Circular 55

Some Scheelite Occurrences in the Magdalena Mining District of New Mexico

by Carl F. Austin

NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY
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CAMPUS STATION SOCORRO, NEW MEXICO

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INTRODUCTION

The Magdalena mining district of Socorro County, New Mexico, has in past years been a major producer of zinc, lead, and copper, with the accompanying recovery of minor amounts of silver and gold. The district presently produces zinc and lead ores. Tungsten minerals have not been reported in the published literature concerning this district despite many years of mining activity in a geologic setting favorable for the deposition of tungsten minerals.

The Magdalena mining district is located at the northern end of the Magdalena Mountains. The location of the district, approximately 28 miles west of the town of Socorro, New Mexico, is shown in Figure 1. The towns of Magdalena and Kelly lie within the district, although the town of Kelly is abandoned at present.

The town of Magdalena, on U. S. Highway 60, is also the terminus of a branch of the Atchison, Topeka & Santa Fe Railway. The site of the former town of Kelly, 3 miles southeast of Magdalena, is located in the central portion of the Magdalena mining district. Half of the distance to Kelly is traversed by a paved road, the remainder by an excellent graded road. A railroad spur extends to the end of the pavement, at which point there are ore-loading facilities. Individual mine-access roads within the district vary from excellent to impassable.

The Magdalena district includes Granite Mountain, to the north, and the northern portion of the Magdalena Range , to the south. Relief within the district is large. The prospects north of the railroad tracks opposite the mouth of Anchor Canyon are located at an altitude of 6,300 feet above sea level, whereas the prospects in the southern portion of the district are at altitudes of over 9,000 feet. Locally, relief reaches 2,000 feet per mile. Many of the higher properties, such as the Cavern and Grand Ledge, the Woodland, the Mistletoe, and the Hardscrabble, were served by tramroads or aerial tramways in former days.

The geology and ore deposits of the Magdalena district have been described in several papers. Most comprehensive of these is a study by Loughlin and Koschmann (1942).

The author wishes to express appreciation to the mine owners and operators of the Magdalena district for their cooperation, especially to Mr. L. A. Patten, operator of the Linchburg mine, and to the management of The New Jersey Zinc Co. , owner of the Linchburg mine and the Enterprise tunnels. Mr. Robert Chamberlin, lessee of several mines in the central portion of the district, facilitated the project by providing ready access to properties under his control.

Mr. J. H. Carman served as field and laboratory assistant for this study. R. H. Weber and E. H. Kase, Jr., of the New Mexico Bureau of Mines and Mineral Resources, have read and criticized the report.

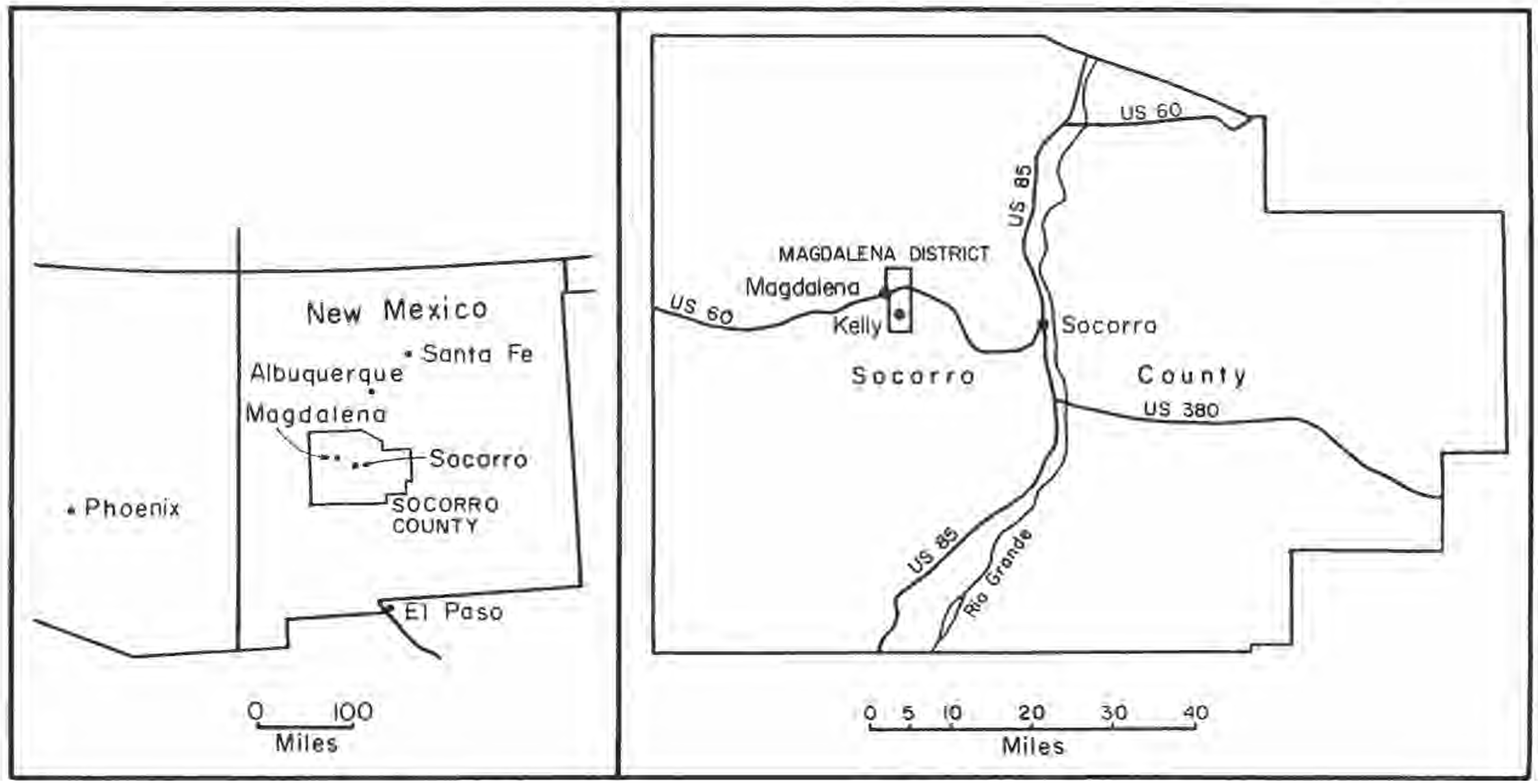


FIGURE 1. LOCATION MAP FOR THE MAGDALENA MINING DISTRICT

GEOLOGIC SETTING

Regional Setting

Figure 2 presents the regional tungsten distribution for New Mexico and Arizona. As can readily be seen, a belt of tungsten mineralization roughly parallels the margin of the Colorado Plateau. In essence, as pointed out by Kerr (1946), this tungsten belt follows a line of Tertiary intrusive rocks.

Socorro County, the shaded area in Figure 2, falls well within the trend of known tungsten occurrences. Scheelite has been recorded as occurring in Socorro County at the Grandview Canyon prospect, although the change in the county boundaries in 1951 places this location in Sierra County. A description of the Grandview prospect appears in a recent paper by Dale and McKinney (1959), who describe the property as being in Socorro County. Scheelite also occurs in Socorro County in the vicinity of Iron Mountain, although most of the deposit is in Sierra County. This deposit, also, is described in the paper by Dale and McKinney.

When considering a map such as Figure 2, the reader should bear in mind that the delineation of an apparent zone or belt of mineralization does not mean that tungsten minerals will be found throughout the entire zone. Such a zone merely indicates that deposits are known to occur within a definite area or trend. This in turn suggests that all favorable geologic situations within the trend should be examined for additional deposits.

Local Setting

The Magdalena Range and Granite Mountain consist of westward tilted and faulted Carboniferous sedimentary rocks that lie on a Precambrian basement. Over these is a volcanic cover considered, at least in part, to be Tertiary in age. Granitic and monzonitic stocks are present. These mountains are believed to be of the basin-and-range type. Table 1 summarizes the geologic column for this area.

From the standpoint of scheelite deposition, four principal types of occurrences are known throughout the world. These are tabulated in Dana's "System of Mineralogy" (Palache et al. , 1951) as follows: (1) Contact metamorphic deposits formed adjacent to granitic intrusives in limestone; associated minerals include garnet, diopside , tremolite , hornblende , epidote, wollastonite , vesuvianite , sphene , axinite, molybdenite, fluorite , minor amounts of sulfides (principally pyrite and chalcopyrite), and rarely woiframite. (2) High-temperature quartz-rich hydrothermal veins and greisen, usually immediately associated with granitic intrusive rocks and containing important amounts of wolframite and cassiterite, in addition to associated tourmaline, apatite, topaz,

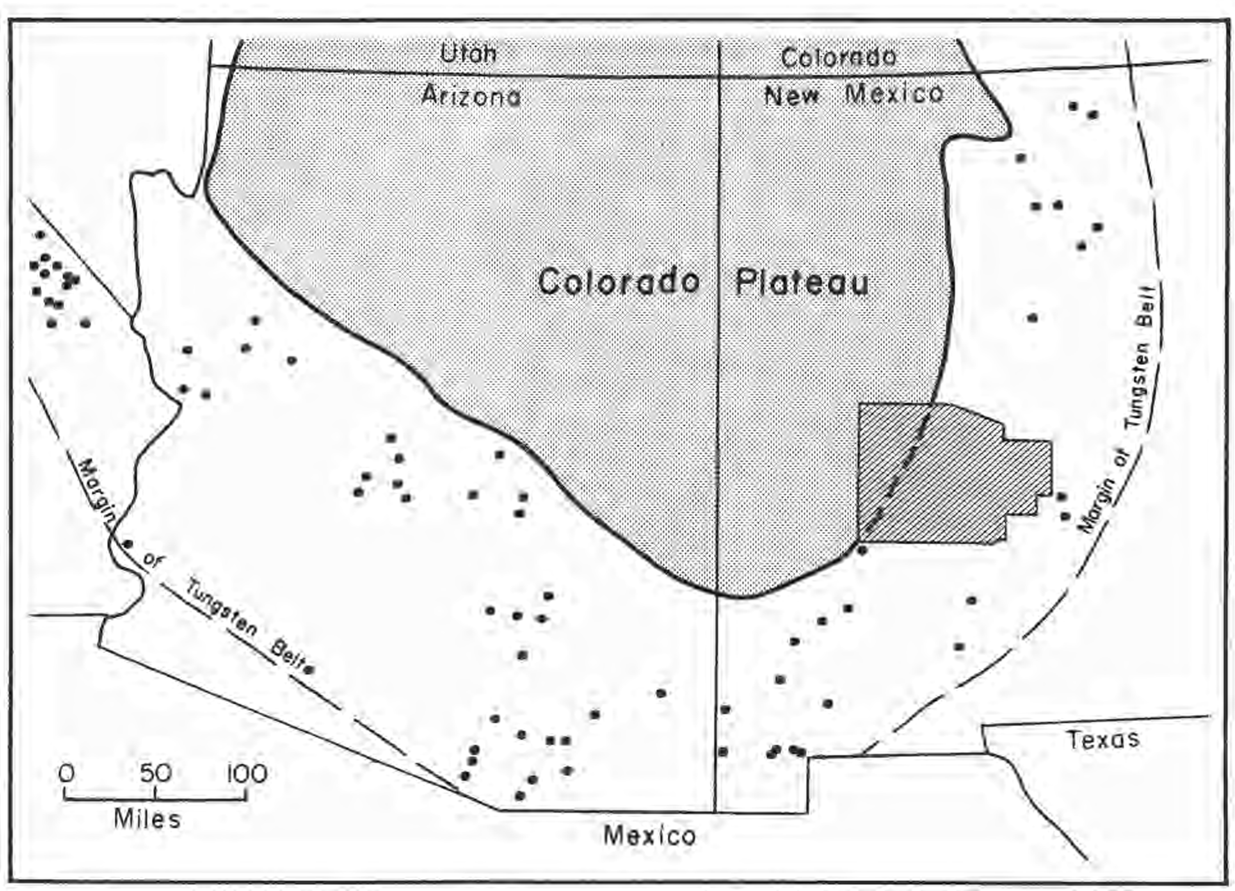


FIGURE 2. SKETCH MAP OF NEW MEXICO AND ARIZONA, SHOWING THE BELT OF TUNGSTEN DEPOSITS ADJACENT TO THE COLORADO PLATEAU (STIPPLED) AND THE LOCATION OF SOCORRO COUNTY (SHADED)

TABLE 1. GEOLOGIC COLUMN FOR THE MAGDALENA MINING DISTRICT
(Data from Loughlin and Koschmann)

System	Formation	Thickness (feet)	Extrusive rocks	Intrusive rocks
Quaternary	Talus Alluvium Landslides	0-100+		
Tertiary(?)	Datil(?) sandstone	0-100±	White felsite tuff Pink rhyolite Upper andesite Red rhyolite Red andesite Banded rhyolite Purple andesite Upper latite tuff Lower andesite Lower latite tuff	White rhyolite dikes Lamprophyre dikes Pitchstone dike Granophyre Granite Monzonite aplite dike Monzonite Augite andesite Hornblende andesite Rhyolite porphyry Latite porphyry
Permian	Abo sandstone	0-175±		
Pennsylvanian	Madera limestone	600±		
	Sandia: Upper quartzite	0 - 65		
	Sandia: Upper limestone	0 - 25		
	Sandia: Shale	320±		
	Sandia: Middle quartzite	0 - 18		
	Sandia: Lower limestone	65±		
	Sandia: Lower quartzite	90±		
Mississippian	Kelly limestone	130±		
Precambrian	Argillite			Diabase dikes Granite Felsite Gabbro

fluorite, mica, albite , arsenopyrite, pyrite , pyrrhotite , molybdenite, chalcopyrite, native bismuth, and bismuthinite. (3) Pegmatite , usually with tungsten present only in small quantities. (4) Hydrothermal veins formed at moderate to low temperatures, with tungsten present only in small amounts.

The type 1 occurrences, the contact metamorphic or more precisely the contact pyrometasomatic deposits, are of major economic importance. It is this type of occurrence that is found in the Magdalena mining district, although immediately adjacent to major faults such occurrences approach those of type 2, the quartz-rich hydrothermal vein or greisen type of occurrence. Traces of scheelite have also been found in lower temperature veinlets located in the more northern portion of the district. These veinlets would correspond to the type 4 occurrence as listed by Palache et al. (1951).

Figure 3 presents the location of the principal intermediate to acid intrusive rocks exposed in the central and southern parts of the Magdalena mining district. These are the Anchor Canyon stock, commonly regarded as a granite , and the Nitt stock, commonly referred to as a monzonite. Figure 3 also shows limestone-intrusive rock contacts where exposed at the surface, as well as the various localities at which scheelite was observed in the field.

One additional intrusive has been proposed for this district, although it is nowhere exposed. The reason for the proposed intrusion is well stated by Loughlin and Koschmann (1942, p. 32):

> Although no stocks are exposed south of Kelly, the presence of metamorphic minerals in limestone along a major fault zone in the Linchburg tunnel 2 miles south of Kelly suggests that there be another stock in that vicinity at no great depth.

The abundance of scheelite in the vicinity of the Linchburg tunnel lends strong support to the suggested presence of this stock, as the sediments immediately over stocks have been found to be very favorable sites for mineral deposition, including the tungsten minerals.

SCHEELITE OCCURRENCES

The field investigations upon which this report is based are not intended to exhaust the possibilities for scheelite or other tungsten mineral occurrences within the Magdalena district. Brief examinations were made of many workings with the intent of outlining the principal areas of scheelite deposition. No doubt, detailed examination of the district will uncover additional areas of scheelite deposition.

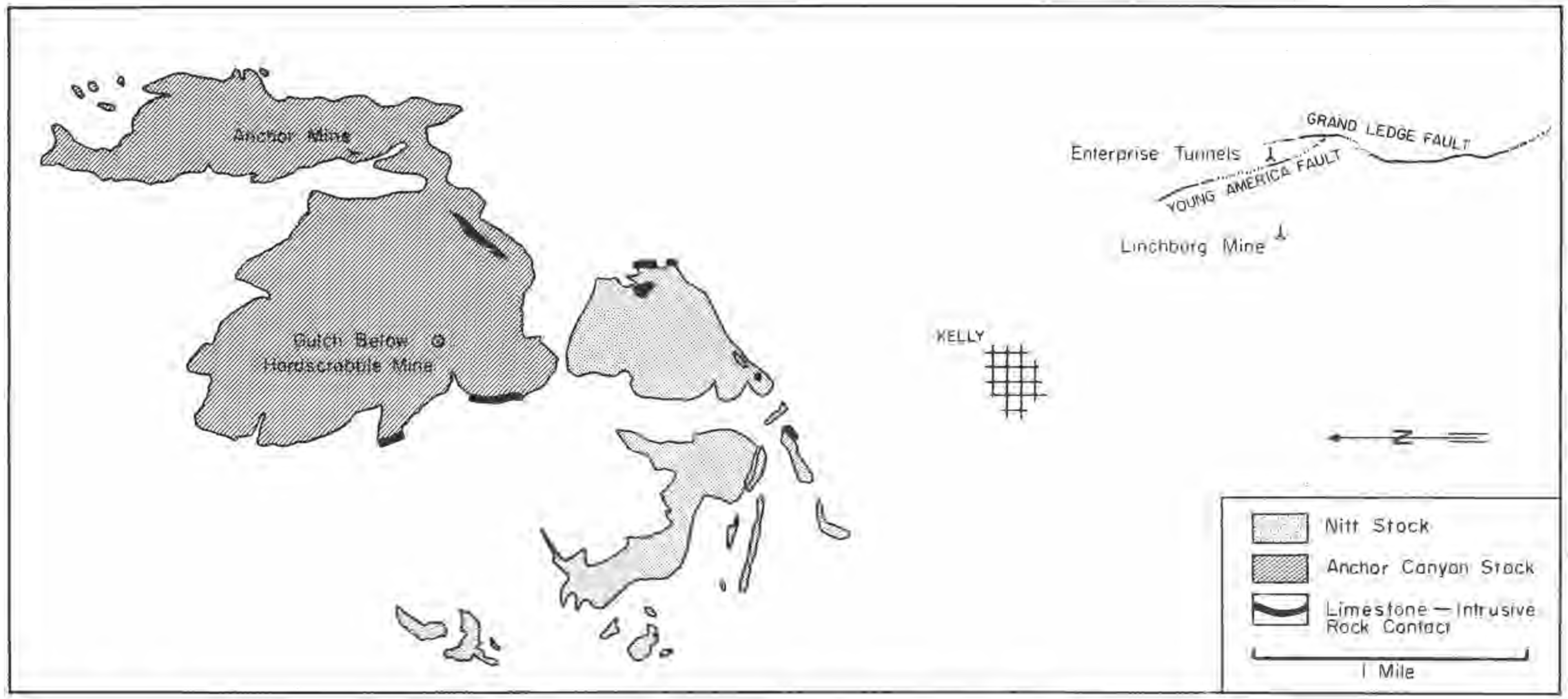


FIGURE 3. PRINCIPAL INTRUSIONS OF THE CENTRAL AND SOUTHERN PORTIONS OF THE MAGDALENA MINING DISTRICT

Limestone-intrusive rock contacts exposed at the surface and observed scheelite localities are shown.

Young America (Linchburg) Fault

The Young America fault, referred to as the Linchburg fault in the Linchburg mine workings, has served as a localizes for intense silication of the adjacent limestone beds. This is well shown on the west side of the fault in the Linchburg mine , as well as on the east side in the Enterprise tunnel area. In addition to silication, or silicate mineral development, each of these mining areas has been the site of abundant deposition of both base-metal sulfides and scheelite.

Loughlin and Koschmann consider the Young America fault to be the east fork of the Mistletoe fault. To the south the Young America fault joins the Grand Ledge fault. These are illustrated in Figure 3. From the surface evidence, however, intense silication and accompanying tungsten mineral formation have occurred only in the segment called the Young America fault. The limestones bordering the Grand Ledge fault to the south show minor silication, but to the north the Mistletoe workings show no significant silicate development. Although essentially a continuous structure, the Mistletoe-Young America-Grand Ledge system was not open in its entirety to the passage of the high-temperature fluids causing the silication of the limestone that served as the host for the Linchburg and Enterprise ore bodies.

The Young America fault is a steeply dipping to vertical zone. Underground development has shown the west side to be clownthrown some 480 feet in the vicinity of the Linchburg workings.

Linchburg Mine

The location of the Linchburg mine is shown in Figure 3. The mine is 2 miles south of Kelly, at an altitude of 8,050 feet above sea level. It is reached by following a graded road south from Kelly. Although the last quarter mile of the road is rather steep, an ordinary passenger vehicle can reach the mine with little trouble. During the winter months occasional snows make the road difficult to impassable.

The' geology of the Linchburg mine, with special emphasis on silication as an ore control, has been described in detail by Titley (1958 a, b). In the following summary of the geology of the Linchburg ore deposit, the descriptions of zonal development in the silicate mineral assemblage are taken from Titleyes work.

In common with most of the mines of the Magdalena district, the Linchburg mine is located in a westward dipping sedimentary sequence. This sequence is overlain by Tertiary(?) volcanic rocks and overlies in turn a Precambrian basement. The one feature of the Linchburg mine that is notably different and perhaps unique within the Magdalena district is the absence of a nearby major intrusion in the vicinity of the high-temperature mineralization. Except for minor dikes , the closest intrusion of significance is the Nitt stock, 2 miles to the north. As previously mentioned , a buried stock is believed to underlie the Linchburg mine area.

Base-metal deposition in the Linchburg mine is controlled by several factors in combination. These are chiefly a fault-favorable bed type of control. Local folding is also considered to be an ore control in the Linchburg mine area. Within the favorable bed (the Mississippian Kelly limestone), the intensity of silication in part exerts a further control on the deposition of the base-metal ores. This control consists of the physicochemical changes caused by silication in the limestone host rocks. In part, however, the intensity of silication simply reflects the ease of access of the host rocks to solutions, that is, the permeability of the host beds. Thus, in the Linchburg mine area, the postsilication ore fluids appear to have been restricted to the same conduits or channels used by the solutions causing silication. Only very minor exceptions are found wherein late, lower temperature sulfides are found in areas free of silicate development.

Table 2 presents Titley's six alteration or silication zones. Through the use of these intensity zones and their mineral assemblages, it is possible to determine the approximate location of any sample found on the dumps with respect to major fractures and areas of base-metal ore deposition. The distribution of scheelite through the ore zone has been established by scanning the mine dumps at night with a short-wave ultraviolet lamp.

TABLE 2. SUMMARY OF SILICATE ZONING IN THE LINCHBURG MINE
(After Titley)

<table>
<tr><th colspan="2">Zone*</th><th>Width</th><th>Ore minerals</th><th>Gangue minerals</th></tr>
<tr><td colspan="2">I</td><td>Up to 10 ft</td><td>Very minor sphalerite and galena</td><td>Intense silicification (may be late and low-temperature)</td></tr>
<tr><td colspan="2">II</td><td>A few feet to 20 ft (avg. 15 ft)</td><td>Dark sphalerite increasing away from zone I</td><td>Garnet, minor quartz, rare calcite</td></tr>
<tr><td>III</td><td rowspan="2">Major ore production</td><td>Wide horizontal extent</td><td>Sphalerite, with galena increasing away from zone II</td><td>Garnet, diopside, hematite, and minor calcite and quartz</td></tr>
<tr><td>IV</td><td>Wide horizontal extent</td><td>Galena, minor sphalerite, disseminated chalcopyrite</td><td>Diopside, hematite</td></tr>
<tr><td colspan="2">V</td><td>A narrow border zone grading into zone VI</td><td>Very minor disseminations</td><td>Hematized limestone, minor pyroxenes</td></tr>
<tr><td colspan="2">VI</td><td>Very widespread</td><td>Very minor disseminations</td><td>Marble</td></tr>
</table>

* Zones adjacent to fractures: zone I closest to fracture, zone VI farthest removed.

The highest grade of scheelite mineralization was noted in the intensely silicified rock that corresponds to Titley's zone I. The scheelite in this environment varies from minute grains to grains one-eighth of an inch across; the overall average grain size is closer to the coarser value. The scheelite is gray white to milky and indistinguishable from the quartz matrix. In hand specimen the host rock is a medium-grained mass of milky quartz, with scattered small vugs lined with clear to milky quartz crystals. Some vugs are filled with coarse carbonates. Scheelite was not observed in any of the open spaces. Other minerals present include disseminated minute grains of the base-metal sulfides , hematite as scales and veinlets , magnetite , and scattered patches and grains of pyrite and pyrrhotite. A 10-pound hand sample of this material assayed 0.9 percent tungsten.

Figures 4A and 4B present thinsections of scheelite occurring in intensely silicified rock. Figure 4A shows a zoned scheelite crystal in a matrix of quartz and fluorite. Quartz both embays the scheelite and forms inclusions in it. Zoning of the scheelite was noted , especially in larger grains when exposed to ultraviolet radiation. In a number of these larger grains a variable molybdenum to tungsten ratio is indicated by bands of blue fluorescence (low molybdenum) alternating with areas of creamy-yellow fluorescence (higher molybdenum). Nearly all of the scheelite observed fluoresced a creamy yellow. Figure 4B shows a thinsection of a scheelite grain that is highly corroded and embayed by quartz and fluorite. In this sample, as in 4A, the quartz shows intense straining. The large fluorite embayment in the scheelite grain in Figure 4B has included calcite grains in its center. The sample matrix contains a few flakes of chlorite in addition to the minerals already mentioned.

Rock specifically representative of zone II was not recognized in the dump samples collected. Underground, however, the margins of the quartz-rich areas adjacent to fractures contained some scheelite. Presumably these marginal areas are equivalent to zone II.

Figure 4C is a thinsection that contains the ore minerals scheelite, sphalerite, and galena as well as much garnet, diopside, and hematite, and associated calcite and quartz. The sample would thus be located in zone III, one of the major ore-producing zones. The rock from which the sample was cut is rich in scheelite and is of ore grade with respect to lead and zinc. In the hand sample, the rock appears greenish gray to greenish brown. Hematite, quartz, calcite, diopside , and garnet can be recognized. The hand sample contains patches of chalcopyrite and a large mass of pyrite in addition to rather coarse-grained galena and sphalerite. The abundance of galena and chalcopyrite suggests that the sample is from the outer portions of zone III. The sample also exhibits a banding suggestive of diffusion banding. This type of banding is present adjacent to many contacts between dissimilar mineral assemblages, especially at the contact between marble (zone VI) and silicates and hematite (zones IV and V). The thinsections show a possible paragenetic relation between the sulfides, scheelite, and quartz. The interpretation, as sketched in Figure 5, is that scheelite formed early, either during or immediately following silicatlon , then galena and sphalerite replaced portions of the host adjacent to the scheelite, and lastly quartz selectively replaced domains within the scheelite crystal.

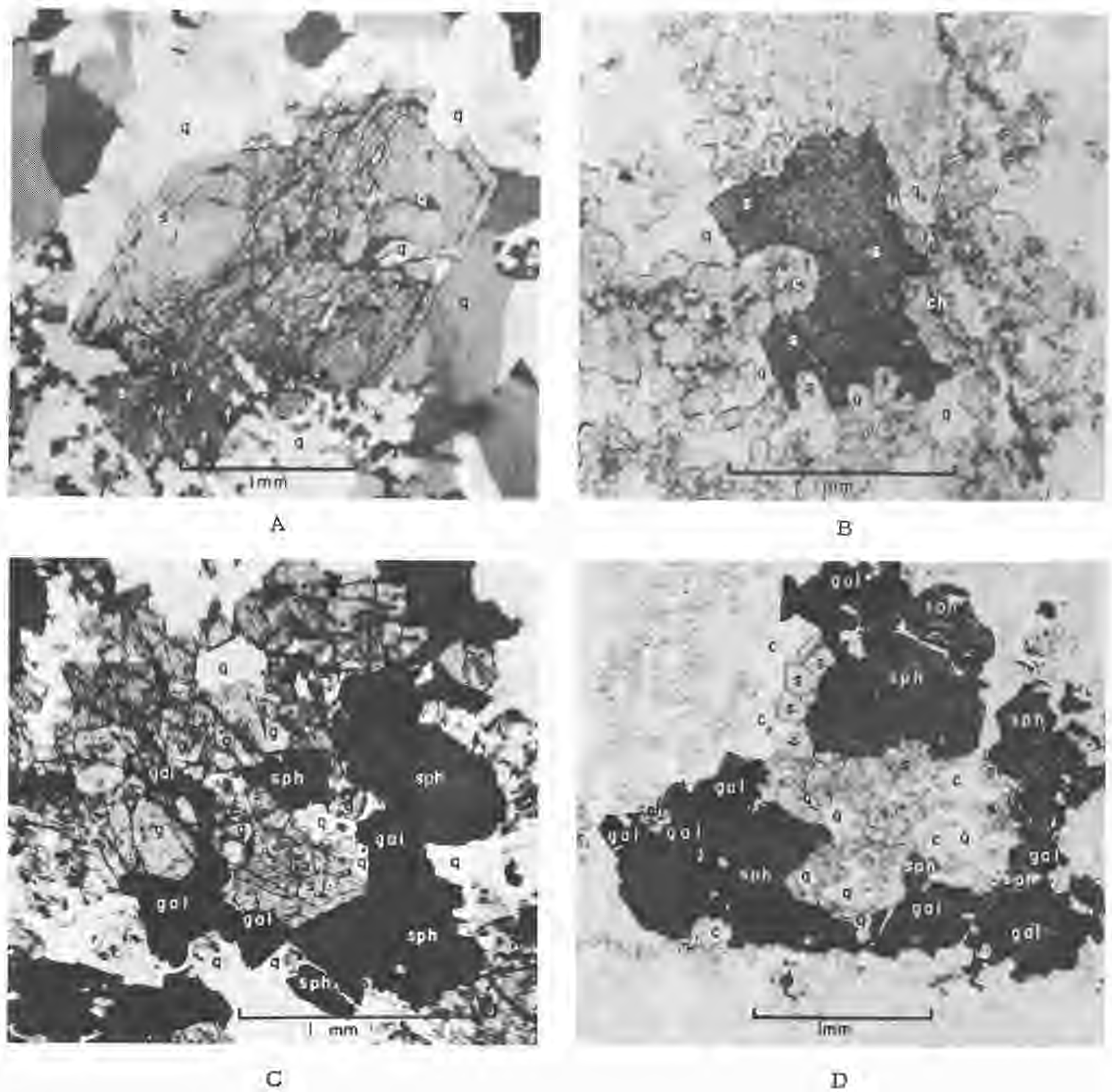


FIGURE 4. THINSECTIONS OF SCHEELITE FROM THE LINCHBURG MINE

q, quartz; g, garnet; c, calcite; f, fluorite; ch, chlorite; s, scheelite; sph, sphalerite; gal, galena. 4A with crossed nicols, all others with plane polarized light.

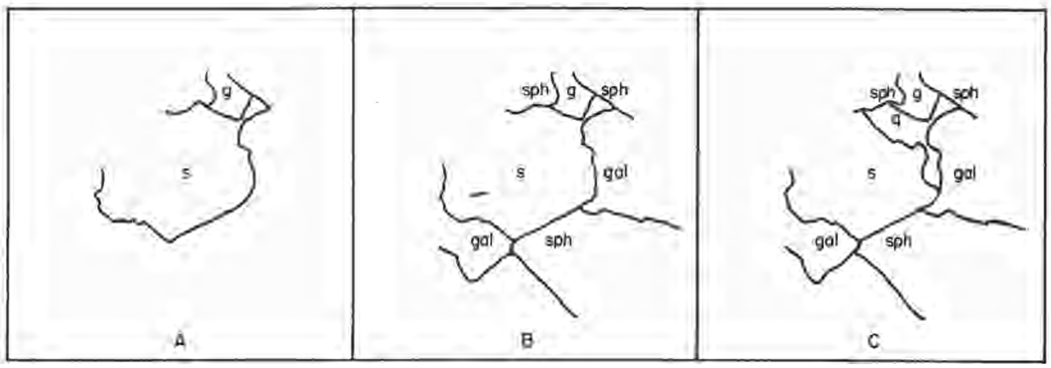


FIGURE 5. A POSSIBLE ORIGIN FOR THE TEXTURE ILLUSTRATED IN FIGURE 4C

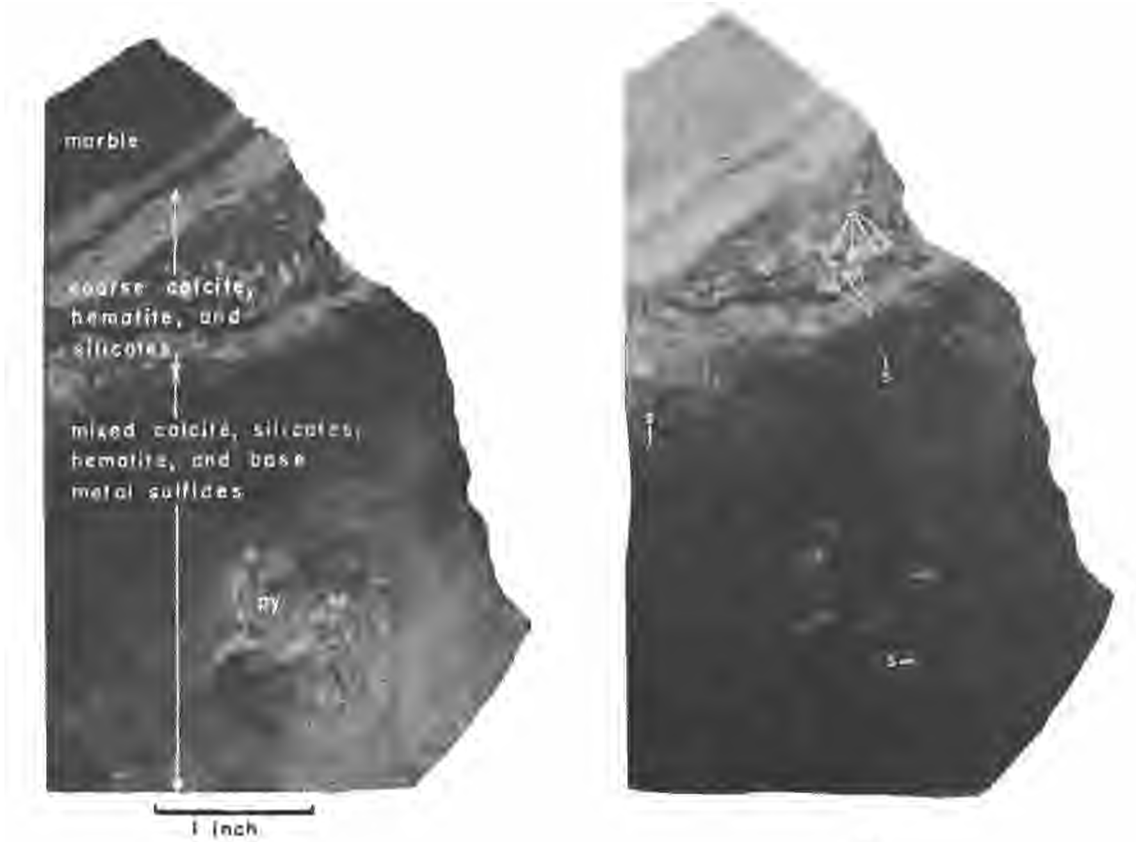
A, scheelite crystals form by replacement in a silicated host rock; B, sphalerite and galena replace host rock minerals adjacent to scheelite, and some galena replaces sphalerite; C, quartz replaces domains within scheelite, leaving the original scheelite outline preserved by the adjacent base-metal sulfides: s, scheelite; g, garnet; sph, sphalerite; gal, galena; q, quartz.

Figure 4D illustrates a rather typical relation between scheelite and the base-metal sulfides. Scheelite appears to be clustered adjacent to and galena. Other areas in the same thinsection also show sphalerite as inclusions in scheelite. Although a definite interpretation of paragenesis is not possible with the data at hand, it may be suggested that scheelite and the base-metal sulfides commonly found the same areas amenable to replacement. The general lack of garnet in this section indicates that the host rock is from zone IV, also a major ore-producing zone. In hand samples the rock is a fine-grained greenish-brown mass of silicates. With the exception of the sulfides and occasional clots of quartz, few minerals can be recognized. In addition to disseminated scheelite, this rock type was also found to contain a few scattered veinlets of very coarse scheelite associated with brown sphalerite, galena, quartz, and calcite. In thinsection, the rock is composed of quartz, fluorite, chlorite, and calcite, as shown in Figure 4D. In places the calcite is partially altered to a fibrous material, probably wollastonite.

Figure 6 shows the appearance of the border between marble (zone VI) and the adjacent silicates. As indicated in the figure, a portion of the contact area is considered to represent zone V by virtue of the hematite present. Part B of the figure, taken with ultraviolet light, shows scheelite close to but not in the marble. At no place in the mine was scheelite observed in marble.

In the Linchburg mine, all areas showing silicate development are worthy of prospecting for tungsten, but areas of marmorization (marble development) appear unfavorable. The data at hand do not indicate whether this is a result of the amenability of portions of the silicated limestone to replacement or simply a result of the deposition of tungsten by the silicating fluids while silication progressed. The distribution of scheelite in the host rock suggests a combination of both factors.

An the base-metal ore examined, it is worth noting, contained at least minor amounts of scheelite, and some was relatively rich in this mineral. This suggests that a by-product recovery of scheelite might be feasible during the milling of the base-metal ores. Whether or not such a recovery would be economically justified is beyond the scope of this report.



A B

FIGURE 6. CONTACT BETWEEN MARMORIZED KELLY LIMESTONE AND SILICATED KELLY LIMESTONE

A, ordinary light; B, ultraviolet light: s, scheelite; py, pyrite.

Enterprise Tunnels

The Enterprise tunnels are located due east of the Linchburg tunnel at an altitude of 8,550 feet above sea level. The mine is accessible by trail and by a jeep path that starts at the Linchburg mine yard.

Geologically the setting of the Enterprise tunnel scheelite locality is very similar to that of the Linchburg mine. In this instance the silication and mineralization are on the east or upthrown side of the Young America fault. The workings are located in and near the surface trace of the fault.

Figure 7 shows a slab of ore-bearing silicated Kelly limestone from the Enterprise workings. The hand specimens have undergone moderate chemical weathering, but galena, sphalerite, and scheelite can be identified readily. The matrix is fine grained and consists of various silicates, quartz, and hematite. Scheelite was also found at this locality in rather massive fine-grained hematite.

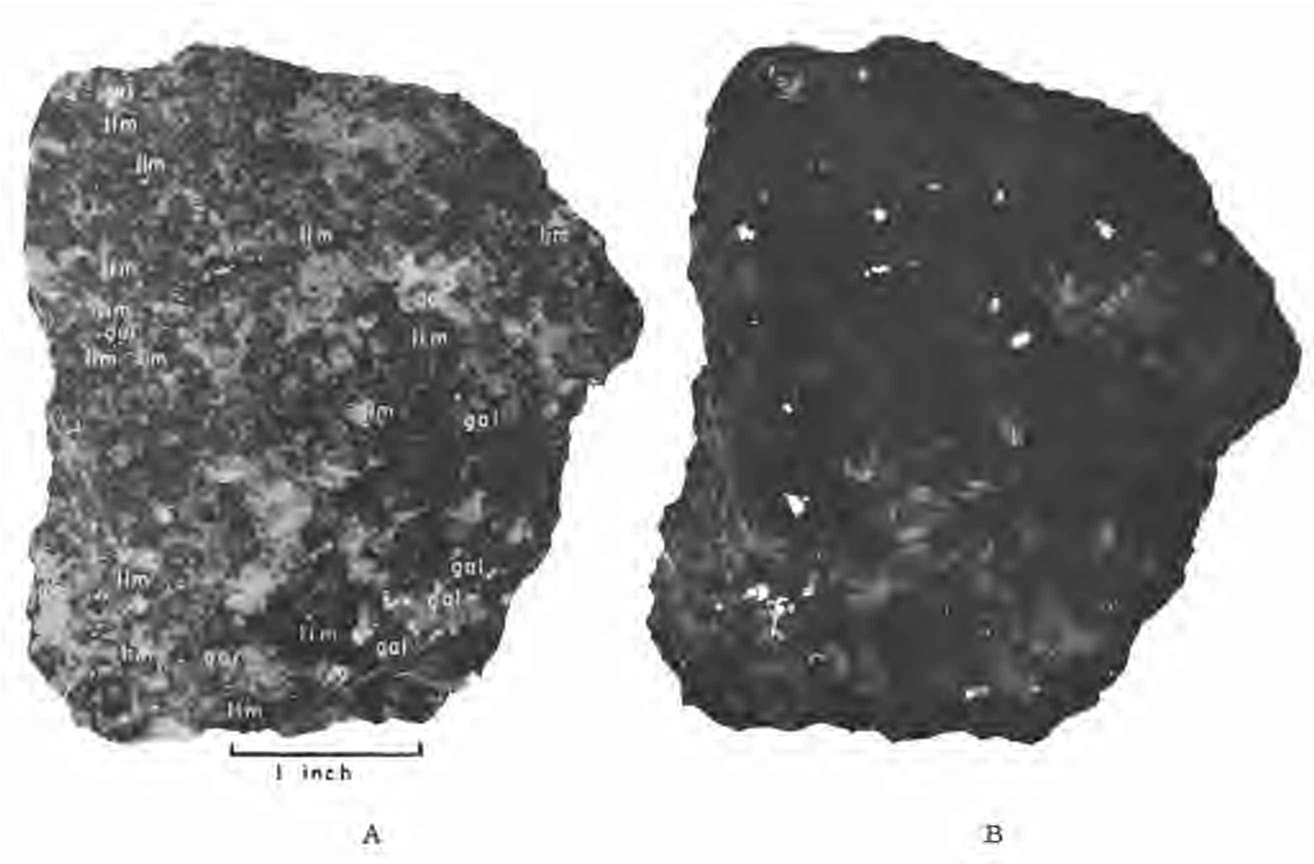


FIGURE 7. SCHEELITE AND SULFIDE MINERALIZATION IN SILICATED KELLY LIMESTONE FROM THE ENTERPRISE TUNNELS

A, ordinary light; B, ultraviolet light: gal, galena; lim , limonite in boxworks representing former sphalerite grains. Light areas in B are scheelite.

Anchor Canyon Stock

Scheelite samples were found at two localities (fig. 3) in the Anchor Canyon Stock. Both samples represent vein-type deposition at moderate temperatures, comparable to type 4 in the list of typical scheelite occurrences.

Hardscrabble Area

Scheelite was found as scattered grains in weakly mineralized joints in the Anchor Canyon stock. The samples were float in the canyon in which the Hardscrabble workings are located. The canyon is accessible by a rough dirt road which extends to within 150 yards of the lower station of the tram-road that served the mine workings. The canyon is due east of the site of the former Graphic mill, slightly northeast of the former Hardscrabble camp. The samples were found at an altitude of 7,150 feet above sea level. No scheelite was found in place in this area.

In hand specimen the samples containing scheelite are a porphyritic granite cut by weakly mineralized joints. Pyrite, epidote(?), and scheelite were identified in the joints. The scheelite identification was confirmed by X-ray analysis. Locally the pyritic joint fillings are as much as one-quarter inch in width, but where scheelite was found, only very scattered, small to minute individual pyrite grains were present. Figure 8 is a thinsection made in the plane of one of these joints.

The presence of scheelite on joint surfaces, though without commercial value in itself, indicates that at some stage during or after the cooling history of the Anchor Canyon stock, tungsten-bearing fluids permeated this portion of the stock. Although tungsten mineralization was not noted in the limestone contact at the Hardscrabble mine, the presence of scheelite in the adjacent stock suggests that prospecting of the border of the Anchor Canyon stock for tungsten is warranted.

Anchor Mine

The Anchor mine, located in Anchor Canyon (fig. 3), is accessible only by an extremely rough jeep trail. The mine is most easily reached on foot.

The country rock in which the mine is driven is granite , which has been cut by lamprophyre and rhyolite dikes. The ore is a low-temperature fissure filling comprised of base-metal sulfides, fluorite , barite, and quartz. In past years a small mill was operated on the property. Loughlin and Koschmann (1942, p. 161) report that half of the lead, 60 percent of the silver, and all of the zinc in the ore went into the tailings. On the assumption that the tailings would also contain the greater part of any scheelite present in the ore milled, tailings samples were collected and panned. A heavy concentrate was obtained, and the blue fluorescent fraction picked out and identified by X-ray analysis. The presence of scheelite was confirmed. Although only granitic material was noted in the tailings, there is, of course, the remote possibility that ore from some other mine was hauled in and milled along with the ore from the Anchor mine.

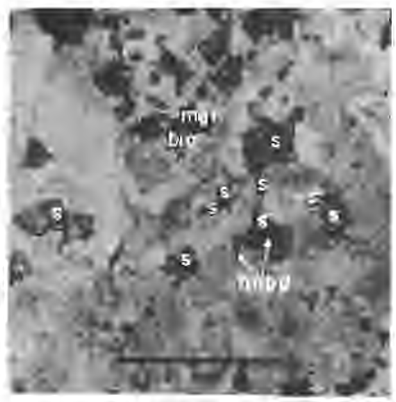


FIGURE 8. SCHEELITE ON A JOINT SURFACE FROM THE ANCHOR CANYON GRANITE

mgt, magnetite; bio, biotite; hnbd, hornblende; dusky-gray matrix is composed of partially sericitized orthoclase; clear matrix is composed of quartz.

CONCLUSIONS

The bulk of the scheelite discovered to date in the Magdalena district occurs adjacent to the Young America fault in the southern portion of the district. This general area offers distinct possibilities for at least economic byproduct production of scheelite in conjunction with base-metal operations. Further prospecting of this area for tungsten is warranted. In addition, the presence of tungsten in the southern portion of the district lends strong support to the concept of a buried stock in that area.

The Anchor Canyon stock was found to contain very minor amounts of scheelite as patches or grains in joints in the intrusive rock. This indicates that prospecting of the margins of the Anchor Canyon stock for tungsteni mineralization is warranted. The same cannot be said, however, for the margins of the Nitt stock. The dumps of the principal mines in the margins of the latter were examined by ultraviolet light, and no scheelite was found, thus suggesting the absence of commercial quantities of scheelite in and adjacent to the Nitt stock.

Scheelite is recognized readily in the field because of its fluorescence. When prospecting in the Magdalena district, the prospector should also look for possible occurrences of other high-temperature minerals, such as wolframite (tungsten), cassiterite (tin), and associated bismuth minerals,

REFERENCES

Dale, V. B., and McKinney, W. A. (1959) Tungsten deposits of New Mexico, U. S. Bureau of Mines Rept. of Inv. 5517.

Kerr, P. F. (1946) Tungsten mineralization in the United States, Geol. Soc. Am. Mem. 15.

Loughlin, G. F., and Koschmarin, A. H. (1942) Geology and ore deposits of the Magdalena mining district, New Mexico, U. S. Geol. Survey Prof. Paper 200.

Palache, Charles, Berman, Harry, and Frondel, Clifford (1951) Dana's system of mineralogy, 7th ed., v. II, p. 1076, New York, John Wiley & Sons.

Titley, S. R. (1958a) Silication as an ore control, Linchburg mine, Socorro County, New Mexico, unpublished Ph. D. thesis, Univ. of Arizona.

— — — (1958b) Structural and mineralogical control of ore, Linchburg mine, Socorro County, New Mexico, Arizona Geol. Soc. Digest, Tucson, Arizona (October issue).