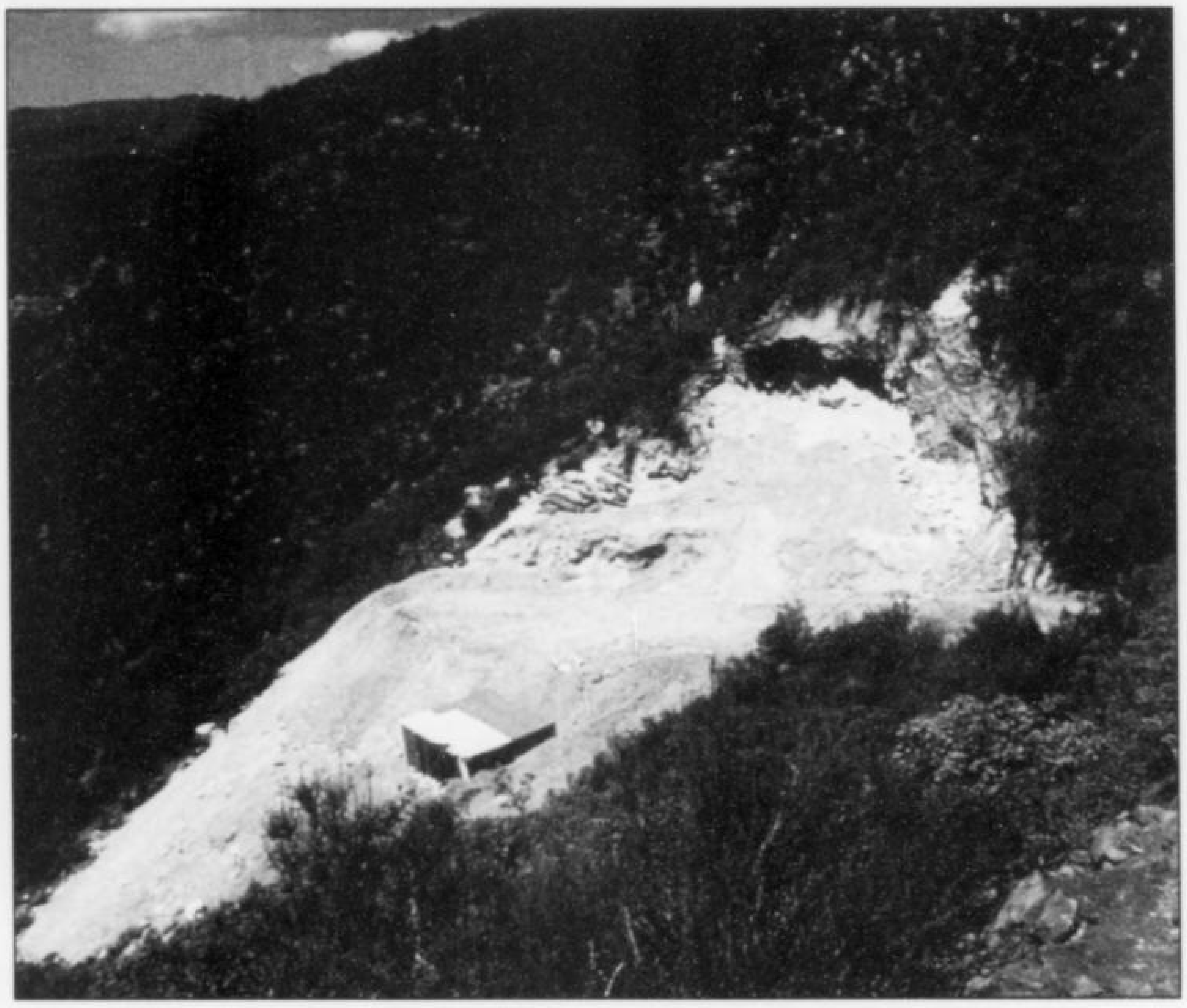


Figure 17. **The Maple Lode mine, Aguanga Mountain, north-central San Diego County, 1982. Photo courtesy Roland Reed.**

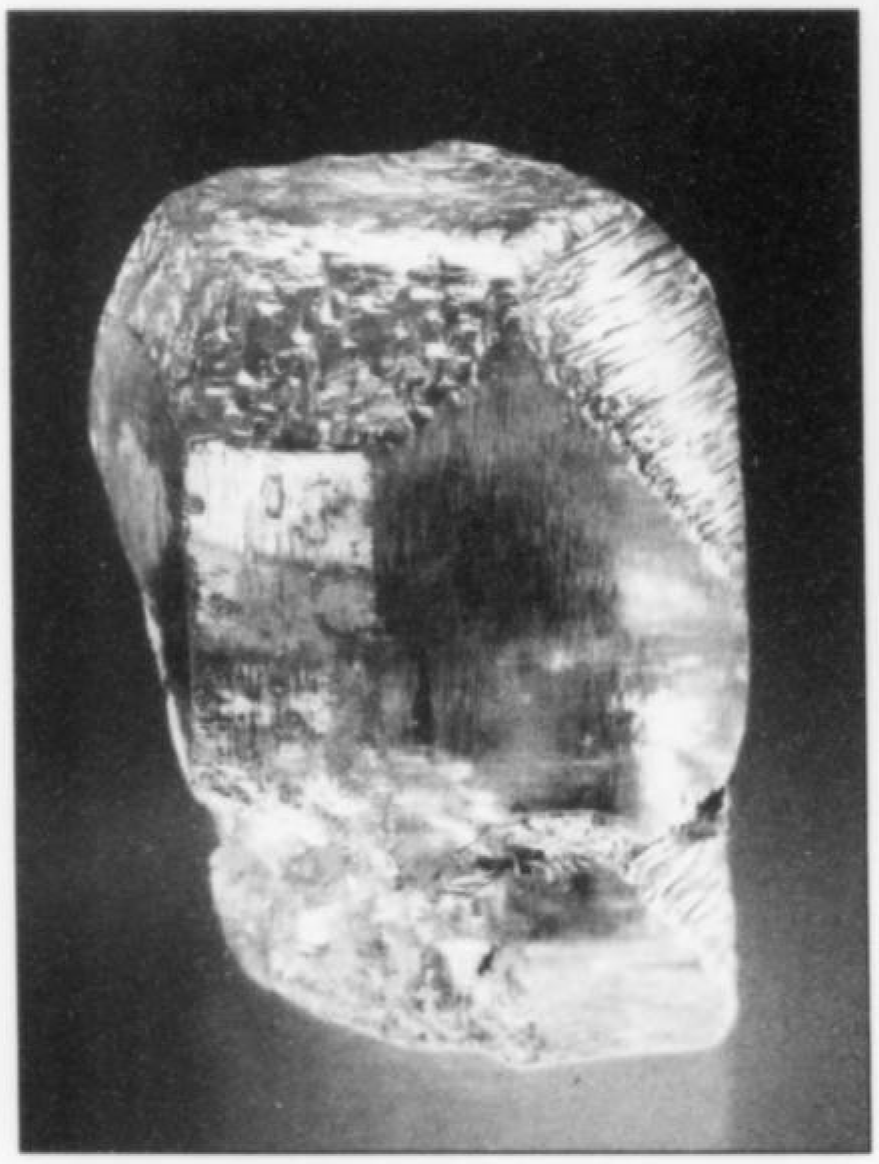


Figure 16. **Topaz crystal, 5.2 cm high, from the Ware mine. Los Angeles County Museum of Natural History collection; Jeff Scovil photo.**

worked around 1903, at the same time as the Ware, but specific references to the mine in early literature cannot be found. The mine is currently owned by local miner Roland Reed who, along with several partners, worked the mine during the late 1970's and early 1980's. Reed and his partners recovered a number of well-formed topaz crystals ranging in color from medium blue to colorless to pale green, along with numerous blue and bicolored blue-pink elbaite crystals. The tourmalines usually occur as small "pencils" up to around 5 cm long and are sometimes a bright sky-blue in color. Some very good red, tabular apatite crystals, up to 7.5 cm in size, were recovered as well. Matrix specimens are very rare from

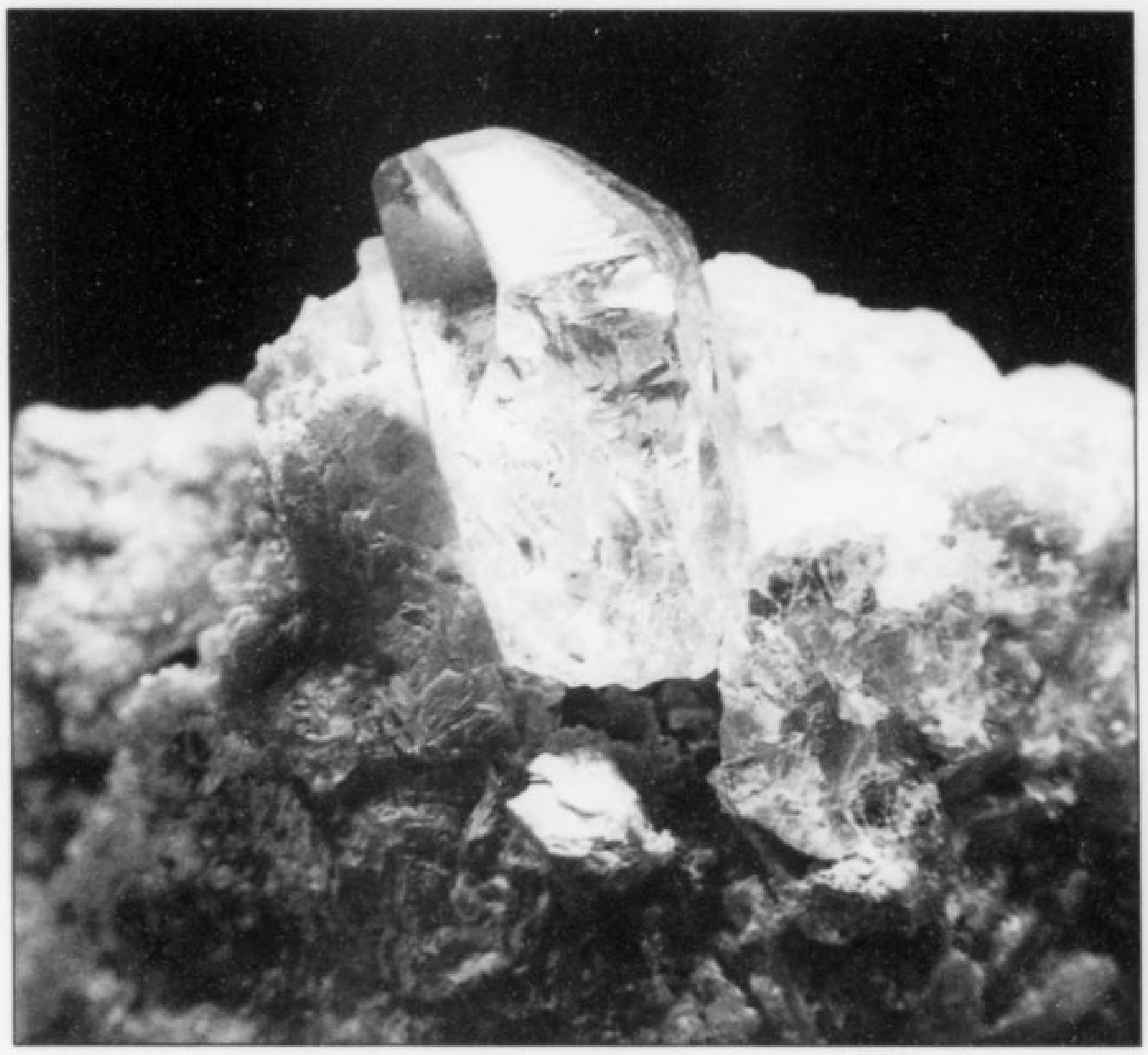


Figure 18. **Topaz on Lepidolite, 2 cm, from the Maple Lode mine. R. Reed collection; Jesse Fisher photo.**

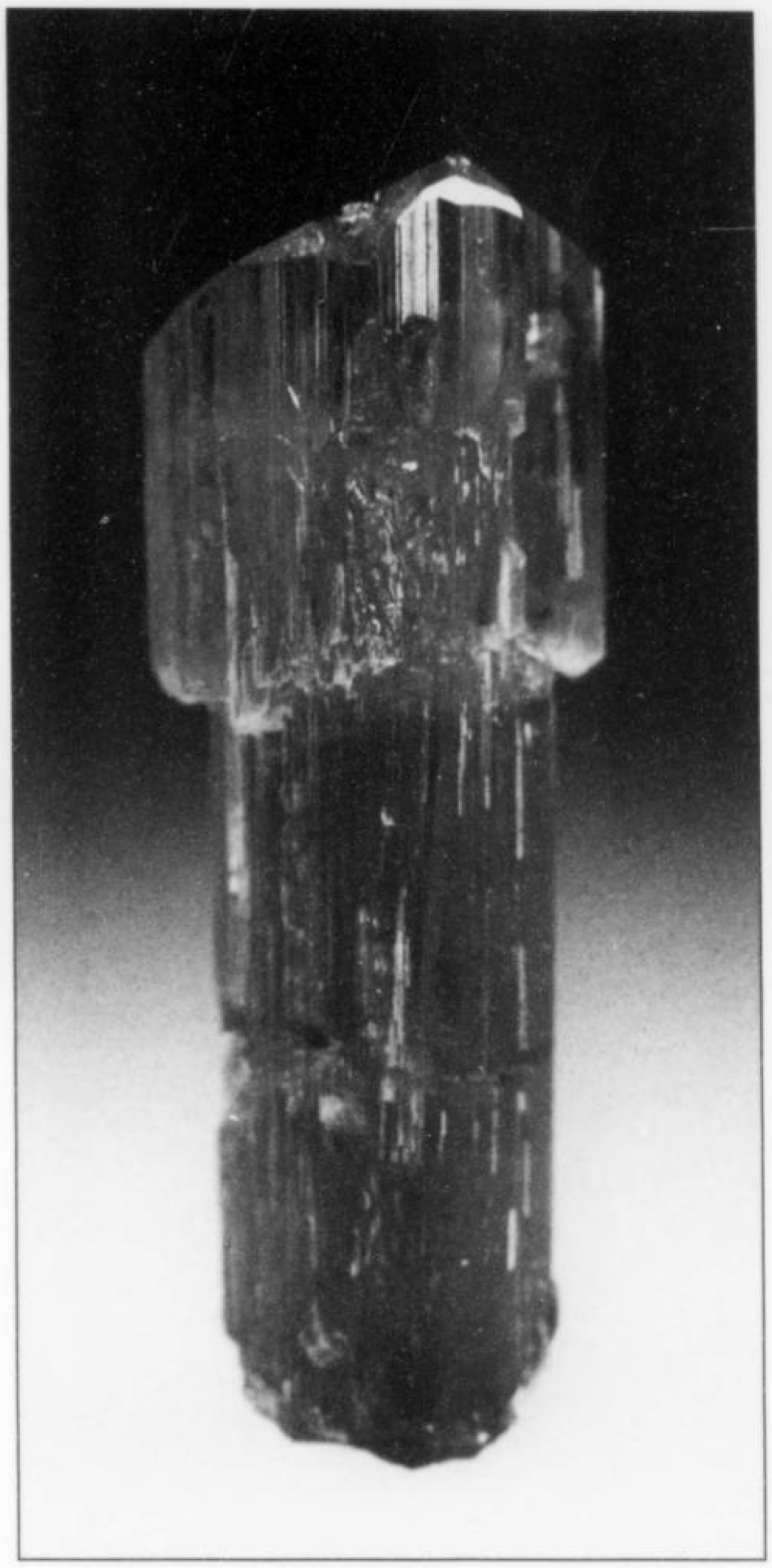


Figure 19. **Elbaite, 2.6 cm high, from the Maple Lode mine. Cal Graeber collection; Jeff Scovil photo.**

the Maple Lode because of the brecciated nature of the dike, and the crystal-bearing pockets are reported to be often no more than sand-filled and clay-filled cavities between blocks of pegmatite (Fisher, 1995).

Warner Springs District

The Warner Springs district is an area of scattered pegmatites located just south of Aguanga Mountain, near the town of Warner Springs. The pegmatites of this area, like most others in the region, were originally prospected during the first decade of the 20th century, but little information remains as to what, if anything, may have been found.

Cryo-Genie Mine

The best known pegmatite prospect in this area is the Cryo-Genie—originally known as the Lost Valley Truck Trail Claim, which is located approximately 2 miles north-northwest of Warner Springs. Weber (1963) reports that several shallow cuts and trenches were dug along the dike during the 1910's or 1920's but gives no further details. The claim was re-established in 1962 by the San Diego Gem and Mineral Society (J. Clanin, personal communication, 2001). Ownership of the claim was then picked up by mineral collector Bart Cannon in 1973, who gave the property its current name. Cannon sold the claim to the current owners, Ken and Dana Gochenour in the mid 1980's.

During most of its existence, the claim has been little more than a hobby mine, producing the occasional crystal of schorl or dark blue to green elbaite. In the spring of 2001 the Gochenours enlisted the help of Jim Clanin and John Klinke, a couple of experienced geologists and miners, and began an organized mining project on the dike. Tunneling down-dip on the dike, the crew quickly encountered several pockets containing quartz, feldspars, and fine "jack-straw" like groups of pale green and pink elbaite. After several months work a major tourmaline-bearing pocket was found. Elbaite crystals from the pocket are mostly a medium

Figure 20. **Aquamarine beryl, 7.9 cm, from the Cryo-Genie claim. Gochenour specimen, now in the Bill Larson collection; Jeff Scovil photo.**

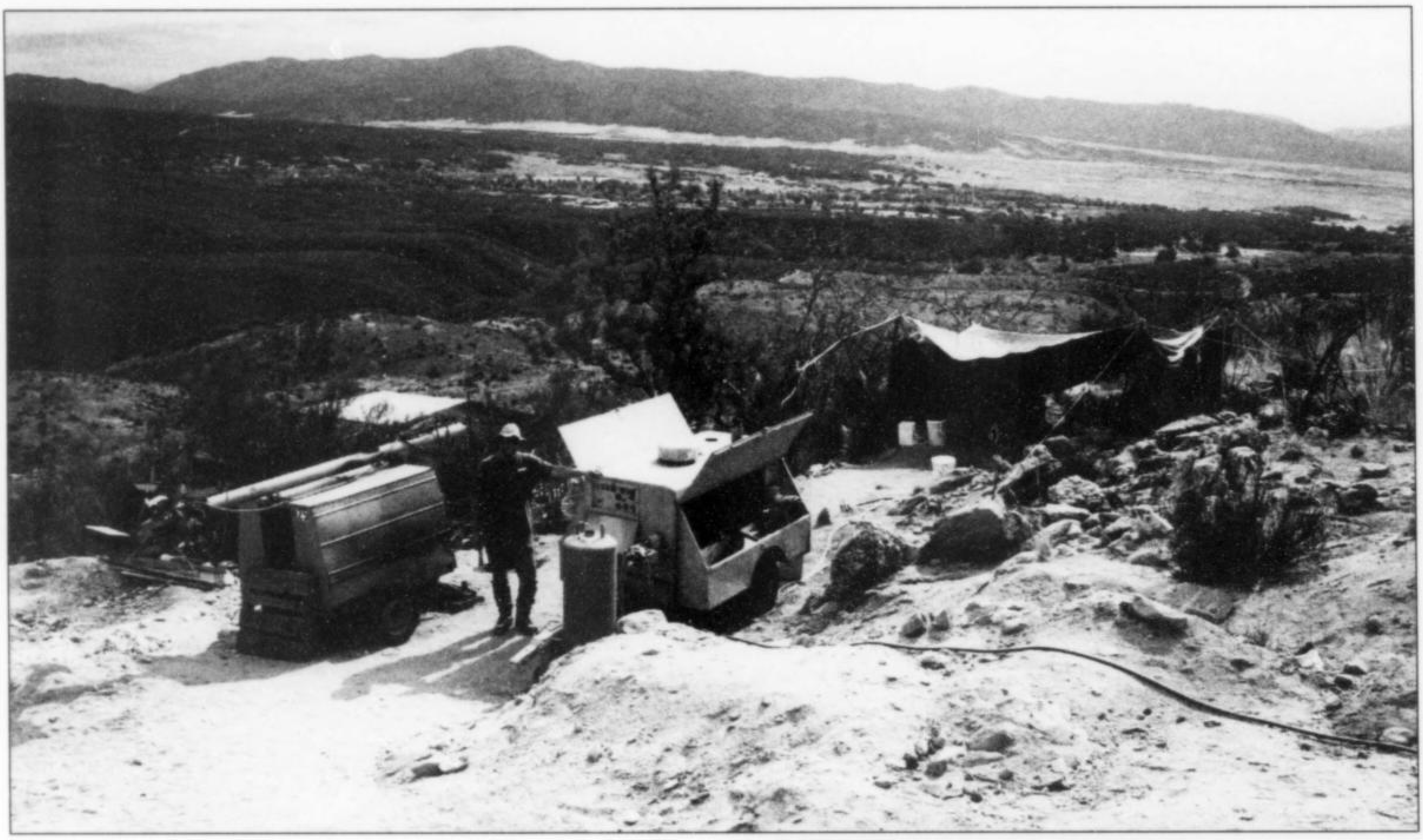


***Figure 21.* The Cryo-Genie mine near Warner Springs. Brendan Laurs photo.**

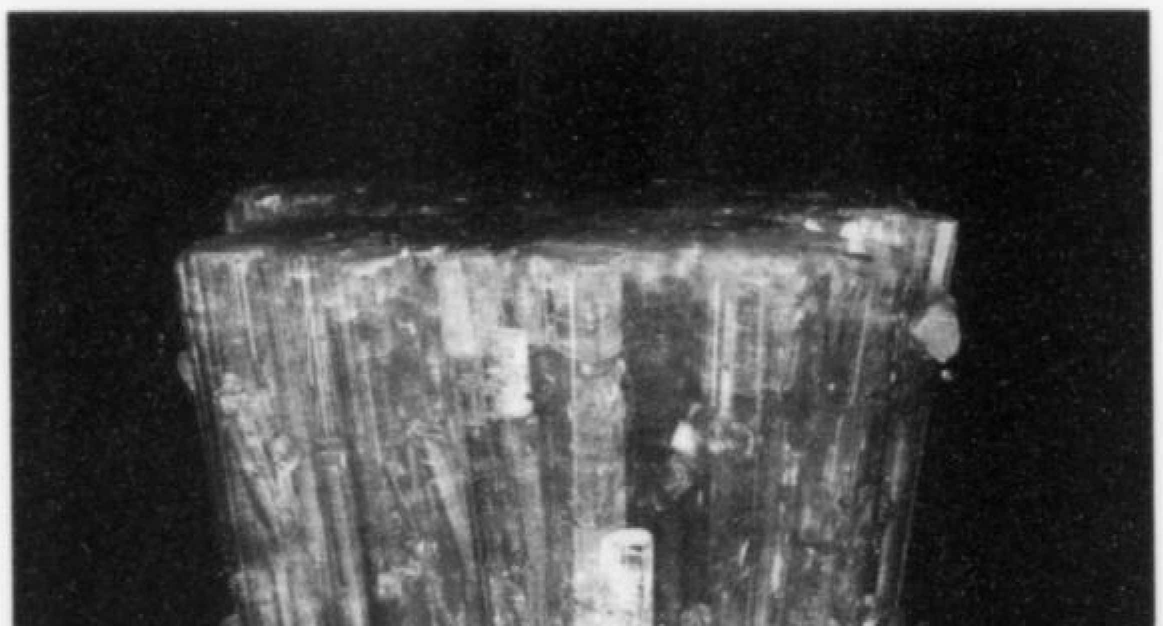


***Figure 22.* One of the extraordinary tapered elbaite crystals (11.4 cm) characteristic of the discovery at the Cryo-Genie mine. Gochenour specimen, now in the Bill Larson collection; Jeff Scovil photo.**

pastel-pink color, and most are deeply striated with pedion terminations. In all, seven major specimens were recovered (K. Gochenour, personal communication, 2001), the largest being a tapering, 19-cm, doubly terminated crystal with a bluish green cap at the pyramidal termination. Another interesting specimen recovered from the pocket consisted of two slightly divergent pink pencil-like elbaite crystals, approximately 5 cm long, growing from a base of ferrocolumbite. Along with the elbaite, several gemmy crystals of beryl (both aquamarine and morganite color varieties) were found.

Pala District

The Pala district, located in northwestern San Diego County near the village of Pala, is perhaps the most famous of all the pegmatite districts in Southern California. The district encompasses four hills: Queen Mountain (formerly called Pala Mountain) to the west, Chief Mountain and Little Chief Mountain in the middle, and Hiriart Mountain to the east. These hills are host to hundreds of individual pegmatite dikes.

The pegmatites of the Pala district are usually tabular to sheet-like in shape. The average thickness is around 3 meters, though there is considerable variation, and most are at least 120 meters long. The dikes are largely parallel, striking northward and dipping toward the west at an average of 20º (Jahns and Wright, 1951).

Over the years, numerous mines and prospects have been established on pegmatites in the district; Jahns and Wright (1951) list 74, but only a small number of these have ever produced gem or

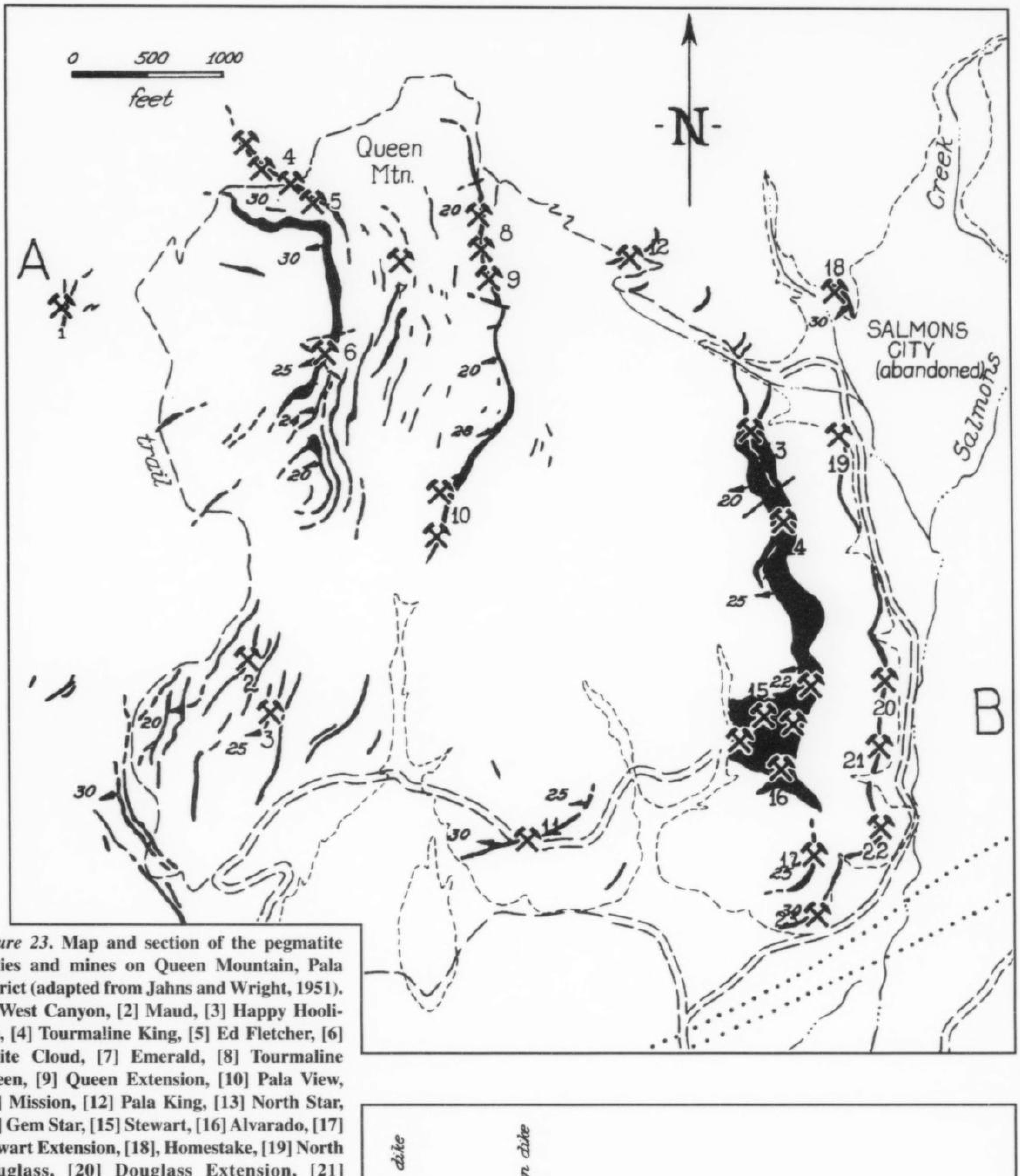


Figure 23. **Map and section of the pegmatite bodies and mines on Queen Mountain, Pala district (adapted from Jahns and Wright, 1951). [1] West Canyon, [2] Maud, [3] Happy Hooligan, [4] Tourmaline King, [5] Ed Fletcher, [6] White Cloud, [7] Emerald, [8] Tourmaline Queen, [9] Queen Extension, [10] Pala View, [11] Mission, [12] Pala King, [13] North Star, [14] Gem Star, [15] Stewart, [16] Alvarado, [17] Stewart Extension, [18], Homestake, [19] North Douglass, [20] Douglass Extension, [21] Douglass, [22] Pasture, [23] Pala Douglass.**

Figure 24. **The main portal of the Stewart mine, 1997. Jesse Fisher photo.**

specimen material in any quantity. The few that have, however, have been the source of some of the finest specimens of elbaite, kunzite, and morganite known. The most productive dikes are located on Queen, Chief, and Hiriart Mountains. Little Chief Mountain is host to numerous pegmatites, but none is reported to have ever produced much specimen or gem materials.

Most of the mines in the Pala district are located within the boundaries of the Pala Indian Reservation. The reservation was not formally established until after most of the mining claims in the district had been filed, but in recent years many of these claims have become inactive and have fallen under tribal control. A few of the more famous and productive mines still remain as valid claims, but it is unlikely that many of the others will be worked again in the foreseeable future.

Stewart Mine

The first reported mining in the Pala district was at the Stewart (or Stewart Lithia) mine, a patented claim located low on the southern slope of Queen Mountain. The Stewart dike is a very large pegmatite, in places exceeding 30 meters in thickness. In the southern portion of the dike the core zone is made up of large masses of fine-grained purple lepidolite containing numerous embedded needle-like crystals of pink elbaite. The tourmaline is highly fractured and not of gem quality, but the combination with lepidolite makes attractive specimens for which the mine is well known.

Kunz (1905b) reported that the Stewart was first claimed as a mercury mine by a prospector who mistakenly thought the pink tourmaline to be cinnabar. The deposit was re-claimed as a source of building stone by another individual who thought the massive lepidolite to be a peculiar type of marble. In the 1890's the lepidolite was finally recognized for what it is, and the mine soon became the largest source of lithium known at the time in North America. The mine was worked off and on until 1928 for lepidolite (Weber, 1963), but the gem-producing potential of the pegmatite was not fully recognized at the time because gem-grade elbaite is not found in the same portions of the dike as the massive deposits of lepidolite.

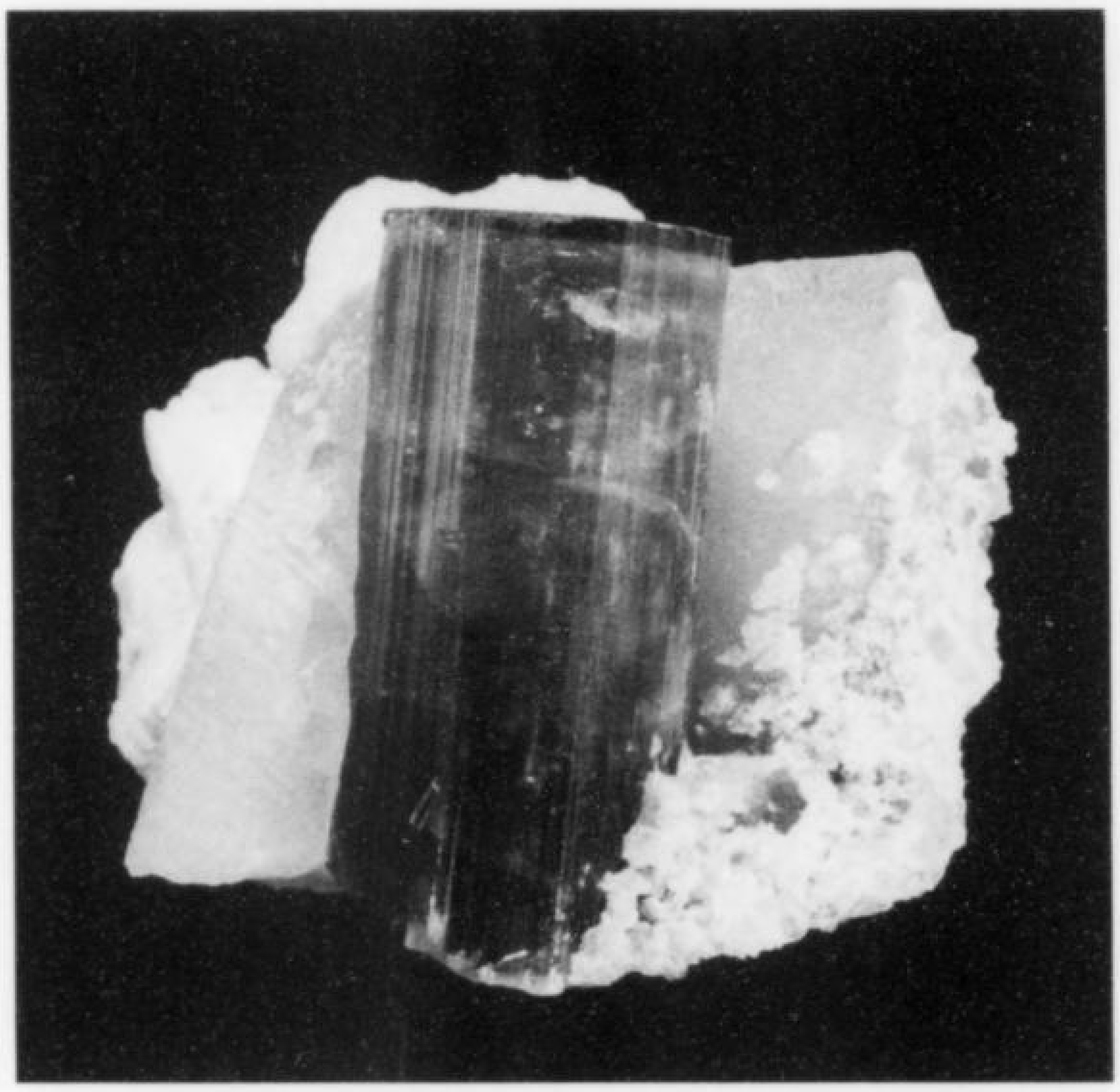
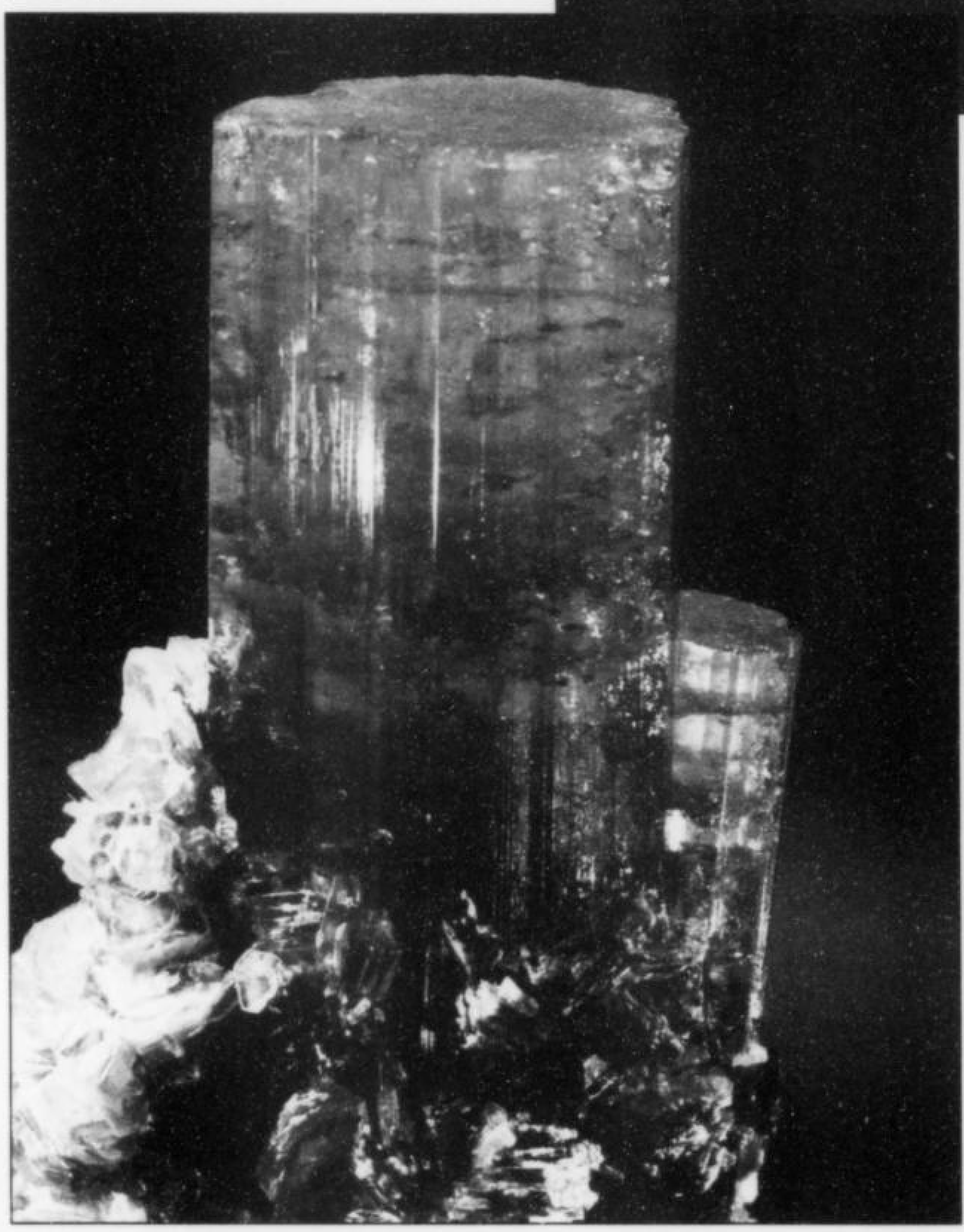


Figure 25. **Elbaite with quartz and lepidolite, 7.4 cm across, from the Stewart mine. Jesse Fisher collection; Jeff Scovil photo.**

In 1968 the mine was purchased (along with the Tourmaline Queen and Pala Chief) by Ed Swoboda, a Los Angeles jeweler and mineral collector. Swoboda, along with partner Bill Larson, established Pala Properties International (PPI) to work these mines and market gem rough and mineral specimens. Work began immediately at the Stewart and by late the next year elbaite-bearing pockets had been uncovered (Szenics, 1970). The mine was successfully operated by PPI between 1969 and 1972, producing a fair amount of elbaite, along with minor amounts of morganite and kunzite.

Figure 26. Elbaite with lepidolite, 5.1 cm high, showing the "hot pink" color characteristic of tourmaline from the Stewart mine. Los Angeles County Museum of Natural History collection; Jeff Scovil photo.

Figure 27. Elbaite, 3 cm wide, showing the "hot pink" color typical of the Stewart mine tourmalines. American Museum of Natural History collection; photo by Harold and Erica Van Pelt.



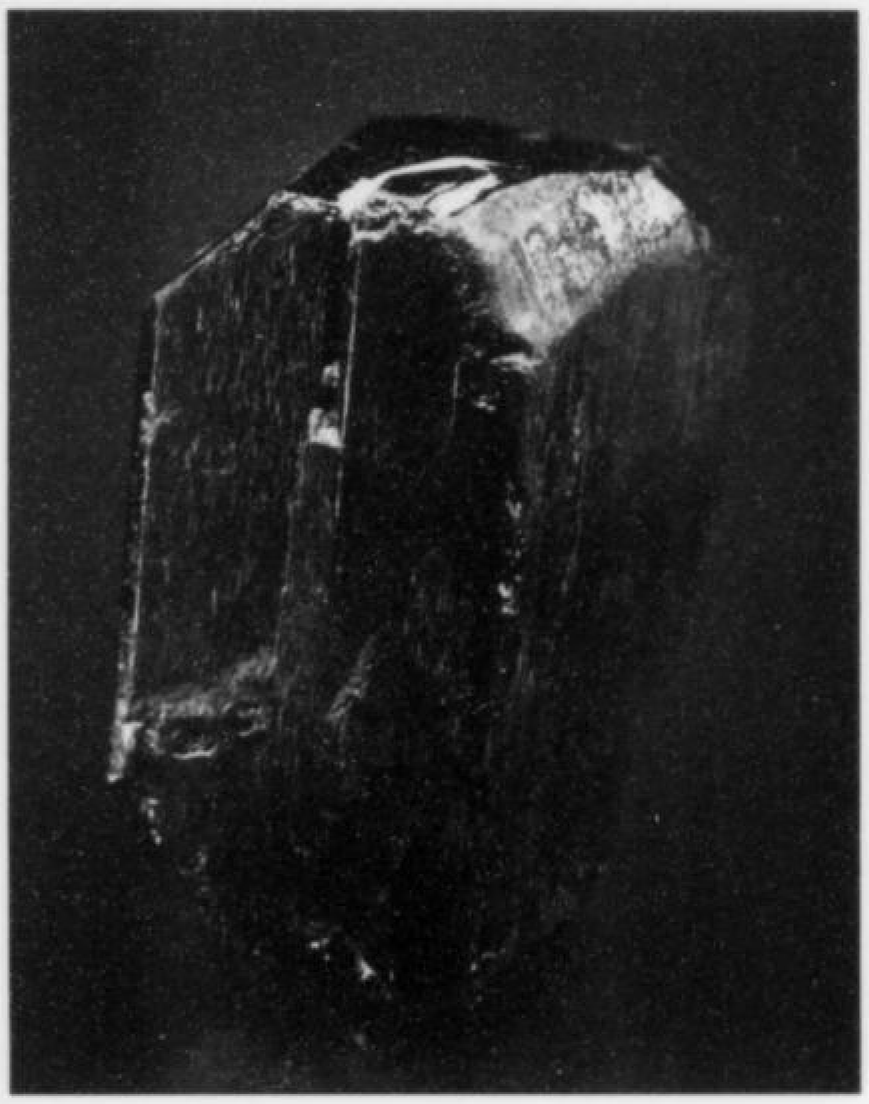


Figure 28. Manganocolumbite, 2.5 cm high, from the Stewart mine. Jesse Fisher collection; Jeff Scovil photo.

Figure 29. **Orthoclase, 5.1 cm across, from the Stewart mine. Jesse Fisher collection; Jeff Scovil photo.**

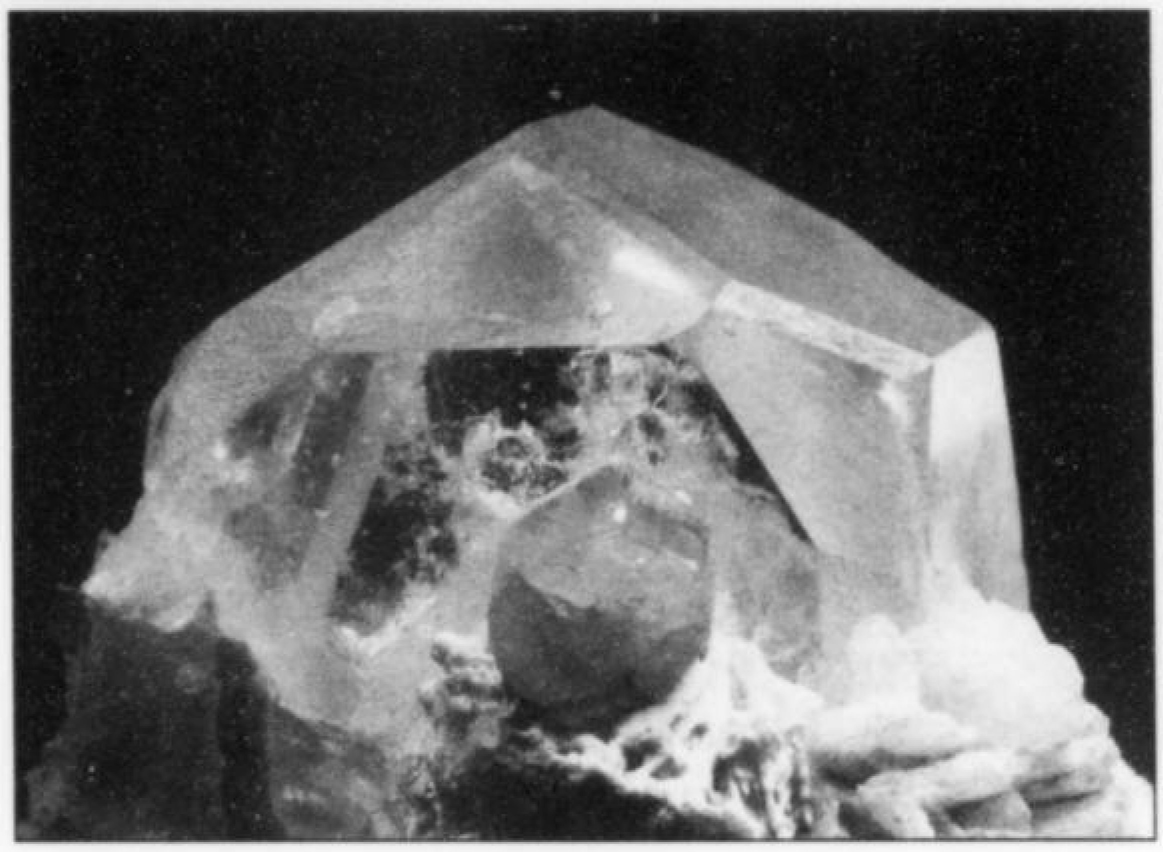


Figure 30. **Pink beryl (morganite), 2.2 cm across, from the Stewart mine. Jesse Fisher collection; Jeff Scovil photo.**

The Stewart was worked only occasionally after operations at the nearby Tourmaline Queen mine became successful in 1972, and after the break-up of the Larson-Swoboda partnership in the late 1970's, the mine was purchased by a syndicate of owners based in Germany. This syndicate, relying on hired local management, operated the mine through the 1980's with limited success. Because of the absentee ownership, oversight of the mine was rather lax during this period and much unauthorized work (or "high-grading") is reported to have occurred.

In 1990, operation of the mine was taken over by Millennium, Inc., headed by Blue Sheppard. Sheppard was successful in increasing security at the mine, and continues to operate it on a small scale today. Faceted elbaite, gem rough, and mineral specimens from the mine are marketed through his retail store, *Gems of Pala*, located just outside the village of Pala.

Elbaite from the Stewart mine is predominantly pink, and the vivid "hot" pink varieties are among the most brilliantly colored tourmaline found in Southern California. The mine has produced elbaite in a wide variety of other colors, however, including blue, green, and various color combinations. Most elbaite from the Stewart mine is of lapidary rather than specimen grade; intact undamaged tourmaline crystals, much less good matrix specimens, are relatively rare. The core zone of the pegmatite appears to have been broken up by natural forces at some point after formation and the contents of most pockets were shattered. When they do occur, matrix specimens from the Stewart mine are distinctive because any associated lepidolite is usually much finer grained than that from other mines in the district.

Minor amounts of morganite, spodumene, and manganocolumbite-manganotantalite (Shigley et al., 1986) have been found as well. Morganite crystals are usually a very pale pink and typically have a tabular habit, showing development of pinacoid and pyramid faces. Spodumene is found in some pockets as small, etched fragments of what had originally been larger crystals. Colors found include pink, lilac, blue, yellow, and colorless, but crystals are usually small and pale in comparison to spodumene from other mines in the district.

The Stewart pegmatite is also very rich in both primary and secondary phosphate minerals. Lithiophilite is the principal primary phosphate mineral (Shigley and Brown, 1985), but amblygonite, triplite, and triphylite (possibly misidentified lithiophilite, A. R. Kampf, personal communication, 2000) have also been reported (Jahns and Wright, 1951). Lithiophilite occurs as sooty black, well formed, equant crystals as well as irregular masses, sometimes in excess of 10 cm in size. The lithiophilite is almost always at least partially altered to secondary phosphates, and oxides of manganese and iron. Secondary phosphates found in the Stewart pegmatite include hureaulite, sicklerite, purpurite, heterosite, stewartite, and phosphosiderite. Apatite appears to be rare.

Tourmaline Queen Mine

Located on the northeast slope near the summit of Queen Mountain, the patented Tourmaline Queen mine is one of the most well-known elbaite-producing pegmatites in California, if not the world. Specimens of bicolored elbaite from the famous "blue cap" find of 1972 (see the accompanying article by Ed Swoboda) are considered some of the finest in the world. Despite this renown, no detailed studies of the mine's mineralogy and geology have ever been conducted and little information on the mine has ever been published.

Kunz (1905b) reports that the Tourmaline Queen mine was established as a quartz claim in 1903 by Frank Salmons and several associates, but at the time of Kunz's report, little mining had yet been done. Soon thereafter, the mine began producing and until 1912 was, along with the Himalaya mine in the Mesa Grande district, one of the leading sources of colored tourmaline in Southern California. After the collapse of the gem market, the mine was idle for some time. Sinkankas (1959) reports that some small-scale mining was done during the 1940's and 1950's, but gives few details.

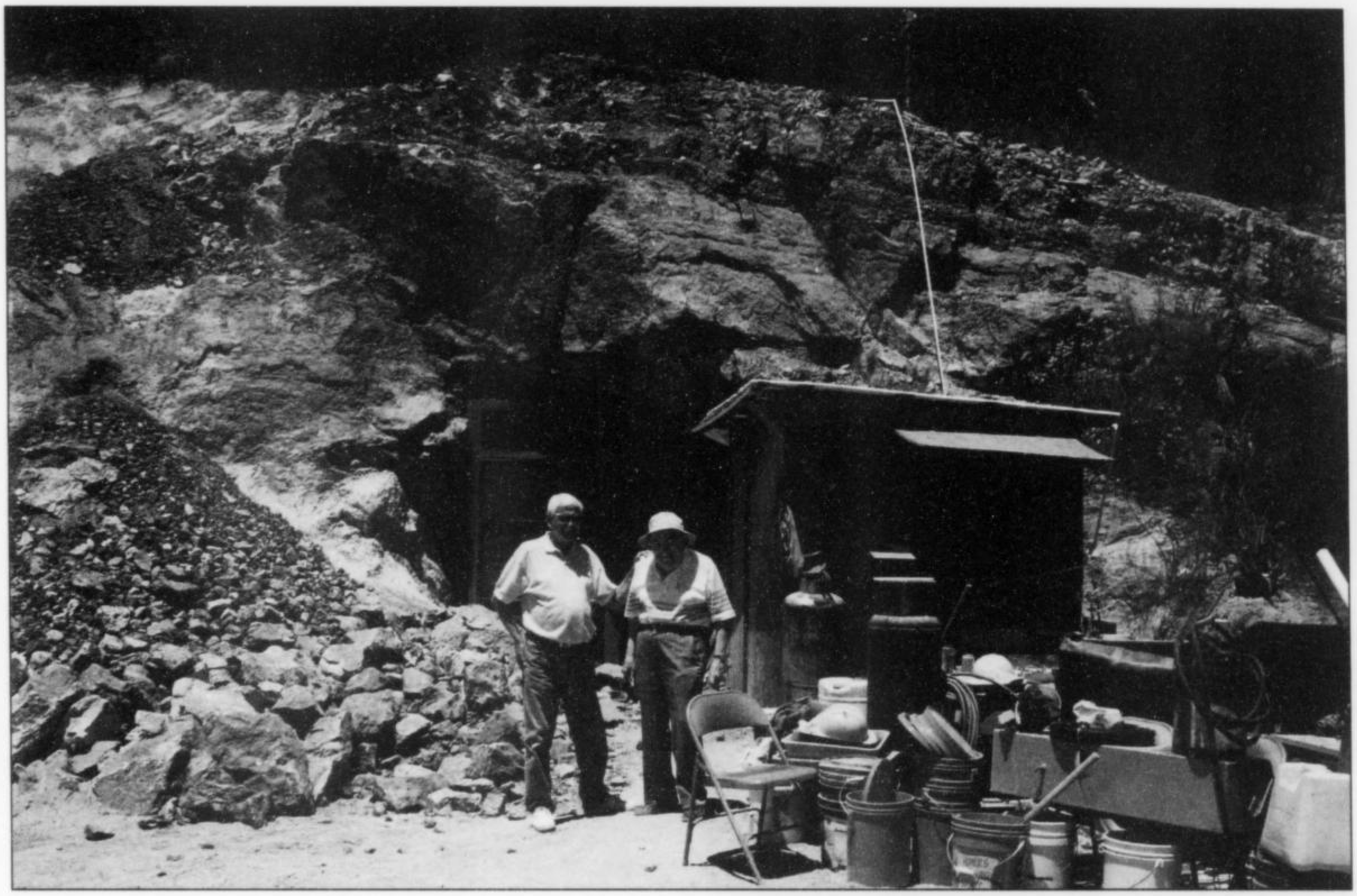


Figure 31. **Ed Swoboda and Richard Liddicoat at the Tourmaline Queen mine. Photo (2001) by Brendan Laurs.**

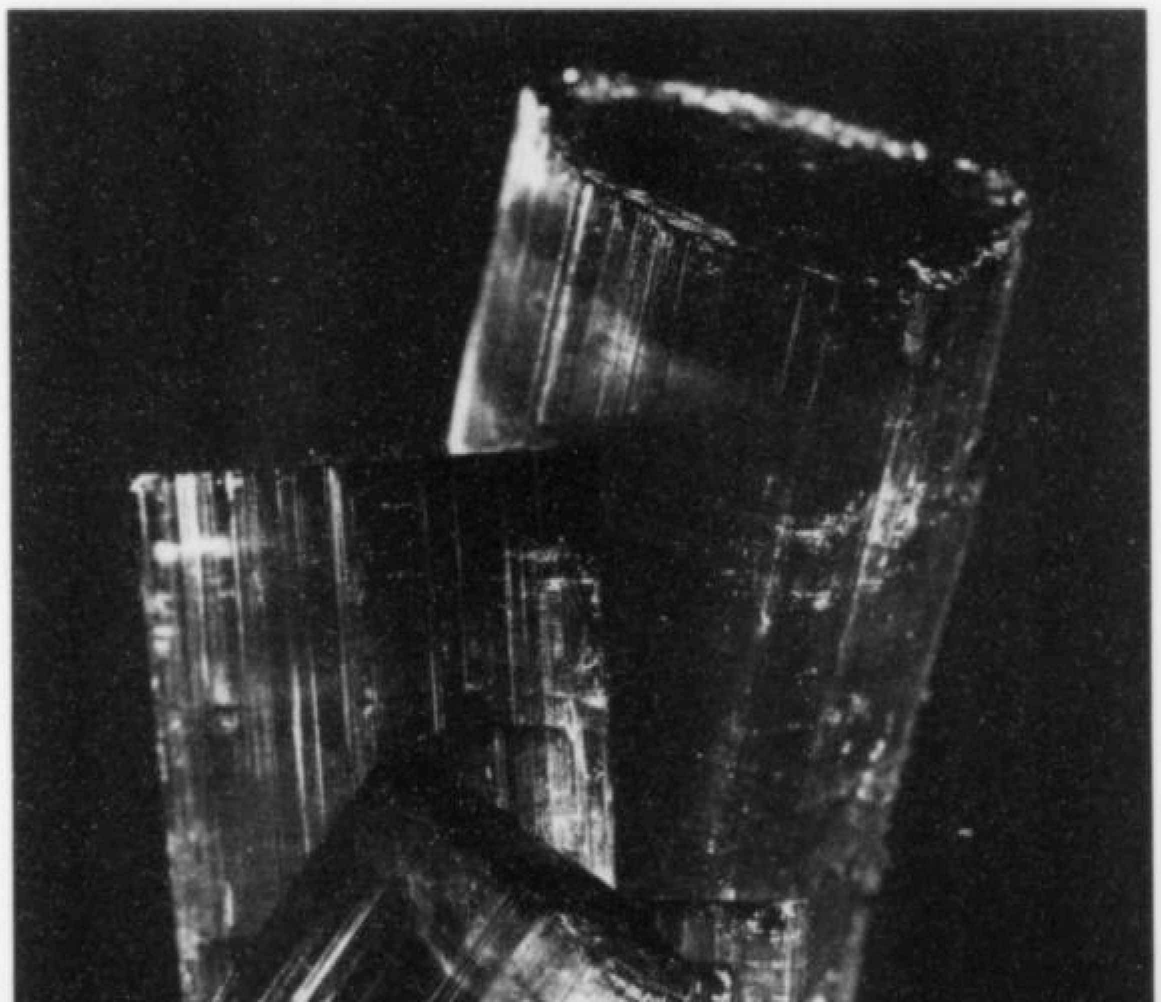
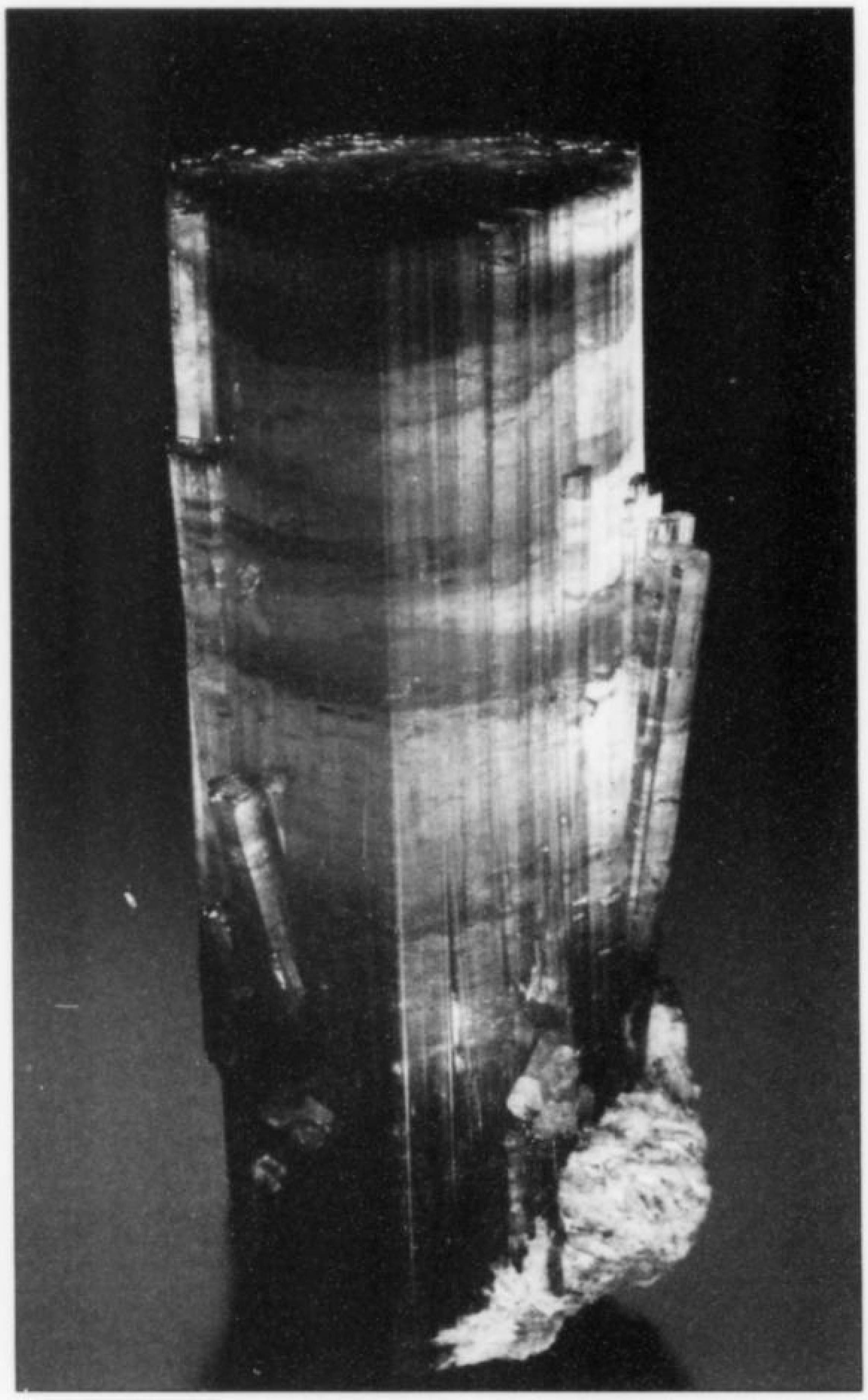


Figure 32. **"Blue-cap" tourmaline from the famous 1972 discovery at the Tourmaline Queen mine. American Museum of Natural History specimen; photo by Harold and Erica Van Pelt.**

Pala Properties International began full time work at the mine during the summer of 1971, shifting their operation from the Stewart mine, further down the hill. Under the direction of John McLean, tunneling began in September, and several small pockets were encountered through the fall. The famous "Blue Cap" pocket was first encountered on December 31, 1971, and excavation of this pocket (actually a series of interconnected pockets) continued through the next month (Larson, 1972). Elbaite crystals from this pocket are a rich reddish-pink color with a deep blue band at the termination. Many crystals are quite large, some exceeding 20 cm in length, giving rise to the informal unit of measurement for tourmaline crystals known as the "beer can". A number of sizable specimens were recovered associated with quartz and cleavelandite, and a few with well-formed, pale crystals of morganite. In all, around 33 major tourmaline specimens were produced from this pocket (W. Larson, personal communication, 1999) along with a few smaller ones. Specimens from this pocket can be seen in many major museum collections in both Europe and the North America, and some, such as "The Candelabra" now in the National Museum of Natural History (Smithsonian Institution) and the "Rabbit Ears" in the Houston Museum of Natural Science, are among the best known tourmaline specimens ever found.

Pala Properties International continued work at the Queen mine through 1975, finding at least 10 significant pockets in all (Sinkankas, 1976). The mine was finally closed after being actively worked for the better part of the last year without finding any new pockets. Since then, several attempts have been made to work the mine with little success. For several years during the early to mid-1990's, Roland Reed leased and worked the mine along with several partners. No significant finds were made, however, and the mine (as of this writing) is once again being operated by long-time owner Ed Swoboda.

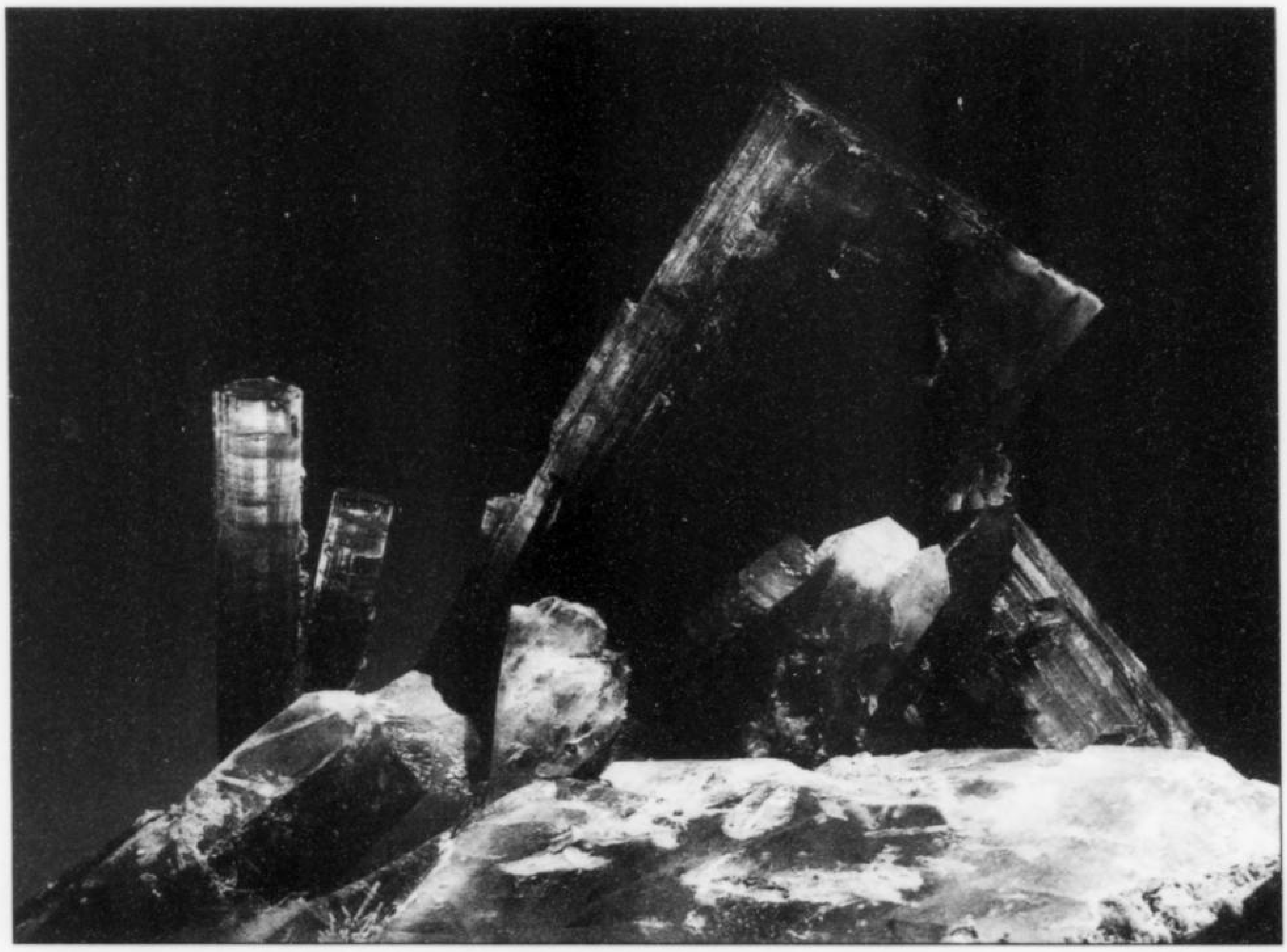


Typical elbaite crystals from the Tourmaline Queen mine are heavily striated trigonal prisms with simple pedion terminations, which may be either glassy or matte. Smaller parallel growth or "side car" crystals are commonly associated with larger tourmalines and, as previously mentioned, individual crystals can be quite large. Various shades of blue and pink are the most common colors. Pocket crystals will often have a core of pink, ranging from pale to a rich reddish color, with a thin blue layer on the prism and pedion faces. The blue may range from a pale bluish gray to a deep indigo-blue dark enough to mask the interior color of the crystal. Some pockets have produced elbaite that is mostly blue, with little or no pink. Green elbaite appears to be relatively rare in this pegmatite. When crystals do occur, they often have a dull grayish cast.

Pink beryl or "morganite" also occurs in pockets in the Tourmaline Queen mine, sometimes directly associated with elbaite. Typically, morganite forms tabular crystals with prominent pinacoid faces that are usually glassy. Prism and pyramid faces are usually present and often have a dull or matte surface. The color is usually pale pink, and smaller crystals may appear to be almost colorless. Morganite crystals from the Tourmaline Queen mine are often quite similar in appearance to those from the Stewart mine. Distinguishing characteristics include associated lepidolite, which will generally be much coarser grained on specimens from the Tourmaline Queen mine than on those from the Stewart, and elbaite, which may be bi-colored from the Tourmaline Queen mine, but is usually pink from the Stewart.

***Figure 33*. Elbaite, 6.4 cm tall, from the "Blue Cap Pocket," Tourmaline Queen mine. Gene Meieran collection; Jeff Scovil photo.**

***Figure 34*. Elbaite on quartz, 26 cm wide, from the Tourmaline Queen mine. Los Angeles County Museum of Natural History specimen and photo.**



Quartz, albite (var. cleavelandite), microcline, and lepidolite are common in pockets, while spodumene has not been reported from the Tourmaline Queen. Quartz crystals are often large and well-formed, and range from colorless to pale smoky, sometimes with a yellow cast. As the Tourmaline Queen pegmatite has never received a detailed mineralogical study, many of the rare minerals of the pegmatite have never been documented. Small crystals of uranium-bearing microlite can occasionally be found embedded in elbaite crystals and are distinguished by the radiation damage halos they create. Spessartine, apatite, stilbite and minerals of the columbite-tantalite group have also been found in small amounts.

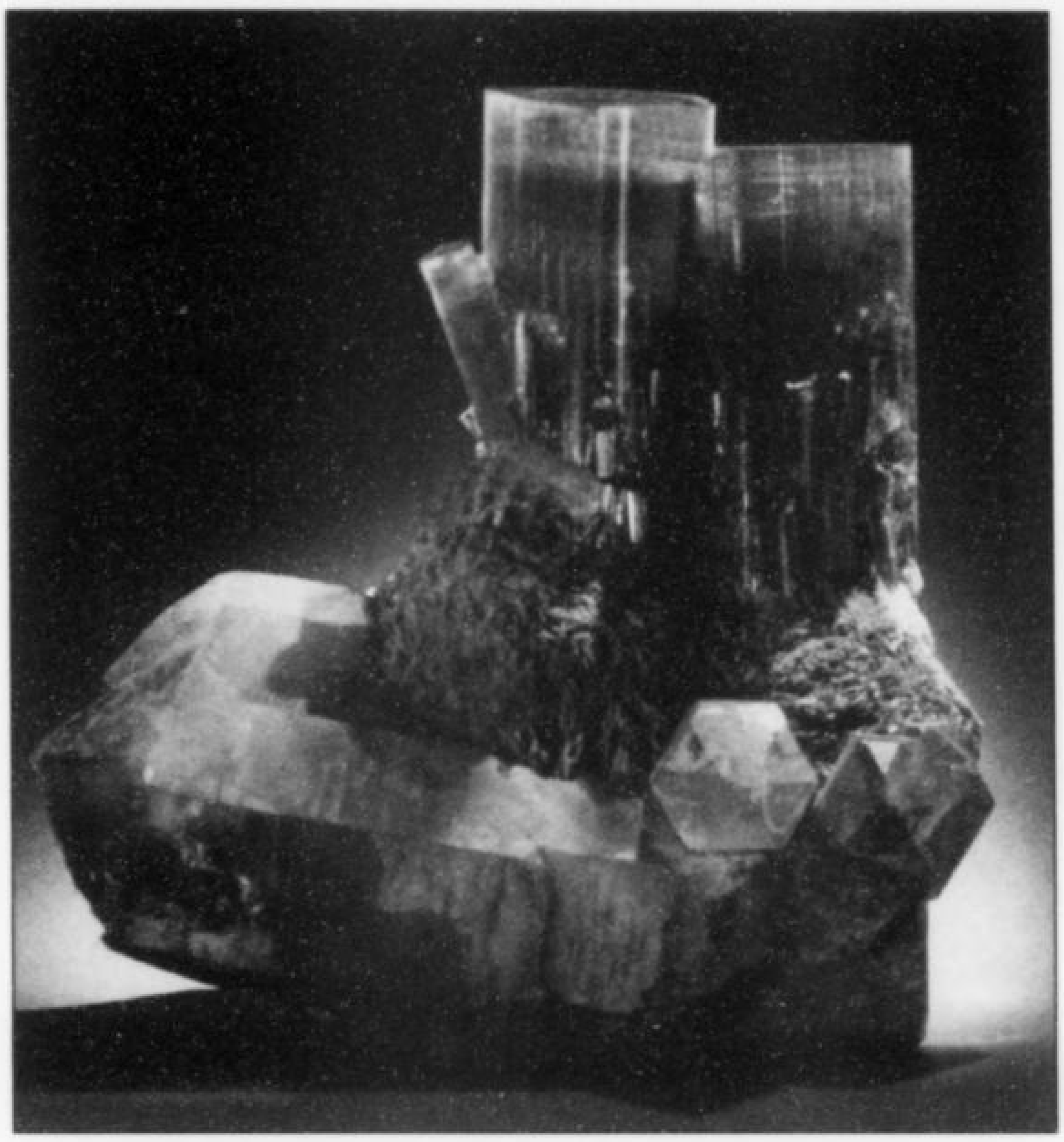


Figure 35. **Elbaite on quartz and cleavelandite, from the Tourmaline King mine, Pala district. This specimen, known as "The Steamboat," is approximately 27 cm high, and was mined ca. 1907. It was originally in the Roebling collection, which is now in the National Museum of Natural History (Smithsonian) collection. Dane Penland photo.**

Tourmaline King Mine

The patented Tourmaline King mine is located high on Queen Mountain, to the north of the summit. The mine was originally claimed in 1903 by a Mr. Schuyler and is reported to have produced much gem tourmaline of exceptional quality during the early years of its operation. Very little has been found since, despite several attempts to reopen the mine, and it is considered possible that most of the early production came from a single large pocket (Jahns and Wright, 1951). The occurrence of other gem or rare-element minerals from the mine has not been documented.

Elbaite crystals from the Tourmaline King mine are often similar in appearance to those from the nearby Tourmaline Queen mine. Large pink and bicolored pink-blue and pink-green crystals are common. Crystals usually occur as moderately to heavily striated trigonal prisms with simple pedion terminations. Without documentation, it is difficult, if not impossible, to tell older specimens from the King and Queen mines apart. Greens appear to have been more common from the King mine, however. The best specimen known to have come from the King mine is "The Steamboat," a 27 x 32-cm specimen consisting of two parallel, bicolored elbaite crystals on quartz and cleavelandite. This specimen was originally in the Roebling collection and is now in the National Museum of Natural History (Smithsonian Institution) (see Bancroft, 1973).

Katerina and Vandenberg Mines

Hiriart Mountain is located on the eastern side of the Pala district and is host to a complex system of inter-connected, mineralogically similar pegmatites that are exposed on the southern, eastern, and northern flanks of the mountain. Numerous mines and prospects have been developed on Hiriart Mountain since the beginning of the 20th century, but in recent years the White Queen, San Pedro, Vandenberg, and Katerina have been the most important producers of gem and specimen material. Other mines on Hiriart Mountain that have produced gem or specimen materials in the past include the Senpe, Anita, Fargo, El Molino, and Naylor mines. All the mining claims on Hiriart Mountain are unpatented.

Spodumene (including kunzite) and beryl (mostly morganite) are the principle gem minerals found in most mines on Hiriart Mountain, and it was in these pegmatites that kunzite, the lilac-colored gem variety of spodumene, was first discovered (Schaller, 1903; Kunz, 1904). Many of these pegmatites are also enriched in phosphate and bismuth-containing minerals, as well as minerals of the columbite group, which usually occur in or around the quartz core zones of the dikes. Phosphate minerals include primary lithiophilite, triphylite, and amblygonite, and numerous alteration products including hureaulite, purpurite, and sicklerite. Bismuth-containing minerals found include native bismuth, bismite, bismutite, bismuthinite, and beyerite (Jahns and Wright, 1951). Pucherite and clinobisvanite have also been reported (Foord *et al.*, 1991).

Unlike in the pegmatites further west in the district, tourmaline is relatively scarce in the core and pocket zones of dikes on Hiriart Mountain. When they do occur, tourmaline crystals from the Hiriart Mountain pegmatites are usually small and dark indigo-blue in color, and though often quite flawless, are usually too dark to cut as gemstones.

The Katerina and Vandenberg mines, along with most of the others on Hiriart Mountain, were originally discovered by the father and son team of Marion and Fred Sickler, along with French Basque prospectors Bernardo Hiriart and Pedro Peiletch during 1902 and 1903. During the following decade, the Katerina and Vandenberg, along with the neighboring Pala Chief mine, were the only major sources known for gem kunzite (Kunz, 1905b). The Sicklers are reported to have originally found colorless fragments of spodumene on the site of the White Queen mine around 1900, but were unable to identify the mineral. This material was found again when they began working the Katerina, and some specimens were ultimately sent to George Kunz, a gemologist with Tiffany and Company in New York, for identification. It was this material that Kunz identified as the lilac-colored gem variety of spodumene and that was later named in his honor (Sinkankas, 1959).

Between 1903 and 1912 the Sicklers, Hiriart, and Peilitch worked the Vandenberg, Katerina, and several other nearby mines and are reported to have produced a fair amount of kunzite and beryl (Sinkankas, 1959). Full-time mining came to a halt in 1912 with the collapse of the tourmaline market. Most work since that time was done by "unofficial" visitors until several of the mines, including the Vandenberg, Katerina, and White Queen properties, were purchased by George Ashley in 1948. During the 1950's, Ashley successfully worked both the Katerina and the nearby Vandenberg mine for kunzite and is said to have found one pocket in particular which produced enough gem material to support his rather modest lifestyle for many years. One often-repeated story

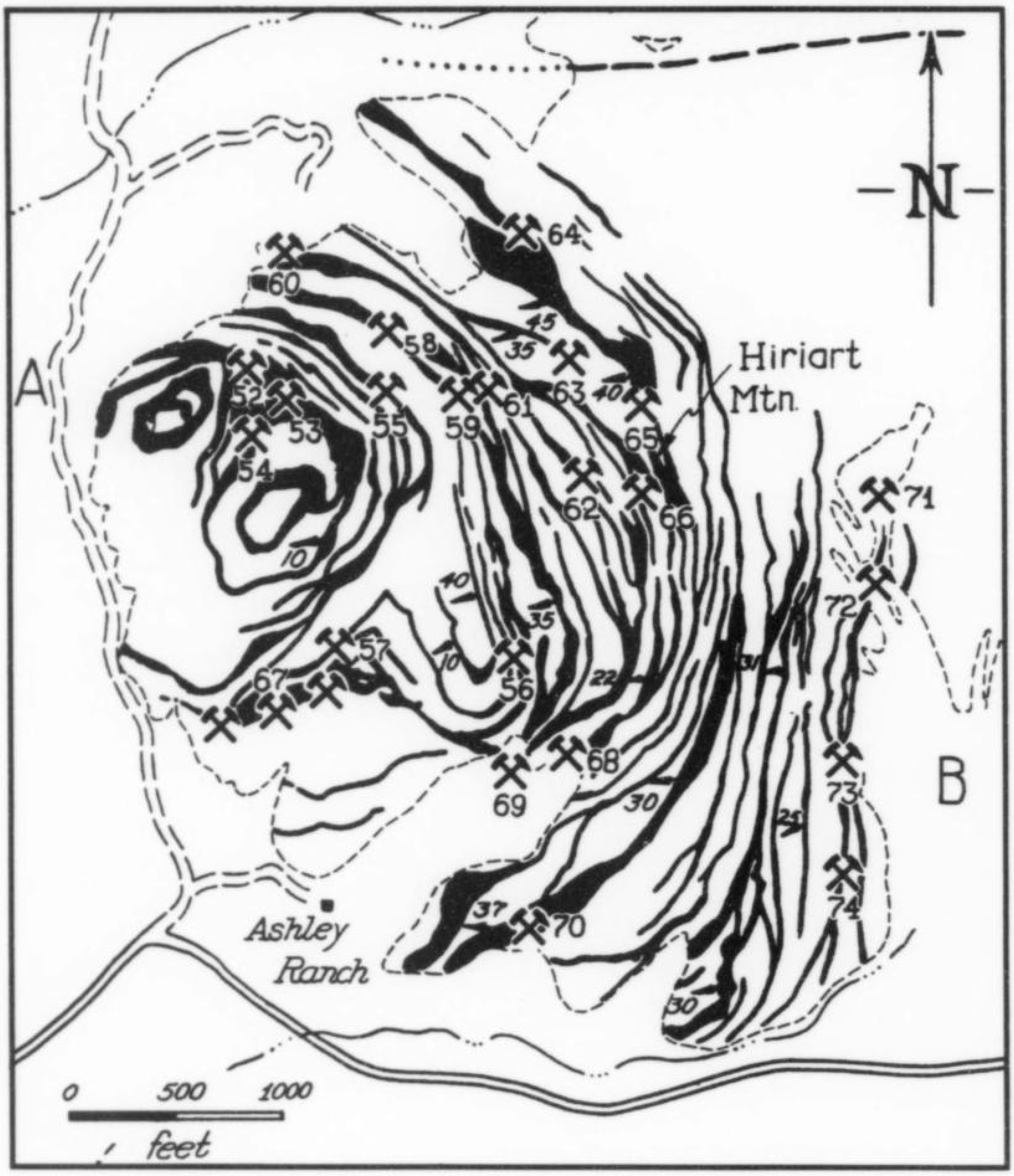
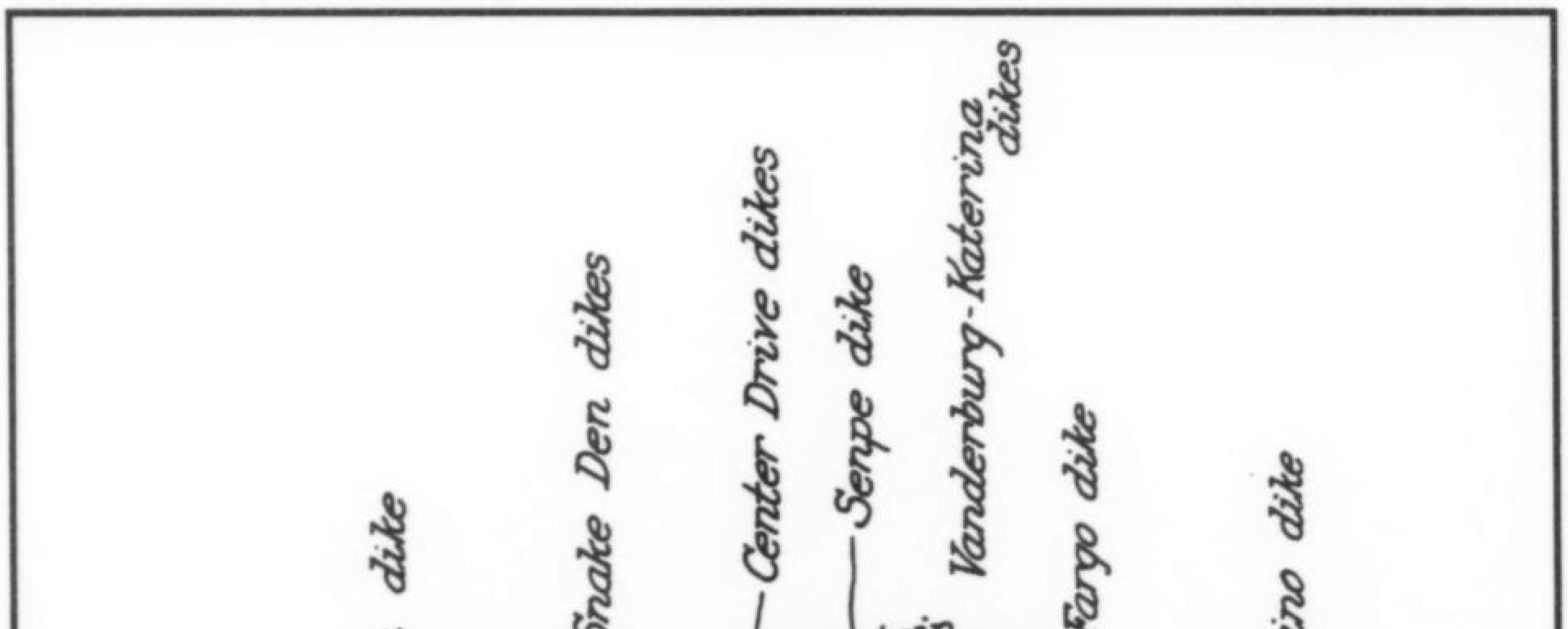


Figure 36. **Map of pegmatite bodies and mines on Hiriart Mountain, Pala district (adapted from Jahns and Wright, 1951). [52] Chapparal, [53] Anita, [54] Spar Cut, [55] Snake Den, [56] Center Drive, [57] Upper Katerina, [58] Senpe, [59] El Lobo, [60] Pluto, [61] White King, [62] White Queen, [63] Spar Pocket, [64] San Pedro, [65] Buttercup, [66] Vandenberg, [67] Katerina, [68] Hiriart, [69] Hiriart, [70] Fargo, [71] Canyon, [72] Naylor, [73] Tizmo, [74] El Milono.**



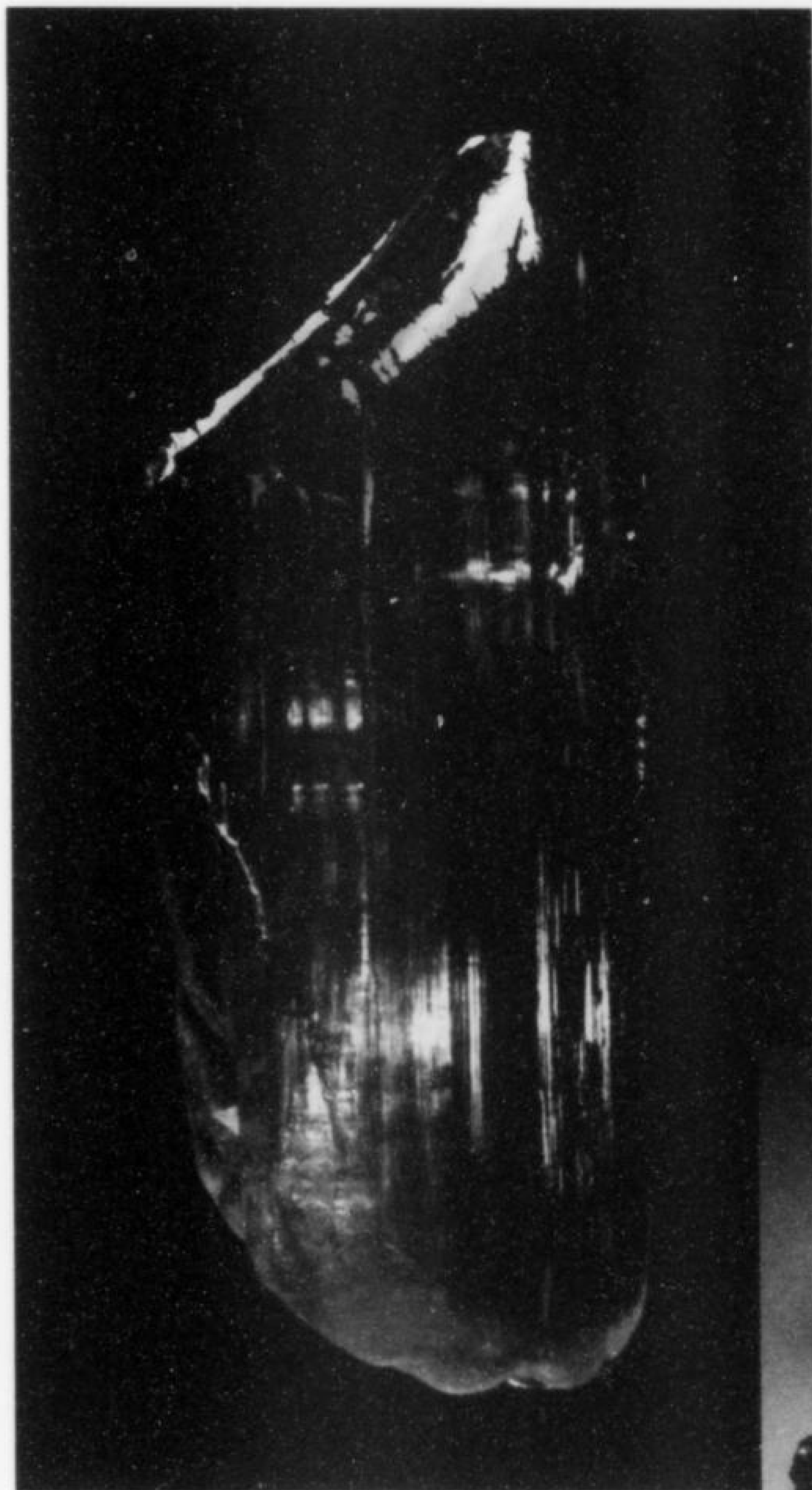


Figure 37. **Spodumene (var. kunzite), 14 cm, from the Vandenberg mine. Roebling collection, Smithsonian Institution; Wendell Wilson photo.**

has it that Ashley purchased the mines from Fred Sickler with funds generated through the sale of kunzite he had "unofficially" collected there prior to the purchase.

Ashley sold both mines in the late 1950's and only occasional mining has been accomplished at either mine since. The Vandenberg was purchased and briefly worked in the early 1970's by Norm Dawson, who produced around 12 kg of high-quality kunzite, along with some morganite and large smoky quartz crystals (Sinkankas, 1976). The mining claim on the Vandenberg property was recently ruled invalid by the Bureau of Land Management (BLM) and possession of the mine has now reverted to the Pala Indian tribe.

Serious attempts to work the Katerina began again when the current operators, Otto Komarek and Byron Weege, became partners in the mine during the late 1980's. Komarek and Weege began work on the property in 1990, quickly finding pockets containing numerous large "cathedral" habit quartz crystals, many colored blue by the inclusion of micro-tourmaline needles, as well as some pale pink morganite specimens. A subsequent dispute with the Pala Indian tribe over the validity of the mining claim forced a halt to mining for several years while the status of the claim was under review by the BLM. During this process Komarek and Weege were allowed to resume mining for a short time in order to make a "discovery" which would establish the mine's economic viability. They found a pocket containing numerous morganite specimens, most on a matrix of cleavelandite and quartz, along with a modest amount of kunzite. In late 1997, the BLM ruled in favor of the mine owners and work on the claim has recently resumed. In November of 1998, a small find of kunzite was made in the area of the dike worked by Ashley during the 1950's (Fisher, 1999).

White Queen Mine

The White Queen mine is located uphill from the Katerina mine, just below the summit on the south side of Hiriart Mountain. Although the White Queen was the site of the original discovery of kunzite by Fred Sickler around 1900 (see Conklin, 1988), very little mining took place on the property until the late 1950's. The mine was among the properties purchased from Sickler by George Ashley in 1947, but he sold it the next year to Norm Dawson without having done any work there. Dawson did not begin work at the mine until 1959. After tunneling for approximately 25 feet (7.5 meters) along the pegmatite he encountered a pocket that, once excavated, was large enough that ". . . a grown man could stand within it and observe numerous quartz crystals of large size descending from the ceiling" (Sinkankas, 1976). This pocket produced numerous fine specimens of morganite and much gem rough, along with many large, seemingly opaque quartz crystals. When sawn length-wise and polished, these quartz crystals re-

Figure 38. **Spodumene (var. kunzite) crystal fragments to 9.5 cm, from the White Queen mine; some of the original specimens received by Prof. Charles Baskerville from George F. Kunz in 1903, and used as the basis for naming the lilac-colored variety "kunzite." Lawrence H. Conklin specimens; Wendell Wilson photo.**

vealed very intricate and attractive inclusions of pink and tan montmorillionite clay. Sinkankas (1976) states that this pocket produced an estimated 5600 kg of quartz crystals and 80–120 kg of morganite. Other minerals found included dark blue fibrous tourmaline, columbite-tantalite group minerals, phosphates including apatite crystals and massive lithiophilite and amblygonite, and very attractive clusters of albite (var. cleavelandite). Several smaller pockets of similar composition were found during the mid- to late-1960's. In 1973 another large pocket was found which yielded approximately 6000 kg of quartz crystals and 30 kg of morganite.

Little subsequent work was done at the White Queen until 1990 when Dawson's sons Bob and Ken, along with several other partners, began a new tunnel on the pegmatite. In early September of that year, they encountered a pocket measuring approximately

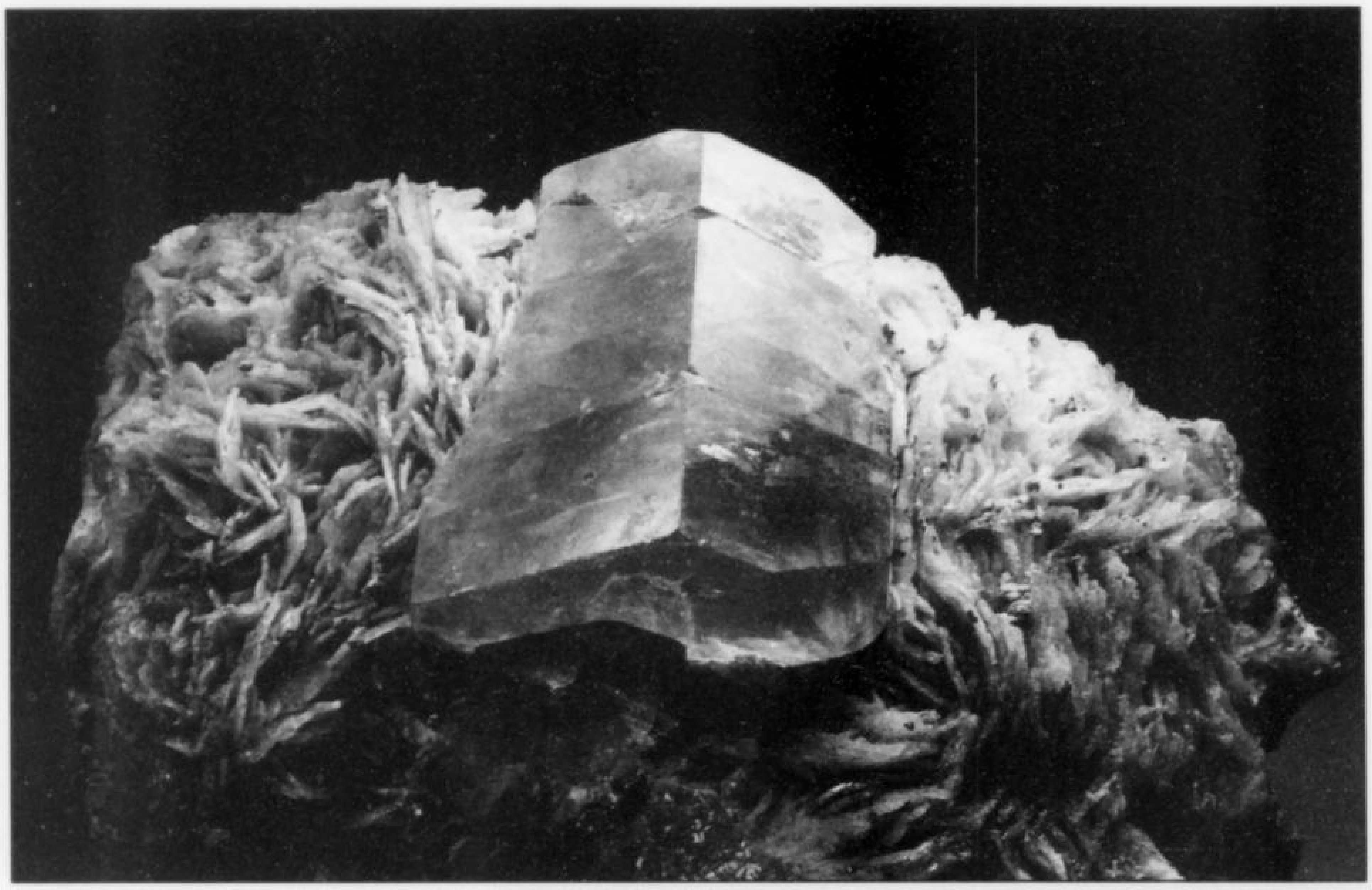


Figure 39. **Beryl (var. morganite), 7.7-cm crystal on albite, found at the White Queen mine in 1989. Bill Todzia specimen; Wendell Wilson photo.**

Figure 40. **Beryl (var. morganite), 4.5 cm (the large crystal), found at the White Queen mine in 1989. Bill Todzia specimen; Wendell Wilson photo.**

Figure 41. **Pink beryl (var. morganite) crystal, 4.3 cm high on albite (var. cleavelandite), from the White Queen mine, Pala district. Bob Dawson collection; Jeff Scovil photo.**

2.5 meters across, which produced nearly 200 well-formed specimens of morganite. Most crystals are highly lustrous and up to 8 cm in size; many are on a cleavelandite matrix (Foord *et al.*, 1991). Specimens from this pocket are widely regarded as being among the finest ever produced by the mine. When first removed from the mine, most morganite crystals were a peach to salmon-pink color. However, this color changes rapidly to a pure pink on exposure to direct sunlight, and many specimens have since undergone this color change.

Shortly after this find, a dispute arose with the Pala Indian tribe over the validity of the mining claim. The BLM subsequently ruled the claim invalid and ownership has reverted to the tribe. Several parties have recently attempted to lease the claim from the tribe, but to date no agreements have been reached.

Foitite is a recently described member of the tourmaline group (MacDonald *et al.*, 1993), the type specimens of which were found in an old collection, labeled only as having come from "Southern California," so the actual type locality is currently unknown;

Figure 42. **Chief Mountain. Brendan Laurs photo.**

however, foitite has since been identified from material collected at the White Queen mine. The foitite from the White Queen is similar in appearance to much of the tourmaline found in other nearby mines, but no studies have yet been published on how widespread foitite might be in the pegmatites of Hiriart Mountain.

San Pedro Mine

The San Pedro mine is located on the northern flank of Hiriart Mountain and, along with the nearby Anita and Senpe mines, comprises the northernmost of the group of claims originally discovered by the Sicklers around 1903. Kunz (1905b) reports that some kunzite, beryl, and tourmaline were produced from the San Pedro claim at the time, but gives no further details. The San Pedro, Anita, and Senpe (along with the other claims of the Sickler group) were purchased from Fred Sickler by George Ashley in 1947. Ashley appears not to have done any work on these claims, and sold them almost immediately to Charlie Reynolds. Reynolds began work on the San Pedro and in 1951 encountered a large pocket which produced approximately 300 pounds of spodumene of various colors, including pink, colorless, and pale green (Sinkankas, 1957). Reynolds continued to work the mine through the 1950's with varying degrees of success. The claim was sold in the early 1960's and little appears to have been done there since. The San Pedro, Senpe and Anita claims were recently ruled invalid by the Bureau of Land Management (BLM) and have now reverted to the Pala Indian tribe.

Pala Chief Mine

The Pala Chief mine is a patented claim that works a complex, braided system of pegmatite dikes located on the northwest side of

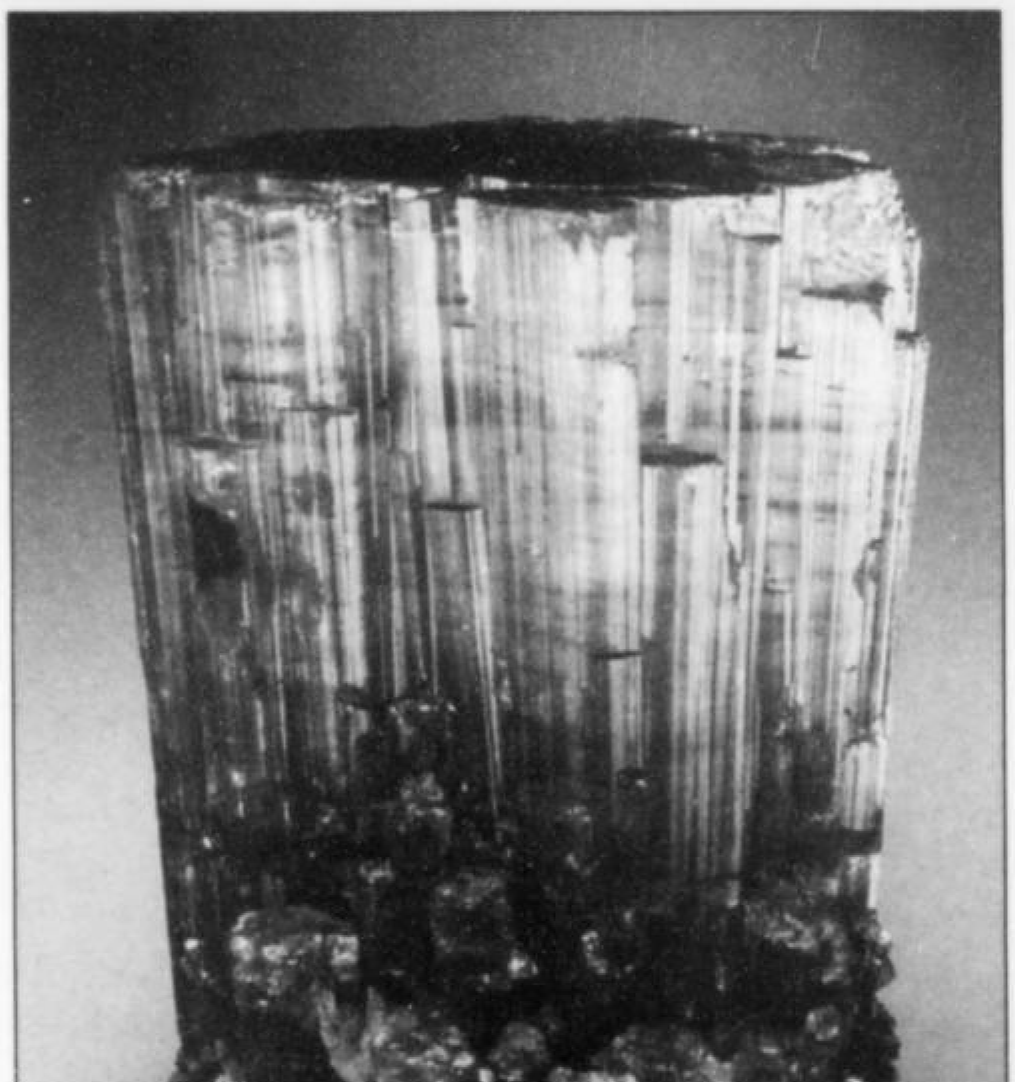


Figure 43. **Elbaite, 16.3 cm high, from the Pala Chief mine, Pala district. Los Angeles County Museum of Natural History collection; Jeff Scovil photo.**

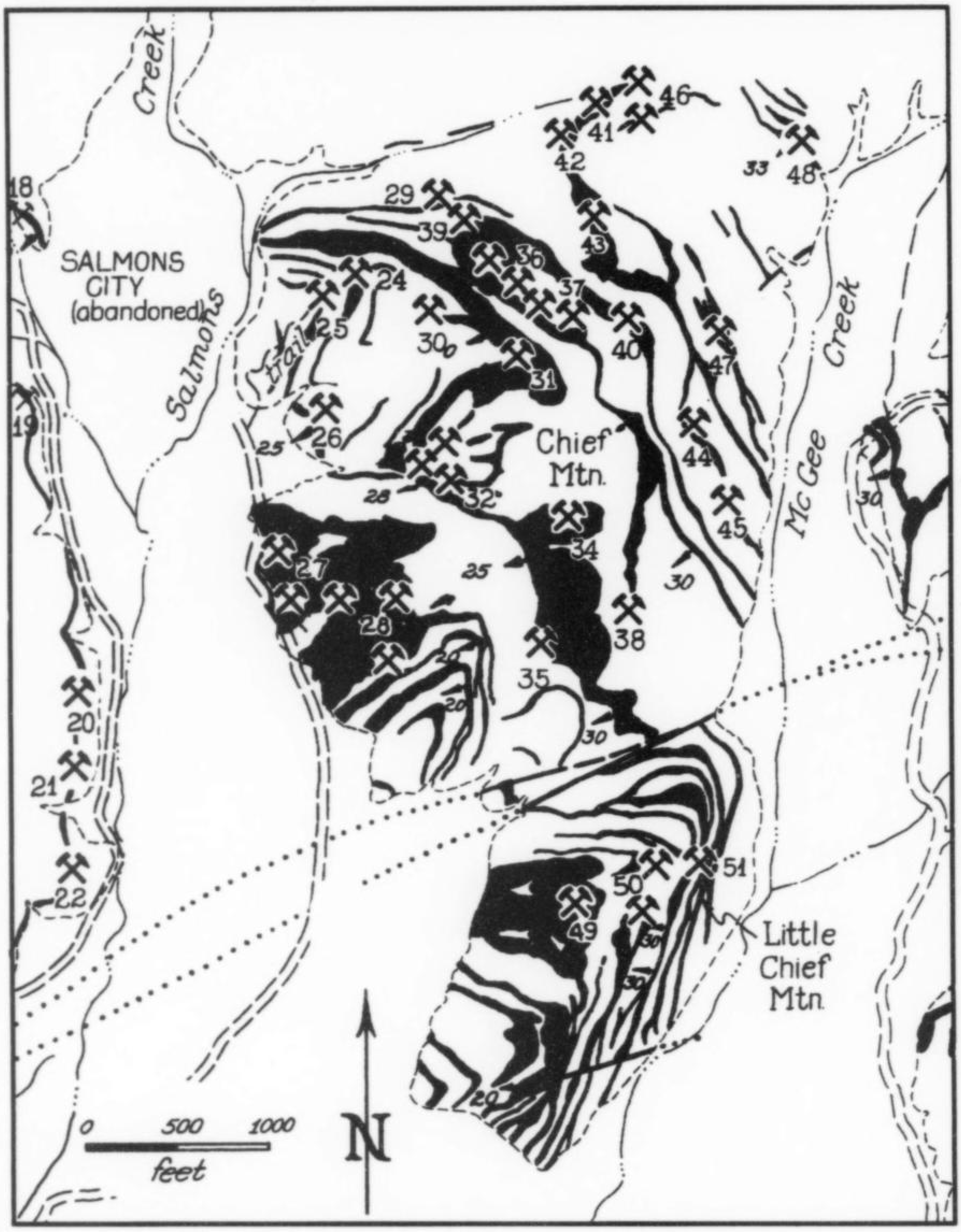


Figure 44. **Map of the pegmatite bodies and mines on Chief Mountain and Little Chief Mountain, Pala district (adapted from Jahns and Wright, 1951). [24] Upper Salmons View, [25] Lower Salmons View, [26] Redlands King, [27] Lower Blanket, [28] Upper Blanket, [29] Elizabeth R, [30] Canyon King, [31] West Knickerbocker, [32] Margarita, [33] Crystal King, [34] Olla, [35] Butterfly, [36] Chief Extension, [37] Pala Chief, [38] Verdant View, [39] Chief Ridge, [40] East Knickerbocker, [41] Meadow, [42] Poison Oak, [43] Ocean View, [44] Redwing, [45] Jackpot, [46] North End, [47] Goddess, [48] Snipe, [49] Big Slope, [50] Little Chief, [51] Cliff.**

Chief Mountain, in the center of the Pala district. The mine was opened in 1903 by Frank Salmons, John Gibbons, Bernardo Hiriart, and Pedro Peiletch, and was for the next ten years the world's foremost source of gem spodumene. While the lilac-colored gem variety of spodumene now known as kunzite was first discovered in the pegmatites of neighboring Hiriart Mountain, the Pala Chief mine surpassed all others with respect to the quality and quantity of kunzite it produced. Kunzite crystals from the Pala Chief mine tended to be, on average, larger and of better color than those found elsewhere in Southern California. Stones cut from Pala Chief kunzite found a ready market through Tiffany and Company of New York. Kunzite crystals from the Pala Chief mine are almost always twinned on {100} and can be distinguished from those from the mines on Hiriart Mountain, which are usually untwinned.

The Pala Chief mine has also produced some very attractive specimens of elbaite. This occurrence of both gem tourmaline and spodumene in the same pegmatite is unusual, as the two have not been found together in any quantity elsewhere in Southern California. Elbaite from the Pala Chief mine occurs in a wide range of colors, but shades of pink and red are the most common. Individual crystals can be quite large and excellent specimens can be seen in the American Museum of Natural History in New York City, the Los Angeles County Museum of Natural History, and the British Museum of Natural History in London.

The mine is reported to have been the source of numerous other minerals as well. Along with gem spodumene and tourmaline, Jahns and Wright (1951) list quartz, perthitic microcline, albite, beryl (morganite and aquamarine), bavenite, bertrandite, numerous bismuth-containing minerals including native bismuth, bismuthinite, bismutite, and bismite, and numerous phosphates including lithiophilite, triphylite, sicklerite, purpurite, heterosite, stewartite, and hureaulite.

The pegmatite was heavily worked during the early part of its history, leaving a complex maze of tunnels on the dike. More recent attempts to reopen the mine were made by various parties in 1959, 1966 and 1976. Only limited amounts of kunzite and other minerals were found, and all efforts were short-lived.

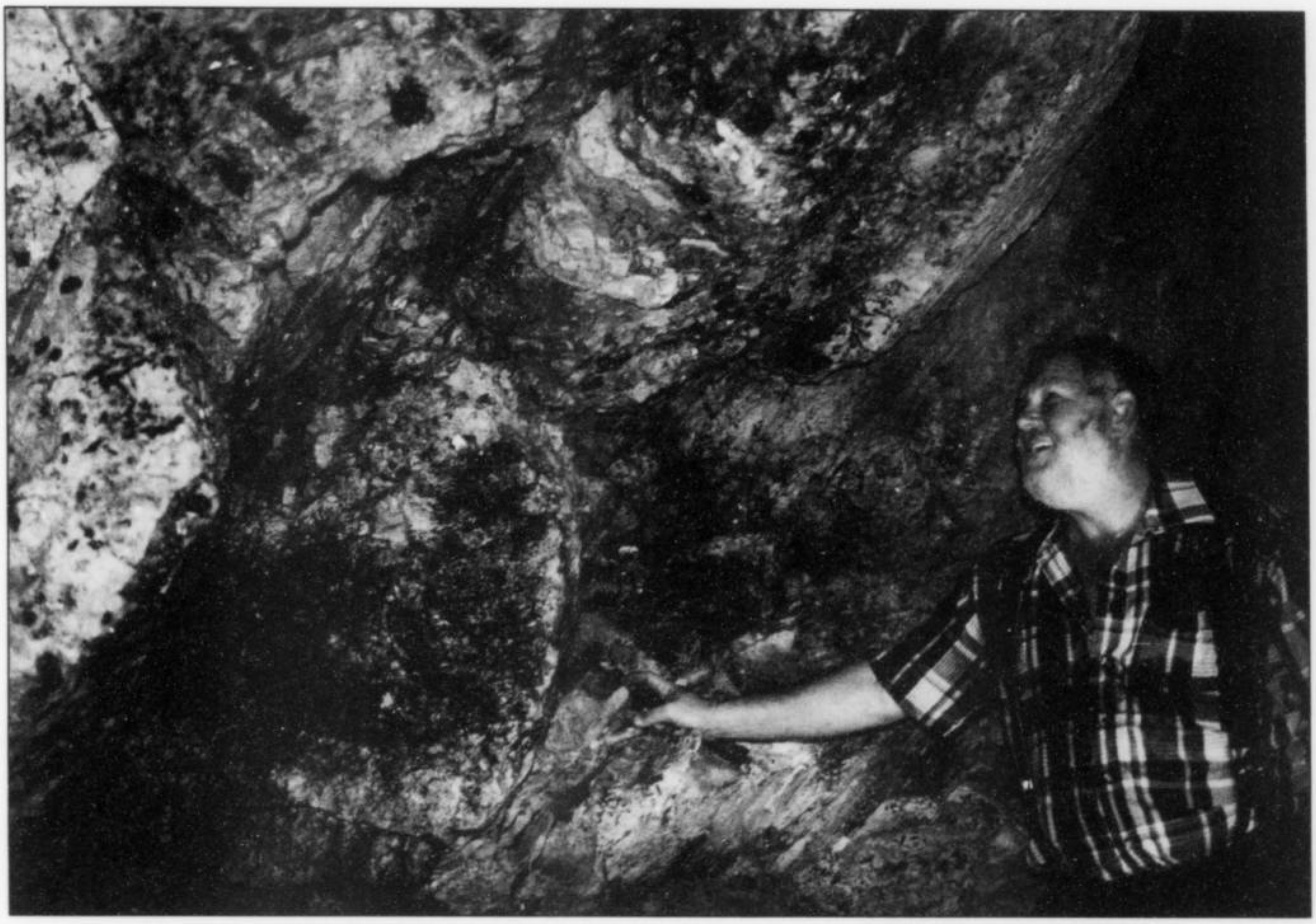


Figure 45. **Bob Dawson examining the remains of a recently mined pocket at the Pala Chief mine. Brendan Laurs photo.**

The Pala Chief is currently owned by Bob Dawson of Temecula, California, who purchased it in the early 1990's. Dawson has recently (October 2000) improved the access road and extended one of the short tunnels which, after a distance of only 3 meters, encountered a 30 x 50 x 100-cm gem pocket which yielded several pieces of lustrous kunzite to 10.7 cm and five attractive, well-formed crystals of pink elbaite with flat, pale blue-gray caps. The tourmaline crystals are stout prisms measuring from 6.1 to 8.4 cm in length. Continued mining has uncovered additional small pockets containing pink to blue-gray tourmaline (Laurs, 2001).

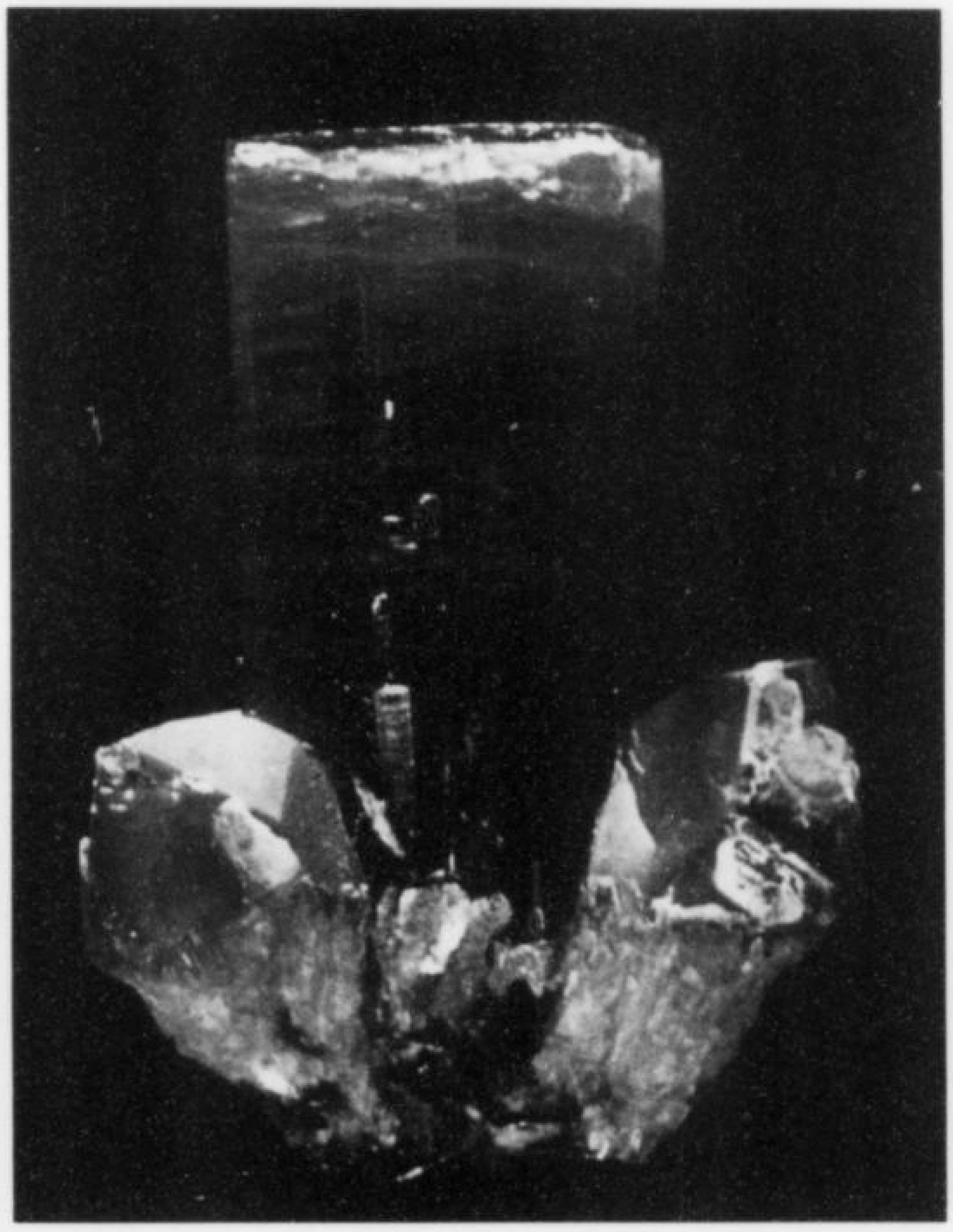


Figure 47. **Elbaite crystal with quartz, 6 cm, from the Pala Chief mine. Bill Larson collection.**

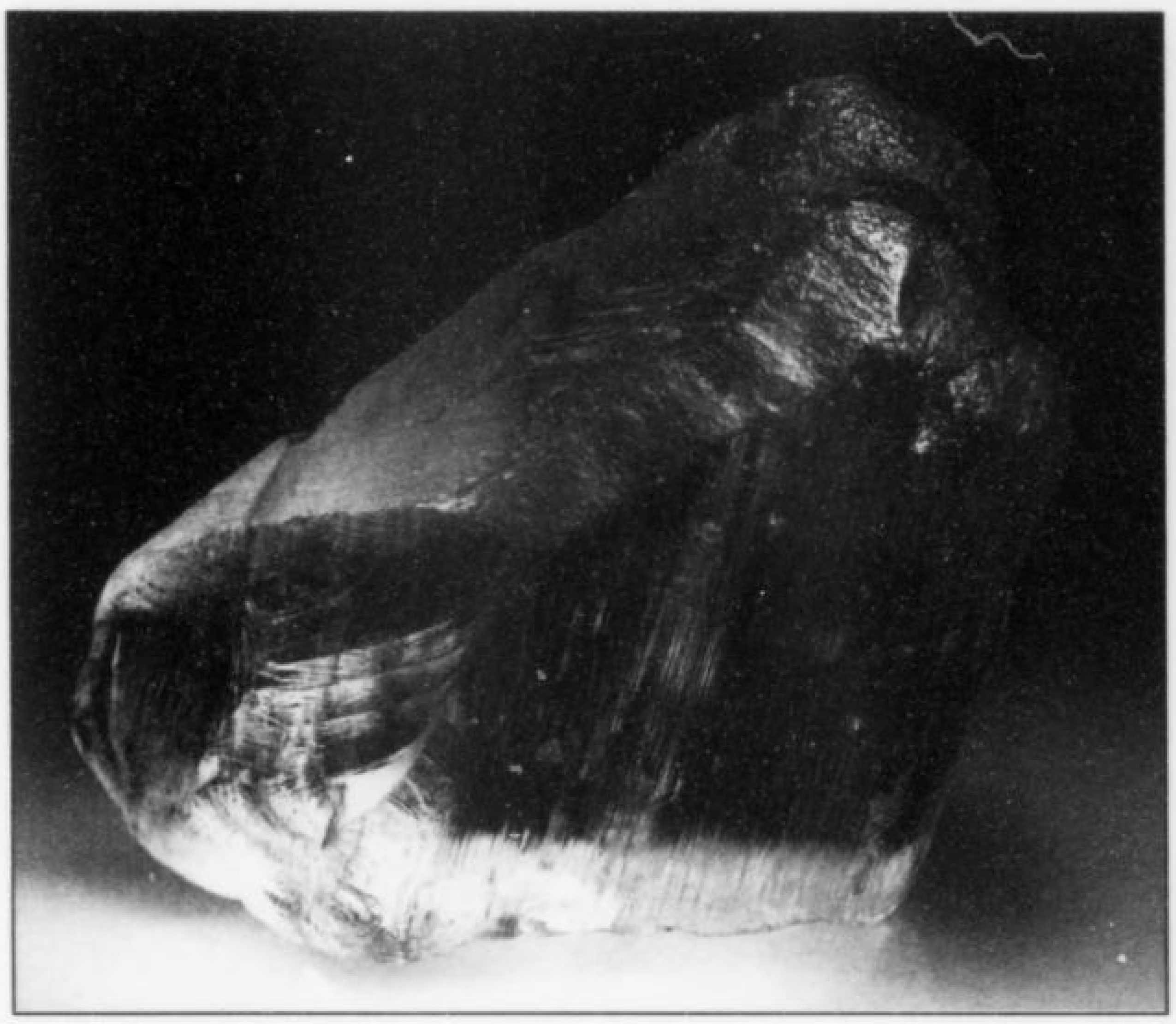


Figure 46. **Spodumene (var. kunzite), 7.3 cm, from the Pala Chief mine. Gene Schlepp specimen; Wendell Wilson photo.**

Figure 48. **The new Elizabeth R mine (at bottom) and the Ocean View mine (top). Brendan Laurs photo.**

Figure 49. **Pink beryl (var. morganite), 11.9 cm, from the Elizabeth R mine. Los Angeles County Museum of Natural History collection; Jeff Scovil photo.**

Elizabeth R Mine

The Elizabeth R mine is a patented claim on a pegmatite dike located on the north side of Chief Mountain, not far from the Pala Chief mine. The mine is on the site of the former Ocean View and Hazel W prospects, which were first claimed around 1903, but there is no record of any production dating from that period (Weber, 1963). In 1973–1974 these claims were purchased by local miner and collector Roland Reed, who single-handedly drove more than 300 meters of tunnel (Sinkankas, 1997). In 1974–1975 and again in 1982 he discovered a major morganite-containing pocket. According to Foord *et al.* (1991) approximately 100 kg of morganite specimens were recovered, with individual crystals ranging up to 13 cm across. Reed renamed the Hazel W property the Elizabeth R in 1980. In September of 2000 Reed sold the original Ocean View mine to a group headed by Jeff Swanger and Stephen Koonce, Jr. of Escondido, California.

Another find was made in 1992, which produced what may be, according to Sinkankas (1997), the finest morganite specimen ever found in Southern California. This specimen consists of a large plate of cleavelandite, approximately 50 cm across, with seven large (up to 15 cm) morganite crystals, plus numerous smaller ones scattered about one side of the plate. The morganite crystals are lustrous and well formed, and have pale aquamarine cores. This specimen was recently sold by Reed and is now in a private collection. Overall, however, morganite-containing pockets have been rare at the Elizabeth R, and the majority of pockets encountered have produced only quartz and feldspar. Some of the quartz specimens recovered have been huge, however, weighing in excess of 100 kg.

The core zone of the pegmatite is very rich in spodumene, with large lath-shaped crystals penetrating the quartz core in a jackstraw fashion. Unlike at the nearby Pala Chief, however, all the spodumene in the Elizabeth R pegmatite appears to have been thoroughly altered to montmorillonite, and no kunzite or other gem

spodumene has been recovered from the mine. According to Foord *et al.* (1991), minerals found in pockets in the pegmatite include quartz, perthitic microcline, cleavelandite, muscovite, tourmaline (schorl), beryl, columbite, and apatite. Numerous other phosphates also occur in the pegmatite as alteration products of primary lithiophilite. These include sicklerite, purpurite, hureaulite, phosphosiderite, strengite, stewartite, eosphorite, robertsite, mitridatite, jahnsite, fairfieldite, hopeite, and pseudomalachite. Sinkankas (1997) also reports the presence of bismuth-containing minerals including clinobisvanite, namibite, and beyerite.

In July of 2000 Reed started a new tunnel extending down-dip on the Elizabeth R property, and four months later intersected a mineralized quartz-spodumene core zone containing several small vugs which have yielded attractive elbaite—pink, blue, and bicolored pink/bluish green—plus kunzite. Interestingly, this zone is completely unlike the beryl-bearing zone previously exploited on the property; it more closely resembles the zones of tourmaline mineralization at the Tourmaline Queen and Pala Chief mines (Laurs, 2001).

Rincon District

Mack, Clark and Victor Mines

The Rincon pegmatite district is located approximately 17 km southeast of the Pala district in the Pauma Valley of north-central San Diego County. The district encompasses numerous individual pegmatite dikes, most of which are mineralogically simple. A few pegmatites show enrichment in rare elements such as lithium,

Figure 50. Roland Reed examining a pocket zone in the new Elizabeth R mine. Brendan Laurs photo.

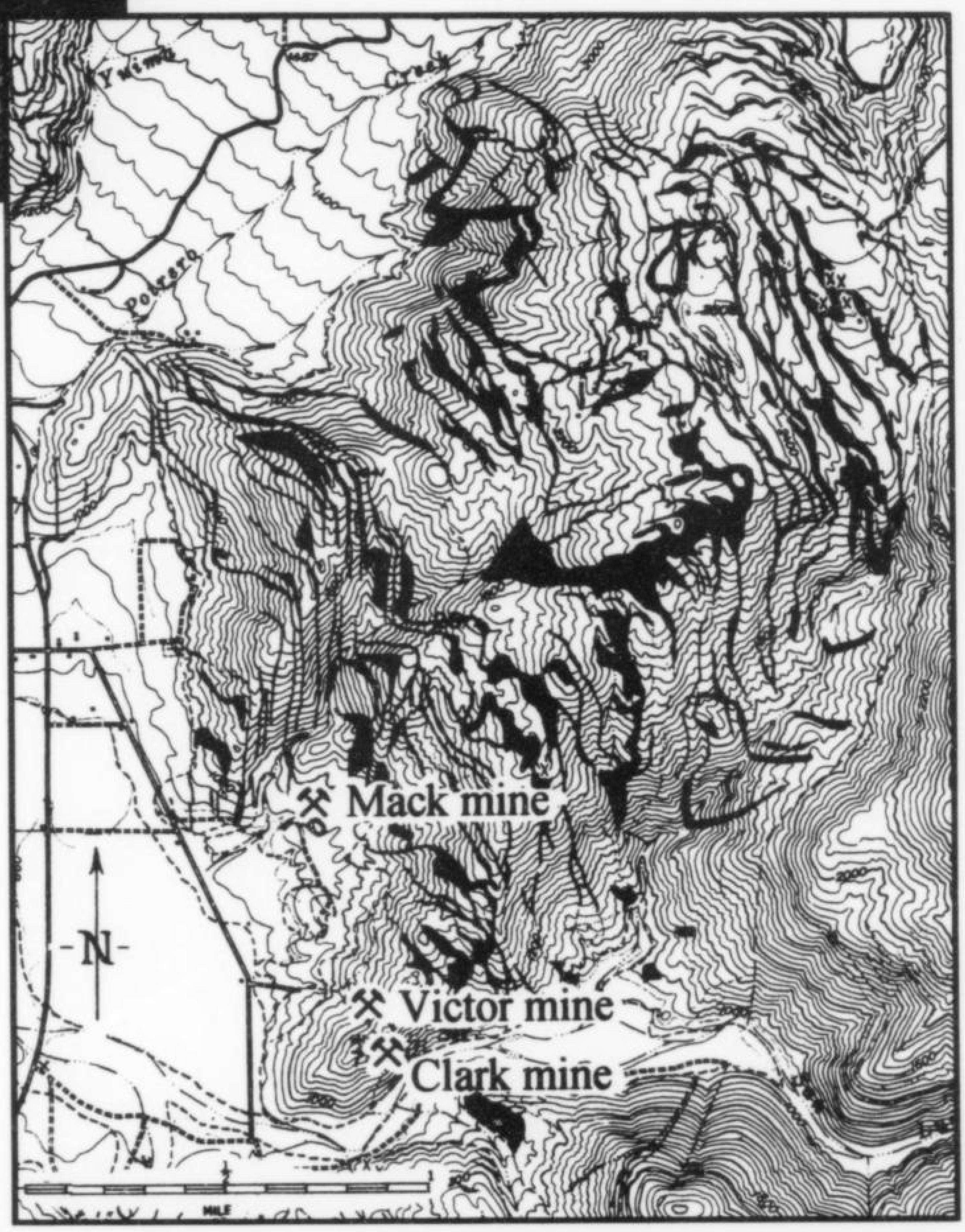


Figure 51. Pegmatite veins and mines in the Rincon district (adapted from Weber, 1963).

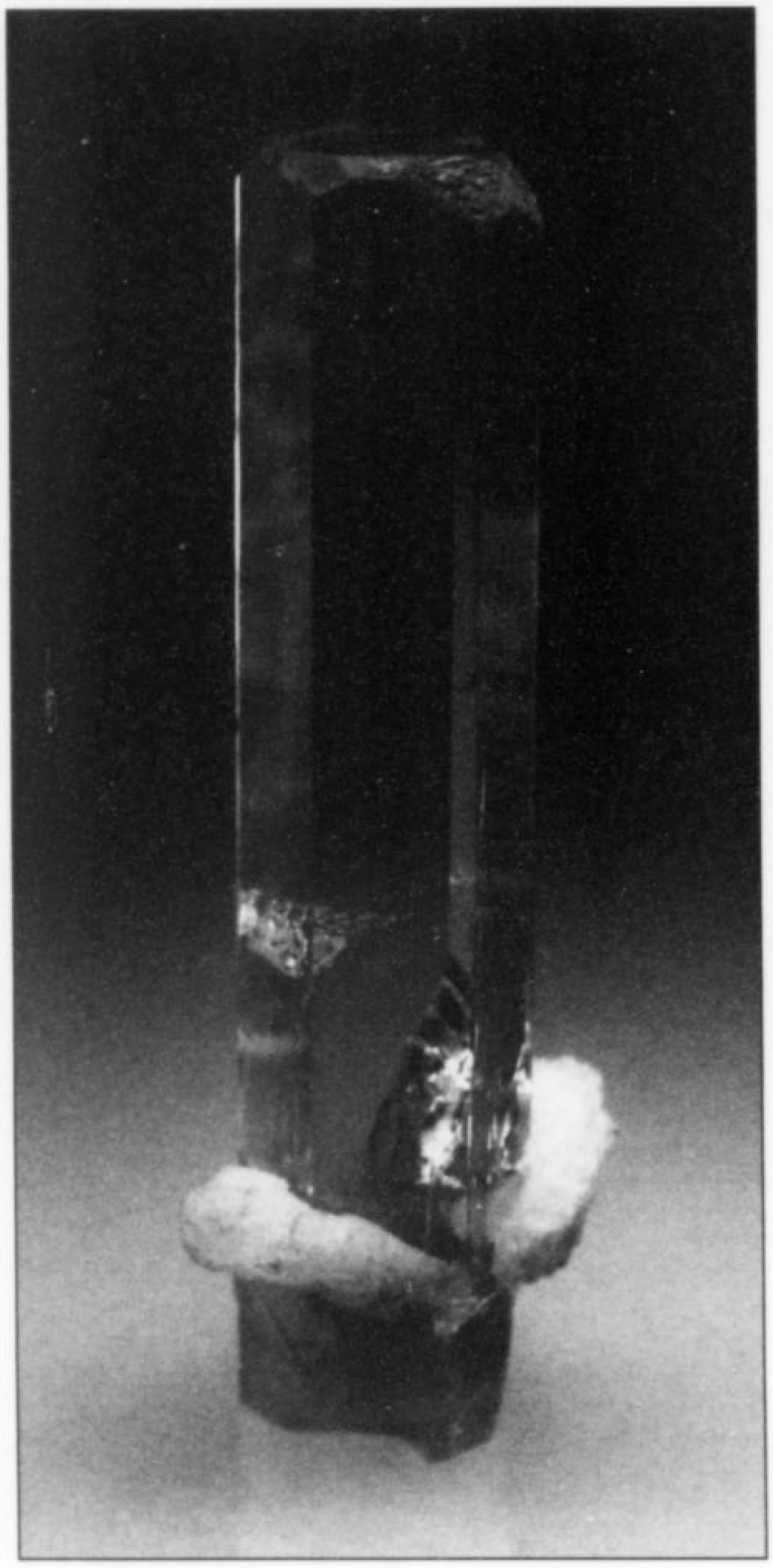


Figure 52. **Beryl (var. aquamarine), 4.1 cm high, from the Mack mine, Rincon district. Bill Larson collection; Jeff Scovil photo.**

beryllium, and boron and have produced small amounts of gem and specimen materials in the past (Hanley, 1951).

The best-known mines in the Rincon district are the Mack, Clark, and Victor mines, all of which were originally developed by John Mack between 1903 and 1910. None of these mines proved productive enough to sustain commercial development and, with the exception of some excavations at the Clark mine during World War II for radio-grade quartz, the properties have only occasionally been worked by amateur collectors since 1910.

The Mack mine is best known for producing small amounts of gemmy, pale blue to bluish green, prismatic crystals of aquamarine. The Clark mine has produced, in addition to quartz, small quantities of gem morganite (Sinkankas, 1959). The Victor mine is the only pegmatite in the Rincon district that has yielded any gem-quality colored tourmaline. The mine is best known for producing gem-quality pencil-like crystals of blue to violet-colored elbaite, but pinks and greens have been found as well, along with a few aquamarine crystals.

During May of 1999, local property owner Brian Chuchua, with the assistance of Blue Sheppard, uncovered and collected a helvite-containing pocket on a pegmatite dike in the vicinity of the Clark mine. Well-formed, dark brown, tetrahedral helvite crystals, some over 2 cm on edge, occurred on a matrix of partially decomposed feldspar and quartz. Some specimens were heavily manganese stained, possibly by the decomposition of locally abundant primary phosphates such as lithiophilite. In all, several hundred specimens were collected from the pocket (B. Sheppard, personal communication, 1999). Much of the Rincon pegmatite district is on either Indian tribal land or private ranch land and, with the exception of the helvite find, very little mining has occurred in the district for many years.

Mesa Grande District

The Mesa Grande pegmatite district is located in north-central San Diego County, about 25 miles (40 km) southeast of the Pala district, near Henshaw reservoir. The district contains numerous pegmatites that are dispersed over a fairly wide area centered on Gem Hill (elev. 1305 m). Jahns and Hanley (1953) described a total of 26 mines and prospects that were known to have produced gem or specimen material during the earlier part of the 20th century. The Himalaya dike system has historically been the most productive pegmatite in the district, and in recent years the Himalaya mine has been the only active mine. The following description of the history and mineralogy of the Himalaya mine is abstracted from Fisher *et al.* (1998). The reader is also referred to Foord (1976, 1977) for more information.

Himalaya Mine

The Himalaya mine is the northernmost, and historically the most productive, of three mining properties which occupy a system of several roughly parallel, northwest-trending pegmatite dikes located on the north and east flanks of Gem Hill. Adjoining the Himalaya mine on the south is the San Diego mine, and to the south of that is the Mesa Grande mine. Since its discovery in 1898, the deposit has enjoyed intermittent production, depending largely on the economics of the gem and specimen market. During this time, however, the output of colored tourmaline (elbaite) from the Himalaya mine has been considerable and the mine has certainly been the largest producer of gem-quality and specimen-grade tourmaline in North America, and possibly the world.

The Himalaya dike system is a group of several relatively thin and remarkably continuous pegmatites that crop out along the east and north flanks of Gem Hill, dipping westward into the hillside. On the Himalaya property, the dike system consists of two major and several smaller, roughly parallel dikes that meet the surface on the southeast side of the property and curve around to the northwest across the northern flank of Gem Hill. Historic mining activities have obliterated most surface exposures of the dikes, but a total of four pegmatites are exposed along the length of the current mine access adit.

The two larger dikes each average between 30 and 100 cm thick and are referred to as the upper and lower dikes. Both are pocket-bearing and are about 12 to 15 meters apart on the Himalaya property, though they appear to converge southward and are seen in contact in the San Diego mine (Foord, 1976). In the Himalaya mine almost all of the current workings have been developed on the upper dike. Although the lower dike has seen some development in the San Diego mine, it has been largely ignored, at least during the most recent mining activities at the Himalaya, as it produces only dark green elbaite and not the more commercially desirable pink.

Because production records are incomplete, the total production from the mine is not known, but has been estimated at over 100 metric tons of elbaite and other specimen materials (Foord *et al.*, 1991). This is all the more remarkable considering that the main Himalaya dike is, on average, less than a meter thick. Besides its

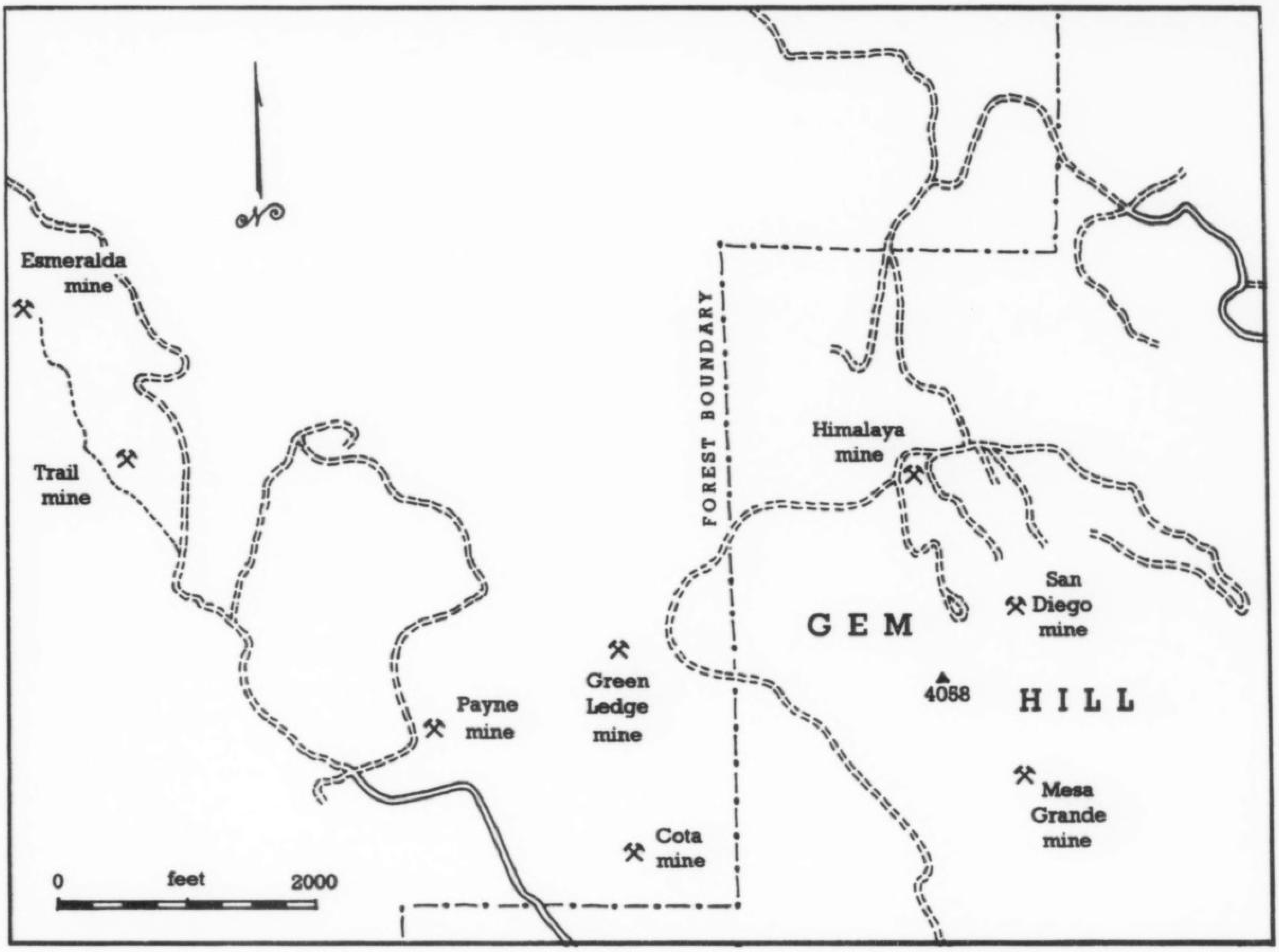


Figure 53. **Map of Mesa Grande district showing the locations of mines and prospects (adapted from Jahns and Hanley, 1953, base map USGS 7.5-minute *Mesa Grande* quadrangle).**

output of tourmaline, the mine has also produced well-crystallized specimens of numerous other pegmatite minerals, most notably perthitic microcline, colorless and smoky quartz, lepidolite, albite (var. cleavelandite), stibiotantalite, hambergite, apatite, beryl (morganite and goshenite), and stilbite. Compared to some other southern California pegmatites, such as those near Pala, the Himalaya dike system is depleted in phosphorous, resulting in a scarcity of phosphate minerals other than occasional apatite. The dike system is also devoid of any of the primary Li-Al silicates, e.g. spodumene (including kunzite), petalite or eucryptite, which are present elsewhere in the world in complex pegmatites of this type.

Though the Himalaya mine was officially claimed in 1898, Kunz (1905b) reports that local Indians had prior knowledge of the tourmaline and that crystals were even occasionally found in Indian graves in the area. A perhaps apocryphal story related by Kunz (1905b), Carnahan (1960) and again by Bancroft (1984) has it that tourmaline from the area first came to the attention of white settlers when someone noticed Indian children playing with colored tourmaline crystals in the nearby village of Mesa Grande.

Details of the early operation of the mine are sketchy, but it appears that both the Himalaya and San Diego mines were originally claimed by Gail Lewis around 1898; he accomplished a limited amount of work on the surface of both properties during the next few years (Weber, 1963; Foord, 1976). In 1902 the Himalaya property was acquired by J. L. Tannenbaum, apparently using the time-honored process of claim jumping. In the ensuing legal battles Tannenbaum was forced to pay Lewis $40,000 (a significant sum at the time) to clear the title, but was able to gain possession of the claim (Bancroft, 1984). Lewis retained and continued to work the adjoining San Diego mine.

Between 1902 and 1912 the Himalaya Mining Company, headed by Tannenbaum, produced considerable amounts of elbaite from the mine. Shigley *et al.* (1986) have estimated that during this period approximately 100,000 kg of tourmaline were produced by the Himalaya and San Diego mines, with a value at the time of more than $750,000. After the collapse of the local gem market, tourmaline prices remained depressed for several decades; between 1913 and the early 1950's mining activities on the Himalaya property were small-scale and sporadic.

In 1952 the Himalaya mine was acquired by Ralph Potter, who made the first attempts at systematic mining since 1912. Beginning in 1957, Potter rehabilitated several inclines on the southeast side of the property, as well as the old "Main Tunnel" which accessed the dike from the northwest. In addition, he drove several new tunnels from the northwest to reach portions of the dike below the Main Tunnel. Though no records were kept, Potter is reported to have found major pockets of elbaite in 1958 and 1963 (W. Larson, 1997, personal commmunication).

In 1963 Potter divided the property into ten shares, selling eight of them and retaining two for himself. The partnership, operating as the Himalaya Gem Mines, Inc., did a moderate amount of work, but with the collapse of the Main Tunnel portal during the wet

Figure 54. **Entrance to the "Old Main Tunnel" on the northwest side of the Himalaya mine, ca. 1910. Photo by D. B. Sterrett, USGS, courtesy of E. E. Foord.**

winter of 1968–1969 underground mining ceased entirely. Some surface work was done on the east side of Gem Hill in unmined portions of the dike system.

In 1977 Pala Properties International leased the property from the partnership (Eidahl, 1977), and later purchased it outright in 1988. Under the direction of mine manager John McLean, they began an aggressive mining program that resulted in the highest level of gem and specimen production since the Tannenbaum era. Work initially focused on reopening and expanding an incline, which followed the main dike down-dip on the southeast side of the property. Beginning in 1990, an entirely new adit was driven low on the southeast side of the property in order to reach the dike at a low level. After tunneling westward for approximately 670 feet, the main dike was intersected and mining proceeded up-dip on the dike, as well as along strike to the north and south, extending into the areas previously worked by Potter and Tannenbaum.

Tourmaline production from the mine was remarkably consistent during the 1980's and 1990's, but several exceptional pockets were encountered, including the "McLean Pocket" in 1983, the "President's Day Pocket" in 1989 (Jones, 1990), the "Green Pocket" in 1993, and "The Rainbow Pocket" in 1996 (Fisher *et al.,* 1998).

Over the years, the main Himalaya dike has been heavily worked; remaining blocks of potentially productive ground in the upper levels appear limited. It is estimated that during the last 20 years Pala International (a corporation owned by William Larson, formed upon the dissolution of his Pala Properties International partnership with Ed Swoboda) has driven over 8000 feet of tunnel, which yielded over 2.5 metric tons of tourmaline (W. Larson, 1997 personal communication). After being worked for almost two years without any significant new finds, the Himalaya mine was closed by Pala International in 1998 and the property was leased to new operators who, so far, appear to have had little success.

Feldspars and quartz are the most abundant minerals in the Himalaya dike system, and well-formed crystals are found in most pockets. The most common feldspars in the pocket zone are perthitic microcline, and albite (var. cleavelandite). Well-formed crystals of tan to gray microcline can range in size from less than 1 cm to over 30 cm and commonly show incipient to moderate corrosion, producing a "boxwork" texture on the surface of the crystals. Most microcline crystals are twinned and well-formed crystals displaying Baveno, Manebach, and Carlsbad twin laws can be found. Well-formed quartz crystals up to 10 cm are common in the pockets and are often associated with other minerals. The color is often a pale smoky shade, though the range is colorless to almost black (morion).

Muscovite is the most common of the mica group minerals in the Himalaya dike system and is found in all portions of the dikes. Within the pocket zone, muscovite crystals usually form wedge-shaped "books" up to 4 cm in size and may be silvery to a pale yellow-green. Lepidolite is confined largely to the core zone of the upper dike and appears to be largely absent in the lower dike. In the core zone, lepidolite occurs as large masses of fine-grained, purple crystals. In pockets, lepidolite often occurs as well-formed, barrel-shaped crystals up to 3 cm long on the surface of, or slightly embedded in, other pocket minerals such as quartz, feldspars and elbaite. Epitaxial overgrowths of lepidolite on muscovite are also common in some pockets.

Elbaite crystals from pockets in the upper Himalaya dike are usually trigonal and heavily striated on the prism faces, though

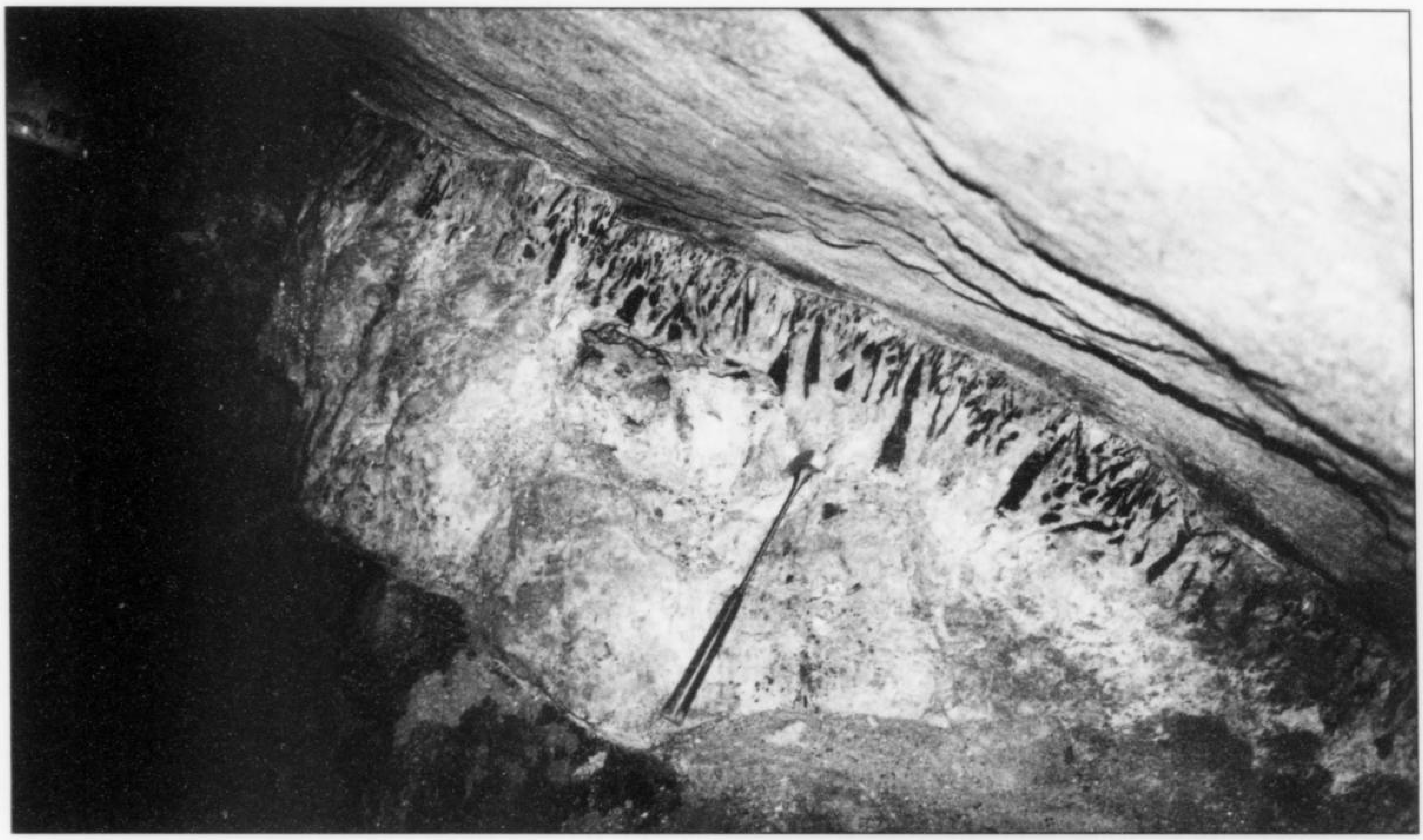


***Figure 55.* The main Himalaya pegmatite dike, exposed underground at the end of the main adit. Jesse Fisher photo.**

late-formed, pencil-sized gems are often smooth and hexagonal in cross section. Schorl is abundant in the intermediate zones of all dikes, but has not been found in pockets on the upper dike. Schorl crystals are, however, occasionally found in pockets on the lower dike. Crystals of elbaite found in the upper dike are almost always multi-colored. Various shades of pink and green are the most common in pocket-zone crystals from the upper dike and late-stage tourmaline overgrowths on crystals may be colorless, burgundy red, green, and/or blue-green. Reverse "watermelon" patterns (green interior, pink "rind") are common. Pink elbaite is rare in the lower dike and crystals from the pocket zone are usually dark green. Doubly terminated single crystals are common.

Beryl is relatively scarce in the Himalaya dike system. Frozen masses of both morganite and pale aquamarine have been observed in the intermediate zones of the upper dike, but pocket occurrences of beryl from the mine are uncommon. Highly etched and cavernous fragments of morganite are sometimes found in pockets. These fragments almost never show any crystal faces, but are usually quite gemmy and have a rich peach-pink color. Even scarcer are occasional well-formed, colorless crystals of goshenite beryl.

Fluorapatite is the only phosphate mineral of any abundance in the system, though Foord (1976) reports the rare occurrence of monazite and xenotime. Specimens of fluorapatite are occasionally found in pockets on both the upper and lower Himalaya dikes. Crystals are usually well-formed, simple hexagonal prisms up to 5 cm in length, and may be tabular or prismatic in habit. The color ranges from a pale pink to a deep wine-red; occasionally crystals are found that have a thin blue layer at the termination. The pink-red color is unstable, however, and will fade rapidly in sunlight to an unattractive grayish white.

Specimens of the stibiocolumbite-stibiotantalite series from the Himalaya mine are relatively scarce, but are among the finest

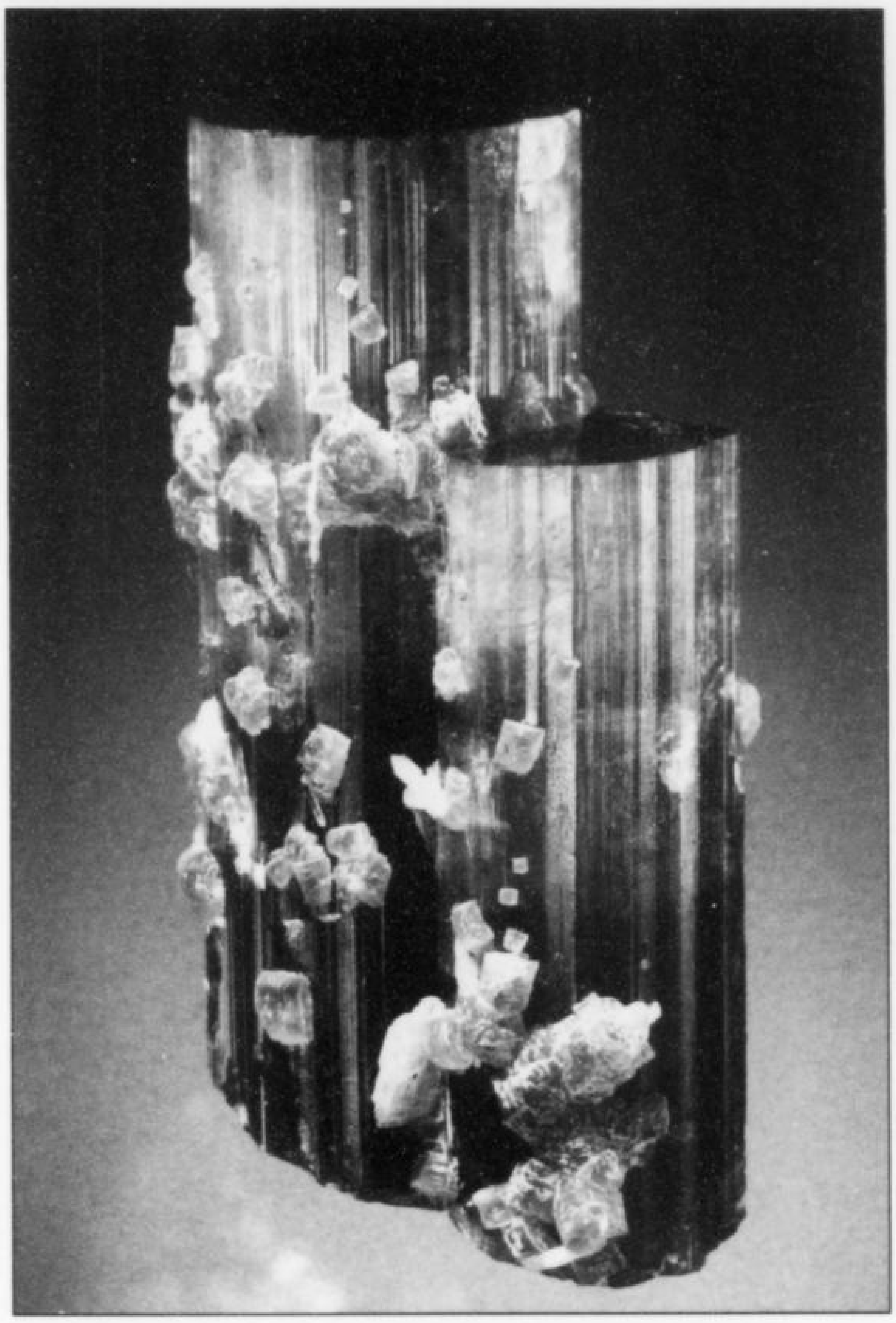


***Figure 56.* Bi-colored elbaite crystal with lepidolite, 8 cm, from the Himalaya mine. Pala International specimen; photo by Harold and Erica Van Pelt.**

Figure 57. **Elbaite crystal cluster with albite and lepidolite, 8.5 cm, from the Himalaya mine. Bill Larson collection; Wendell Wilson photo, 1987.**

Figure 58. **Elbaite on quartz, 13 cm tall, from the Himalaya mine. Los Angeles County Museum of Natural History collection; Jeff Scovil photo.**

Figure 59. Elbaite, 5.4 cm high, from the Himalaya mine. Specimen was recovered by Ralph Potter during the late 1950's. Jesse Fisher collection; Jeff Scovil photo.

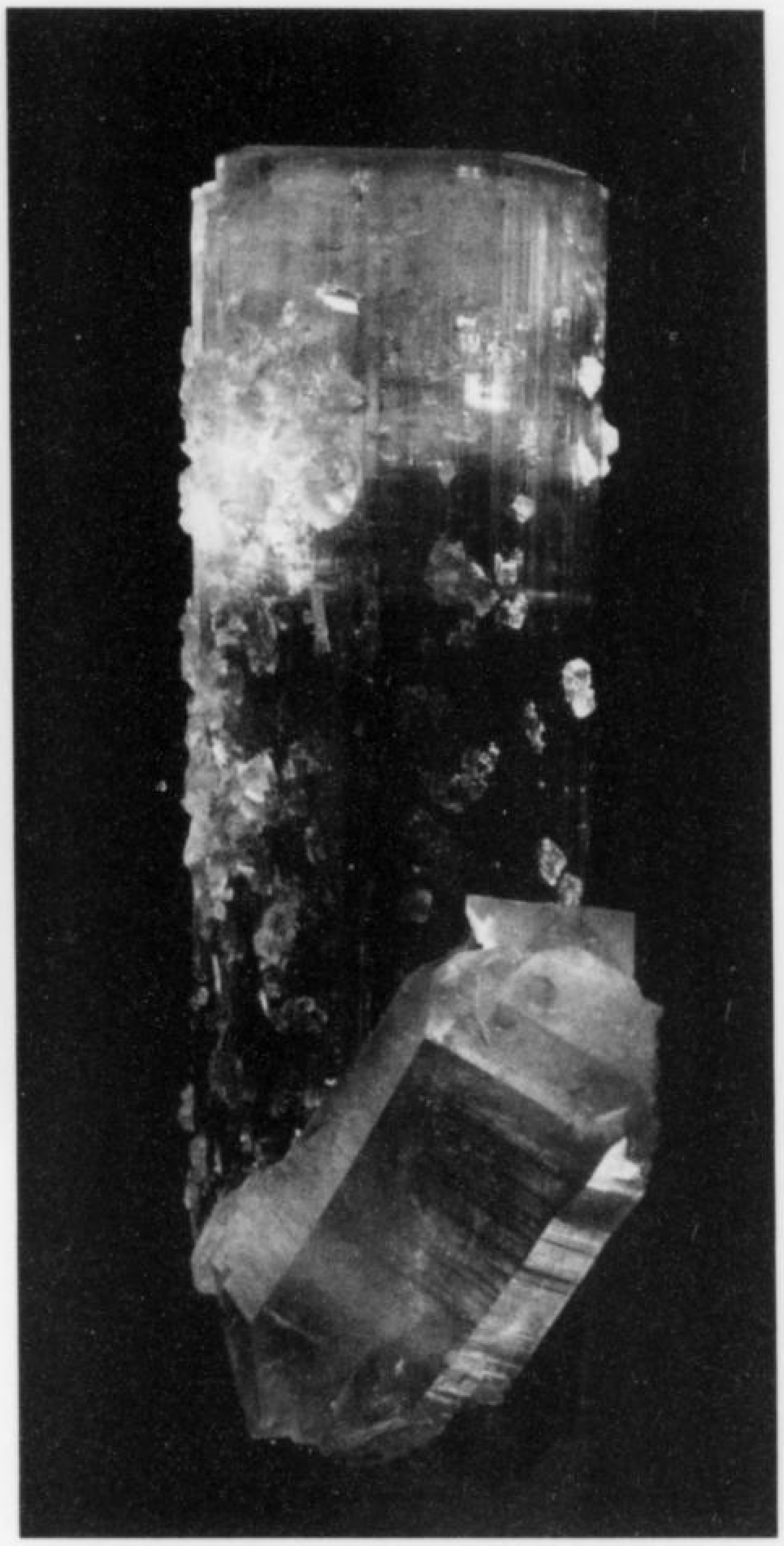


Figure 61. Elbaite and quartz, 9.2 cm high, from the Himalaya mine. Specimen was mined in September, 1995. Jesse Fisher collection; Jeff Scovil photo.

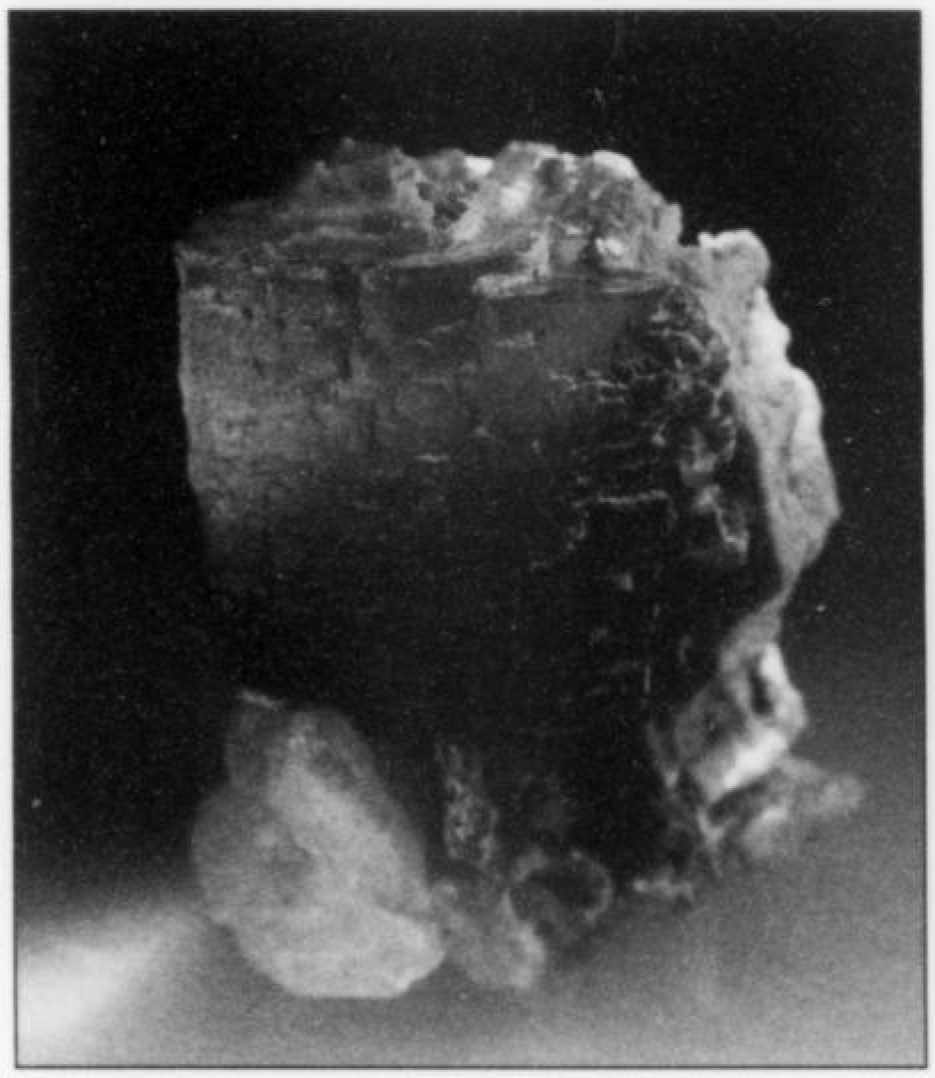


Figure 60. Lepidolite thumbnail crystal, 2.4 cm, from the Himalaya mine. Tim Sherburn collection; Wendell Wilson photo.

Figure 62. Stibiotantalite crystals on lepidolite, 2.4 cm, from the Himalaya mine. Tim Sherburn collection; Wendell Wilson photo.

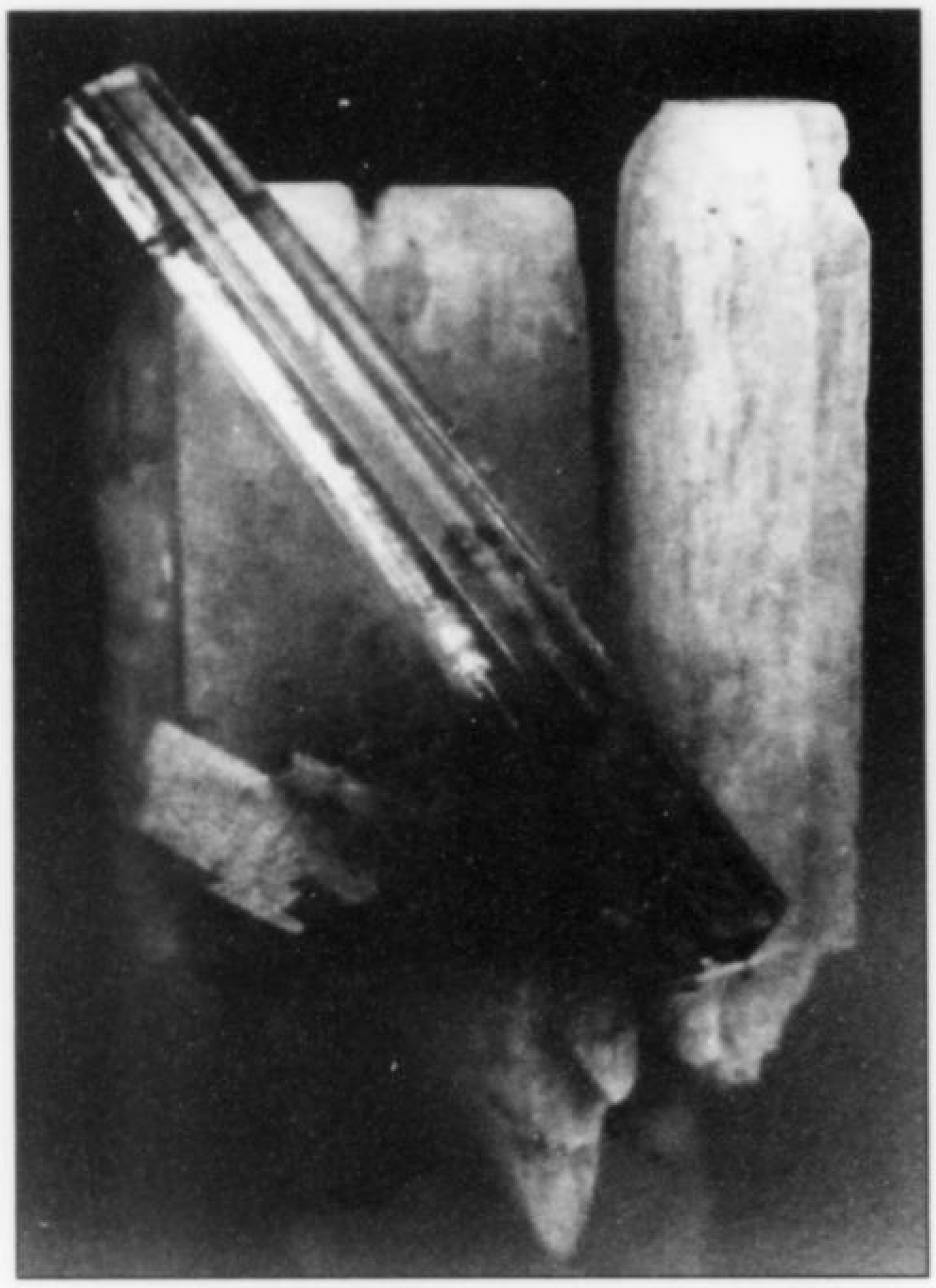


Figure 63. **Hambergite with elbaite, 2 cm high, from the Himalaya mine. Cal Graeber collection; Jeff Scovil photo.**

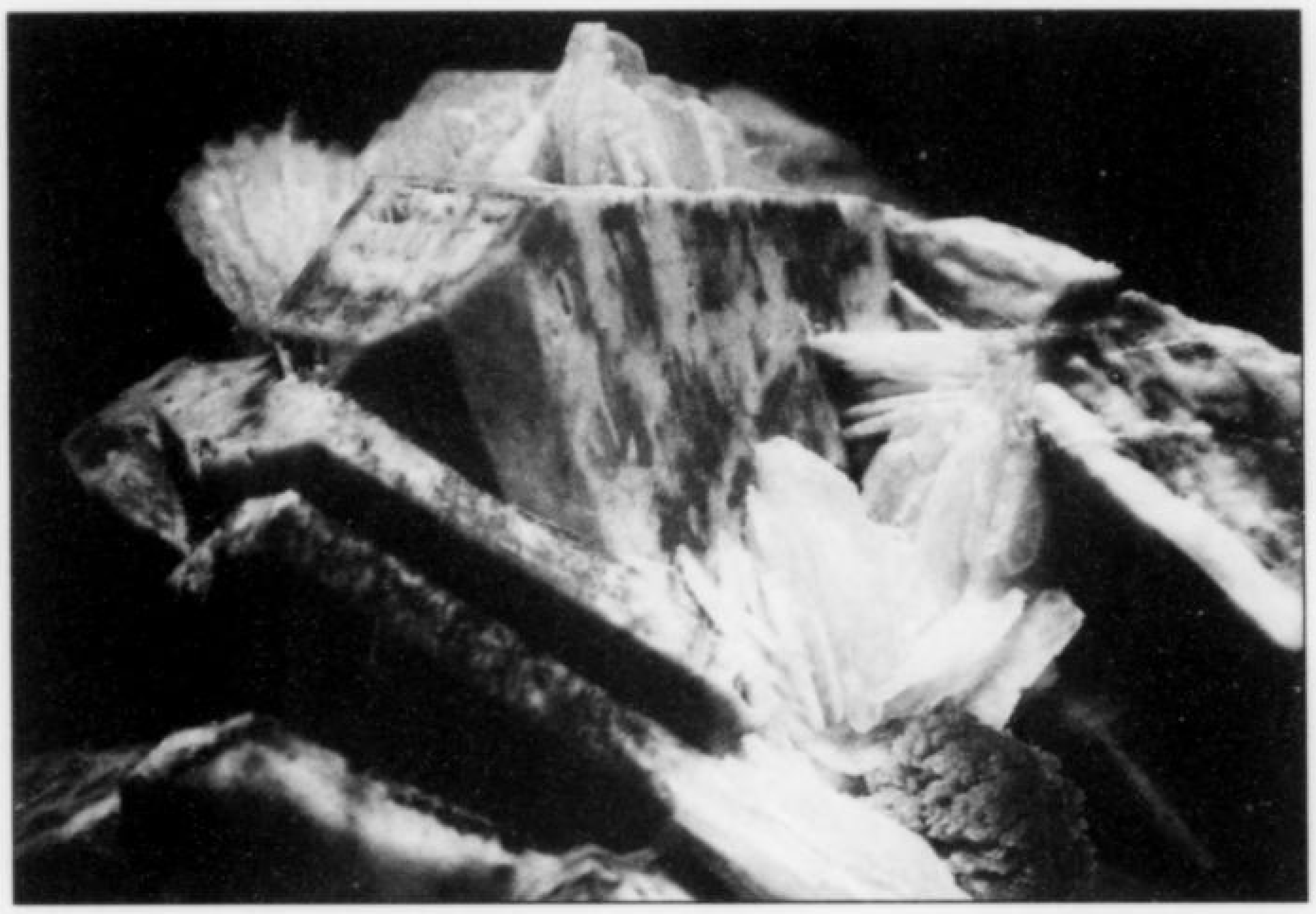


Figure 64. **Microcline with cleavelandite and lepidolite, 10.6 cm across, from the "Rainbow Pocket," Himalaya mine, July, 1996. Jesse Fisher collection and photo.**

crystals of the species found anywhere in the world. Most specimens from the Himalaya dike system appear to be the stibiotantalite end-member (Foord 1976, 1977) and typically occur as tabular to equant single crystals or clusters up to 5 cm. The color ranges from honey-yellow to reddish brown with a resinous luster. The rare minerals rynersonite [$Ca(Ta,Nb)_2O_6$] and fersmite are occasionally found associated with stibiotantalite as alteration products; the Himalaya mine is the type locality for rynersonite (Foord, 1976, 1977; Foord and Mrose, 1978).

Small crystals of honey-yellow microlite and darker brown uranmicrolite are often found included in other pocket minerals such as quartz and elbaite. Uranmicrolite inclusions can be identified by the radiation-induced discoloration halos in the host mineral. Late-stage secondary minerals including stilbite, laumontite, calcite and cookeite are often found as coatings on earlier formed minerals such as quartz, feldspars and elbaite. Secondary Be-containing minerals including hambergite and bavenite are occasionally found in pockets in the upper dike, probably formed at the expense of earlier beryl. Hambergite usually occurs as small porcelain-white, wedge-shaped crystals, commonly associated with other pocket minerals such as elbaite and feldspars. Bavenite usually occurs as crusts of acicular white microcrystals coating earlier-formed pocket minerals. Bavenite pseudomorphs after beryl are occasionally found (Schaller and Fairchild, 1932).

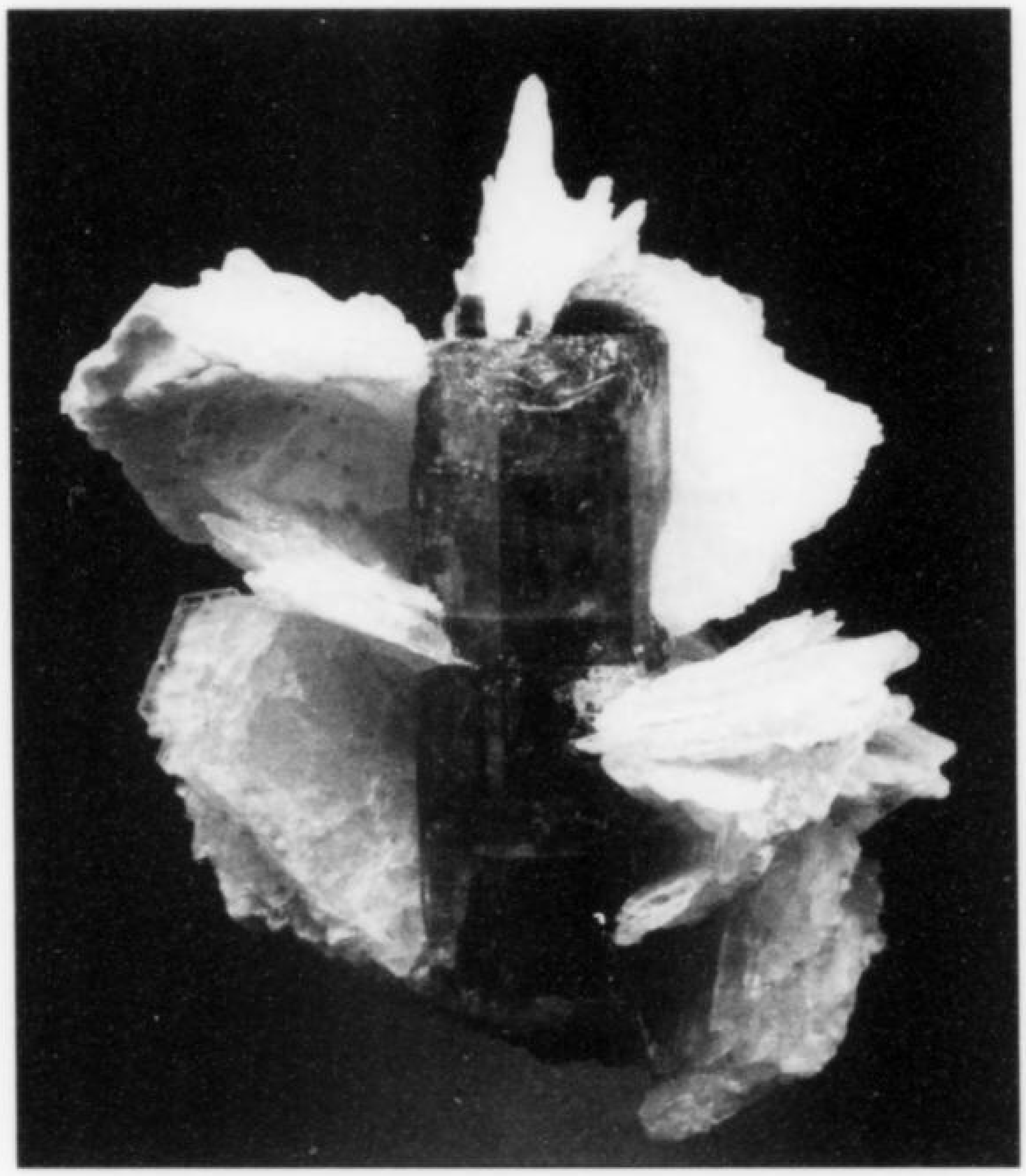


Figure 65. **Fluorapatite with cleavelandite, 5.1 cm high, from the Himalaya mine. Jesse Fisher collection; Jeff Scovil photo.**

San Diego Mine

As previously mentioned, there are numerous other mines and prospects in the Mesa Grande district that may have produced some specimen or gem material during the height of the Southern California gem mining activities during the early years of the 20th century. Only a couple of these are known to have produced any volume of material, however.

Adjoining the Himalaya mine to the south is the San Diego mine, which works the same dike system. The mine was originally opened in 1899 by Gail Lewis and was worked intensively until around 1910, during which time sizable amounts of tourmaline, beryl, and quartz were produced (Jahns and Hanley, 1953). After the collapse of the local gem market in 1912, the mine was idled, and has never been reopened on a commercial scale. The mine was acquired around 1915 by Fred Rynerson who, along with several lessees, accomplished some small-scale mining during the next several decades. Projects included exploration of the dike for pollucite (as a source of cesium) by General Electric during the late

Figure 66. **Entrance to the San Diego mine, Mesa Grande district, in 1997. Jesse Fisher photo.**

Figure 67. **Eugene Rynerson with an exposed tourmaline-bearing pocket in the San Diego mine, ca. 1975. E. E. Foord photo.**

1920's and an attempt to work the mine for gem tourmaline by the famous collecting team of Ed Over and Arthur Montgomery in 1935 (Montgomery, 1997). None of these projects proved particularly successful, however.

With Rynerson's death in 1960, his son Eugene took over operation of the mine, and for approximately the next 25 years he worked the mine single-handedly. Eugene Rynerson was evidently a very secretive person and it is not known what he found in the mine or how it may have been disposed of. Failing health forced Rynerson to give up work on the mine in the mid-1980's and the property was idle until recently. In the late 1990's Rynerson's family leased the property to a partnership who were planning to jointly operate both the Himalaya and San Diego mines. Unfortunately, little work appears to have actually occurred.

Elbaite from the San Diego mine is largely identical in appearance to that from the Himalaya mine and without documentation it is impossible to tell material from the two mines apart. The amount of elbaite produced by the San Diego has never matched that of its northerly neighbor, the Himalaya, and according to Foord (personal communication, 1996), the density of pockets (and thus gem and specimen producing potential) within the core of the main dike decreases southward along the dike.

Mesa Grande Mine

Adjoining the San Diego mine to the south is the Mesa Grande mine—the southern-most mine on the Himalaya dike system. According to Jahns and Hanley (1953), this mine was worked actively between 1906 and 1909, producing an unknown amount of pink and purplish blue tourmaline, along with some morganite and aquamarine beryl. The property has been largely idle since that time, but minor amounts of black to dark green tourmaline and smoky quartz have come from recent excavations carried out by the property owner, a Mr. Forest (J. McLean, personal communication, 1997).

Esmeralda Mine

The other mine of note in the Mesa Grande district is the Esmeralda, which is located approximately 2 km west of the Himalaya on a ridge east of Temescal Canyon. This pegmatite was originally prospected by Gail Lewis between 1899 and 1904 with apparently only modest success (Jahns and Hanley, 1953). The mine was subsequently taken over by Harry Dougherty, who

Figure 68. **Morganite crystal, 6 cm across, from the Esmeralda mine, Mesa Grande district. Bill Larson collection; Jeff Scovil photo.**

worked the property until 1909. During this time, the mine produced some fine specimens of morganite and aquamarine and modest amounts of tourmaline of various colors (Sinkankas, 1959). According to Jahns and Hanley (1953), most of the production from the Esmeralda came from one very large pocket found in a section of the dike where the core bulges. Many specimens from this find were sold to museums in the eastern United States and Europe. The Esmeralda mine has been idle in recent years.

Other Mines

Several other mines and prospects in the Mesa Grande District are mentioned by Jahns and Hanley (1953) as having produced minor amounts of specimen and gem material during the early part of the 20th century. These include the Cota, Bushnell, Green Ledge, Payne, and Trail mines. None of these mines appear to have been active since that time.

Ramona District

The Ramona pegmatite district consists of numerous individual pegmatite dikes exposed along the north side of Hatfield Creek Canyon, approximately 3 km east of the town of Ramona in central San Diego County. The pegmatites form a roughly parallel swarm, striking northwest and dipping moderately to the southwest. Because the pegmatites occur mostly on south-facing slopes their southwest dip gives them a fortuitous dip-slope orientation, which has allowed much mining to be done from the surface rather than underground. The Ramona district is somewhat unusual compared to other Southern California districts in that dikes in close proximity to each other often contain widely varying mineral assemblages. The district is also unique to the region in producing major amounts of gem-grade and specimen-quality topaz and spessartine.

Numerous mines and prospects were established in the district during the first decade of the 20th century, but the most productive and well known are the Little Three and Hercules mines. Both mines were first claimed in 1903 and actively worked until around 1912. Kunz (1905b) reports the production of blue and colorless topaz, spessartine, green and pink beryl, large quartz crystals, and large crystals of dark green tourmaline. Other mines worked during this period include the ABC, Black Panther, Surprise, Lookout, and Prospect mines. Most of these appear to have been idle since 1912, and the Surprise, which is located on an eastern extension of the main Little Three dike, is now back-filled with dump material (Sinkankas, 1959).

Little Three Mine

In 1951 the Little Three mine was acquired by Louis Spaulding, Sr., who began work there a few years later. With his death in 1973, the mine was taken over by his son, Louis Spaulding, Jr. Full-time mining was resumed in 1975 and the mine was worked more-or-less full time for the next 20 years by both surface trenching and underground tunneling.

In July of 1976, a major topaz and tourmaline-bearing pocket known as the "New Spaulding Pocket" was found in the main Little Three dike. This pocket was approximately 50 cm by 3 x 3 meters in size and produced an estimated 90 kg of elbaite, 28 kg of topaz, and over 200 kg of large, euhedral specimens of lepidolite (Shigley *et al.*, 1986). Several large matrix specimens were recovered from this pocket, including a 25-cm plate of cleavelandite and smoky quartz with two large, dark green elbaite crystals and two blue topaz crystals, now in the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania. Several other smaller pockets were found in the vicinity of the New Spaulding Pocket; a detailed description of the find is given in Stern *et al.* (1986). A second major topaz and elbaite-bearing pocket was discovered in 1986. Total production from the Little Three mine has been estimated by Foord *et al.* (1989) to have been approximately 900 kg of elbaite, 110 kg of topaz, and 25 kg of beryl.

Besides the main Little Three dike, there are several other pegmatites on the Little Three property, including the Spaulding, Sinkankas, and Hatfield Creek dikes. Some small-scale mining has been done on these dikes in recent years, but none has ever produced significant amounts of gem or specimen material. The Spaulding and Sinkankas dikes are reported to have produced some spessartine and the Hatfield Creek dike is known for producing manganaxinite specimens (Sinkankas, 1976).

Topaz from the main Little Three dike occurs in two distinct generations. Earlier-formed crystals tend to be large (some exceeding 450 grams) and pale blue to pale green in color, often resembling those from Murzinka in the Ural Mts. of Russia. Crystals may be terminated by either a well-developed basal pinacoid {001} or well-developed first order prism faces {021} and {011} with a small or absent pinacoid. When first mined, these topaz crystals are often pale in color, but Foord *et al.* (1989) note

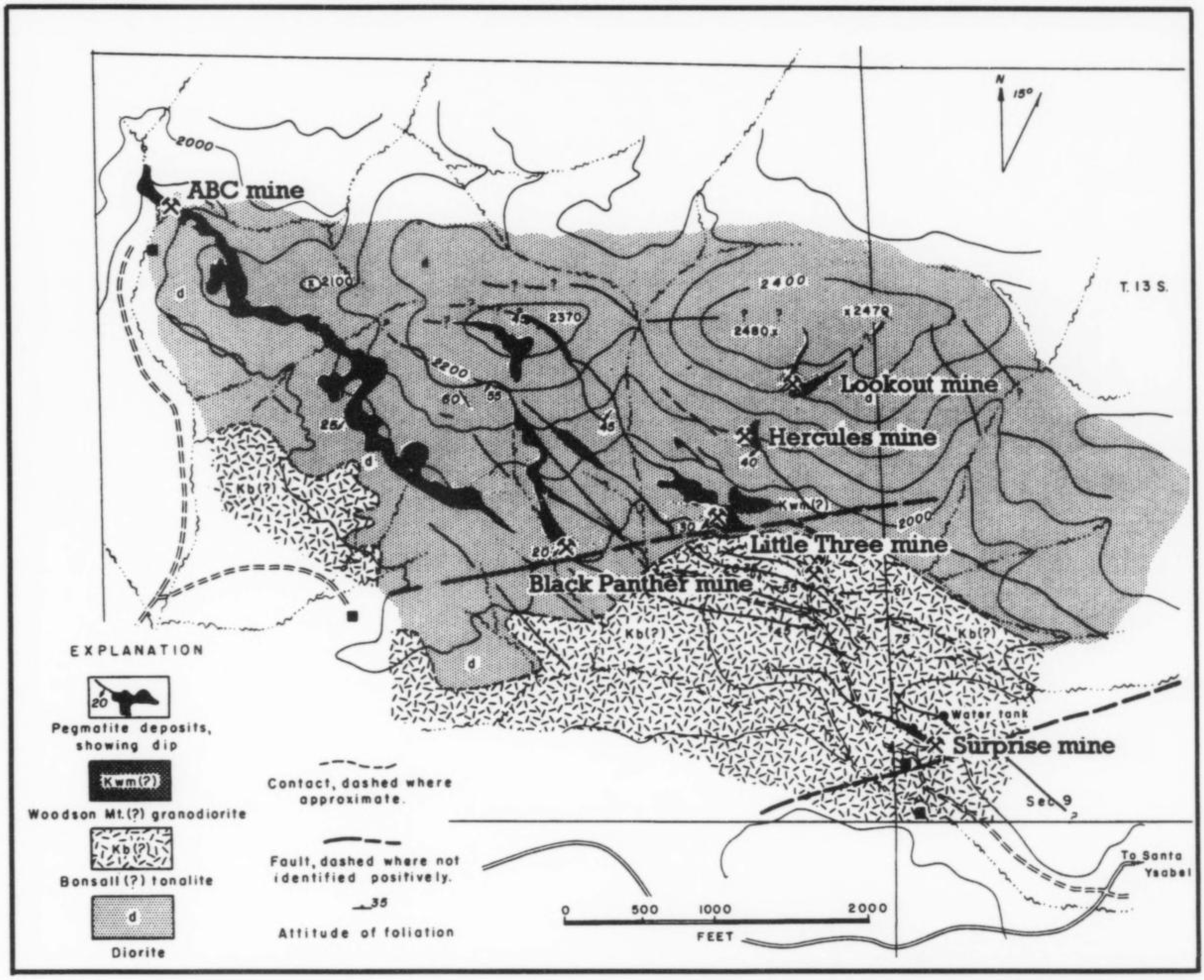


***Figure 69*. Geologic map of the Ramona district showing the locations of pegmatites and major specimen-producing mines (adapted from Weber, 1963).**

a tendency of many Little Three topaz crystals to darken over time after recovery. A second, later generation of topaz occurs as small (less than 1 cm), colorless crystals, sometimes doubly terminated, which are occasionally found on the surface of elbaite and other pocket minerals. Foord *et al.* (1989) mention the occurrence of one pocket containing topaz and green elbaite on the Hercules dike, but give no other details.

Elbaite from the main Little Three dike is usually various shades of dark green, olive-green or brown, though crystals with pale pink sections are occasionally found. Crystals are usually heavily striated trigonal prisms with simple pedion terminations. Elbaite crystals from pockets in the main Little Three dike are often associated with cleavelandite, smoky quartz, and sometimes topaz, forming very attractive specimens. Some small gem "pencil" crystals displaying pyramidal terminations have been found as well. Schorl is common in the main Little Three dike, but is not usually found as well-formed pocket crystals.

The main Little Three dike is more complex mineralogically than the Hercules dike, and is the source of numerous other, often rare, mineral species. Foord *et al.* (1989) reports the occurrence of

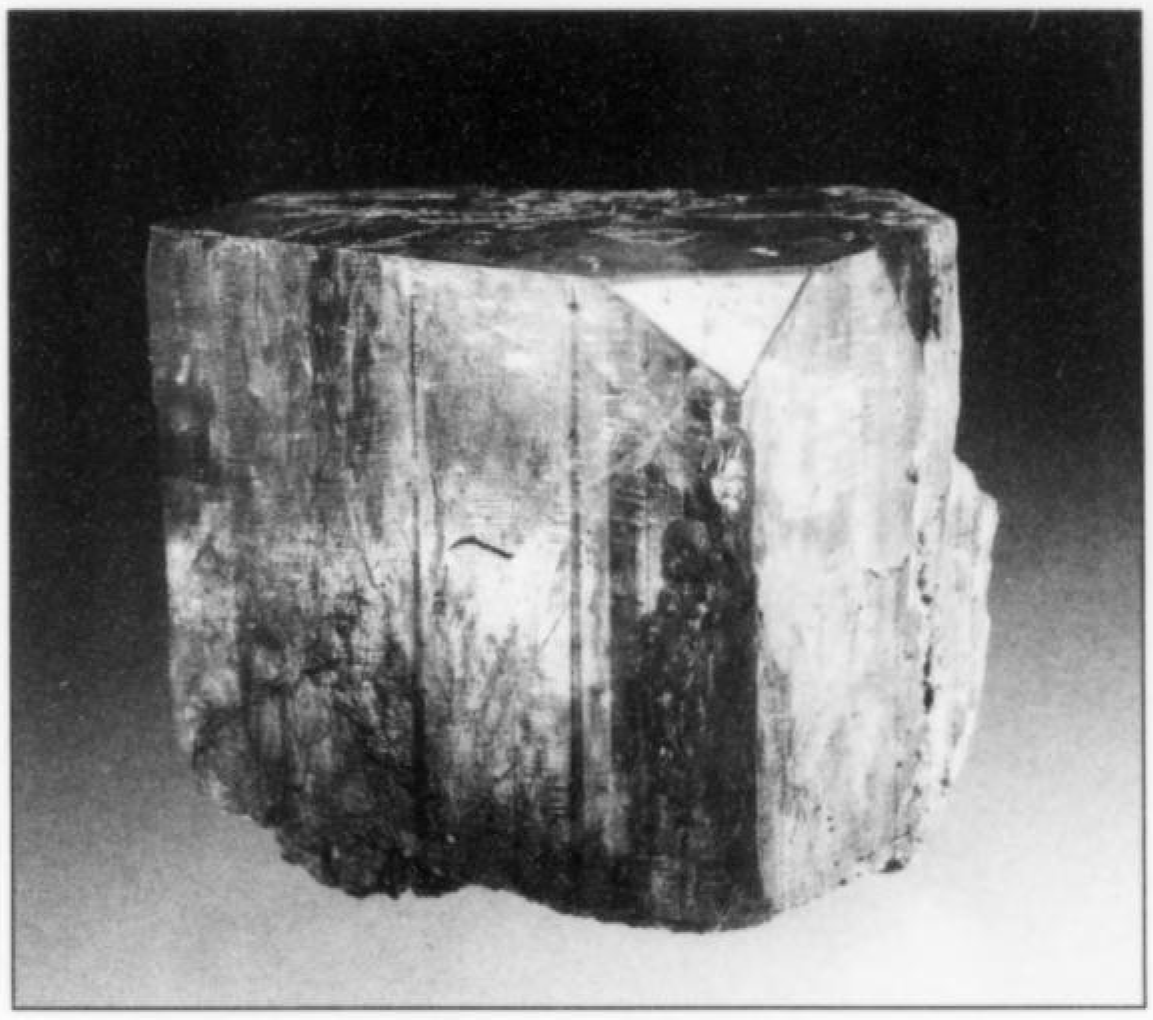


***Figure 70*. Danburite crystal, 4.4 cm, from the Little Three mine. Los Angeles County Museum of Natural History collection; A. R. Kampf photo.**

Figure 71. **Surface workings on the main topaz-bearing dike at the Little Three mine, Ramona district, 1996. Jesse Fisher photo.**

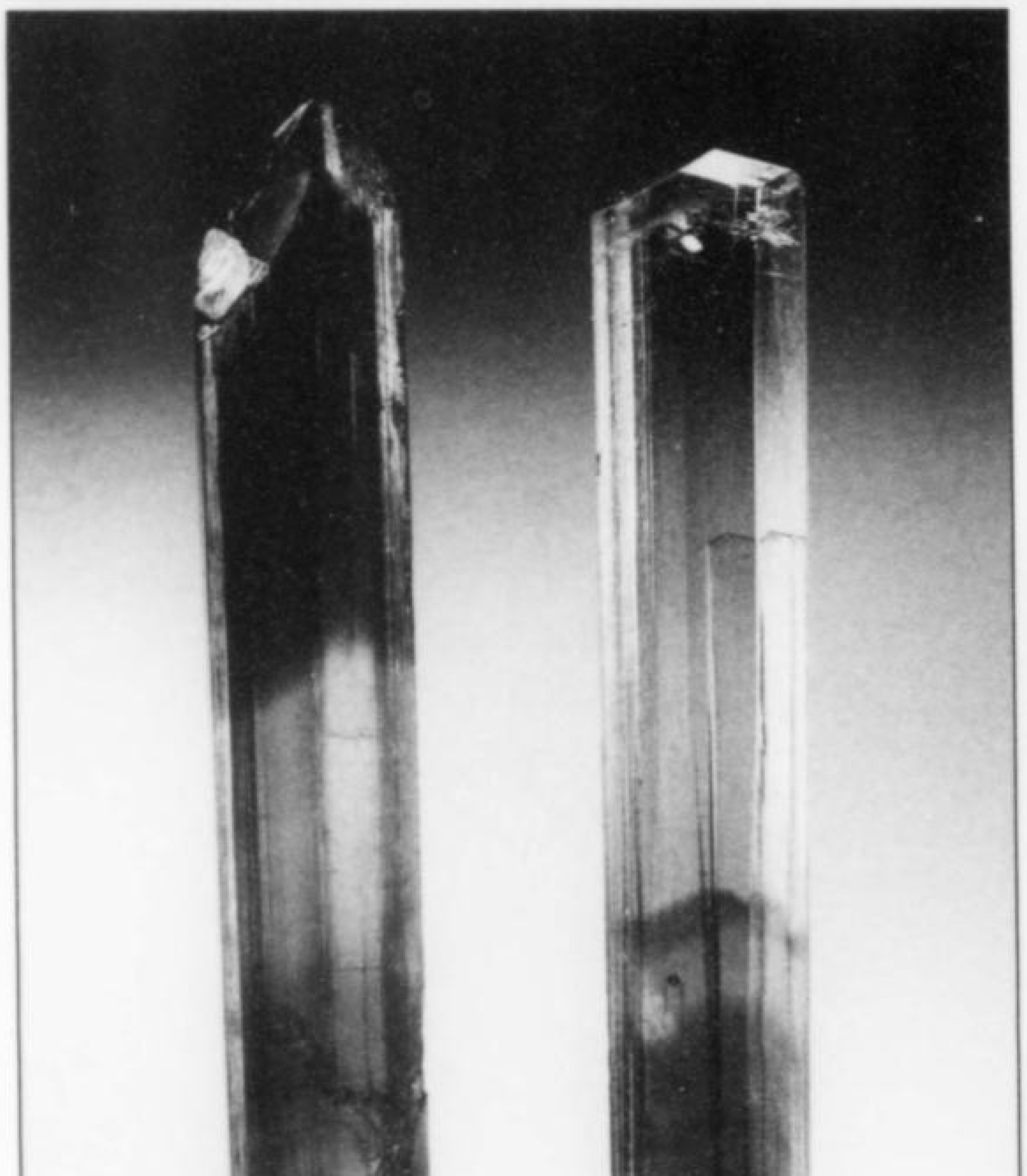
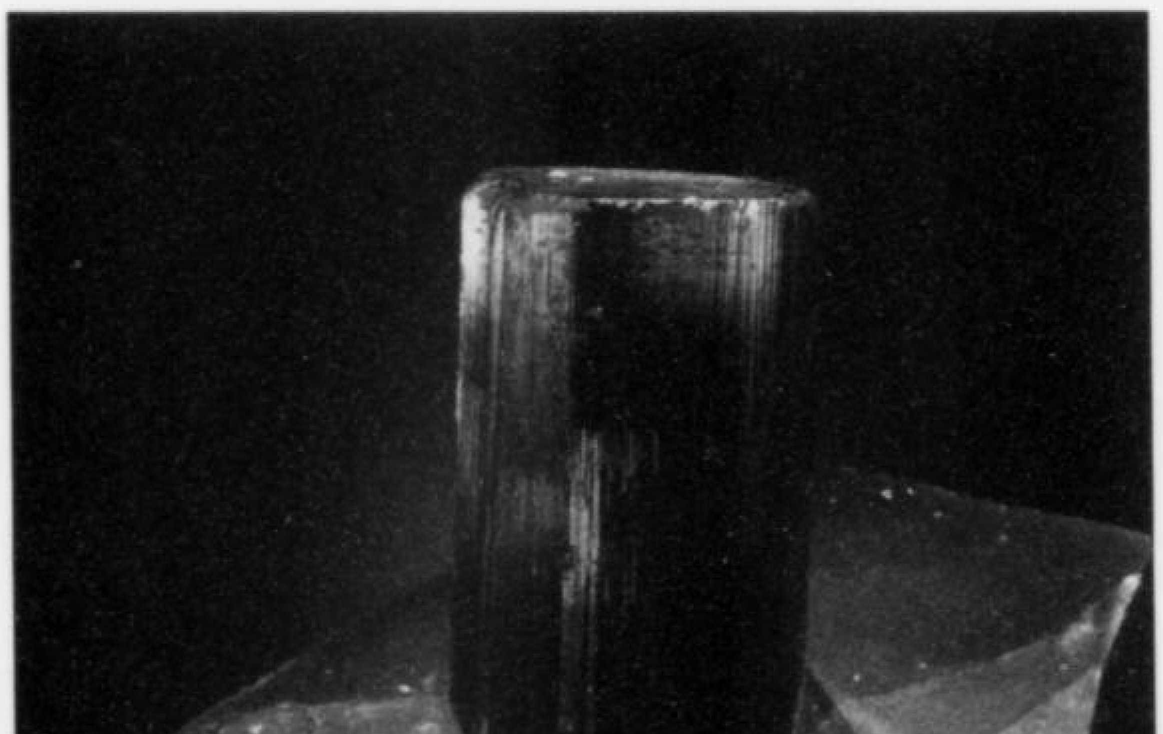


Figure 72. **Elbaite crystals to 5.5 cm, from the Little Three mine. Bill Larson and Cal Graeber specimens; Wendell Wilson photo.**

Figure 73. **Elbaite, 3.9 cm high, on quartz, from the main dike of the Little Three mine. Jesse Fisher collection; Jeff Scovil photo.**



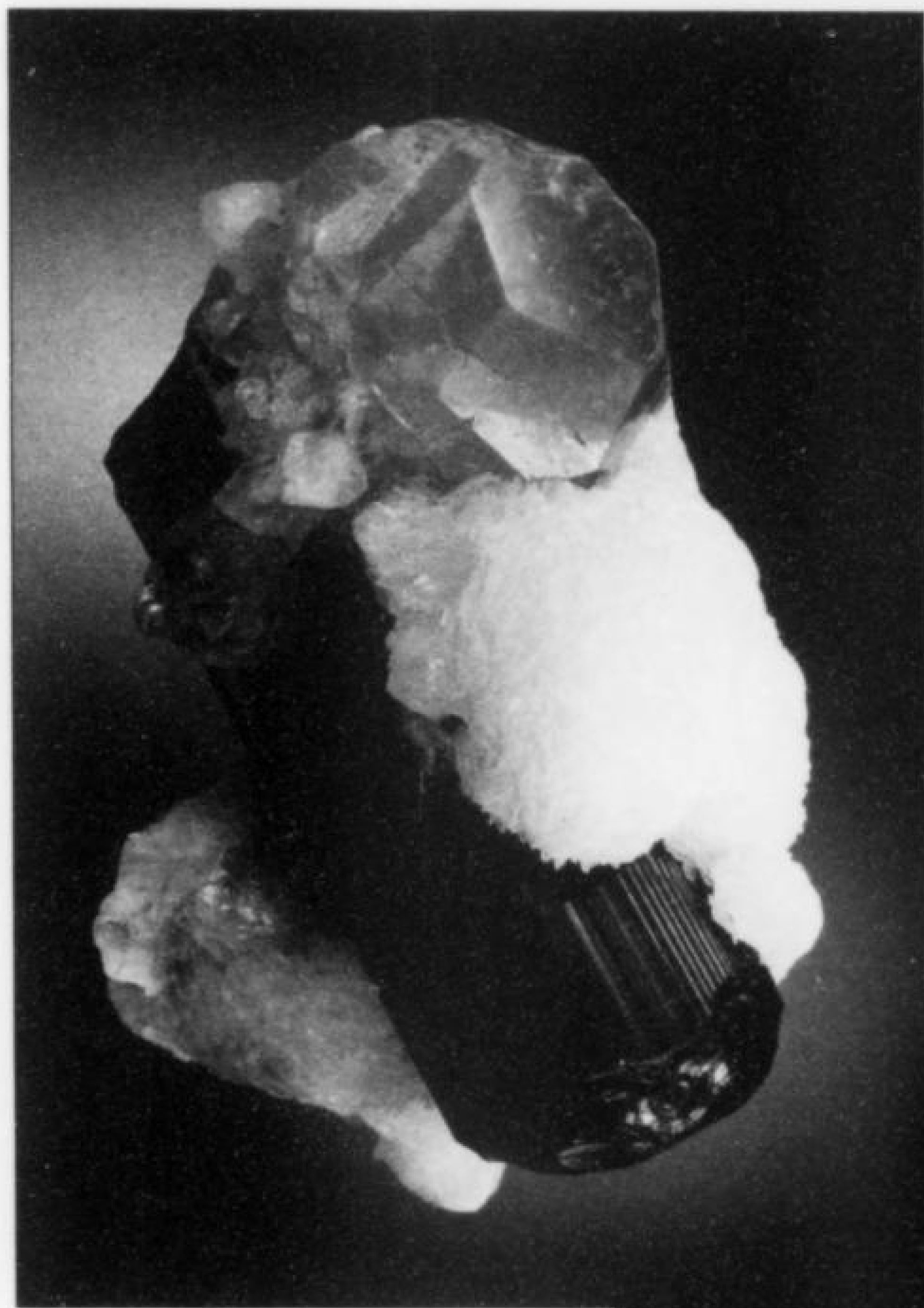


Figure 74. **Spessartine with schorl and albite (var. cleavelandite), 7.6 cm wide, from the Hercules-Spessartine dike, Little Three mine. Jesse Fisher collection; Jeff Scovil photo.**

Figure 76. **Spessartine crystal with schorl and albite, 4 cm, from the Little Three mine. Los Angeles County Museum of Natural History specimen; Wendell Wilson photo.**

Figure 77. **Spessartine crystals to 2 cm, on albite, from the Little Three mine. Tim Sherburn collection; Wendell Wilson photo.**

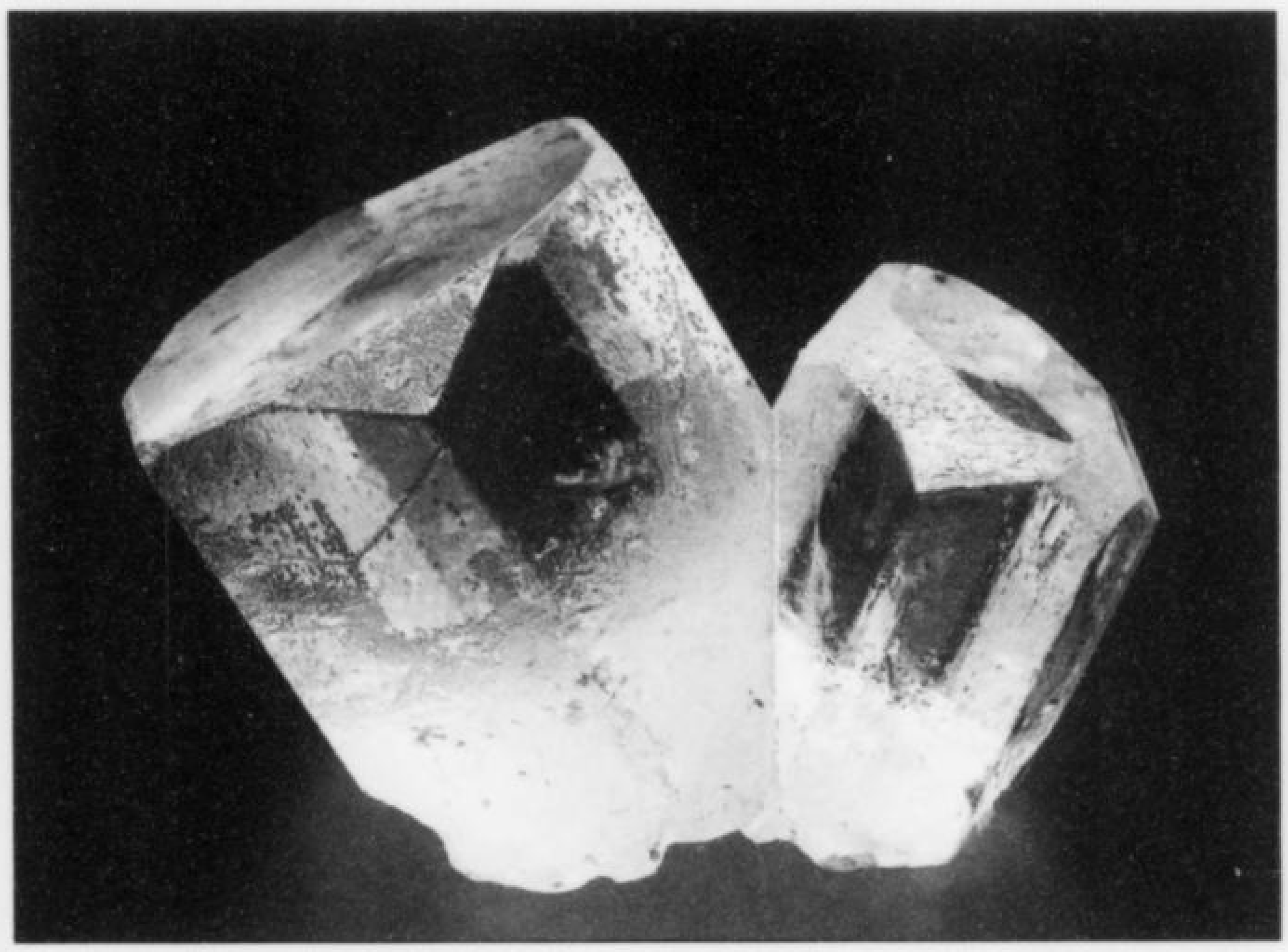


Figure 78. **Pink beryl (morganite), 4.4 cm wide, from the Hercules-Spessartine dike, Little Three mine. Los Angeles County Museum of Natural History collection; Jeff Scovil photo.**

Figure 75. **Blue topaz crystal, 5.1 cm, from the Little Three mine. Los Angeles County Museum of Natural History collection; Jeff Scovil photo.**

Figure 79. **Louis Spaulding at the site of the 1976 pocket discovery, Little Three mine. Brendan Laurs photo.**

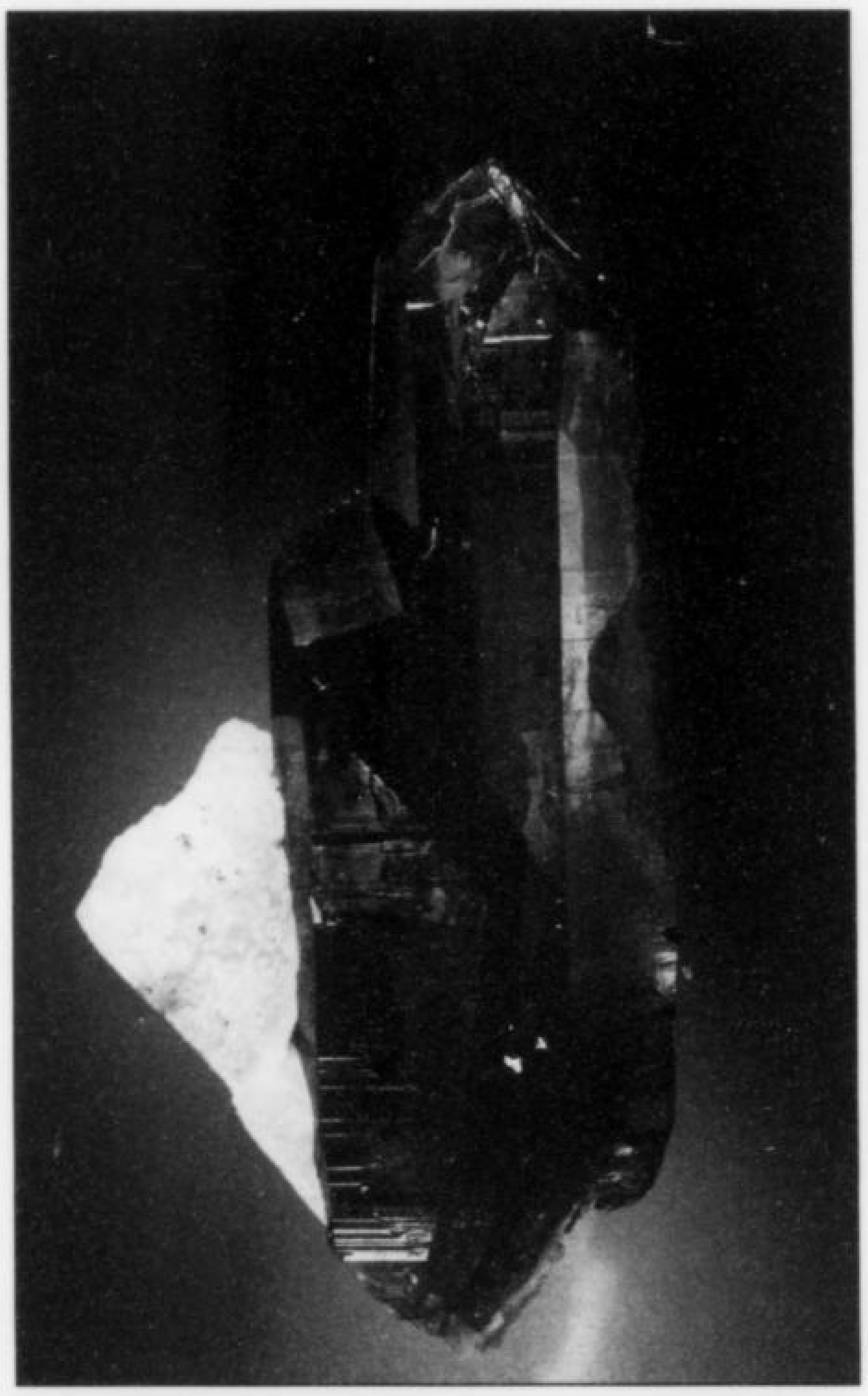


Figure 81. **Smoky quartz on microcline, 7.7 cm tall, from the main dike of the Little Three mine. Jesse Fisher collection; Jeff Scovil photo.**

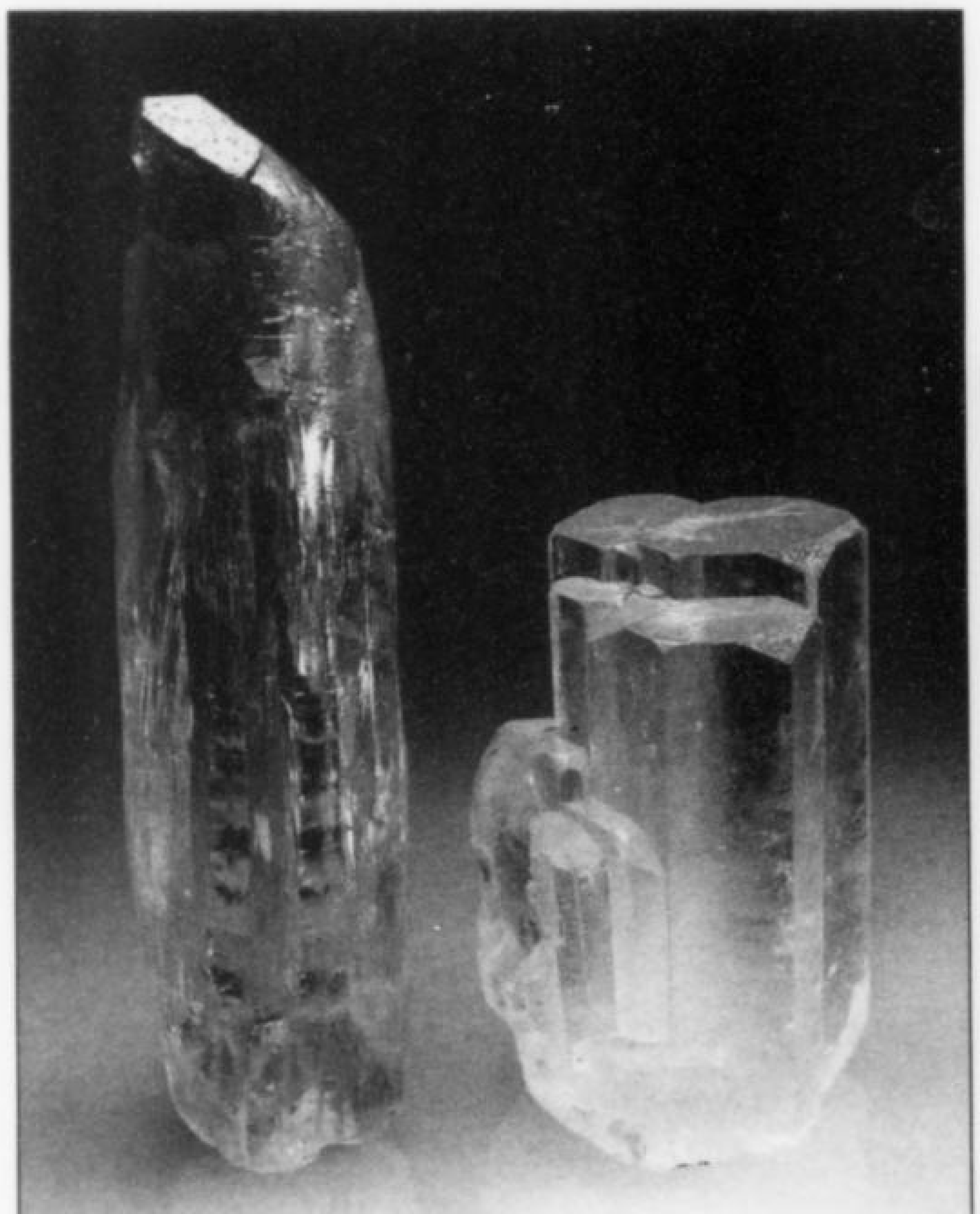


Figure 80. **Beryl (var. morganite) crystal, 4.8 cm, showing an unusual elongated habit (most pink beryl is of tabular habit), from the Little Three mine. Bryant Harris collection; Wendell Wilson photo.**

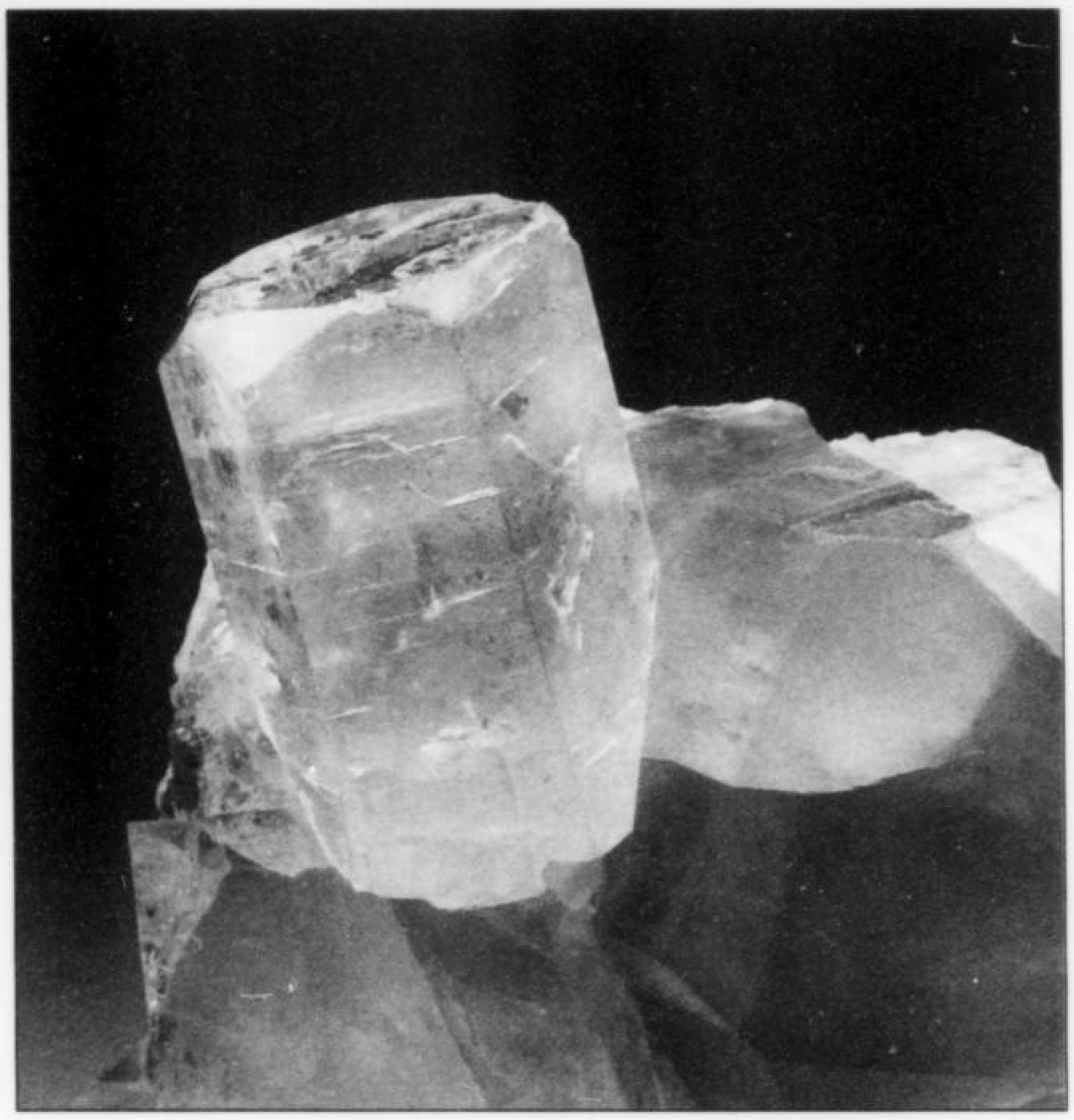


Figure 82. **Colorless beryl (var. goshenite) on quartz, 4.8 cm, from the Little Three mine. Bill Larson specimen; Wendell Wilson photo.**

Figure 83. **Lepidolite crystal cluster, 4.1 cm, from the New Spaulding pocket, Little Three mine. Cal Graeber specimen; Wendell Wilson photo.**

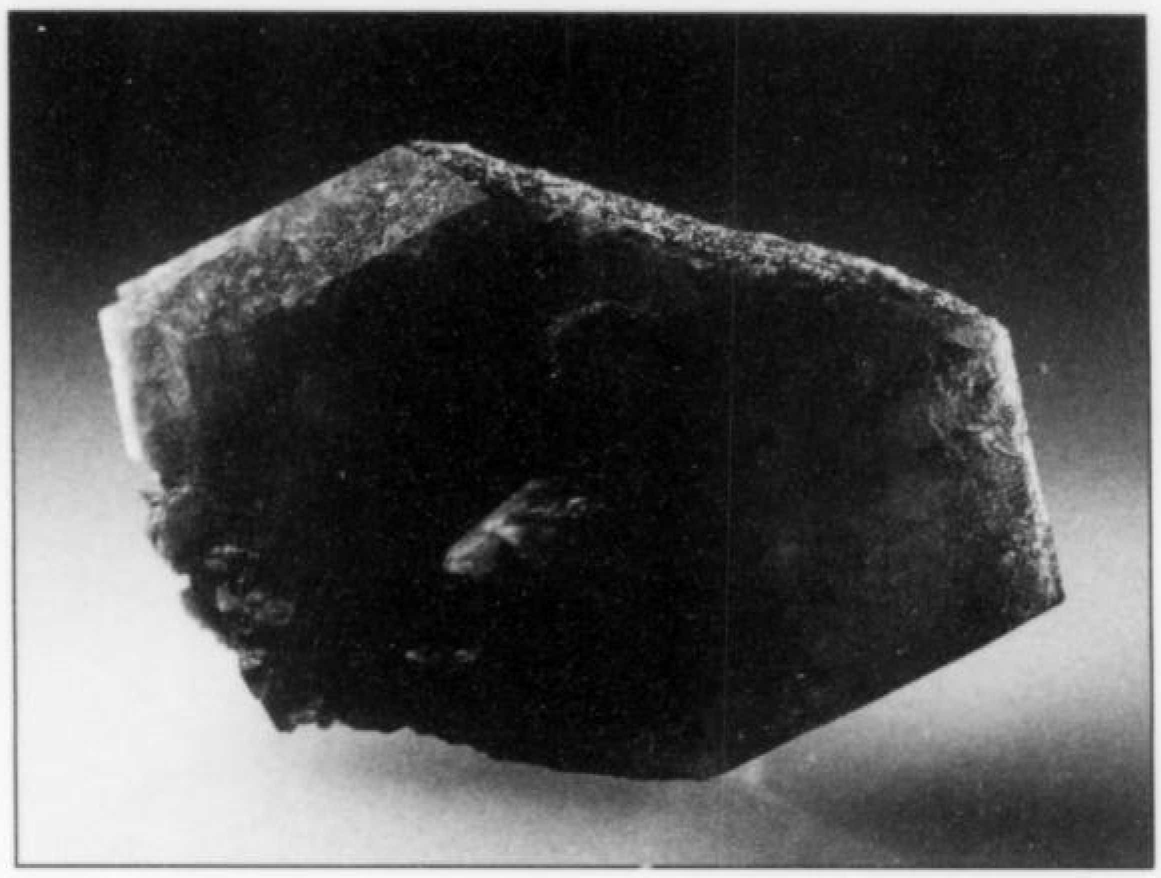


Figure 84. **Manganaxinite crystal, 4.5 cm, from the Little Three mine. Cal Graeber specimen; Wendell Wilson photo.**

native bismuth, bismite, bismutite, pucherite, cassiterite, fluorapatite, columbite group minerals, microlite, uranmicrolite, hambergite, stilbite, laumontite, and two species for which the Little Three mine is the type locality, boromuscovite (Foord and Martin *et al.*, 1991) and a Bi-W containing polymorph of stibiocolumbite-stibiotantalite.

Hercules Mine

The Hercules mine (also called the Hercules-Spessartine mine) is adjacent to the Little Three on the north. Though the two are separate claims, they have both been worked in recent years by Louis Spaulding Jr. For many years the Hercules claim was actually owned by Buzz Gray, a well-known gem cutter, and Bryant Harris, a mineral collector. Spaulding was given permission to work the property in exchange for first rights to any gem materials recovered. During the 1970's and 1980's, Spaulding alternated work between the main topaz-bearing dike on the Little Three property and the Hercules dike. Working the dike by surface trenching, Spaulding produced a fair amount of spessartine, mostly gem rough, during this time. Foord *et al.* (1989) estimate that the Hercules and other nearby dikes have produced a total of around 40,000 carats of spessartine; major finds are thought to have occurred in 1976, 1985 and 1986.

Garnet of the almandine-spessartine series is common in both the main Little Three and Hercules dikes. It has not been found within pockets in the main Little Three dike, however, and most garnet of gem or specimen quality has come from the Hercules dike. Garnet from pockets in the Hercules dike is bright orange in color and compositionally is close to end-member spessartine (Foord and Kleck, 1993). Much of the spessartine from the pockets in the Hercules dike has been etched or corroded into gemmy fragments which are found in cavities in masses of cleavelandite or loose at the bottom of pockets. Lustrous, euhedral spessartine crystals are also found, often associated with other pocket minerals such as cleavelandite and schorl. These crystals usually show dominant dodecahedral {110}, trapezohedral {211}, or hexoctahedral {321} faces, or a combination of these.

In addition to spessartine, a major beryl-containing pocket (morganite, goshenite, and aquamarine) was discovered in 1985, and a pocket containing numerous large manganaxinite crystals was found in 1986 (Foord *et al.*, 1989). By the mid 1990's excavations on the Hercules dike had become dangerously deep, limiting further surface development of the mine; the mining claim on the property was allowed to expire.

Although the main Little Three and Hercules dikes are in relatively close proximity to each other, each dike has its own characteristic mineralogy. Pockets in the main Little Three dike are known for producing fine specimens of topaz, elbaite, and lepidolite, whereas pockets in the Hercules dike have produced excellent spessartine, schorl, and occasional beryl and manganaxinite.

Tourmaline from pockets in the Hercules dike is almost always schorl and some fine specimens associated with orange spessartine and white cleavelandite have been found. Excellent specimens of this type are in the collections of the National Museum of Natural History (Smithsonian Institution) and the Los Angeles County Museum of Natural History.

Beryl is occasionally found in both the main Little Three and Hercules dikes, though most well-formed crystals appear to have come from the Hercules. Prismatic crystals of morganite, goshenite, and aquamarine up to 8 cm long have been found in recent years, mostly from one pocket in the Hercules dike discovered in 1985. Beryl crystals are often lustrous and euhedral, but highly etched crystals are also found. Foord *et al.* (1989) state that beryl crystals found in pockets with spessartine usually show varying degrees of corrosion while those from pockets devoid of garnet are usually pristine. While crystals of morganite from other occurrences in southern California usually have a tabular habit, Ramona morganite crystals tend to be prismatic.

Jacumba District

The Jacumba pegmatite district is located in an arid and remote region of southeastern San Diego County, approximately 100 km east of the city of San Diego, and just north of the Mexican border. The pegmatites have been intruded into metasedimentary rocks (gneisses and schists) around Tule Mountain, which is 11 km northwest of the town of Jacumba.

Crystal Gem Mine

Kunz (1905b) mentions several prospects in the Jacumba area, including one known as the Crystal Gem mine, which had, at the time, produced some spessartine and beryl. The exact location of the Crystal Gem mine is uncertain, and it is unknown whether it correlates with any of the current mining claims in the area. Little else appears to have been done in the district until late 1974, when local mineral collector Loren Beebe discovered a pocket of spod-

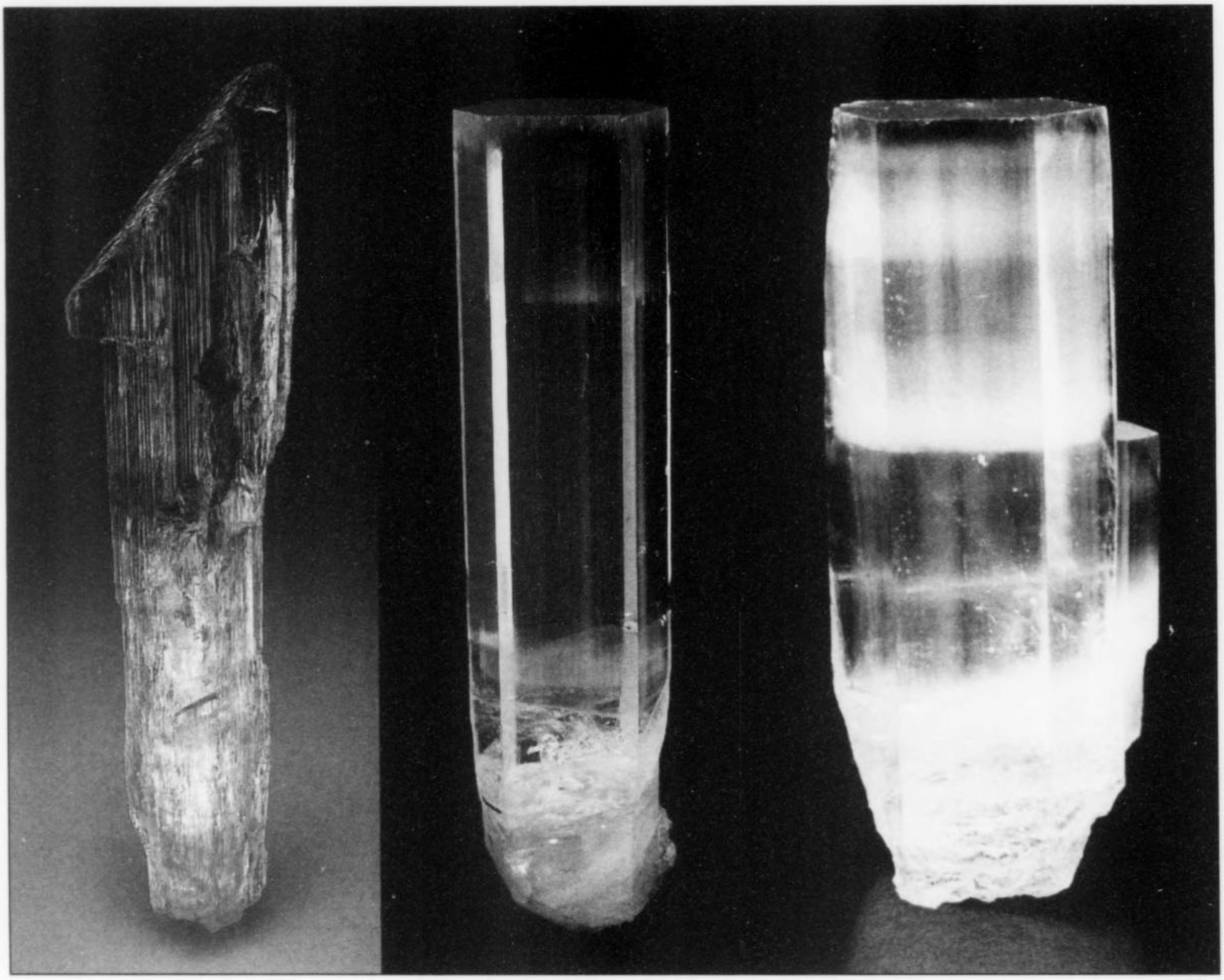


Figure 85. **Spodumene (var. kunzite), 21.9 cm high, from the Beebe Hole (now part of the Pack Rat mine), Jacumba district, 1974. Los Angeles County Museum of Natural History collection; Jeff Scovil photo.**

Figure 86. **Beryl (var. aquamarine) crystal, 6.4 cm, from the Beebe Hole mine. Los Angeles County Museum of Natural History collection, gift of the California Federation of Mineralogical Societies;**

Figure 87. **Beryl (var. aquamarine), 3.5 cm high, from the Pack Rat mine, Jacumba district. Jesse Fisher collection; Jeff Scovil photo.**

umene while prospecting the area. Sinkankas (1976) reports that the pocket yielded 24 kg of spodumene of various colors, including lilac (kunzite), blue, yellow, and colorless. One of the largest crystals from the find is now in the collection of the Los Angeles County Museum of Natural History. A claim, known as the "Beebe Hole," was established on the site, but little else appears to have been found there.

Pack Rat Mine

In 1981 Fred Stevens began working the Pack Rat mine, a claim adjacent to the Beebe Hole on the same pegmatite. Stevens worked the claim for about 10 years, producing some spessartine and apatite crystals, before selling it to the current owner, Gary Wallace. Wallace has continued to work the Pack Rat on a part-time basis. During the early 1990's he also acquired the Beebe Hole claim, which he has merged with the Pack Rat. The mine has produced an interesting suite of minerals in recent years, including pale blue to green aquamarine, alpine-like smoky quartz crystals, spessartine, danburite, columbite, cassiterite, helvite, and numerous phosphates including apatite, lithiophilite, purpurite, herderite, strengite, phosphosiderite, hureaulite, robertsite, eosphorite, frondelite and mitridatite (A. R. Kampf, personal communication, 2000). The pegmatite shows considerable potential for specimen production, and several other mining claims have been established on neighboring pegmatites in recent years. The area is, unfortunately, within the local bighorn sheep breeding grounds and is considered "ecologically sensitive" by the BLM, who are reluctant to allow the development of access roads and the use of heavy equipment. This effectively places restrictions on the scale of mining activities that can be conducted at the Pack Rat and other pegmatites in the area.

Northern Baja California

During the mid 1960's and 1970's, a number of gem-bearing pegmatites were discovered and worked in a broad region extending southward for several hundred kilometers from the area around the town of Tecate near the California-Mexico border. Much of the area is remote and sparsely populated. Roads are often more like ephemeral dirt trails, and consequently the exact location of many of the pegmatites is today far from certain. None of the pegmatites in this region has ever produced large amounts of gem or specimen materials and little work appears to have done other than casual collecting. The following are descriptions of some of the better-known pegmatites.

Chuqui Mine

The Chuqui mine is located near the small town of Rosa De Castilla, about 75 km south of Tecate. Sinkankas (1976) reports that the pegmatite here trends north-south, dips gently to the east, is approximately 3 meters thick, and consists largely of graphic granite. The pegmatite has produced tourmaline crystals up to 12 cm long, mostly black to dark purple in color. No other minerals are reported.

***Figure 88*. Elbaite on microcline, approximately 3 cm high, from Mina La Verde, La Huerta, Baja California Del Norte. Tim Sherburn collection; Wendell Wilson photo.**

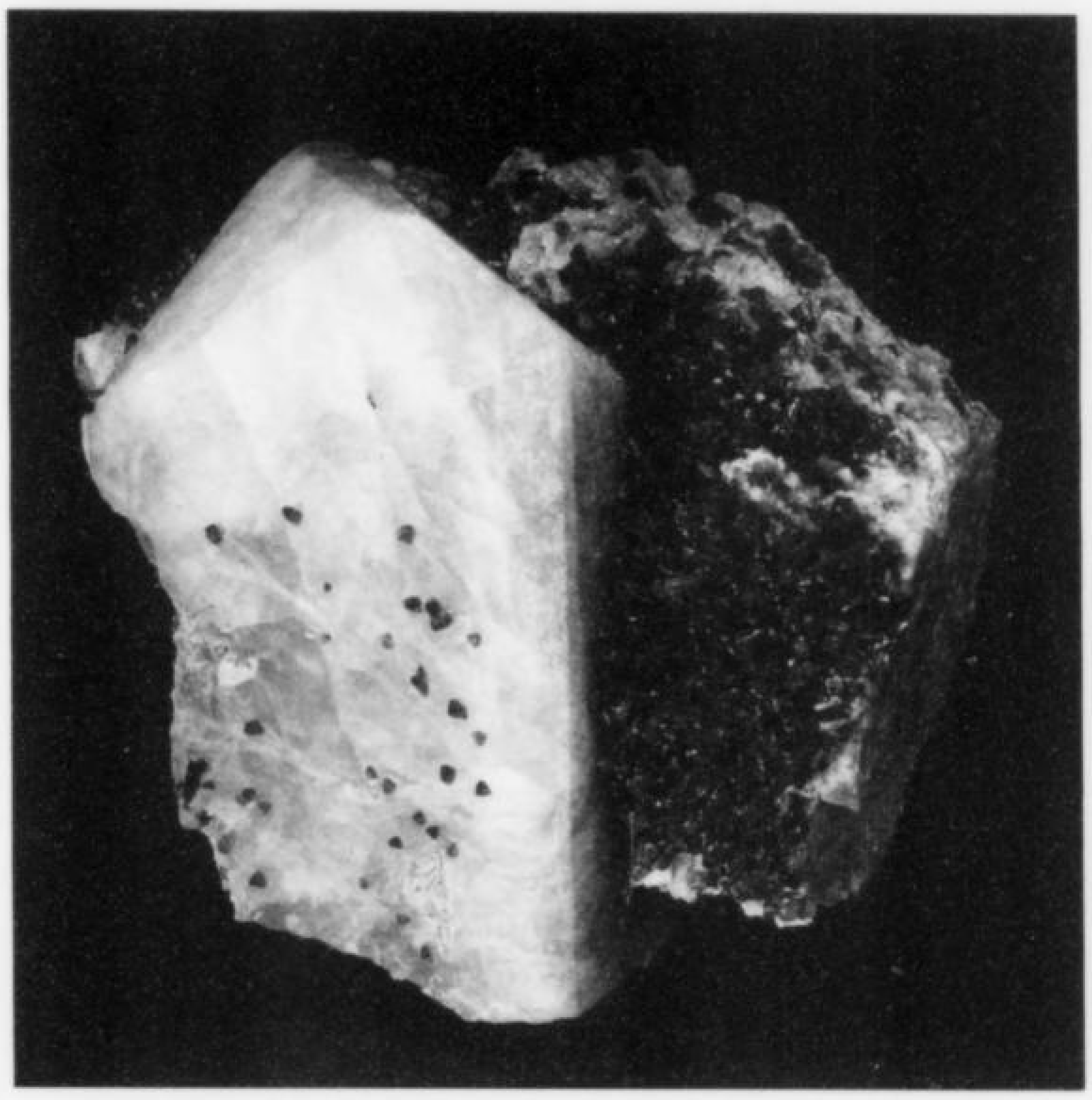


***Figure 89*. Danburite crystal with dark green elbaite, 8 cm, from Mina la Verde. Jesse Fisher collection; Jeff Scovil photo.**

***Figure 90*. Location of Mina la Verde in Baja California.**

Mina La Verde

The Mina La Verde pegmatite is located near the village of La Huerta, approximately 48 km east of Ensenada. The pegmatite was discovered in 1964 and worked in the early 1970's by a party sponsored by the late Josie Scripps, a San Diego mineral collector and volunteer curator of minerals at the San Diego Museum of Natural History. Sinkankas (1976) reports that a series of small pockets produced microcline, muscovite, smoky quartz, some large opaque danburite crystals, and green tourmaline. The tourmaline was usually olive green, forming interesting specimens, but not of gem quality. Individual crystals formed as triangular, spray-like composites up to 12 cm long. Tourmaline also occurred as crusts of small individual crystals on the surface of microcline crystals.

Las Delicias Mine

The Las Delicias pegmatite is located near the village of El Alamo, 62 km southeast of Ensenada, along the rim of the Arroyo de Rincon. The Las Delicias is one of numerous pegmatites that stand out like ribs along the canyon walls. The pegmatite is enriched in rare elements, including lithium, beryllium and boron. Minerals such as tourmaline (schorl and elbaite), lepidolite, spessartine, and beryl appear common, but are usually frozen in the dike, as pockets are relatively scarce. The mine was actively worked during the late 1960's and Sinkankas (1976) reports that some large, heavily striated tourmaline crystals were found. These have a raspberry-red core and a green outer layer; many are coated with smaller tourmaline crystals. These large crystals are highly fractured, but smaller ones are often gemmy, ranging from green to grayish purple in color. Quartz, microcline, albite, morganite, and topaz are also reported to have been found in pockets in the pegmatite.

CONCLUSIONS

The Southern California pegmatite province has been a major world source of gem and specimen materials throughout the 20th century. Exquisite specimens of elbaite, kunzite, morganite, and other pegmatite minerals from the region can be found in most major collections, both public and private, throughout the world. Mining activity in the region has been episodic, with high points between 1902 and 1912 and from the late 1950's into the early 1990's. During these periods, the area produced significant amounts of specimen material and gem rough. In addition, the study of these pegmatites by Richard Jahns, Eugene Foord, and others has produced a wealth of scientific information and contributed greatly to the current understanding of how and why complex granitic pegmatites form.

Currently, however, mining activities are again at a low point throughout the region for a number of reasons. Depletion of the near-surface portions of many productive pegmatites means that most future attempts at mining will have to go much deeper, drastically increasing the cost of mining. Environmental regulations and property ownership issues have also conspired to limit mining, particularly on Indian tribal lands. Encroaching human development is also an issue, particularly in the area around Ramona. Some mines, such as the Stewart, White Queen, and Little Three, appear to have the potential to produce more specimens if logistical and access issues are resolved. Others, such as the Himalaya, Pala Chief, and the Tourmaline Queen have been heavily mined and are likely to be worked again on a commercial scale only if the prices of specimens and gem rough rise enough to justify further development of these mines.

Although future prospects for pegmatite mining in southern California appear limited, the province ranks among the most productive and well studied gem and rare-element pegmatite regions in the world, surpassed in recent years only by pegmatite provinces in Brazil , Afghanistan and Pakistan. Mining activities in southern California throughout the past century have yielded a wealth of gemstones, mineral specimens and scientific information for the collector and academic communities. Specimens from the more famous and productive mines will always be prized by discriminating collectors and curators.

ACKNOWLEDGMENTS

Numerous individuals and organizations have assisted in the preparation of this article. First and foremost, the author would like to acknowledge the assistance of the late Dr. Eugene Foord, who provided many rare and unpublished documents and photos, as well as much feedback and general inspiration. Access to, and historical information on, individual mines was generously provided by many individuals, including Bill Larson and John McLean of Pala International, Blue Sheppard of Gems of Pala, Roland Reed, Byron Weege, Otto Komarek, Louis Spaulding, Jr., Paul Geffner, Matt Taylor, and Jim Clanin. Dr. Anthony Kampf of the Los Angeles County Museum of Natural History and Dr. Abraham Rosenzweig provided a useful critique of the manuscript. Dr. Kampf also supplied numerous photos of relevant specimens from the museum's collection. Logistical support was given on many occasions by Cal and Kerith Graeber, and by Jim Walker and Mary Fong Walker. Numerous photos of mining activities taken by the late Josie Scripps were provided by Cal Graeber. Photographic assistance with specimens was provided by Jeff Scovil.

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Tourmaline crystal (25 cm tall) on Quartz, Cryo-Genie mine, San Diego County, California
Natural History Museum of Los Angeles County specimen

Photograph by Harold & Erica Van Pelt
Design by Anthony R. Kampf

History of the
TOURMALINE QUEEN MINE
San Diego County, California

Edward R. Swoboda
1004 North Rexford Drive
Beverly Hills, California 90210

For over a century the Tourmaline Queen mine near Pala, California has been known for large and beautiful crystals of tourmaline and morganite beryl. The extraordinary blue-capped pink elbaites recovered in 1972 remain among the most famous mineral specimens of any kind ever found in California, and are surely the finest tourmalines ever recovered in North America. Here is the story behind this great locality, which today is once again producing fine specimens.

EARLY HISTORY

The most conspicuous feature of the eastern flank of Pala Mountain in northern San Diego County, California, is a white pegmatite vein that scars its smooth, brush-covered upper slopes for several thousand feet in a north-south direction, embracing within its thicker northern sector, the property known as the Tourmaline Queen Mine. In the immediate area of the old underground workings the vein ranges in thickness from about 8 to 14 feet. The pegmatite body, which intruded and developed within a series of step fractures in the granitic host rock, dips some 20 degrees to the southwest toward its point of origin.

The original discovery of pink tourmaline crystals at the Tourmaline Queen mine was made just a few hundred feet below the summit where the vein prominently crops out along the surface. The discoverers, Pedro Peiletch and Bernardo Heriart, two Basque sheep herders, eventually claimed this property as a quartz mine together with their partner John Giddens. They had been following their flocks over the slopes in the late 1800's when they came upon an exposed pocket that had spilled its contents across the soft topsoil of the mountain.

Figure 1. **The Tourmaline Queen workings on the side of Queen Hill. Bryan Swoboda photo.**

In 1905 George F. Kunz published a review of gem materials being found in California. It describes the Tourmaline Queen mine property as follows:

> Other openings on Pala Mountain are the Tourmaline Queen and Tourmaline King, of which the former especially shows crystals of rich and varied coloring.
>
> *Tourmaline Queen Mine.*—This mine, owned by Mr. Frank Salmon, John Giddens, Pedro Peiletch, and Bernado Heriart, is situated near the summit on the northeast slope of Pala Chief Mountain, at an altitude of 1450 feet. It is about 3½ miles north by a little east from Pala, San Diego County. The section and quarter were not obtainable. The mine was located as a quartz claim by the above named parties, in March 1903. The vein is about 14 feet wide, and dips to the southwest 15 degrees. Very little has been done on the property, but scalping work in the nature of an open cut 60 feet wide, and entering the vein to a depth of about 10 feet, produced in weight approximately 80 pounds of gem-tourmaline crystals. The colors are yellow, green of several different shades, light pink, ruby-red, and black. In examining the ledge, 18 inches lying between the diorite hanging wall and the coarse pegmatite appears to be an infiltration of decomposed feldspar, gradually altering to pegmatite. Below this are about 3 feet of coarse, granular pegmatite (or granite), consisting of crystallized quartz, feldspar, and muscovite mica, with impurities of black tourmaline in fan-shaped crystallizations, and essonite garnets (microscopic), with occasional crystals of biotite mica and hornblende. Below this again, and gradually altering from the above, are masses of graphic granite, incrusted at the lower edge with albite, in which the gem-tourmaline seems to have a root or extremity. Between the albite and the line-rock (or granite) are large pockets filled with rose- and lavender-colored muscovite, and decomposed spar in the nature of a whitish or pink clay; in these pockets the gems are found, broken in many instances, and more or less altered. Many crystals were observed with an exterior of opaque green, while the interior was a rich pink or ruby-red, affording beautiful gems. The ledge has been prospected for about 250 feet, and shows gem indications wherever it has been opened. The hanging wall is a coarse, greenish and grayish diorite, which is the general formation of the entire belt. The foot wall is the same, though showing more alteration. Both Giant and Judson powders have been used, although from the hardness and toughness of the rock, the former was found to be the best. After the pocket material has been extracted, screens are used by which the dirt and fine, worthless stuff are eliminated. The matter left in the screens is then examined for gems, and afterwards washed. Two of the owners have performed all the work so far accomplished, and no other men have been employed. Active operations will again be resumed, but nothing is being done at present. The same parties have filed on a spring 350 feet northeast of the present workings, and abundant water for mining and domestic purposes has been developed. The minerals noted in above claim are: tourmaline, albite, orthoclase, muscovite, lepidolite, kaolin, talcose clays, essonite garnets, hornblende and indications of epidote. The

lower part of the ledge is composed of a fine granular micaless granite of a gray color, banded at intervals of from 3 to 6 inches with minute essonite garnets, whence the name line-rock. As is usually the case in all ledges of pegmatite bearing precious stones in this region, this lower layer of the ledge has approximately the same width as that of the formation from the pocket layer or center to the top, and lies directly in contact with the diorite foot wall.

During the ten-year period following George Kunz's description of the Queen property, from 1904 to 1914, some 900 feet of tunnel were driven within the pegmatite vein in search of gem tourmaline. No record exists of the amount of faceting or carving material removed during this period, but evidence left throughout the old underground workings suggests that a large number of tourmaline crystal pockets were uncovered that easily could have produced several thousand pounds of gem tourmaline.

Some of the clear gem crystals from the Queen were being faceted in San Diego, while the bulk of the less gemmy pink material destined for carving in China was hand cobbed and beneficiated into gemmy chunks for shipment. Consequently, untold quantities of natural crystals, probably including crystal formations of singular beauty were broken up and destroyed in order to provide the raw materials that were being sought by the Chinese stone carvers.

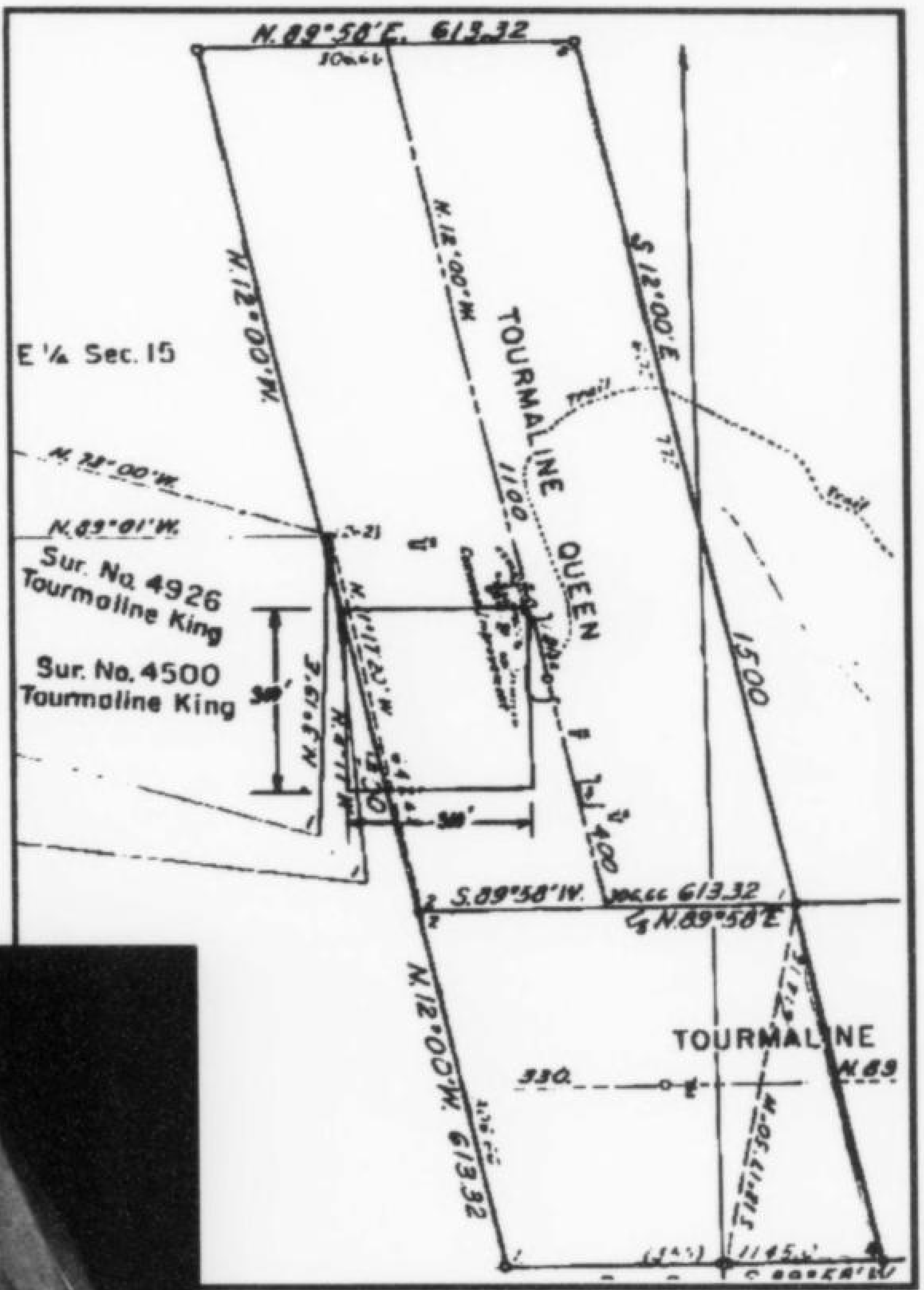


Figure 2. **Survey map showing the Tourmaline Queen claim.**

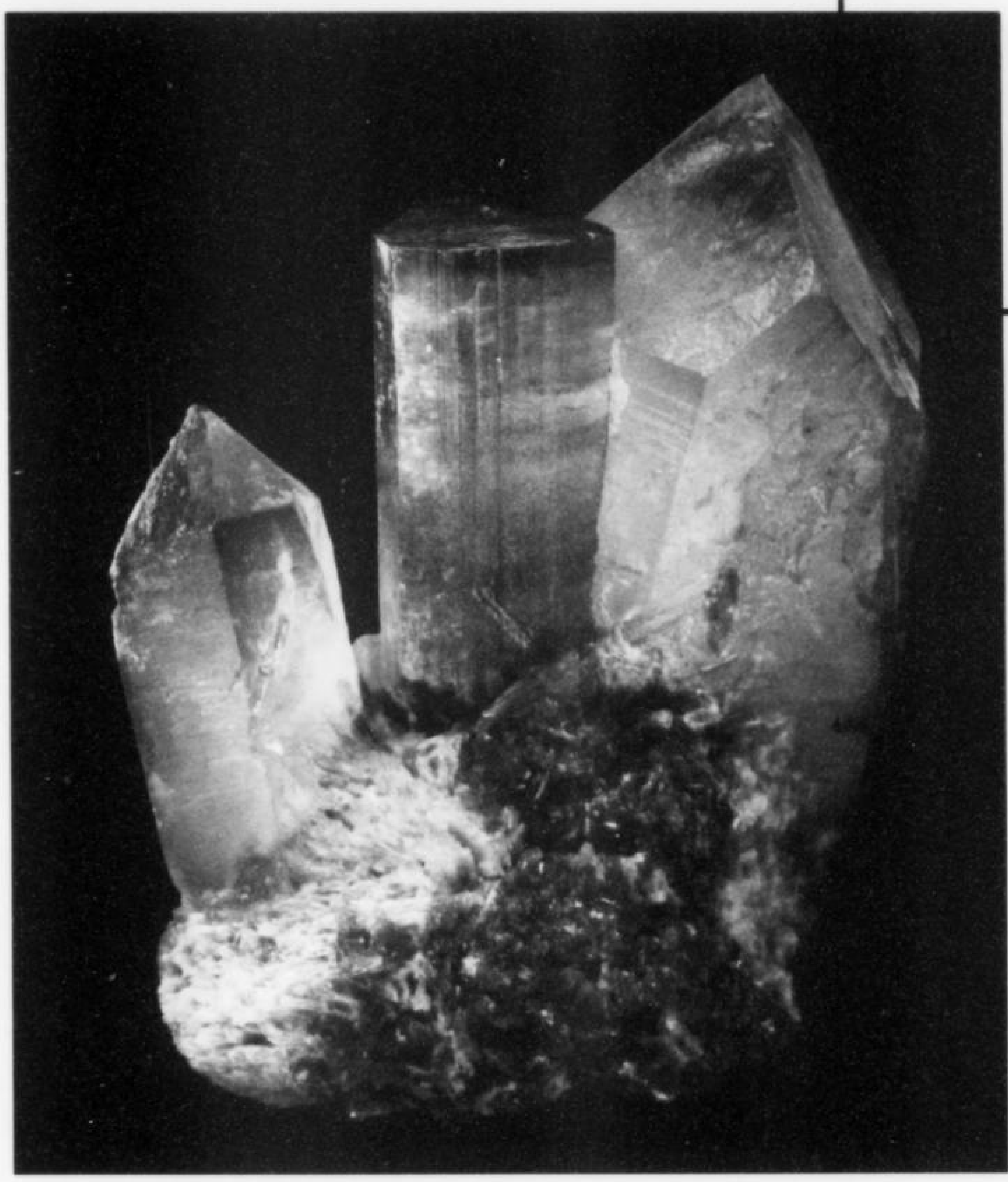


Figure 3. **The "Postage Stamp Tourmaline," 7-cm crystal with quartz, collected in 1913 at the Tourmaline Queen mine. Wendell Wilson photo.**

The fall of the Ch'ing Dynasty (1681–1912) in China marked the end of demand for pink carving-grade tourmaline, resulting a short time later in the closing down of the tourmaline mines in California. Local problems at the Queen may have prompted the closure too. Poor returns from unproductive areas, and an increase in labor costs for the removal of waste rock through the twisted passageways to the ever more distant surface, may have made the mine uneconomical to work. In addition, an ominous sign plainly marking the upper tunnel walls is a high-water mark, once quite visible, indicating that a devastating underground flood took place at some time, probably from a severe downpour visited upon the upper slopes of Pala Mountain. Consequently the gem mines in San Diego County were "officially" shut down.

At least one prominent specimen did survive from those early years, probably by virtue of having been collected just after the collapse of the Chinese market. It is a moderately attractive blue-cap tourmaline with quartz and lepidolite, said to have been collected in 1913. In December of 1967 it was offered for sale by two young New Jersey dealers, Charles L. Key and Frederick L. Smith, and was purchased by Paul Desautels on behalf of the Smithsonian Institution. It sat in the "blue room" for several years, drawing little attention. Around 1973 the Smithsonian traded it to the University of Texas at Austin, not learning until February 1974 that the U.S. Postal Service had chosen it to be represented on a postage stamp. The "postage stamp tourmaline," now famous, was acquired from the University by Dave Wilber in a September 1974 trade. Wilber sold it to John Barlow in 1983.

THE HIGHGRADER PERIOD

During the ensuing 50-plus years of inactivity, the dormant mine properties were overseen by their various owners or by family members, who fought a losing battle against a host of surreptitious highgraders willing to take a chance trespassing into the underground in search of the elusive gem crystals. Some collectors during this interim period were quite successful. Sinkankas (1959) was able to describe pockets and contents in some detail, despite the many years that had elapsed since major "official" production had taken place. Pockets were encountered between the edge of the quartz core and the lower half of the pegmatite, the pocket roofs always covered by large quartz crystals and blocky, corroded feldspar, penetrated by large, colorful, gemmy tourmaline crystals with black roots extending into the pocket wall:

> At the points where [the black tourmaline crystals] penetrate through the quartz crystals lining the roof, they assume color and transparency, crystallizing in large crystals of wonderful quality within the pockets. Sometimes these crystals remain rooted among the quartz crystals and provide magnificent specimen groups if carefully and intelligently removed. Most frequently, however, [tourmaline] crystals are found broken by the violence of late-stage activity within pockets and are then found loose and sometimes doubly terminated.

Sinkankas (1959) also noted that many of the larger tourmaline crystals contained bright pink to red cores sheathed in a thin, pale blue to very dark blue outer zone which tends to mask the interior color. The blue zones represent the last stage of tourmaline crystallization, and consequently many of the smaller crystals are entirely blue throughout. One particular mineralized vein was especially noted for blue tourmaline; in the outermost portion of the streak, near the southern adit, peculiar "black-skinned" crystals were found in a pocket several feet across. The black skin is actually a very deep indigo color, surrounding a pale aquamarine-blue core, "a most unusual and rare color in this species." Further down dip more pockets were found containing similar crystals to several inches. Sinkankas estimated that a total of several tons of tourmaline had been produced as of the late 1950's, along with quartz and crystals of morganite (pink) beryl.

PALA PROPERTIES OPERATIONS

In April of 1968 I was able to purchase the patented Stewart Lithia mine property from Leo and Dorothy Mies; the Pala Chief was next to be acquired, and then in September of that same year I succeeded in purchasing the patented Tourmaline Queen mine from Mrs. Margaret S. Moore and Mrs. Mildred S. Wear. The initial exploratory work at the Stewart mine I entrusted to Terry Szenics, who was quite successful (but that's another story; see his entertaining 1970 article in *Lapidary Journal*).

I had a local D-6 bulldozer operator convert an old wagon trail on Pala Mountain into a four-wheel-drive-accessible road, connecting the Stewart Lithia mine to the Queen mine farther up the mountain. He then established a large pad at the old portal to the Queen underground, at the same time removing huge amounts of decomposed granite that had slumped into the main entry.

A short time later, after taking in the young Bill Larson as partner and forming a little company called Pala Properties International—dedicated to the mining and acquiring of fine mineral specimens, cutting materials and cut gemstones—I leased my three Pala properties to the PPI company for one dollar per mine per year.

Over the years, highgraders had done extensive damage underground, demolishing support pillars and clogging the passageways with piles of muck. My first impression of the old workings was that they were a hopeless and chaotic mess. However, because of my desire to find a way to reopen this supposedly exhausted gem mine, I spent many hours exploring the underground workings by squeezing through a side entry of the badly caved 70-year-old tunnel system. Making my way under and around huge blocks of dislodged pegmatite, I penetrated through narrow passageways that had to be enlarged by removing some of the highgraders' muck. At last I sat down with a flashlight to try to fathom the significance of the various mineral formations exposed on the walls and ceiling of the old tunnels. What made me finally decide to acquire the Queen property was my belief, after spending this time underground, that the pegmatite vein still contained undiscovered gem pockets deeper in the mountain, beyond the deepest of the old workings.

Many of the old tunnels still contain the remains of mined out gem pockets showing formations of purple lepidolite mica, rust-stained pocket clay, quartz crystals and blocks of feldspar, with large black schorl prisms, all of which are considered good indicators of nearby gem pockets.

After the access road between the Stewart and the Queen had been completed, an air compressor was dragged up the steep little dirt road by bulldozer and positioned on the new pad. The crawl hole that I had used to enter the old underground workings was cleaned out enough for us to wrestle a 60-pound air-hammer through fractured tunnels to reach a spot that I felt was promising. At the end of one of the northernmost tunnels, we planned to advance the face of the tunnel just a few feet through the vein to reconnoiter. Soon we were drilling, blasting and piling muck to one side, heading in a northwesterly direction.

After advancing no more than 6 feet [Bill says 20 feet in his description] we broke into a little pocket. Luckily the blast had not destroyed the pocket, but had removed enough of the surrounding rock to reveal an opening into the clay-filled interior. Careful probing with an ice pick uncovered four multi-colored tourmaline crystals, terminated but malformed, the largest of which measured almost 2 inches thick by 3 inches long. We accepted this discovery as a good omen, even though the color of the tourmaline was a somber blue-gray, suffused with some pink, and the crystals were not too well formed. We were convinced we were heading in a promising direction within the vein.

John McLean had been hired by PPI to supervise the mining of the Queen. Before continuing forward in this promising direction, he first had to clean out a tunnel to the surface and install some haulage equipment: two battery-driven winches that struggled to lift our primitive wheelbarrow-loads up the steep grades leading to the outside dumps.

Before leaving on a trip of several weeks through Africa and South America with Bill Larson, I gave John an idea of where the tunnel should be driven in our absence. He began work in September of 1971, and for several weeks dutifully drove tunnel in a northwesterly direction from where we had uncovered the first little pocket. He advanced 30-some feet [Bill says 40 feet], passing

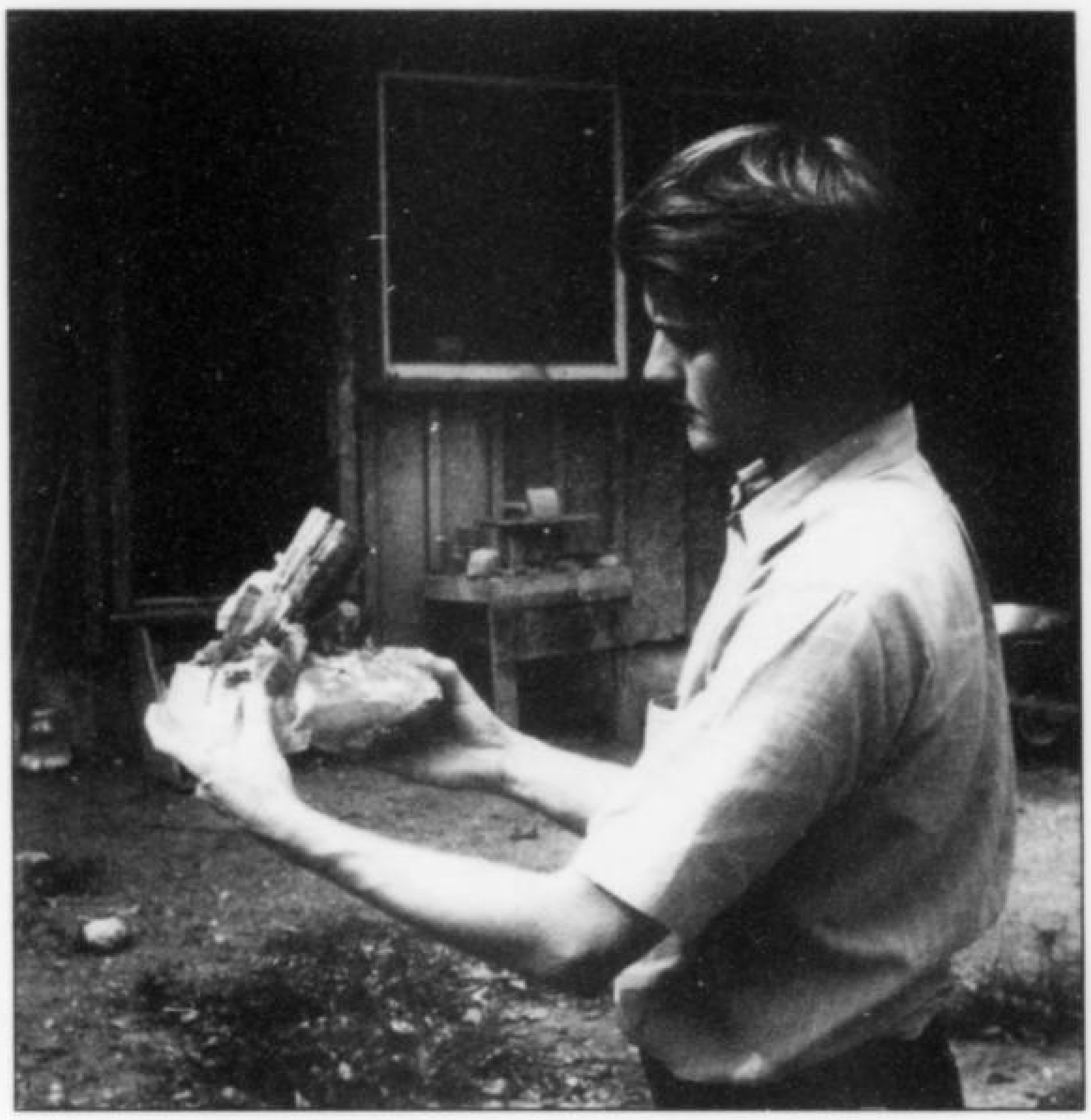
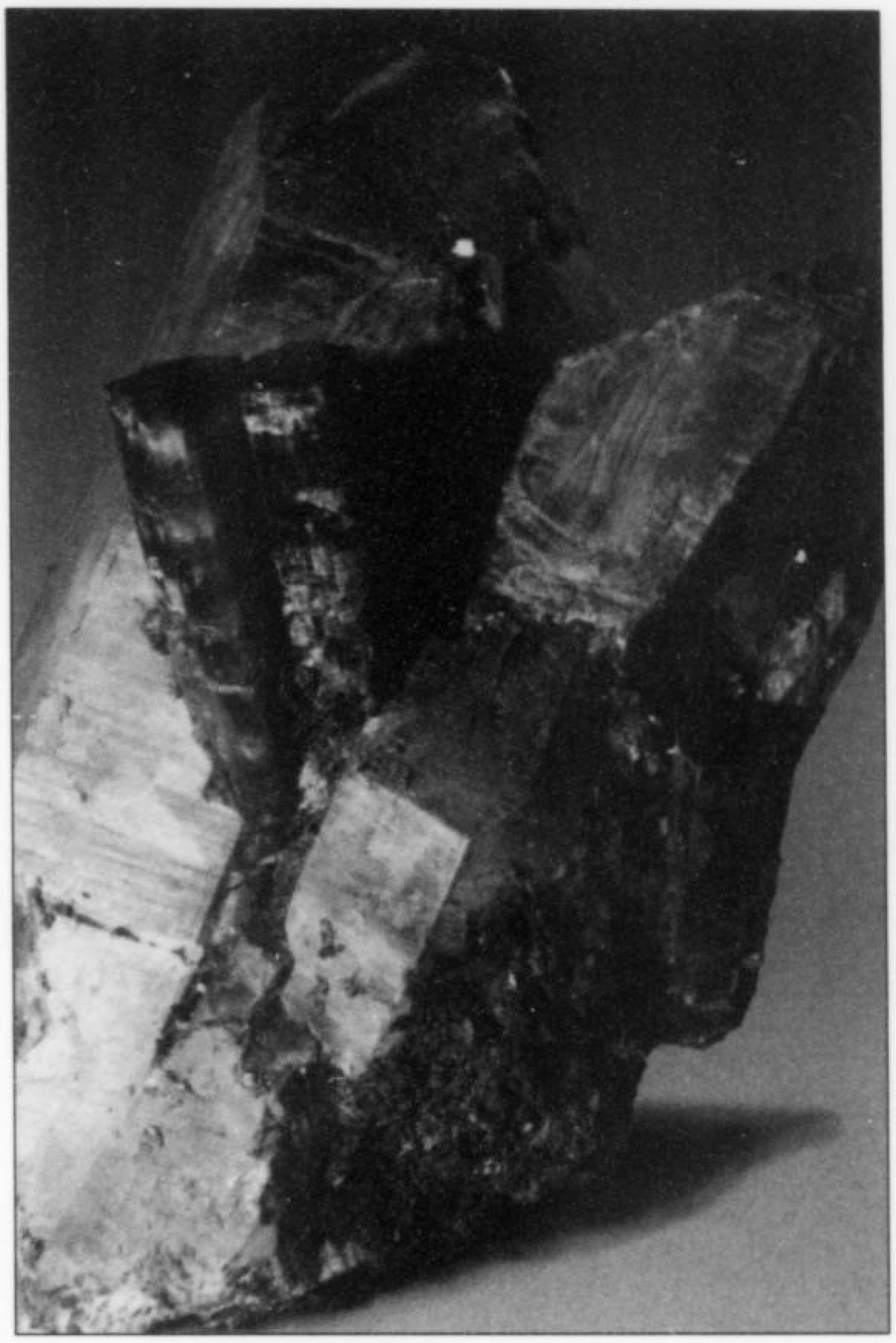


***Figure 4.* Bill Larson in 1972, holding one of the remarkable matrix specimens of "blue-cap" tourmaline which had just been discovered. This is the same specimen as shown in Figure 85, page 380, found several months after the main blue-cap pockets.**

***Figure 5.* One of the big "blue-cap" tourmalines in 1972, shortly after removal from the mine, before washing to remove pocket clay. E. Swoboda photo.**



through some incredibly unpromising-looking pegmatite, tight and fine-grained and completely devoid of those pocket indicator minerals that signal the potential presence of gems in the vicinity.

A day before my arrival home from overseas, John finally came upon something of interest: a thin little horizontal veinlet running across the new working face of the tunnel. It was only an eighth of an inch thick on the left side and barely a quarter of an inch thick on the right, but this bright little ribbon of violet pink lepidolite mica was the first indicator that he had come across since starting the new tunnel.

The next day after arriving home, I went underground with John to be shown the thin little strip of violet mica. It seemed logical to favor the direction in which the veinlet was enlarging, so we shifted our tunnel direction to the right to almost due north to follow its lead. John tunneled through some very promising looking ground, which we soon found to be the outer components of a huge gem pocket.

It took us about two days of carefully placing charges of powder to uncover a window into a very nice pocket. After removing the sticky red mud, we saw that it measured at least 1.5 feet wide by 2.5 feet long. Careful probing and digging with a screwdriver netted us only one tourmaline, but what a crystal! A 2.25-inch-thick deep pink shiny prism almost 5 inches long and capped with a flat, quarter-inch-thick, heavenly bright blue termination that glistened brilliantly. It was the first of the "blue caps" . . . what a stunning find!

Continuing our probe into the soft clay, we soon came up against a mass of quartz and feldspar that marked the end of the pocket. That night after the rest of us had dragged ourselves out of the underground and had gone our separate ways home, John McLean drilled a very short, carefully placed hole into the sidewall behind the quartz-feldspar mass and just popped it out with a short stick of dynamite, not knowing if there was anything of worth behind it. When the smoke had cleared he went back in. After taking a look, he immediately came down the mountain and spread the electrifying news that a much bigger pocket lay just beyond that one we had been digging in. With some effort we all excitedly gathered once again, very late that same night, and went back underground. We were all soon mud splattered and weary, working like a busy pack of gnomes, removing box after box of mud covered lumps and forms that showed bright crystal faces underneath and were just waiting to be cleaned. This was the most exciting pocket dig that any of us had ever experienced.

The main pocket measured about 4 feet across, with from 1 to 2 feet of space from floor to roof, and was completely clogged with sticky red mud. On its outside perimeter we came upon several small satellite pockets, each of which produced blue-cap crystals, some as free singles and some attached to quartz crystals.

This huge pocket, occupying a gently rising, near-level portion of the vein, was connected to three or four satellite pockets around its eastern rim. Another short step to the east and the pegmatite makes an abrupt upward turn. We found two or three very large blue-cap tourmalines, each completely filling its own satellite pocket. We speculated that originally all of the pockets had been open to each other, allowing a free flow of the hydrothermal solutions during tourmaline crystallization, but had later been closed off from each other as a result of the subsequent growth of other minerals.

Many if not most of the more outstanding blue-caps found in the main pocket had grown downward out of the roof, where they had developed among a network of intergrown quartz crystals. Most of these fabulous specimen tourmalines had been dislodged from their quartz matrix and had fallen into soft clay, which cushioned them from any damage. Their former attachment points were still clearly visible amongst the quartz crystals covering the roof.

Several pieces of quartz crystal matrix removed from the pocket as rather uninteresting broken segments of the roof, later became the most beautiful and exciting specimens after reattachment of their original tourmaline crystals. Many of the loose single blue-cap crystals recovered from the pocket mud fitted precisely into their sockets among the quartz crystal clusters.

Two especially noteworthy specimens, rare and beautiful with salmon-pink morganite beryl crystals attached to gorgeous pink tourmaline crystals, brought whoops of joy upon being removed from their muddy refuge. Several days of very careful digging with small hand tools were required to complete the extraction of the amazing contents of this fabulous pocket.

BILL LARSON'S ACCOUNT, 1972

In October of 1972, Ed Swoboda's partner in the blue-cap discovery, Bill Larson, published his own first-person account of the big find and the work leading up to it. His description, recorded when the exciting events were still fresh in his mind, is given (slightly abridged) below.

We needed a small strike to strengthen our conviction that this mine would be productive. A suitable area for some preliminary exploratory work was found where a pocket had been removed during earlier operations; this was the same area where Ed Swoboda had wanted to work many years before, and I had also done some considerable sniping there. John McLean began drilling and blasting into the rock face in September of 1971. After two weeks of back-breaking work, 20 feet of new tunnel had been carved out. I was up in Seattle at the National Gem and Mineral Show when I got a call that a large pocket of dark blue tourmaline had been hit. As soon as I returned I examined what remained of the pocket. It had measured about 1 x 2 x 2 feet, quite a nice size, and contained a sticky red clay. Four fine tourmalines had been found: One was a doubly terminated single crystal 2 x 3 inches. The other three were matrix specimens, all quite similar, and each with a single crystal 2 x 3 inches attached to a quartz crystal. Many quartz crystals were found in the pocket, all with distinctive montmorillonite inclusions giving them a white to pink opaque exterior. The most exciting aspect of this initial find was that the tourmaline crystals, while a dark indicolite-blue in their outer zone, were deep rubellite pink in the interior. This was almost too much to hope for, since most of the recent pockets that had been documented lacked rubellite.

Encouraged by this discovery, we set to work in earnest. Little by little the adit was cleared to the area where the indicolite had been found. After two months we could walk standing up through the 180-foot incline instead of crawling. The pegmatite continued to show signs of increasing richness. The size of the lepidolite crystals increased two or three times. Much cleavelandite feldspar was still present along with subhedral to euhedral quartz crystals. The next 6 feet or so were unproductive; however, all the pocket indications continued until we were again rewarded with a pocket. This time it was a small vug series, a group of interconnected vugs from fist size to football size. These vugs, however, were mostly devoid of gem minerals, being filled with red clay on top and a sandy clay on the bottom. When a little tourmaline was encountered it was usually present as 1-inch crystals clustered near the bottom. Tourmaline crystals up to 2 inches in diameter were seen in one vug, but even the most careful removal yielded only crystal fragments. The crystals had grown into the facing pocket wall and showed no terminations. The most exciting aspect of these larger tourmalines was their color; they were rubellite without any indicolite at all. Washing and screening the contents of these vugs didn't reveal any more large crystals but many more 1-inch crystals did show up, and even more interesting were the several morganite [pink beryl] thumbnails that were found.

The next 40 feet of tunnel were the most barren footage I have ever seen in the Queen: no lepidolite or fine-grained quartz, feldspar or muscovite. Ed and I had been gone a great deal of the time, buying collections to keep our business supplied. If I had been there all that month, I doubt if I would have continued mining that far downdip; but, since John had gone that far, he wanted to try a little to the right and down, where the rock seemed softer. The next shot uncovered lepidolite. One week later we hit a small pocket containing one specimen, a quartz crystal about 4 x 5 inches with a rubellite tourmaline crystal flaring out of the center, 2 inches in diameter. The tourmaline was recovered in three pieces, but careful repair made it into a fine specimen. (During the depositional cycle of pegmatite pockets, tourmalines and other minerals extending into the pocket void are often broken during an explosive decompression phase.) The discovery of a fine rubellite specimen really turned us all on, and we were now sure something major was shaping up.

I was working in the shop one day when John came down from the mine to tell us he had hit a new pocket. A 2 x 2-inch rubellite had been exposed at the mouth of the clay-filled vug. It came out easily as a single crystal, but it was different from any of the other tourmalines found so far. The termination was a bright indicolite-blue! Here was a real treasure, a bicolored rubellite with indicolite termination. Unfortunately, however, this was another pocket largely devoid of gems except for that first specimen. Ed removed six or seven powder boxes of sticky red clay without finding another tourmaline in the 2 x 2 x 3-foot pocket. The pocket got tight toward the back and we gave up. Ed had a two and a half hour drive back to Los Angeles, so he and his wife Kumja left and I went home.

Buzz Gray and I were still looking over the one specimen we had found when John came in looking terribly muddy, and handed me a perfect 1 x 3-inch crystal. "You quit too soon!" he said, and pulled another crystal out of his pocket, and so on until we had five beautiful tourmaline crystals before us. What a New Year's present! It was 6:30 P.M. and Ed was just arriving home. We phoned him and caught him coming through the door. "We quit too soon! John says there are more! See you at 9:30!" My wife Karla asked, "Ed's coming back at 9:30 tomorrow morning?" "No," I said, "9:30 tonight!"

By 9:30 we were all assembled: Ed Swoboda, Buzz, Karla, Ed Bryant, my father Carl, and me. We all piled into

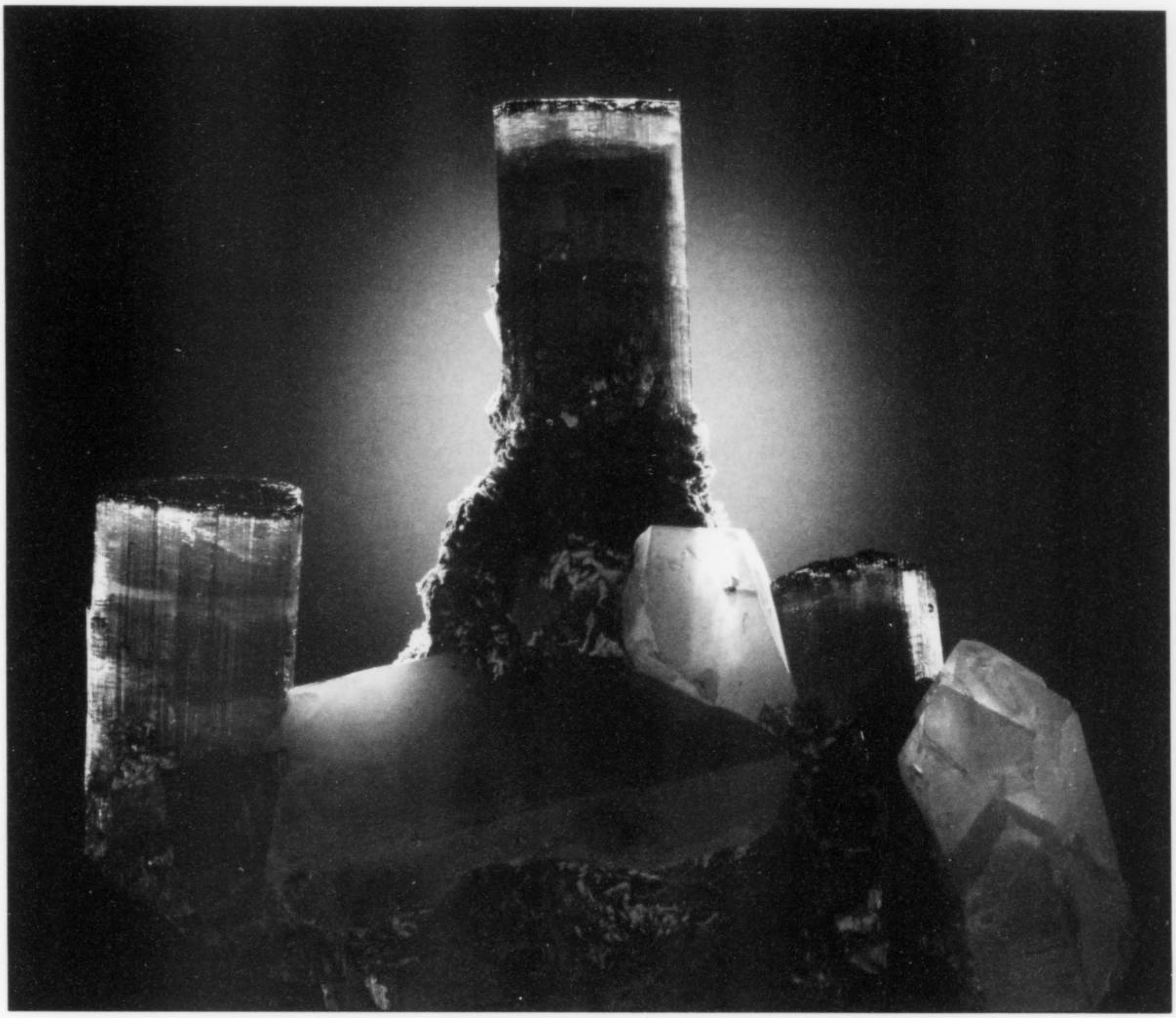


Figure 6. **The famous 1972 "blue-cap" tourmaline known as "The Candelabra," ca. 30 cm across, now in the collection of the Smithsonian Institution; Dane Penland photo.**

our yellow truck, and I was elected to drive up the 2-mile mine road, rough enough in the daytime but treacherous and dangerous at night. When we finally arrived at the mine, everyone tumbled out of the truck. It was quiet and beautiful overlooking Salmon City, the deserted old mining camp below. It had been the living quarters for the miners in the early 1900's. I wondered about all the stories of highgrading you hear about, as most of the thieving took place at night. Feeling vaguely like a highgrader myself, I started up our electric generator, and then we raced down the now-familiar adit to the pocket.

The opening was really large now, after we had worked at it all day and John had expanded it in the evening. After about 10 more minutes of digging in the pocket clay Ed hit a really big tourmaline crystal, 4 inches at least. A real artist at pocket removal, Ed began exposing the crystal. Near it on one side he exposed yet another crystal of similar proportions. After another hour or so they came out, two magnificent singles. Karla cleaned them with a little beer. With the same fabulous colors, they were the finest crystals to date. By this time the pocket was deep enough to crawl into, and it was 4 a.m. We decided to call it a night, but everyone felt well rewarded, and we knew that more thrills awaited us in this pocket.

For the next week John cleared and enlarged the area around the vug. The original pocket was playing out, but two new ones had been found adjoining it. On a Wednesday night, after having exposed a nice single tourmaline during the day, I asked my father Carl to go up with me and finish digging it out. The electric generator had broken down, but Carl had thought to bring a large flashlight, so in we went. When we got to the pocket we set to work trying to remove the exposed crystal but it was tightly attached. Chipping away with a double jack and chisel, I was slowed by the cramped position. After an hour of work I was ready to remove the encasing clay from around the tourmaline. A quartz crystal began to take shape behind the tourmaline crystal. They appeared to be attached. As I continued working, the whole specimen began to take shape. It was really quite large, over a foot long; then, at the rear, I found a second tourmaline attached. I knew then we had a great piece.

Ready for the final removal, we stuck a pry-bar in near the center and gently applied pressure. I felt the entire mass move—what a thrill! I reached in with both hands and pulled out the now-famous specimen we named "The Candelabra." What a sight! Over a foot long, it had two tourmalines, one on each end, and in the center top was a place where a third tourmaline crystal had once been attached. We dug for about 40 minutes more and found the third crystal; it was a perfect fit, making a fabulous specimen, one of the finest ever.

By Friday night of the following week John had finished clearing the area around the two connecting pockets to expose them. All of us were excited because all of the small crystals pulled from the pocket clay thus far were the same beautiful bicolor, blue top and red base.

The group had gathered at the nearby Stewart mine: Josie Scripps, Ed Bryant, Buzz, Carl and myself. We drove up to the Queen portal and went in. Pads had already been laid out, with tools waiting. The two clay-filled pockets, each about 2 feet across, were about 18 inches apart. There were a couple of small tourmalines exposed in the bottom of one. While the others joked and drank beer and Pepsi, Ed and I each got into a pocket. As I worked it back I noticed that my pocket went towards the other. Soon it was apparent that the two pockets were connected; we worked out the bridge between them and had one large working face. Ed and I were now stretched out working the same pocket and not even fighting for the same crystals! The singles were coming out regularly. After we had each removed three or four fabulous singles to a toast of beers and shouts, Ed leaned over to me and said, "You know, I can die happily now!" It was truly a dream come true.

We went down for dinner which Karla had brought up to the Stewart mine for us. We finished around 9 P.M. and, as the pocket was now looking more promising than ever, the men elected to go back up to the mine while Karla and Josie went home to wash up the eight or ten crystals we had found thus far.

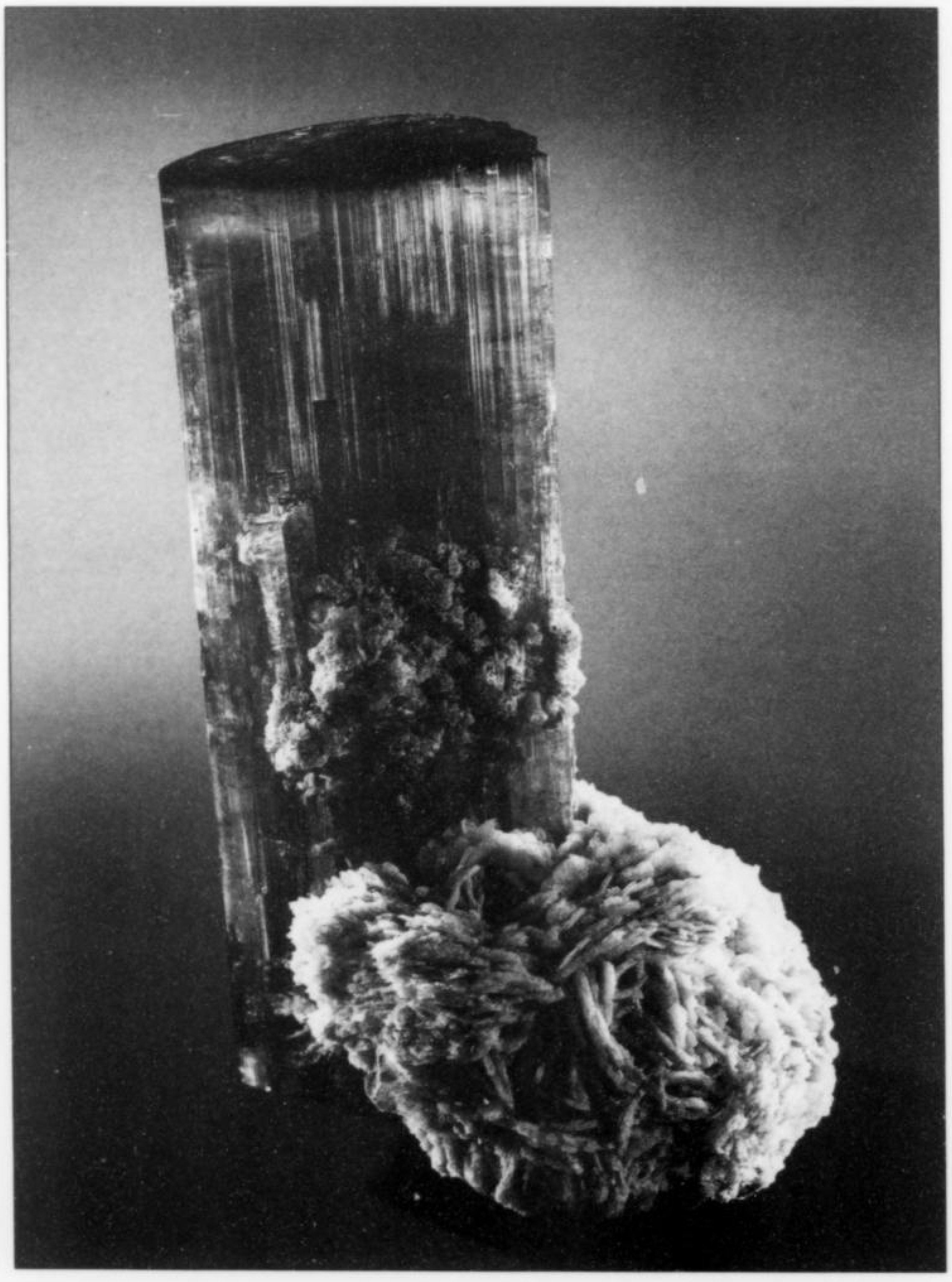


Figure 7. [left] **A 1972 "blue-cap" single crystal, about 15 cm tall, with albite matrix. Photo by Harold and Erica Van Pelt.**

Figure 8. [facing page] **Superb 1972 "blue-cap" tourmaline on quartz, 24 cm tall, known as "The Rabbit Ears," now in the Houston Museum of Natural Science collection; photo by Harold and Erica Van Pelt.**

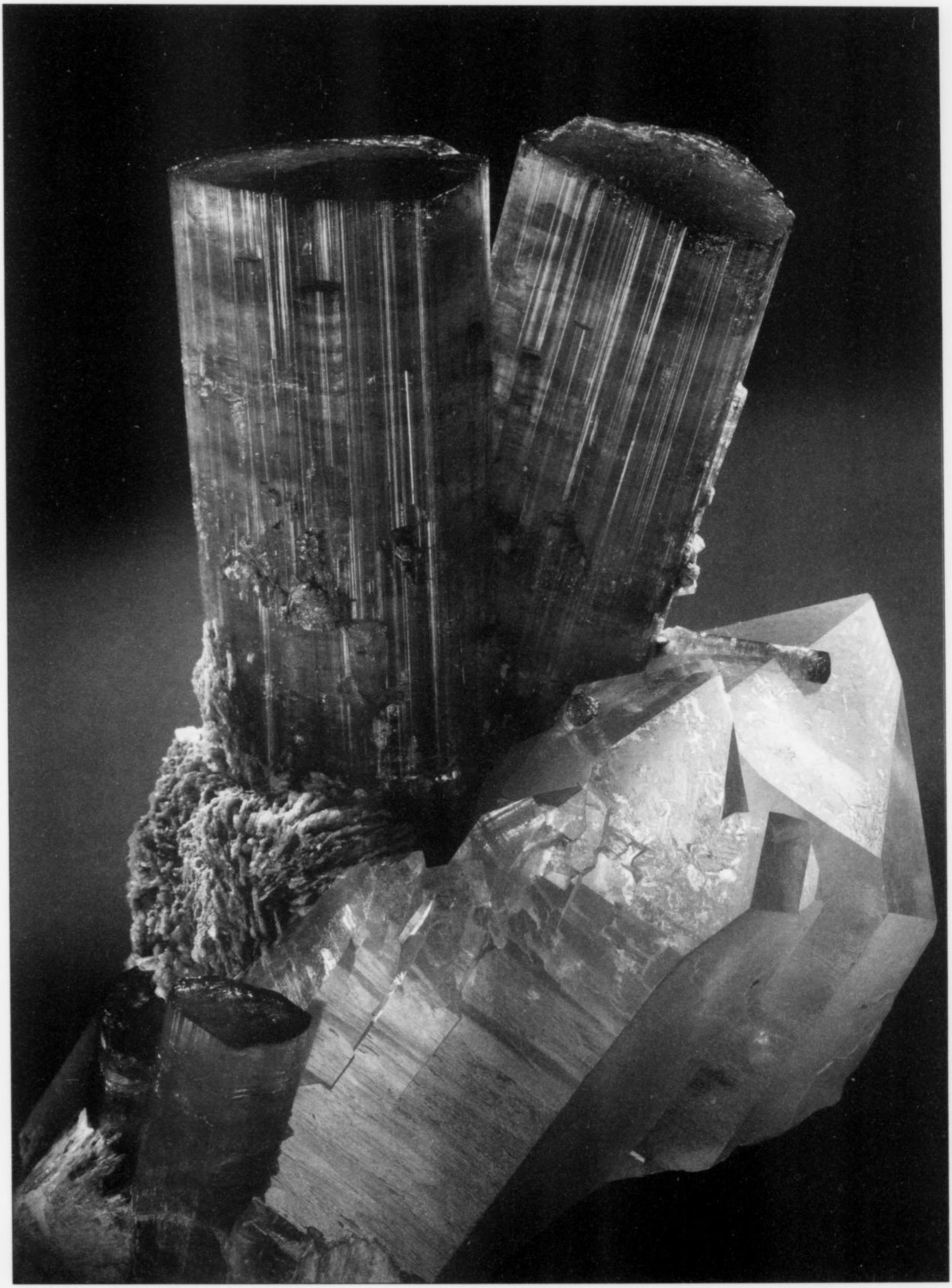


Figure 9. **Morganite (pink beryl) with "blue-cap" tourmalines, quartz and albite, ca. 15 cm, one of the finest specimens from the 1972 pocket. Wm. H. Larson collection; photo by Harold and Erica Van Pelt.**

Ed and I were soon back into the pocket. I didn't know what we would find, but I knew it was going to be great. Both of us were working with only our fingers now; these pieces were too perfect to risk causing any damage to them. More and more singles showed up. The air was filled with excited shouts as each new piece was wiped clean. One crystal was found lying under another in a jumble, until finally we had ten crystals exposed. One by one the pieces were removed. As I was working on the last few singles I wiped my fingers across what at first appeared to be a quartz crystal face in the clay, but it showed a deep salmon-pink. "Morganite!" I shouted. The others crowded around enthusiastically, and soon I hit another morganite, this one a cluster of crystals. I worked slowly for half an hour and they came out: matrix morganites, and the matrix was tourmaline! No one could believe it.

I continued working and pulled out a perfect quartz crystal; thinking little of it, I set it aside. After another two hours we had worked the pocket to near completion. As it was quite late, we decided to take our loot and go home. The girls were waiting; the kitchen table was spread with newspapers and ten sparkling-clean tourmalines in a row from earlier that evening. We unloaded our five dynamite boxes full of additional goodies and mud, and began to clog every drain in the house. Every little piece was saved because many of the specimens would later have to be reassembled and repaired like jigsaw puzzles. As we got most of the pieces clean I found a second tourmaline crystal that fit onto the morganite cluster specimen . . . a unique piece, one of the finest in existence.

I cleaned the large quartz crystal that was so perfect and discovered that it had attachment points for two tourmaline crystals. These were quite easily found, resulting in a specimen that took everyone's breath away. Here was aesthetic perfection.

During the next several days the drama was repeated twice on a somewhat smaller scale, and two more major pieces were discovered. By then it was February and we had been planning to have a mine party the week before the Tucson Show. Now we really had cause for celebration! The party took place on February 7, 1972. The weather had cleared and over 100 people had gathered at the Stewart. That evening the goodies were unveiled at the Collector shop about 25 minutes away. My own favorite memory was going into the back of our shop and viewing The Candelabra with Peter Embrey of the British Museum and Pierre Bariand of the Sorbonne on either side while Paul Desautels of the Smithsonian was down on his knees examining the piece he was destined to acquire for the national collection. Two weeks later, Vince Manson of the American Museum of Natural History summed up everyone's feelings. "In terms of color and degree of perfection," he said, "this is the find of the century."

Bill Larson
Lapidary Journal, October 1972
[reprinted by permission]

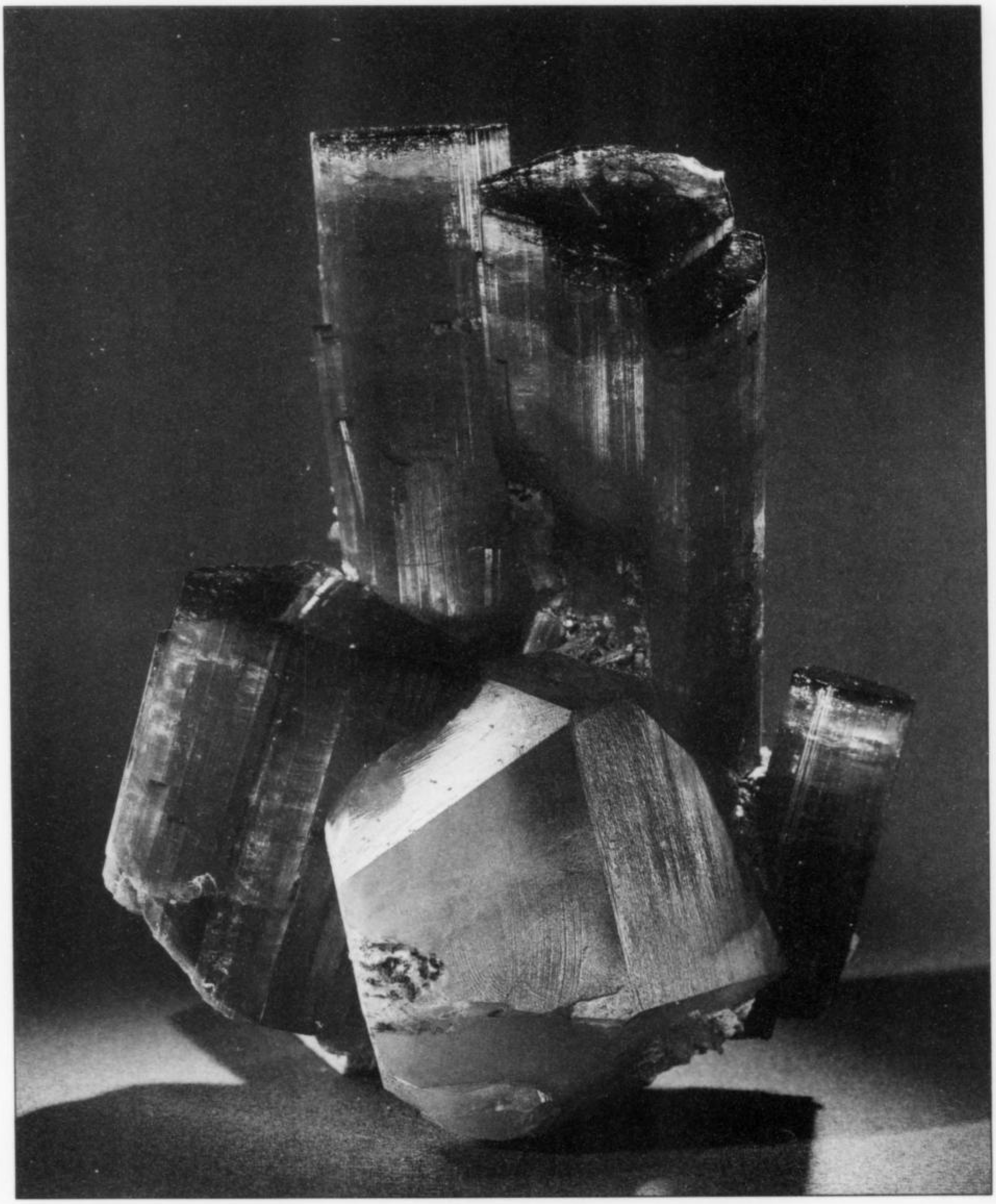


***Figure 10.* "Blue-cap" tourmaline with quartz, 12 cm tall, from the 1972 pocket. National Museums of Canada specimen; photo by Harold and Erica Van Pelt.**

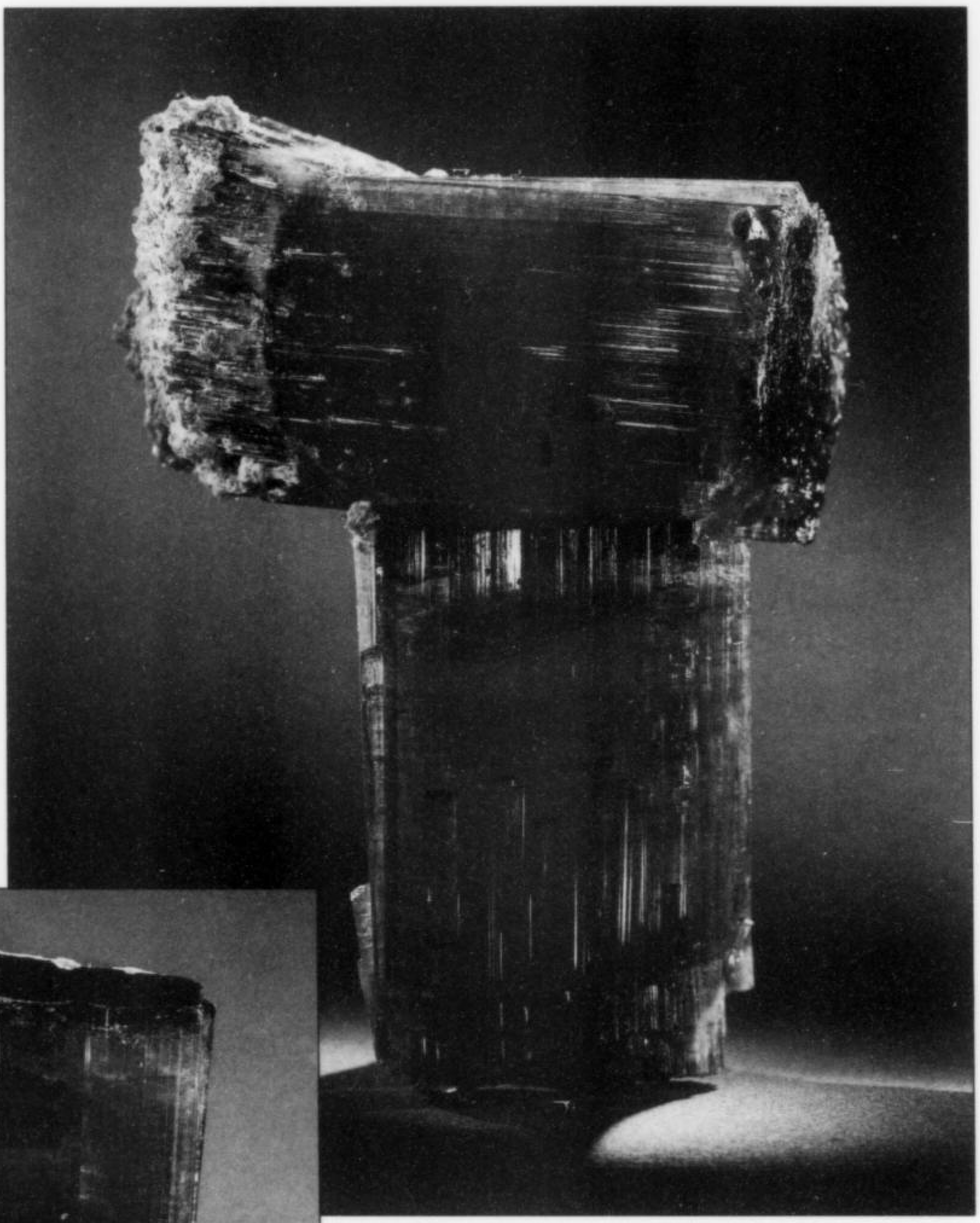


Figure 11. "Blue-cap" tourmaline, 14 cm, known as "The Beer Cans," from the 1972 pocket. Photo by Harold and Erica Van Pelt.

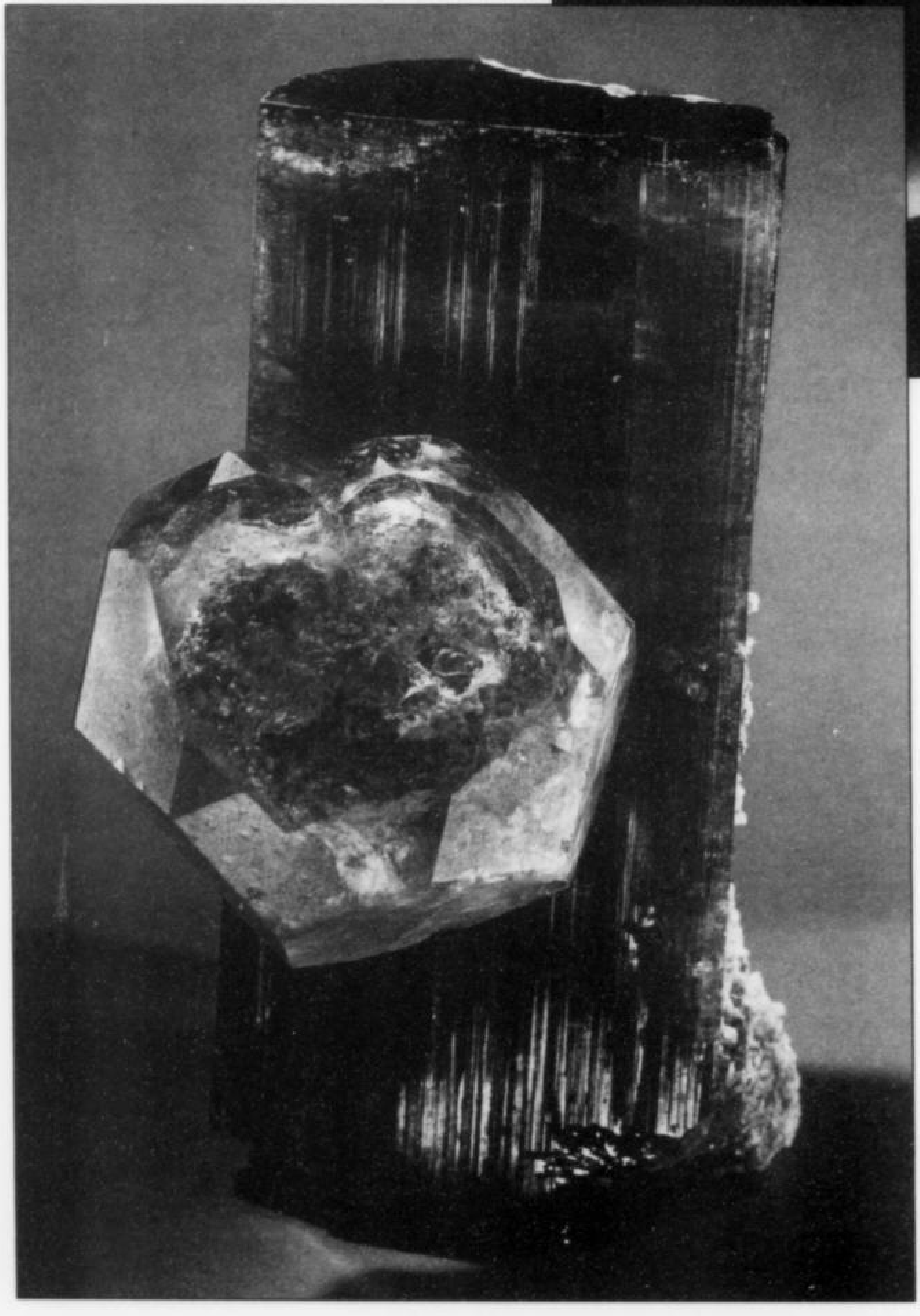


Figure 12. Morganite (pink beryl) on "blue-cap" tourmaline, ca. 13 cm tall, from the 1972 pocket. Keith Proctor specimen, now in the Peter Via collection; photo by Harold and Erica Van Pelt.

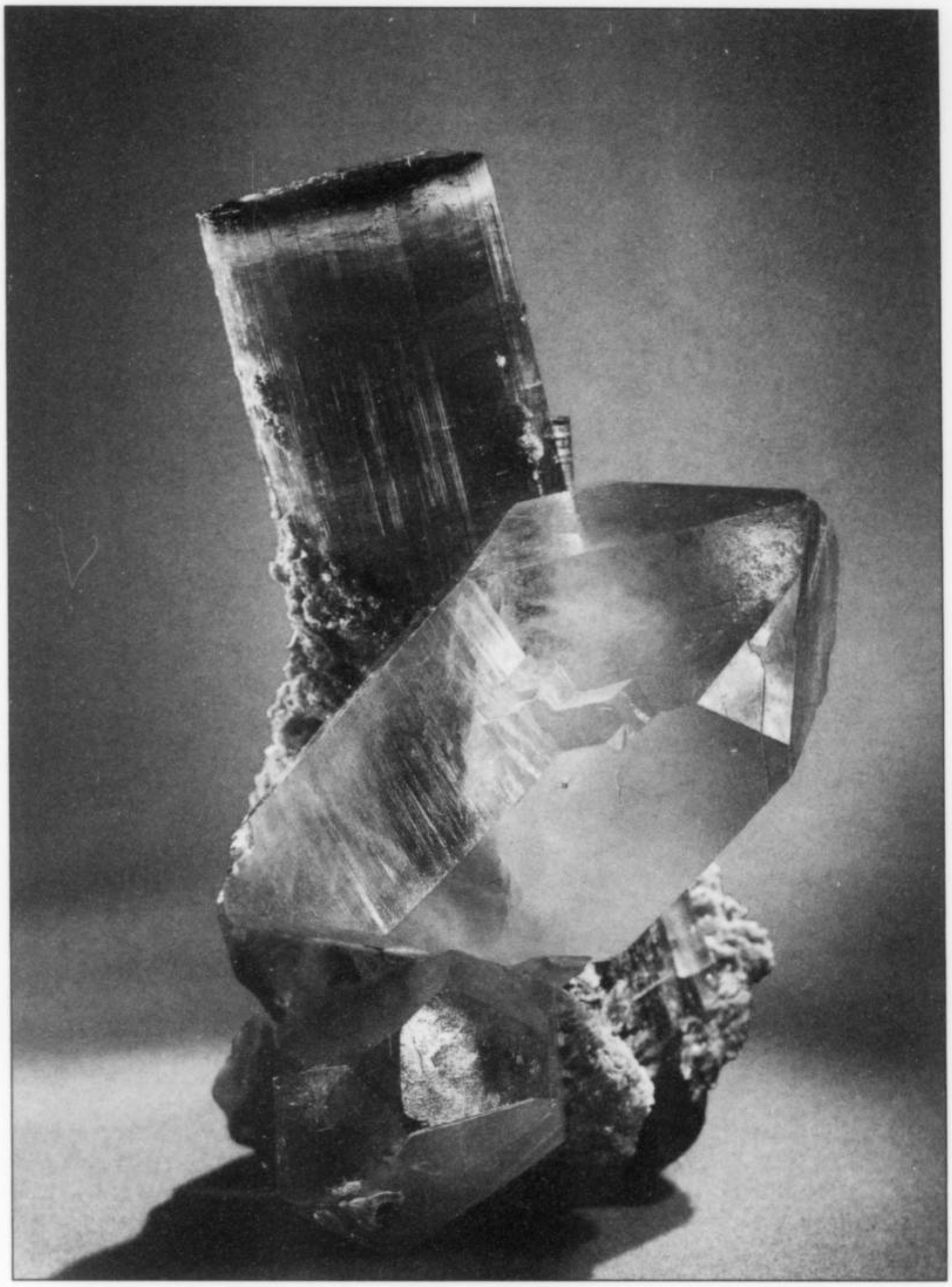


***Figure 13.* Single "blue-cap" tourmaline with quartz, 18 cm tall, from the 1972 pocket. Carl J. Larson collection; photo by Harold and Erica Van Pelt.**

Continuing our search for other gem pockets in the vicinity of this fantastic discovery, we first drove a tunnel to the southwest, the direction from whence came the solution flow that formed the big pocket. Sixty feet of digging revealed nothing of interest, so we drove a tunnel into the vein to the northeast of the big pocket. Only 6 feet away from the main pocket, we found another small satellite pocket containing a very nice blue-cap matrix specimen.

Continuing up dip for another 25 feet just east of the big pocket brought us to a little plateau where the vein had leveled out. Here in the floor of our advancing tunnel we uncovered a pocket containing a cluster of pink tourmaline crystals still attached to the pocket wall and covering an area of about 8 by 10 inches. Using a different technique, we poured water on them as we gently brushed away the mud, taking care not to disturb their natural arrangement. In this manner we brought to light a fascinating specimen of bright pink intergrown prisms, all topped off with flat, brilliant, pale greenish blue terminations, quite different in color from those of the big pocket not 30 feet down slope.

Many days of soaking the mud from the crystals of the big pocket finally revealed a breathtaking assemblage of fabulous specimens that we couldn't stop handling or admiring. In our wildest imagination we couldn't have conjured up specimens as beautiful as the crystals that lay before us.

For several years following the big pocket discovery, we probed the underground with tunnels, searching for gem pockets. From the big pocket we drove 120 feet northwest, following some very good signs, but netted only a meager little pocket of small blue indicolite tourmalines. Extending the tunnel another 90 feet northwest turned up nothing. After a last effort driving 100 feet due west of the big pocket through really promising looking pegmatite brought us nothing, we began to realize how extremely fortunate we had been on our first exploratory drive of a mere 30 feet to bump into such a rich area of gem pockets.

In July of 1974 we struck what came to be known a the "Barlow Pocket," because collector F. John Barlow was there at the time and spent three days helping us dig out specimens. He not only

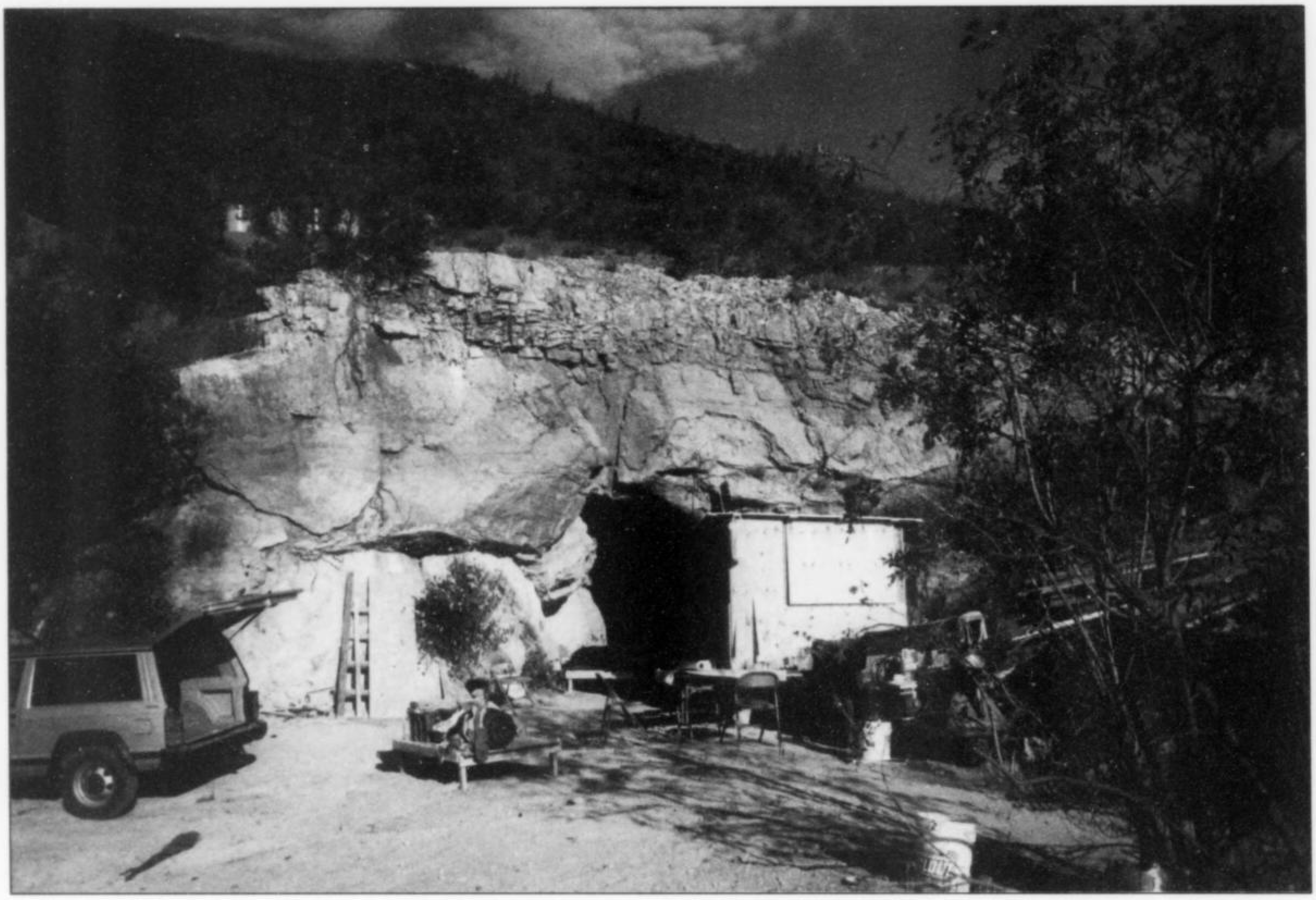


Figure 14. **Tourmaline Queen mine portal in 1994. E. Swoboda photo.**

purchased several of the finest pieces (the largest of which was dubbed the "Barlow Buster"), but also took home hundreds of additional pieces which he and Peter Bancroft later assembled into a representation of what a Tourmaline Queen pocket looks like *in situ*.

During 1972–1974 another prominent collector, David P. Wilber, was in the process of assembling a museum-quality suite of Tourmaline Queen specimens. He ultimately gathered over 100 superb specimens of all the species found there, and exhibited it all in several 6-foot-tall glass cases at the 1978 Denver Gem and Mineral Show. The collection was then expanded to include specimens from other San Diego County mines; it was finally sold (except for the "postage stamp tourmaline") in 1981 to Texas oil man Perkins Sams, who later sold it to the Houston Museum of Natural Science.

During this period, Dr. Richard Jahns made a major contribution to the underground mining program. As Dean of Earth Sciences at Stanford University, he had organized several field trips to the Queen, where his geology students honed their talents. And hone they did, swarming through the underground taking measurements and analyzing the various components of the pegmatite body. Some of the resulting data was used to draft an underground map that marks by contours the boundary between the perthite-rich zones and the underlying finer-grained albite-rich zones of the pegmatite. The boundary between these zones is closely related to the pocket zone. Jahns and his associates had started gathering data in the old tunnel system as early as 1946, and concluded the project with the help of information collected during my digging in the early 70's.

The thickness of the Queen pegmatite in the area of Jahn's underground mapping varies from 8 to 14 feet. The core zone of the pegmatite (see map) ranges in dip from occasionally near-level to up to 40 degrees, averaging about 27 degrees dip to the southwest.

Pala Properties finally ceased work at the Tourmaline Queen mine in 1978. The property was later leased for brief periods by several individuals but remained, for the most part, inactive for the next 18 years.

THE NEW SWOBODA OPERATIONS

In 1996, having regained my gem mines at Pala and after reaching a parting of the ways with Pala Properties, I decided to give the Tourmaline Queen mine another try. A small bulldozer soon had the old pad cleanly smoothed off. We erected a little cook shack at the portal of one of the old haulage tunnels; it had a covered eating area to protect the miners from the rain, wind and sun. For pleasant sleeping, we arranged our beds along the sides of the old haulage tunnel, just inside the portal, where fresh air from the underground maintained a pleasant year-round temperature of 70° F. In a small alcove carved out by one of the miners in the decomposed granite of the tunnel entryway, we placed lighted candles and a statue of the saint of Guadalupe to maintain a protective vigil over the mine and the miners.

Dennis Simpson, one of our miners, lived to dig for gem pockets when he wasn't driving tunnel. He squeezed his big frame into some pretty tight spots in the decaying old tunnel system of the Queen mine during his off hours, looking for crystals. And he came up with some surprisingly nice little blue-cap tourmaline speci-

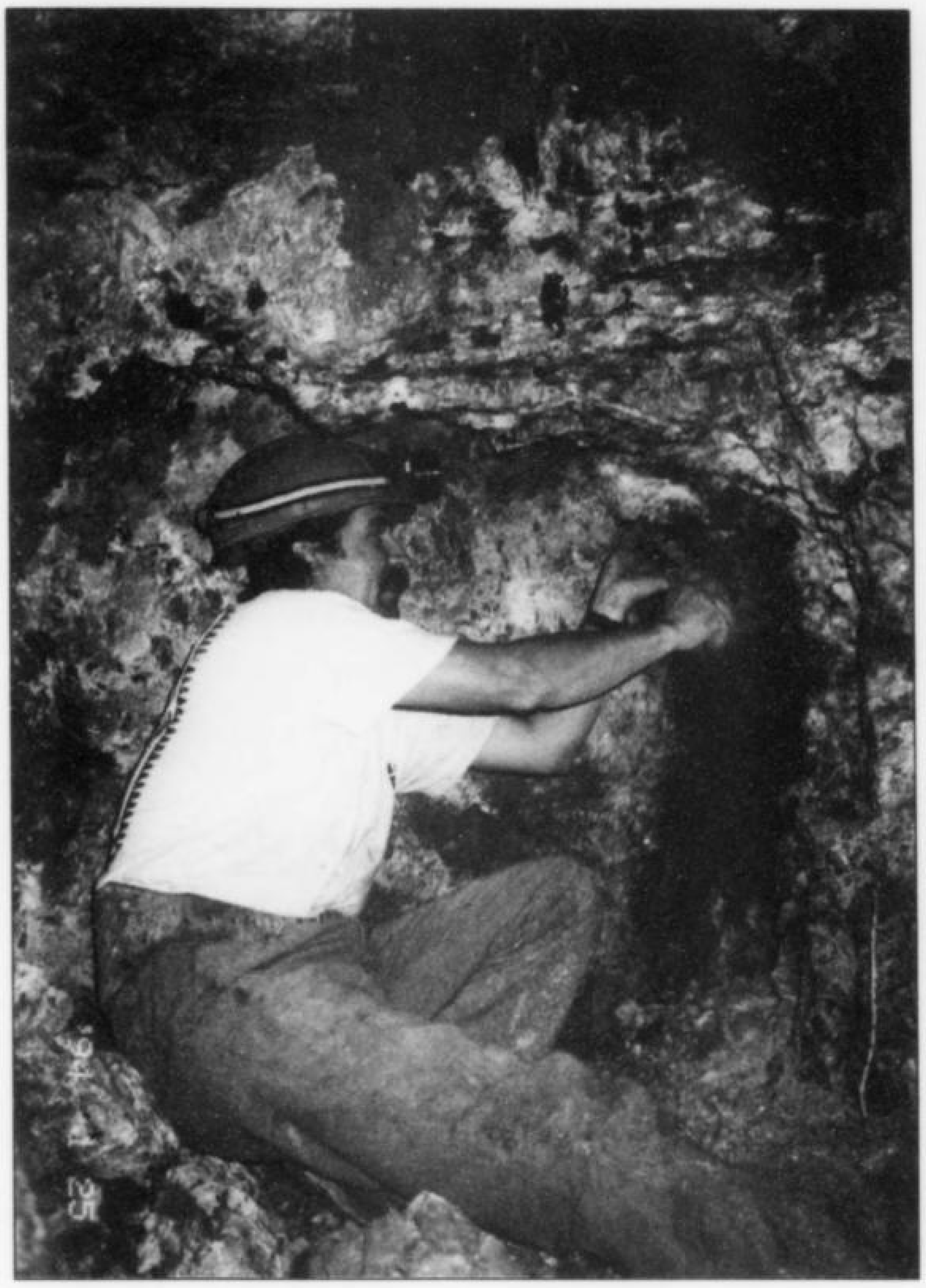


Figure 15. **Working out a clay-filled gem pocket at the Tourmaline Queen mine in 1998.**

mens, taken from remnant pockets bypassed by the miners of yesteryear.

Roger Decker, another miner and lover of gem crystals, also spent his off hours roaming the surface and the underground. He was very good at screening the alluvium and the old dumps, and found some fine gem crystals. In one spot underground, where highgraders in bygone years had done a hurry-up job of removing the contents of a nice pocket of tourmalines, Roger screened out some luscious little clear gems of both blue and pink tourmaline from the highgraders' pile of refuse. He also had a sharp eye for finding occasional gem crystals lying loose on the slopes of Pala Mountain, partially revealed by the scouring of mountain freshets from the rain-soaked heights.

In 1997 two geologists from Canada, Jeffrey Patterson and Dr. Frederick Cook (both from the University of Calgary) approached me for permission to probe a few hundred feet of exploratory tunnels in the Queen mine with ground-penetrating radar. This technique, they hoped, would detect rather accurately, up to a depth of 10 feet, anomalies in the vein that could indicate gem pockets. They worked hard for two days, setting up several stations to probe the tunnel walls, and succeeded in identifying six prominent locations within the vein rock where anomalies were detected. They marked each location with a big painted red arrow on the tunnel walls. Then we followed up immediately by digging short lateral probes into the tunnel walls until we reached the anomaly. One turned out to be a mud-filled fracture, another a "horse" of host rock that had fallen into the pegmatite during its formation, and still others merely faulting and other vein disturbances, but no gem pockets.

In the new millennium, plans were laid to excavate an elongated open cut with huge equipment, cutting a bench along the surface for several hundred yards to expose the thickening Queen pegmatite where its northernmost limits are submerged under the north slope of Pala Mountain. An old open cut on this northern slope, quite short and well hidden in heavy brush, was made by the early miners. The cut appears to have tapped into an upper section of the pegmatite where black schorl tourmaline is well exposed. Most of the vein at this point is hidden below the topsoil. We thought evidence might well be found there of ancient hydrothermal solutions which had forced their way upward through the vein, leaving in their wake the gem crystals of precious colored tourmaline that we crystal lovers so avidly seek.

By July of 2001, I had made arrangements to have a giant Imatsu earth-mover strip away some of the overburden that covered the pegmatite on the Tourmaline Queen property. The machine, which is the largest model allowable for transport on our highways without disassembly, would surely be up to the task.

Accordingly, in the beginning of July of 2001, the Imatsu was delivered to the end of the pavement at a spot about 3 miles distant from the mine, where a mostly rugged, 4-wheel-drive dirt track gives access to the property. The operator walked the big machine in through tough terrain of steep little canyons and huge granite boulders, having to completely transform the narrow dirt road into a graded two-lane roadway just to get it onto the property.

The plan was to first remove the sloughing, decomposed granite that continues to build up over the old main haulageway from the slope above. By slowly moving forward and upward on a zigzag ramp that the operator was constructing as he went along, he was able to trundle the huge machine for a distance of 60 or 70 feet higher up on the mountain above the level of the old portal. There he proceeded to dig back into the cliff side, removing loose and unstable sections and protruding remnant boulders. Ten-ton blocks were routinely picked up in the big steel bucket and wafted to one side. Retreating downwards in this area of first discovery, enough overburden was removed to expose a swath of vein several hundred feet in length along the strike, and at the same time, to uncover 25 to 30 feet of vein that is dipping into the mountain. This allowed the search for gem pockets to be carried out in the open air along the quarry face.

The first such section that was uncovered contained two old tunnels driven by the early miners into the pegmatite just inside the main entry and to one side. Parts of the tunnels were backfilled in an area containing support pillars we planned to disassemble. As soon as the big machine went on idle, I was poking at the face with a little screwdriver, probing into the masses of sticky mud in search of hard objects with smooth surfaces. Here at the Tourmaline Queen pegmatite, the red mud is of secondary origin, having filtered into the open spaces of both the fractures and pockets along with descending groundwaters.

As luck would have it, not 3 feet away from one of the old tunnels that years ago I had first uncovered when beginning to mine underground, the first pocket was uncovered. It was a little fist-sized opening that contained only one tourmaline, a poorly formed crystal of about an inch by 1.5 inches of medium-blue indicolite. Viewing it in the sunlight I caught a gleam of reflective light that signaled cat's-eye. A few days later I cut two medium-blue cat's-eye cabochons, one an 18.5 carat round and the other, a 39.5 carat oval, both very fine stones with sharp eyes. These were the first indicolite cat's-eyes I had ever seen or heard of coming from the Tourmaline Queen mine.

When we were just a few feet beyond the indicolite mini-pocket, we began removing huge gobs of damp red clay that filled broad fractures between disjointed boulders of the core zone pegmatite.

In the process we came upon some pieces of glassy quartz with crystal faces and a bulky crystal of muscovite with a 3-inch face and a beautiful outer layer of purple lepidolite. Both of these we considered very positive signs of colored tourmaline close at hand.

The big backhoe re-entered our workings on the wide, mud-filled fractures to remove more of the overburden surrounding our pocket dig. Fractures separated several large boulders of disjointed pegmatite which required careful removal before we could search further for crystal specimens. One after the other, three boulders of 1 to 2 tons each were expertly nudged out by the teeth of the huge bucket. After being gently loosened, they were carefully extracted and laid on their backsides to one side of our workings. A small pocket, exposed on the backside of one of these boulders, yielded a few nice loose indicolites, most of them terminated, the largest measuring 0.4 inch thick by 1.5 inches long. Where this boulder had rested, the rest of the pocket was immediately found. In the failing light of day, we removed double-handfuls of sandy, pale tan pocket clay bristling with more loose floater pencils of very nice blue indicolite tourmaline.

A 6 x 10-inch matrix specimen of vein matter taken from the tan-colored pocket clay revealed the partially hidden shiny facets of a morganite crystal attached to its matrix, with blue tourmaline terminations peeking out through the clay. What an exciting combination of gem crystals!

I couldn't wait to clean this unusual specimen, and soon had it at home under the air-brasive jet machine, blasting it with fine dolomite grit. Slowly, the layers of harder pocket components that had coated and hidden most of the crystals were worn away, revealing a unique matrix specimen—a pale pink beryl measuring 1.4 by 1.75 inches, attached to matrix supporting an array of colorful pink tourmaline crystals, all with indicolite rinds and terminations, some of them up to 0.4 inches thick.

Careful probing several inches into the sticky clay led to the discovery of two areas along the fracture, less than 3 feet apart, where hard, very smooth surfaces could be felt. An ice pick or a screwdriver is very handy for penetrating this sticky clay; when it touches some hard object, a little movement of the tool on the hard surface will signal if the object is a crystal face. A very smooth surface usually indicates a gem crystal in the pocket.

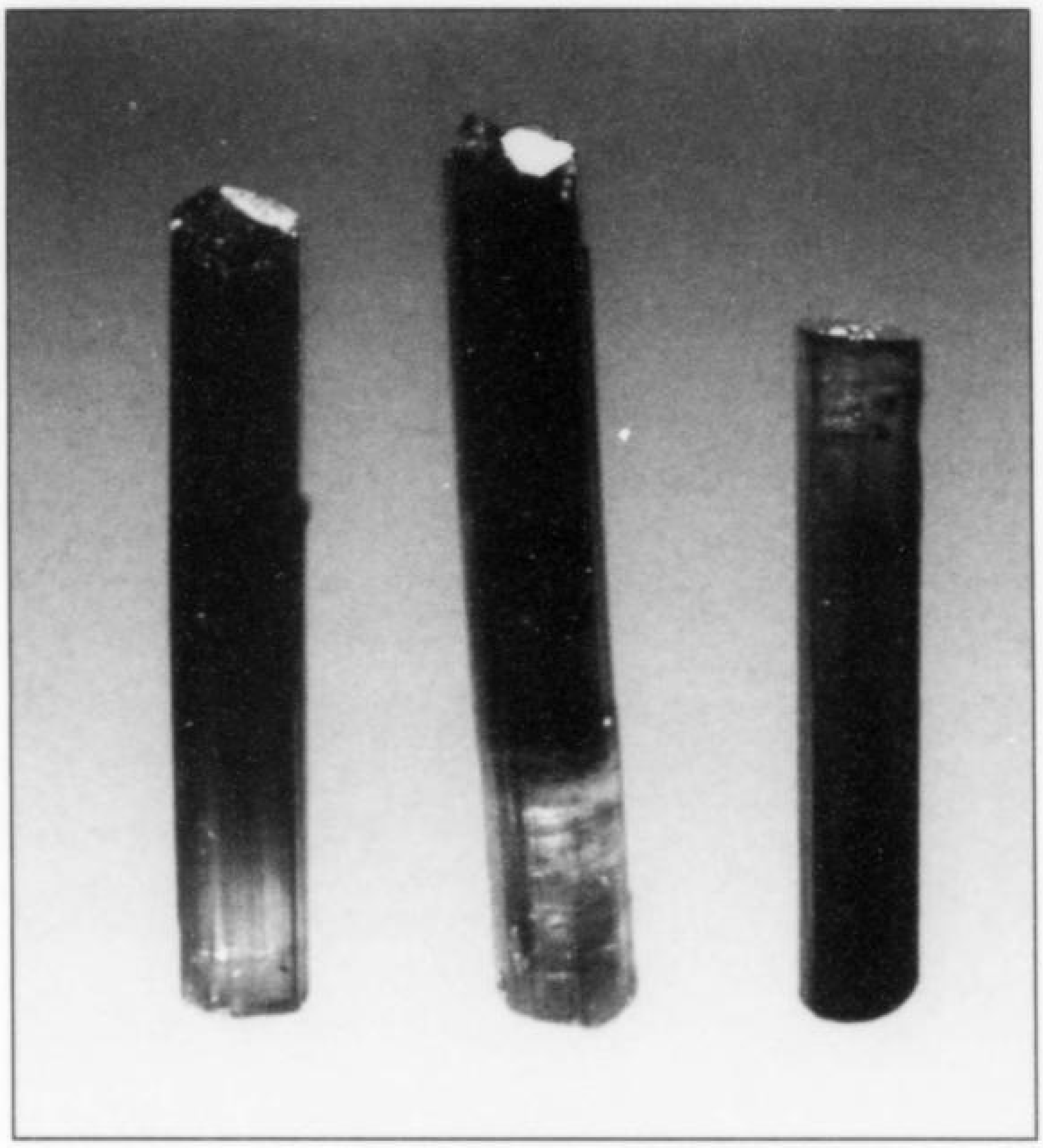


Figure 17. **Indicolite (blue elbaite) crystals to 4.5 cm, collected at the Tourmaline Queen mine in 2001. Swoboda specimens and photo.**

The first pink tourmaline taken from the mud, a 1 x 2-inch crystal with a pale blue termination, elicited excited yells from everyone. Removing more of the red clay exposed several more beautiful pink crystals with blue terminations, some attractively attached to their quartz crystal matrix.

Several broken pink tourmaline prism sections recovered from the mud were later found to fit back together. Some of these sections, separated by more than 2 feet when found, could not be rejoined too closely because of a continuing growth process that had followed the violent rupture of the pocket which had broken the crystals. Solutions had deposited a thin terminal overgrowth of tourmaline irregularly following the contours of the break. Most of these reformed terminations were of the same dark pink as the crystal prisms, an exception being one break that had been covered with a thin veneer of bright yellow-green cat's-eye tourmaline.

An exceptional example of this breaking and regrowth process was a 2-inch diameter crystal about 5 inches long that was removed as five separate segments including a heavily damaged termination. One of the segments, a rounded blob from the 2-inch-thick crystal, proved to be a gorgeous piece of faceting rough containing a transparent, deep pink interior.

From the same sandy pocket mud that had yielded the morganite and blue-cap pencil crystal on matrix, a similar-sized chunk of mud-covered matrix revealed one more attached morganite, almost identical to the first one, with several mini blue-caps peeping out from the mud. Several hours of careful cleaning and some trimming produced the second matrix specimen.

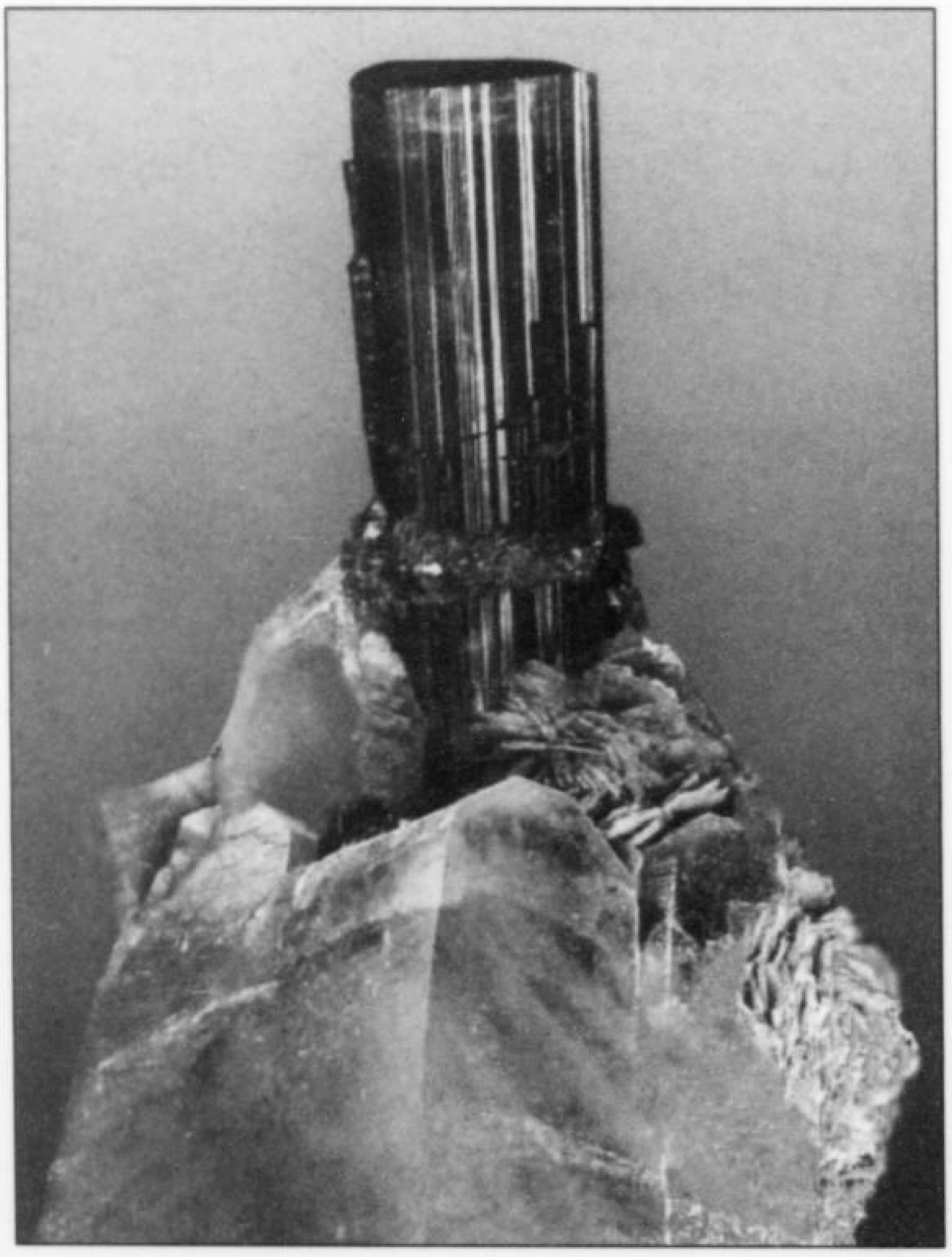


Figure 16. **Deep red tourmaline crystal, 10 cm, on quartz, collected in 2001. Swoboda specimen and photo.**

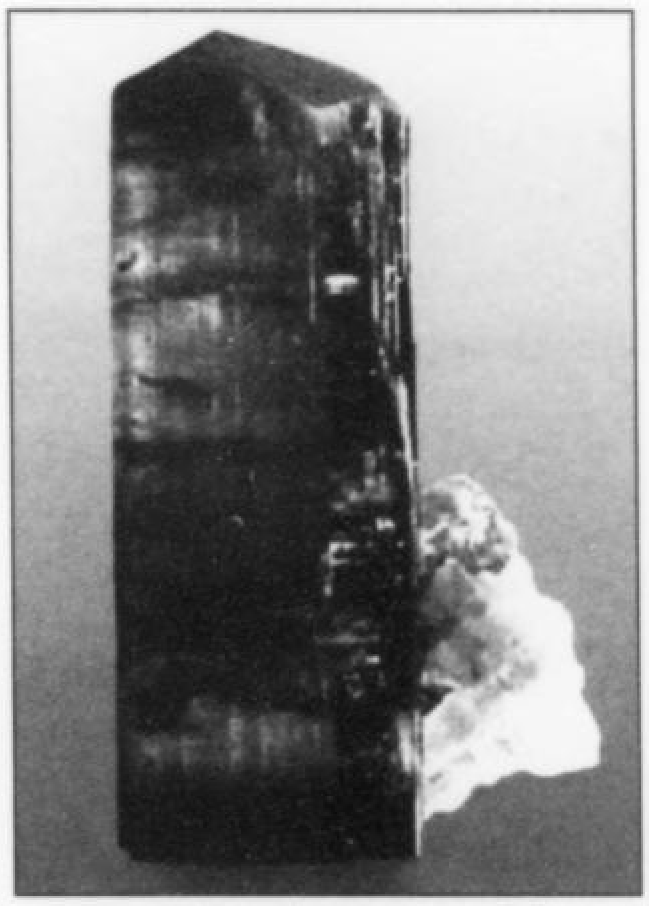


Figure 18. **Small bi-colored elbaite with albite, 4 cm, collected in 2001. Swoboda specimen and photo.**

The arrangement of the tourmaline crystals on this specimen is unique. A 2.5-inch group of richly colored blue-caps had formed in a cluster above the matrix just to one side of the morganite crystal that supports a floater quartz crystal. A second concentration of tourmaline crystals developed in a very striking manner, in an indentation of cleavelandite matrix less than 4 inches away from the morganite. Two 0.4-inch crystals in this pocket started their growth about an inch and a half apart, one a classic blue-cap elbaite, and the other with a pink base that transforms mid-way into a pure blue indicolite. Its blue termination butts into the upper section of the blue-cap forming a sort of tilted "A" frame, making altogether a spectacular matrix arrangement. Each of these two very similar beryl/tourmaline matrix pieces measures about 5 by 8 inches.

July and August of 2001 saw many hours of careful hand-digging in the two now-exposed adjoining pockets, producing some notable blue-cap pink tourmaline specimens, two or three quartz matrix specimens, and several singles. They were delicately removed from their pockets as muddy blobs with crystal faces showing only here and there. Hasty washing disclosed some potentially fine examples of pink tourmaline that the Tourmaline Queen mine is so famous for.

Surprisingly, all of these most recent finds were made in a very small area of the surface where we had removed the overburden. They occurred in a small support pillar, one of the many pillars left in the underground by the original miners in the early 1900's. Our work in the open cut has now been concluded, and the cut has been filled in. But we are by no means finished. This recent find of several small gem pockets was only a pleasant diversion from our main goal, which is to mine underground to a not too distant section of the property, through the 8-foot to 12-foot pegmatite into an area that I have long suspected may contain a zone of gem pocket enrichment that has never been tapped. More to follow . . .

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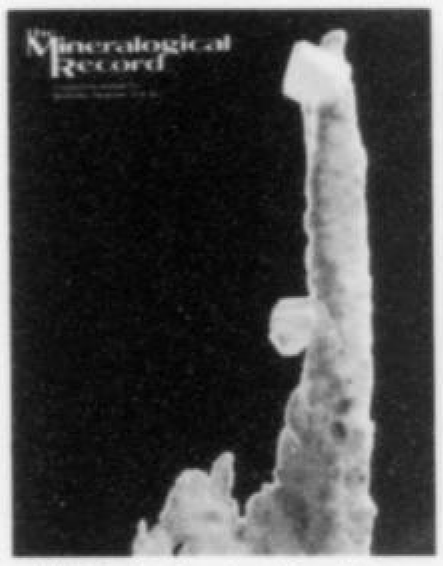

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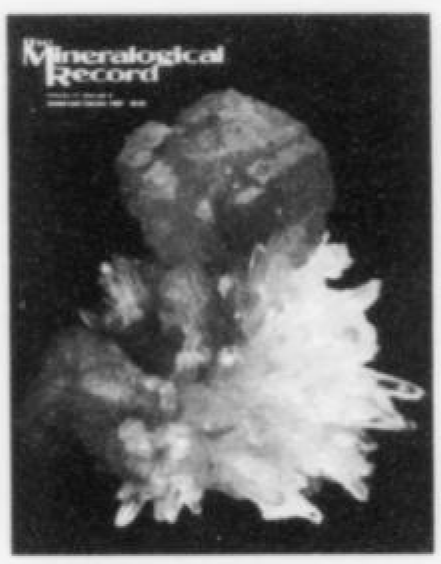

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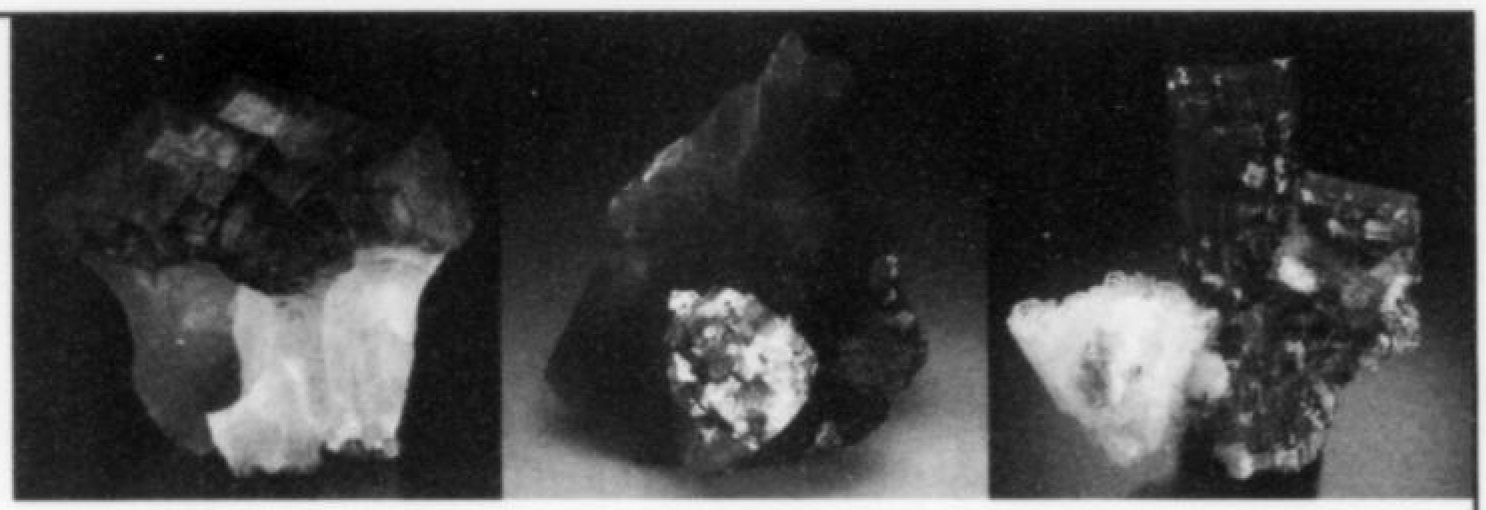

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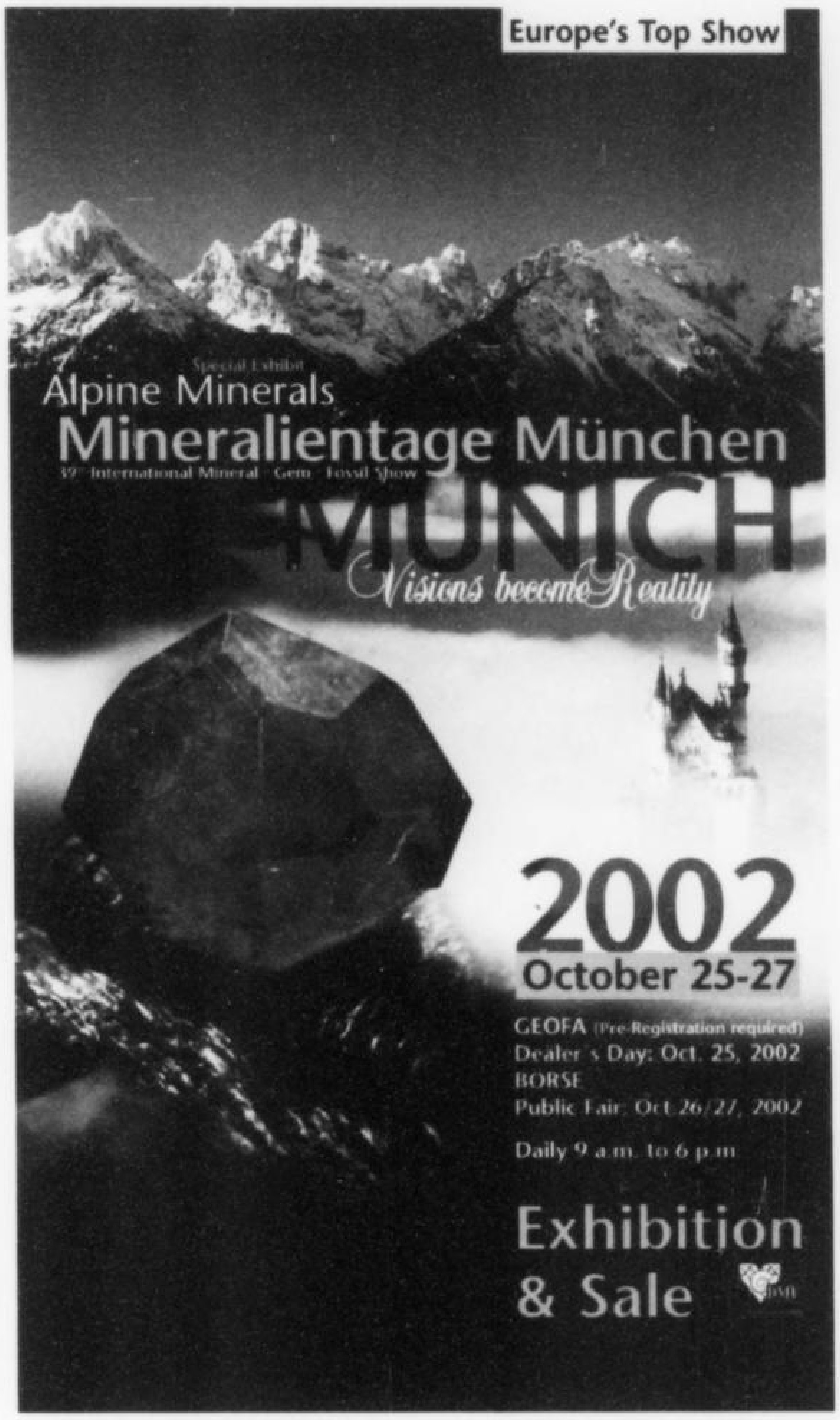

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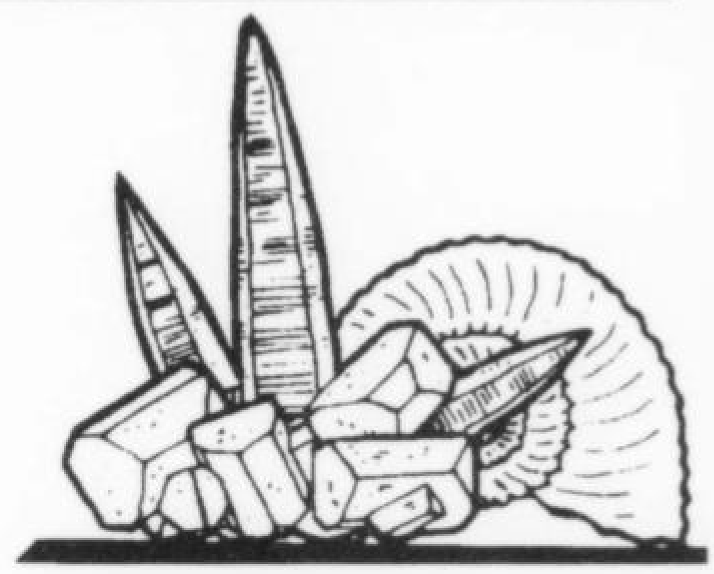

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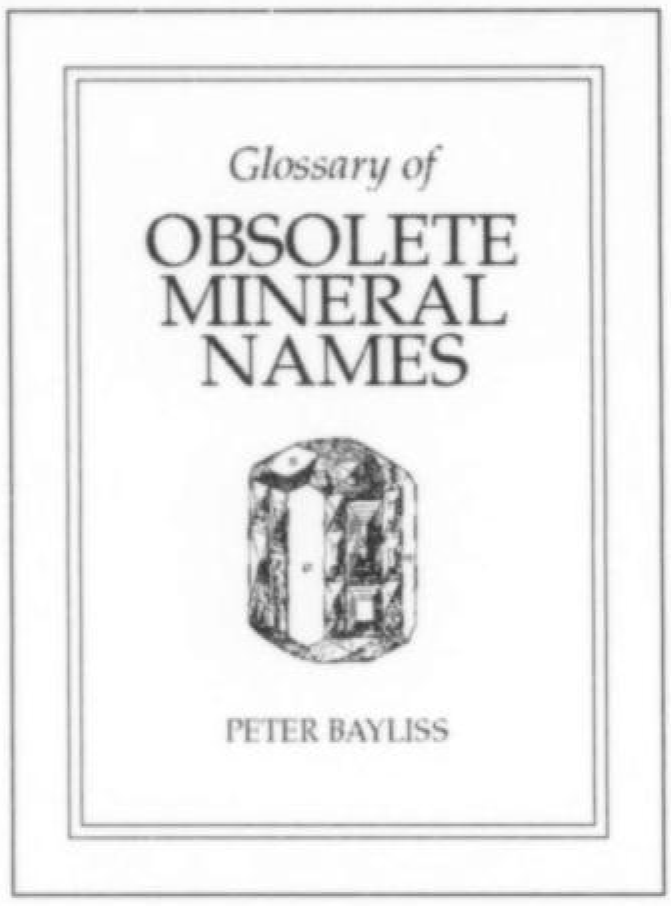

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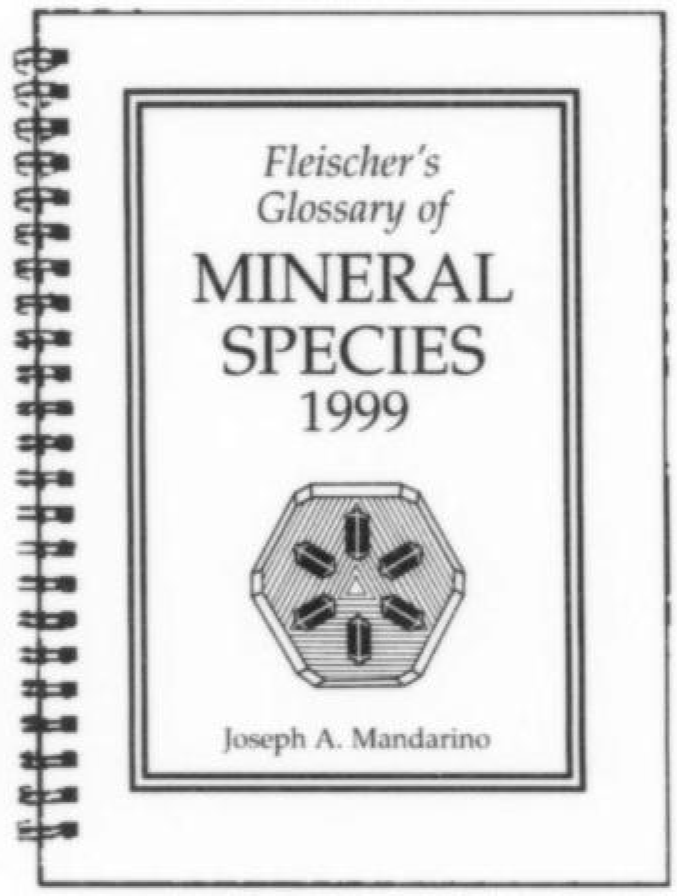

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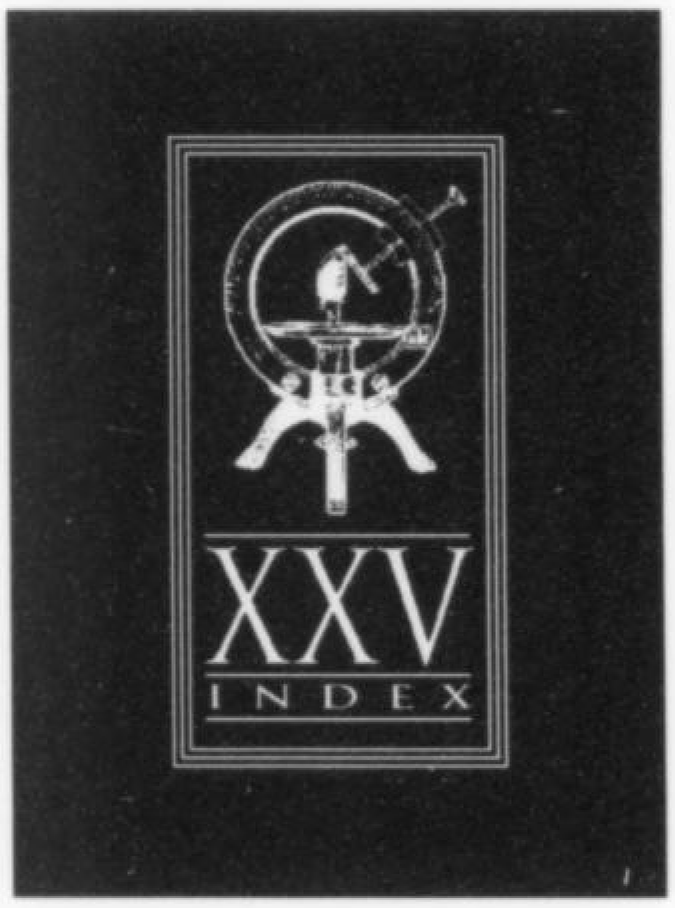

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Fax: (828) 257-4505
Website: www.main.nc.us/colburn
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e-mail: mineralcurator@sierratel.com
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Tel: (505) 835-5325
E-mail: beveleth@gis.nmt.edu
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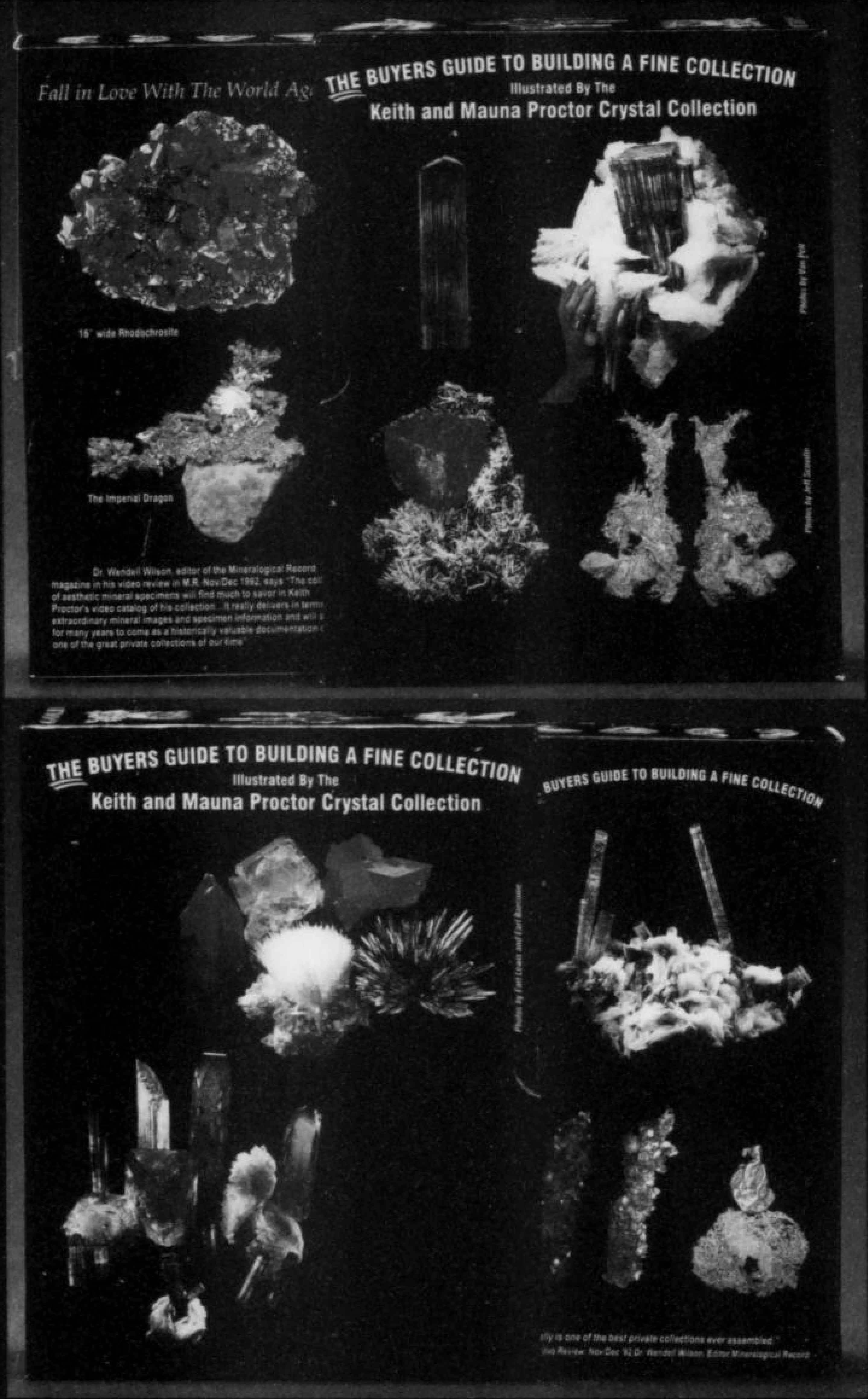

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