



## ***The ancient mineral industries of Cerro Pedernal, Rio Arriba County, New Mexico***

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# THE ANCIENT MINERAL INDUSTRIES OF CERRO PEDERNAL, RIO ARRIBA COUNTY, NEW MEXICO

by  
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## INTRODUCTION

One of the earliest mineral deposits worked by prehistoric man in North America is located on the slopes of Cerro Pedernal, a prominent landmark in the Chama Valley, in northern New Mexico. The bedded Pedernal Chert Member of the Abiquiu Tuff (Tertiary) crops out several hundred feet below the flat summit. Exposures of the chert are also found on San Pedro Mountain about seven miles south of Gallina, New Mexico (Smith, 1936; Bryan, 1938, 1939; Church and Hack, 1939).

Artifacts made of Pedernal Chert had wide distribution and have been found hundreds of miles from the source. Some of these date back to the earliest human occupation of northern New Mexico, ten or eleven thousand years ago. Other artifacts belong to the 20th century. The steep mountain slopes, the canyons and the meadows, and the hummocky landslide areas of Cerro Pedernal all contain evidence of the quarries, workshops, and camps of the American Indian.

## EARLY INVESTIGATIONS

In Spanish, "pedernal" means flint, or a variety of quartz, compact with conchoidal fracture and translucent edges. It is not known when the mountain received its Spanish name, but in 1696, according to Father Velez de Escalante, the "rebellious Tewas, having deserted their pueblos, withdrew to the mountains, some to the *cerro de los Pedernales* (Pedernal Mountain) which is to the west side of the Chama River, beyond Abiquiu ..." (Wilson and Warren, 1974).

The Indian name for Cerro Pedernal is *Tsiping*, or "flaking stone" mountain. Because of its peculiar form—flat topped in one profile and triangular in another, the peak is also referred to as *Tzliping*, or "pointed mountain" (Harrington, 1916). A large pueblo ruin on the mesa between Polvadero and Canones Creeks is called Tsiping Pueblo. There seemed to be some confusion among early archaeologists concerning the type of material that could be found on Cerro Pedernal, for "flaking stone" was also synonymous with "obsidian," and Harrington (1916) felt obliged to remark: "A number of Tewa Indians have stated that there is no more obsidian about Pedernal Mountain than elsewhere in mountains west of the Tewa villages."

Between 1873 and 1875, members of the Wheeler Expedition visited the Chama Valley and archaeological sites of that area, and collected stone artifacts at Santa Clara Pueblo, which were obviously made of Pedernal Chert, but no mention of the quarries was made (Putnam, 1879). Two stone artifacts from Santa Clara were apparently still in use at the time they were collected. A few years ago, a Santa Clara Indian told this author that in the early 1900's his father, then a small boy, had gone with his grandfather and other members of the Pueblo to a place near Youngsville, New Mexico, to gather stone material for artifacts. They went at a certain time each year for a two week period and were joined by Indians from

other Pueblos. Some of the older men made arrow points during their stay, while others gathered raw materials to take home.

In a letter written in 1911, J. A. Jeacon reported that very little obsidian was found during his excavations at Tsiping Pueblo, but that quantities of chalcedony and flaking stone were found (Harrington, 1916). In a report on his excavations at Po-shu Pueblo, a ruin three miles west of Abiquiu, Jeacon (1923) described the two-headed ax typical of the Jemez Plateau: "... called by the Tewa a *tzii-wi* (two flake or two point) ... it was supposed to have been used only in war. Three of the six, two-headed axes illustrated by Jeacon were obviously made of Pedernal Chert. Similar axes of the chert were found in a kiva at Pecos Pueblo. Two double headed axes, such as described by Jeacon, were found at the quarries on the western slopes of Cerro Pedernal. The ends of one of these (Fig. 3a) was battered, indicating that it had been used in the quarry or refining processes; the other may have been a rejected blank or preform.

In the early 1930's, Hibben (1937) visited the quarries at Cerro Pedernal in conjunction with an archaeological survey of the Chama Valley. He was the first to describe the chert outcrops and the ancient pits and workshops of Cerro Pedernal: "Large numbers of roughly worked spalls, points, blanks, and hammerstones are in evidence around these pits.... The deepest pit examined was twelve feet deep, with the bottom, of course, filled with accumulated wash."

Hibben also noted abundant evidence of extensive chipping debris of Pedernal Chert on both large and small sites in the Chama Valley, and there can be no doubt that the Indians carried much raw material to their villages for finishing.

During the early 1930's, H. T. U. Smith (1936) had been doing geologic field work in the Abiquiu area and commented on the chert: "A unique occurrence within the Abiquiu tuff is a 5-foot bed of flint, found on the slopes of Cerro Pedernal about 175 feet above the base of the formation. ... On the southern slope of the peak this flint was once quarried by the Indians. Recent studies by Church and Hack show that this flint is rather widely distributed in the area to the southwest." The unusual chert bed was named the Pedernal Chert Member of the Abiquiu Tuff by Church and Hack (1939).

In 1937, Kirk Bryan (1938) visited the summer camp of Church and Hack on San Pedro Mountain and described the chert and associated prehistoric quarries. That summer he also visited the quarries of Cerro Pedernal, later writing about the chert, the quarries, and associated artifacts in detail (Bryan, 1938, 1939, p. 17):

"The chert was uncommonly white to pearly gray in color, though in places near the top the chert shows bands 1/2 inch thick and is black in color. In places near the top, weathering has changed the color to pink, red, or yellow. The red color also occurs as flecks or spots in the white to pearly

gray mass. Generally, the yellow color is associated with clear, very translucent phases. ...The chert is remarkably free from flaws and joints.... The materials breaks by conchoidal fracture with almost equal facility in any direction."

Three quarry areas along the outcrop of the chert were visited by Bryan. Locality 1, on the southwestern side of the peak was the larger: "The quarry refuse at the main site, as shown by a small pit, is 11/2 feet deep and composed of large fragments and chips." No mention is made of the 12 foot pit seen by Hibben. The quarries of Localities 2 and 3 had only small amounts of refuse. In addition to the chert debris at the quarries, Bryan found hammerstones of basalt and quartzite.

Since the 1930's, the ancient quarries have received little attention from archaeologists or geologists. During the late 1960's and the early 1970's, the author made occasional visits to the area. Additional information concerning the chert exposures, the quarries and workshops, and the artifacts and related cultures was obtained. Large areas of the lower slopes of the mountain remain unexplored.

### THE QUARRIES AND WORKSHOPS OF THE WESTERN SLOPES

In July, 1973, Phyllis Hughes, Museum of New Mexico, and I visited the chert quarries on the western slopes of Cerro Pedernal. Following a jeep trail from the Rito Encino road for about one half a mile, we then climbed the steep talus slopes to the outcrop of chert. On the west side of Cerro Pedernal, the chert is exposed at about 8500 feet and is cliff forming. The Pedernal Chert Member rests on poorly consolidated sand and gravel of the basal Abiquiu Tuff. The chert beds are capped by the Santa Fe Formation and the Lobato Basalt of the late Tertiary (Smith, Bailey, and Ross, 1970). Large talus blocks of the basalt cover the chert ledges along much of the west slope.

We followed the chert outcrops north for about 500 feet, until they disappeared beneath the basalt talus. This was probably Locality 2 of Bryan (1939). Since the underlying gravel weathers rapidly, the chert is in a way self-quarrying. Large blocks of the chert have tumbled down the steep slopes to rest hundreds of feet below. The recent path of one such boulder was noted, where huge gashes were left in tree trunks, and holes had been gouged into the earth as the rock bounded down the slope. Wherever these boulders had come to rest, early inhabitants had stopped to quarry and gather the chert, leaving a litter of discarded chert fragments around the demolished boulder.

The chert also has a tendency to exfoliate near the bottom of the beds, possibly from stress release, which results in natural spalling. Although the weathering of the basal gravel has resulted in rock overhangs and shelters that might appear to be quarries, only one of these had any appearance of antiquity and no artifacts were found. The spalling of the chert must account for some of the flake debris which makes up much of the thousand feet of talus below the cliffs. However, notched tools, axes, hammerstones, and quarry blanks, found among the millions of natural or manmade flakes, are certain evidence of the quarrying activities of man.

The chert layers on the western slopes ranged from 10 to 20 feet in thickness. On the brow of the chert ledges, the ground levels off to gentler slopes. Here are refining or workshop areas, particular in the main quarry southwest of the peak. At

Locality 1 (Bryan, 1939) was evidence of at least one prehistoric quarry, most likely that described by Bryan at the southern end of the chert outcrop. The chert bed dips to the east away from the cliff face. The resultant lessening of the slope angle has enabled a pile of debris and quarry tools from a small quarry cut to remain fairly intact.

The quarries themselves are not spectacular. At most they are small cuts, more or less horizontal, into the face of the chert bed. Usually subsequent erosion has removed evidence of quarrying by man. The most obvious are the "boulder" quarries, for here the quarry debris has remained mostly in place. One such quarry at the foot of the talus slope below Locality 1 consists of masses of broken chat from a huge boulder, crude hammerstones or choppers of quartzite or granite, chert cores, and some crudely worked bifaces. The quartzite and granite cobbles are from the gravel beds underlying the chert.

### Other Lithic Resources

In addition to the quartzite and granite cobbles mentioned above, the basal Abiquiu Tuff contained other materials that had been utilized for artifacts. One of the most common of these is a light brown chert with olive brown chalcedonic cores. This material has been noted in artifacts found at sites peripheral to the Jemez Mountains. White quartzite or white vein quartz cobbles were used mainly as "lightning" stones. Rubbed together, two of these snowy white cobbles produce a glowing light in the dark.

Although there does not appear to be any obsidian source in the immediate area, south of here toward Polvadera Peak, a smoky gray obsidian, found in small to large fragments, was used extensively in prehistoric time. It often occurs at Archaic sites along with Pedernal Chert, and because of the large size of the nodules, seems to have been used earlier and more extensively by preceramic cultures than the other types of obsidian found in the Jemez Mountains.

### WORKSHOPS AND ARTIFACTS OF THE WESTERN SLOPES

The tools found at quarry sites consist mainly of hammerstones, choppers, and crude axes apparently used in the quarrying process, and in breaking off flakes and fragments and crudely shaping them into "blanks," that will be used later to make finished artifacts. No evidence of production of finished artifacts was noted at the quarries or quarry workshops.

As is usually the case at many prehistoric quarries, the camp sites and manufacturing areas are located elsewhere. This practice was observed by Holmes (1919) at aboriginal quarry sites throughout North America, and seems to have been a general practice at other Indian quarries in New Mexico.

Campsites and "finishing" shops were generally located on soil covered knolls of structural and alluvial terraces. Of the innumerable campsites located along Rito Encino, no Puebloan camps were identified. Only two potsherds were found: one from an unidentified micaceous Apache or Navajo culinary jar; the other was a nondescript fragment of a "brownware" vessel.

Artifacts found at these sites cover a time span from 7,000 B.C. to A.D. 400 (Figs. 1 and 2). The assemblage includes only one abortive attempt at producing a point of Pedernal Chert (Fig. 1e).

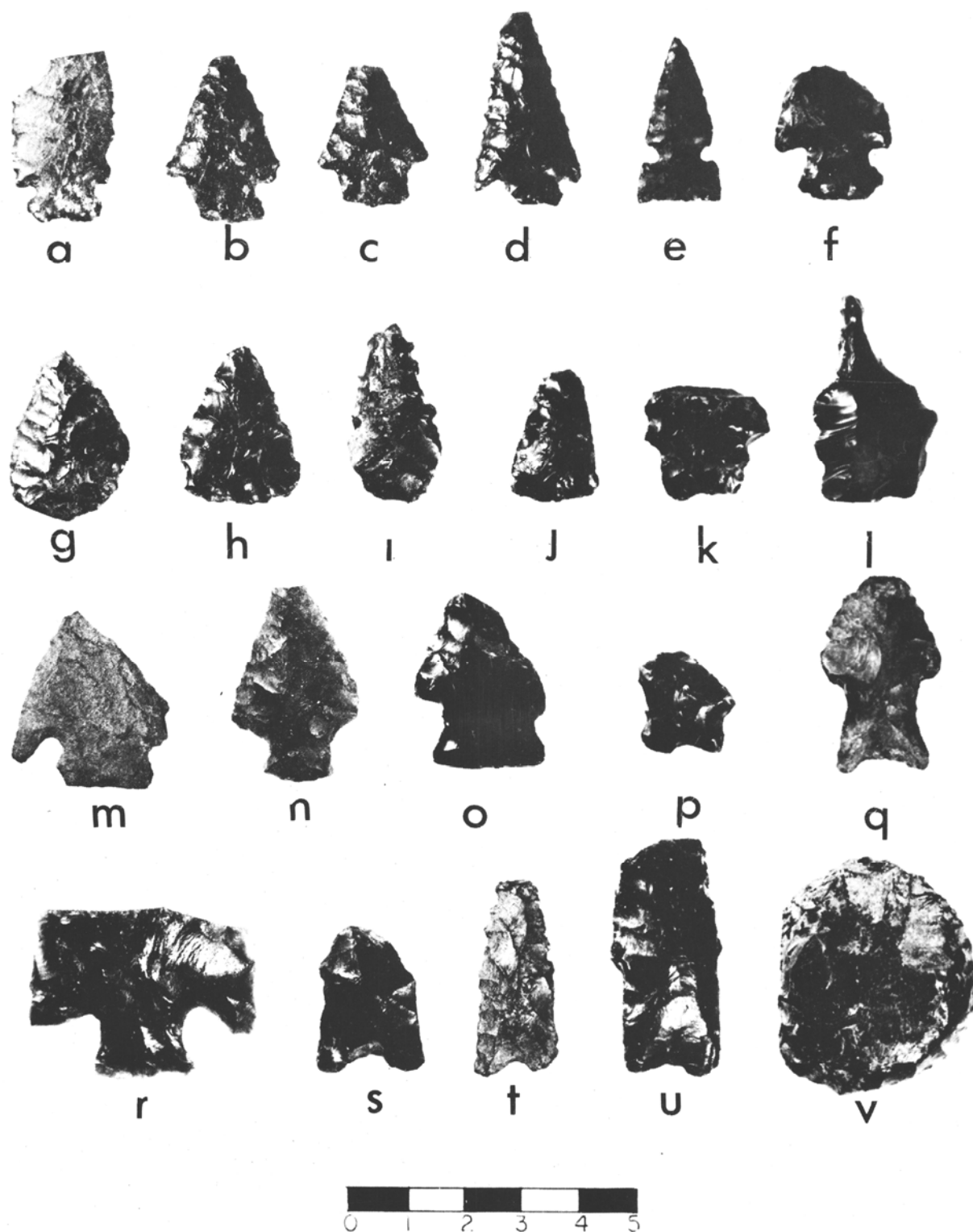


Figure 1. Obsidian and basalt artifacts from workshops and campsites along Rito Encino on the western slopes of Cerro Pedernal (Identified by Reggie Wiseman); a?, b, d, m, r. Basketmaker II points; e. Puebloan point; f, n-o. En Medio points; g-h, j. point preforms, probably Basketmaker; i, k, p. Armijo points; l. Drill; q, s-t. San Jose points; u. Bajada point; v. end scraper (scale in cm).

The earliest point found on the west slopes appears to be of the Bajada Phase (Fig. 1u). The Bajada Archaic projectile points date between 4800 B.C. and 3200 B.C. (Irwin-Williams, 1973). The San Jose, Armijo, and En Medio Archaic phases are also represented (Fig. 1). Basketmaker II and at least one Pueblo Period point is included. Several of the obsidian points are triangular preforms and are non-diagnostic.

Artifacts made of Pedernal Chert include drills, bifaces, miscellaneous objects, and as mentioned above, one Archaic point fragment (Fig. 2e). Three of the artifacts pictured (Fig. 2, k-m) were not found at Cerro Pedernal, but are included as possible evidence of earlier use of the chert by Paleo-Indians of the Clovis Complex, which is dated between 9500 and 9000 B.C. (Irwin-Williams, 1973). The two large bifaces were found in a cache at the base of the valley fill in a tributary east of Rio Tesuque. The cache included another biface made of the smoky obsidian of the northern Jemez Mountains. The bifaces or knives have been tentatively identified by Frank Broilo (personal communication) as belonging to the Clovis Complex. A flake scraper (Fig. 21), also made of Pedernal Chert, was found on the same stratigraphic horizon about three feet from the cache. Several feet of well-indurated clay separated the cache from the overlying Archaic(?) and Puebloan horizons.

## THE EASTERN SLOPES OF CERRO PEDERNAL

### Tsiping Pueblo

The large defensive pueblo ruin of Tsiping is located on Pueblo Mesa about three miles east of Cerro Pedernal. Surrounded by cliffs 800 feet above Canones and Polvadera Creeks, the pueblo was occupied primarily during the 14th century, and had a relatively short period of occupation compared to other biscuitware sites in the Chama Valley (Mera, 1934). Abundant flaking debris and broken preforms indicate that Tsiping had had an extensive lithic industry, producing side-notched projectile points of Pedernal chalcedony in quantity.

### East Slope Quarries

The arrow point makers of Tsiping Pueblo probably quarried the chalcedony on the east slopes of the mountain where landslide deposits and fan gravel contain large boulders of Pedernal Chert. Evidence of extensive "quarrying" or gathering of the artifact material was found on the high benches above a box canyon west of Tsiping Pueblo. *In situ* quarrying was common for many boulders were too large to carry away. Workshop debris from the refining of the chert is widely scattered and not confined to the fan gravel which contains the chert boulders, however. Discarded flakes and preforms are large and no finishing workshops where arrow points may have been made were found, although these probably do exist in the area. Quarry tools of Pedernal Chert included notches axes or mauls, disk hammerstones, choppers, and large unifacial tools.

The fan gravel at this locality was deposited on an outcrop of mudstone, possibly a lateral facies of the Pedernal Chert bed which had been displaced by faulting. Mudcracks and "tubes" suggest deposition of the mudstone in a shallow lacustrine environment. Black chert nodules occur occasionally in the mudstone.

### Canoncito Seco

About a mile and a half south of the East Slope quarries, near the confluence of Canoncito Seco with Canones Creek,

are numerous camp sites on the high benches along the streams. No source of chert was found in the vicinity, but occasional nodules of obsidian may have been native to the area. Both obsidian and Pedernal Chert flakes and broken artifacts were noted at the camp sites. Sherds of corrugated utility and plain polished "brownware" suggest dates in the 1100 or 1200's. Flakes and broken artifacts of Alibates Chert from the Texas Panhandle and quartzitic sandstone, a characteristic artifact material of Northeastern New Mexico, indicate early contact with the Plains Indians of that time period.

An early Jicarilla Apache site was found on a small ridge east of Canones Creek. Thin-walled micaceous utility ware and sand tempered polished black and red pottery at the camp may date back to the late 17th century. Historic documents place the Apache allies of the Taos Indians west of the Rio Grande along the Chama River as early as 1694 (Gunnerson, 1974). Although flakes and broken tools of obsidian and chert were present in the cultural debris, there was no apparent evidence that the Apaches were quarrying or manufacturing tools.

## CONCLUSION

From the scattering of archaeological evidence presented here, one can guess that the chalcedony and chert of Cerro Pedernal played an important role in the economy of varied Indian cultures in New Mexico for ten thousand years or more. Future investigations may tell us more about the importance of this mineral resource in the shaping of the prehistory and history of those early peoples, before steel replaced stone.

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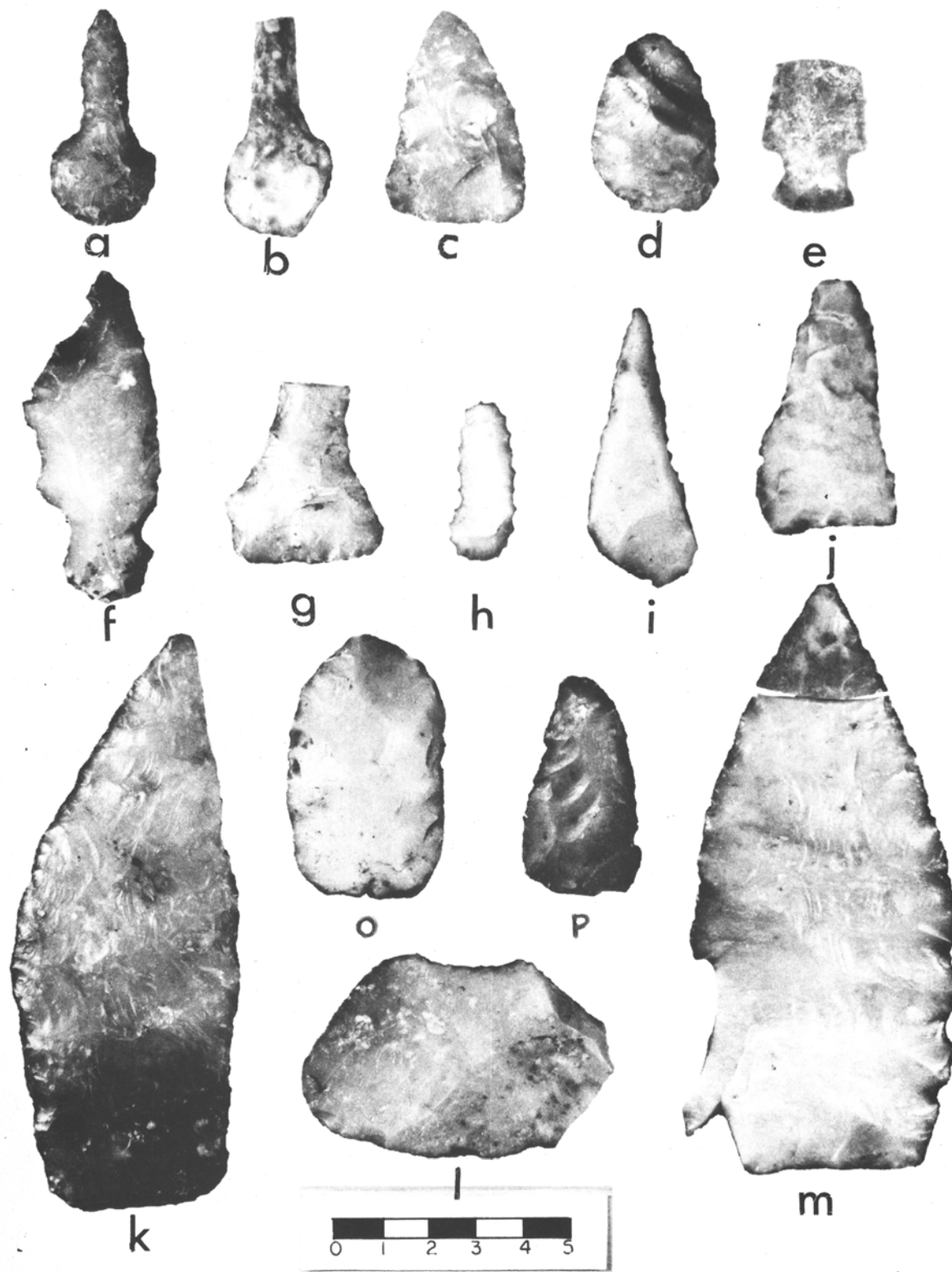


Figure 2. Artifacts made from chert and chalcedony of the Pedernal Chert Member of the Abiquiu Tuff (Tertiary): a, b, g, drills; c, d, p, possible preforms for points; e, archaic point fragment; f, h, i, j, miscellaneous forms; o, bifacial knife; l, flake knife associated with probably Clovis preforms or knives; k, m, bifacial knives or point preforms, probably of the Clovis Complex, found in the Tesuque Valley, New Mexico (Frank Broilo, personal communication) (scale in cm).

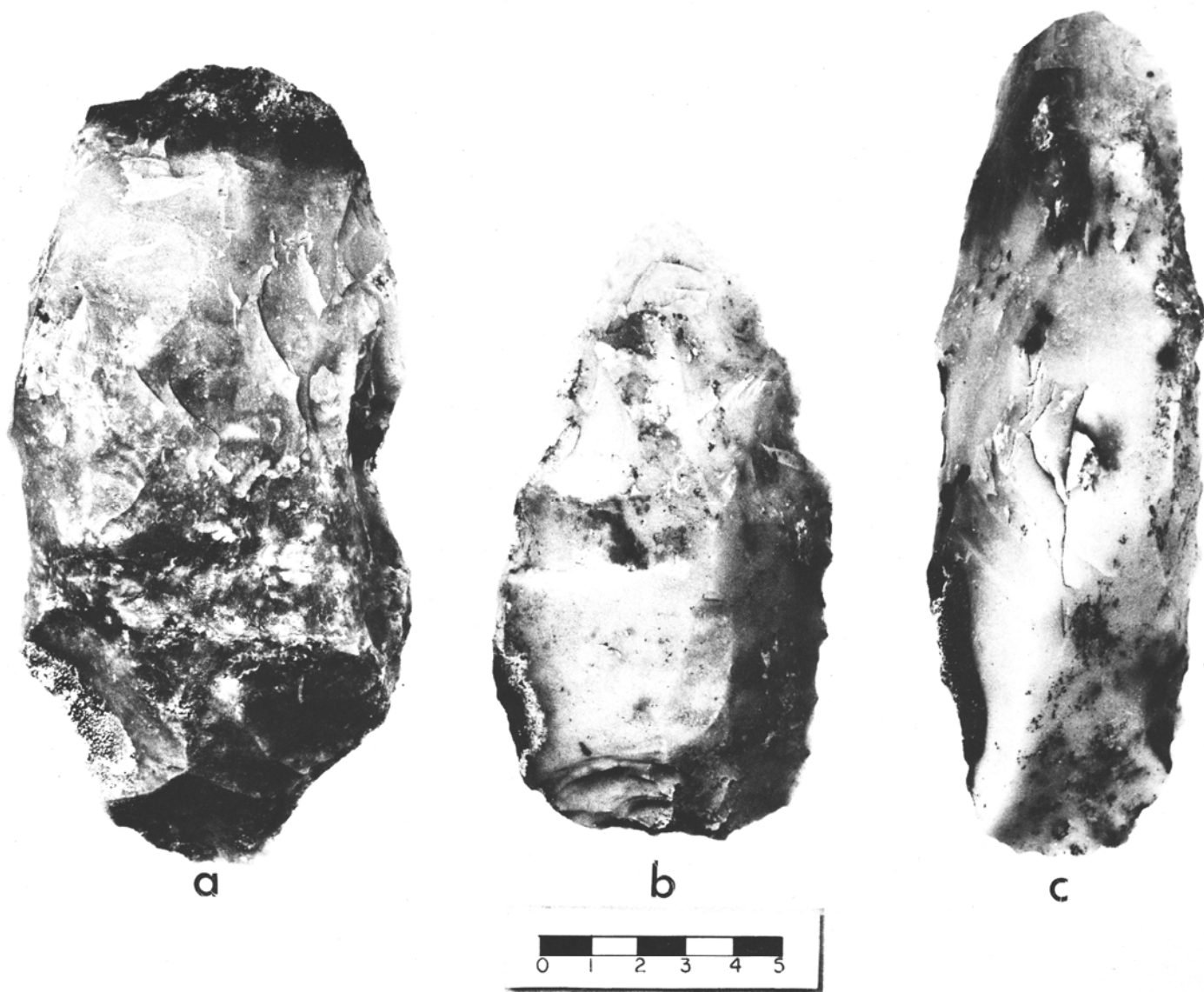
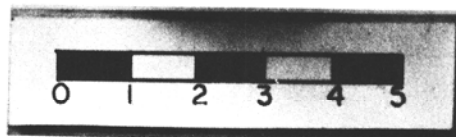


Figure 3. A mining tool and two rejected preforms or "blanks" from the quarries and refining areas on the western slope of Cerro Pedernal (scale in cm).





*Figure 4. A large notched ax used as a mining tool in the Pedernal chert quarries on the western slopes of the mountain (scale in cm).*