The use of turquoise in the New World is not particularly old compared to evidence from the Middle East which dates from at least the third millennium B.C. In the South American Andean culture sequence turquoise artifacts appear in the Cupisnique culture dated from about 900-200 B.C. (Larco Hoyle 1941:149-82). In the Valley of Mexico turquoise mosaics have been found in Middle Pre-Classic contexts, dated at 700-650 B.C. (Pina Chan 1971:175). In the southwestern United States Haury (1937) reported the possible association of two turquoise fragments with Vahki Phase material at Snaketown in southern Arizona. The Vahki Phase has been dated to the last several hundred years before Christ.

The florescence of the Mexican turquoise industry was a Post-Classic phenomenon, and is usually associated with the Valley of Mexico and adjacent cultures after about A.D. 900 (Noguera 1971:59). A single piece of inlay was found at Seibal in the Guatemala Lowlands (Saville 1922:69) on a stela with a long count date corresponding to A.D. 849 (GMT correlation. The long count date on the stela is 10:1:0:0:0).

The importance of turquoise during the Mexican Post-Classic period is evident from Monte Albán V deposits (A.D. 1350-1521) at Monte Albán, Oaxaca, where it “was hardly known or used before, but which among the Mixtecs came to rival jade for use in mosaics and beads” (Caso 1965:913). The Post-Classic ruins of Casas Grandes, in northern Chihuahua, reportedly contained quantities of turquoise and Di Peso (1968) believes that the people of Casas Grandes were involved in a widespread economic pattern through which turquoise and other items passed between Mexico and the Southwest.

Between the years 100 B.C. and about A.D. 900 (a span equivalent to the Mesoamerican Classic Period), turquoise is found in archeological situations sporadically throughout the United States Southwest. Aside from the possible Vahki Phase fragments at Snaketown, only sixty-four pieces were recovered from that site from contexts dated between A.D. 100-900 (Haury 1937). Throughout the entire Southwest only four hundred and five more pieces have been counted or reported from a scattering of sites during this eight-hundred-year period. The figure would be slightly higher had some investigators reported the actual number of pieces recovered (e.g., Roberts 1929). These represent less than one percent of all the turquoise reported from the prehistoric Southwest.

During the tenth and eleventh centuries the incidence of turquoise in the archeological record increases throughout the Southwest, probably reflecting a Mesoamerican stimulus, since the in-
Figure 1: Occurrence of turquoise in prehistoric sites in the Mid-and-Lower-Rio Grande culture areas. Prehistoric mines exist in both. The higher percentages represent increased mining and presumably export. Dark shading represents the Lower-Rio Grande area.

Figure 2: Occurrence of turquoise from prehistoric sites in the Middle Gila drainage and Mimbres areas. Prehistoric mines exist in both. The higher percentages represent peak mining and probably export periods. Dark shading represents Mimbres area sites.

Figure 3: Occurrence of turquoise from prehistoric sites in the Kayenta-Mesa Verde and Flagstaff-Verde River areas. Turquoise was imported to these areas. Dark shading represents the Flagstaff-Verde River area.

Figure 4: Occurrence of turquoise from prehistoric sites in the Chaco and Upper Little Colorado River areas. No prehistoric mines are known for these areas; turquoise was imported. Dark shading represents the Upper Little Colorado River area.
crease corresponds with the Post-Classic florescence of the Mexican industry (Figures 1-4).

The importance of turquoise in later prehistoric southwestern culture is spectacularly illustrated by the accumulation of more than 65,000 turquoise artifacts, fragments and unworked pieces at Pueblo Bonito in Chaco Canyon, New Mexico. This staggering figure represents more than four times the amount of turquoise reported from all archeological sites in the southwest (from which the actual number has been provided in the literature and in field notes). From the evidence at Pueblo Bonito alone, turquoise must be ranked as a major prehistoric commodity, and the mining, manufacturing and commercial activities connected with it indicate an economic pattern of some magnitude.

In societies of the type represented by the prehistoric pueblos the number of tasks involved in the production process (the technology) is usually small, and these often are the labor of a few persons, at most. The mining of turquoise was a relatively simple but tedious process, involving a few types of tools which could be quickly produced on the spot. More important, the technology involved was little, if any, different from the mining and quarrying of a wide variety of natural resources by prehistoric Indians throughout the Americas (Moorehead 1912; Heizer and Treganza 1944; Griffen 1961; Snow 1971).

Most of the tools recovered from turquoise quarries and mines were made from locally available stone and there is no doubt that they were produced at the site. An occasional flake or broken tool of nonlocal stone indicates that some were carried to the area and may, in some cases, indicate use by nonlocal groups (e.g., Rogers 1929:6).

Hammers and mauls, the latter double-polled with a central groove or side notches, the former with poll, bit and grooves or notches at the poll end, are the most common tools at quarry sites. These vary in size from the 20-pound example recorded by Silliman (1881), with the oak handle still attached, to those shown in Fig. 5. Malcolm Rogers’ description of the tools from the Himalaya Mines of eastern California can be applied to collections from all prehistoric mines reported.

These implements may be divided into two distinct classes upon the basis of both material and fabrication. The numerically superior group is made from the local basalt which caps much of the plateau. Members of this group are all crudely made from naturally-formed pieces of basalt which came the nearest in form to the shape desired. These potential hammer-heads were usually only roughly nicked in the median region for hafting, although some have carefully ground grooves about them, either of the full or three-quarter type. If a pick or axe form was desired, the ends were sharpened by percussive flaking. As to the manner of hafting . . . . a pliant haft such as a split green stick would be essential. It is quite evident that wedges were used on many of the turquoise mine hammers, for the sides are often polished from the working of the wedges. Three specific forms occur in this group; a blunt-nose hammer, a sharp-nose pick, and a chopping type similar to the double-bitted axe. (1929:5-6).
Smaller hammers and mauls, neither grooved nor notched, were undoubtedly hand tools, and reflect various stages of refined crushing and breaking of the matrix. Picks and what are probably wedges of various shapes and sizes are reported from several mines.
“Deer horns and elk horns . . . presumably used as picks” were encountered (Harvey 1938:186-92) in prehistoric drifts at the King Mine near Manassa, Colorado.

From the Himalaya mines in California “numerous carapaces of the native tortoise were found which [may have been] used by the Indians for scoops in carrying out the muck. In the bottom of the largest pit was found the shoulder-blade of large animal. It had been ground into the form of a shovel” (Rogers 1929:4). This instrument was said to have been larger than an elk’s scapula. Tortoise shell fragments were also recovered from the fill of open trenches at the Sullivan Turquoise Mines near Boulder City, Nevada (Shutler 1962:60).

Small bits of charcoal and fragments of what were probably skin waterbags found in prehistoric workings suggest that heating the country rock and cooling it rapidly with water to facilitate breaking may have been done by the prehistoric Indians (Johnston 1966; Shutler 1961:60; Sterrett 1908:846). Water was at a premium at many of the source areas, and this method must have been used sparingly. Moreover, heating drives water out of tur-

Figure 6: The “chicken ladder” reproduced here from a late 19th century illustration of New Mexico mining, is like that described by Adolph Bandelier at Cerrillos in 1889.
One method of mining used by the Indians was described to Adolph Bandelier in 1880 (Lange and Riley 1966:86-7):

Instead of sinking a shaft straight and then working on a level on both sides . . . say 50-100 feet, they go by steps, about in the following manner. Each shaft is 10-12 feet, and in each they place a ladder, leaving in every case a sufficient platform to rest it upon. Their ladders are but a round beam in which they cut notches.

Figure 6 illustrates a "chicken-ladder" like that described by Bandelier.

Prehistoric turquoise workings have been reported from the states of California, Nevada, Arizona, and New Mexico (Fig. 7). Turquoise also is reported from Utah and from Texas but no mention of ancient workings is made from these latter localities. Several known sources of turquoise in Mexico have not yet produced evidence of prehistoric work, and the reported occurrences of the stone in Virginia, Alabama, and New Jersey also lack such evidence (Pogue 1915). In nearly every case modern turquoise mines were discovered as a result of prehistoric pits and the associated stone tools (e.g., Duffield 1904:50).

In 1911, Sterrett (1911:1067) measured the main prehistoric pits on Mount Chalchihuitl, in the Cerrillos District and noted:

the main pit on the northwest side of the hill to be about 130 feet deep on the upper side and about 35 feet deep on the lower side, the rim about 200 feet across, and the bottom nearly 100 feet across. The large dumps of waste rock removed from this are about 150 yards long by 75 yards wide and 1 to 30 feet deep. The workings on the other parts of Mount Chalchihuitl are less extensive. On the southeast side is an open cut over 100 feet across, with a present depth of 20 feet on the upper wall. Sterrett estimated that the debris from the main pit (Figure 8) covered some 2½ acres which, according to Ball (1941:24) represents approximately 100,000 tons of rock. Sterrett estimated that prehistoric workings on Turquoise Hill in the Cerrillos District reached a depth of "as much as 100 feet, if not more" (1911:1070). The O'Neal group of prehistoric workings at Cerrillos, a short distance southeast of Mount Chalchihuitl, contains numerous pits covering an area approximately 300 by 100 yards.

The prehistoric workings near Manassa, Colorado, consisted of a pit "fifty to sixty feet deep, 100 or so across, and 150 feet long. Several tunnels had been dug into the sides of the pit to a depth of ten or fifteen feet. These tunnels had been sealed up by the Indians, and later miners broke into one of these ancient tunnels, spilling all around them the hammers and diggers, loose matrix, and the bones of the primitive miners who had been killed while at work" (Bennett 1966:38).

In the Mohave Sink region in eastern San Bernardino County, California, Rogers (1929:5-9) found the remains of extensive prehistoric turquoise quarries and mines. He noted and described three large groups of mines, lying eight miles apart, containing 270 workings. According to descriptions given Rogers it took five men several months to muck out the largest pit. The dimensions were given as thirty feet long, twelve feet wide, and twelve feet deep.
“From this main pit, numerous short drifts or gopher holes extended, where the Indians had pursued promising veins. There is practically no soil at this site, and the entire excavation was conducted in bedrock.” One unexcavated pit measured thirty feet across from rim to rim, and Rogers excavated a trench to a depth of five feet without encountering bedrock.

A brief description of the prehistoric workings at the Sullivan Turquoise Mine, near Boulder City, Nevada, is given by Shutler (1962:60).

“The mine is on a rocky hillside, of the open-pit variety... The mining was carried out on the face of the hillside by trenching. The area worked covered about one-half an acre in extent. During March of 1936, a Civilian Conservation Corps crew of about a dozen men put several trenches into the mine area. The greatest depth recorded was five feet four inches. Various types of mining tools [see Plate 106, a-1] and some pottery were recovered from these test trenches. Numerous fire-hearth were found in the test trenches. They suggest the use of fire to crack the country rock.

Bennett (1966:54) reported thirty-eight localities in Nevada with prehistoric turquoise workings, ranging from the Cortez Mountains in the north-central part of the state, south of Boulder Dam. Unfortunately most of these were discovered and briefly reported by prospectors or geologists and there is little or no description of the archeological remains.

Three major areas of prehistoric turquoise mining have been reported in Arizona, but none of these has been adequately described by archeologists. Shafts cut into solid rock extending 20 to 25 feet were reported in the side of Ithaca Peak in the Cerbat Mountains (Kunz, 1905:623). On Turquoise Ridge in the Courtland-Gleeson District, Smith (1939) claimed that the Indians "turned over whole hillsides in their search for the sky-blue gem."
Haury (1934:15-16) described a minor quarry on the Salt River in Arizona:

A thick ledge of rock which crops out about six hundred feet above the stream has, at some time, been the object of muck quarrying. The rejected material has formed a talus slope which extends far down the hill and is visible from a long distance. As the formation dips back into the hill, a slight trough has been formed at the base of the ledge where efforts were made to carry the operations down below the accumulated mass of waste. Early visitors report that stone implements, battered and worn from heavy work, lay scattered about in great profusion.

Some rough finishing of the matrix was done at the source areas. Lap stones, small abraders, small hammers and picks, files and other miscellaneous tools indicate the obvious assumption that large pieces of country rock were broken down and small pieces of turquoise and matrix roughed out for ease in transporting. A small cache of matrix was found several miles north of Santa Fe, buried under a worn-out lap stone, and was evidently fresh from the mine.

Campsites are mentioned at several quarries and mines, indicating overnight trips. Permanent habitation units are absent, with the possible exceptions of two Nevada locations (Bennett 1966: 53-4). Pueblo villages were located, however, reasonably short distances from most of the sources except for those in California, central Nevada, western Arizona, and Colorado. Expeditions to these areas must have been somewhat more formally organized affairs. Rogers (1929) remarked that

Water is not attainable at any of the mines. The Himalaya mines are situated the nearest to water, and that is five miles to the northwest. Six miles to the southwest lies Halloran Spring. Here we found evidence of extensive occupation, judging not from the abundance of material, but from the area covered . . . the Halloran Spring site produced the most Puebloan artifacts, and possibly was a temporary camp of the turquoise miners (p. 7).

The size of campsites at the mines, usually small but often extensively utilized, suggests that parties were generally small. The worked outcrops and veins, with the exception of Mount Chalchihuitl and a few other large pits, also reflect small work parties, since no more than a few men at a time could have worked comfortably in them. However, there is no way of knowing how many pits or tunnels at a given locale might have been worked simultaneously by any one expedition.

In support of the inferred small size of mining parties are several references to Pueblo Indians who visited the Cerrillos area mines during the latter part of the nineteenth century.

Blake (1858:229) mentioned a legend to the effect that eight or nine Indians had been buried in a cave-in at Mount Chalchihuitl. During the period of his visit, Blake noted (p. 230) that "Two or three Indians, only, go to the locality at one time, and, while there they live in the cave or recess in the face of the cliff."

Bandelier was told, in 1880, that the owners of turquoise deposits in the Cerrillos area had "met two Indians cutting out turquoises with hatchets and carrying them up in leather bags" (Lange and Riley 1966:86-7).
Lange (1959:143) recorded a Cochiti story concerning four men from that Pueblo who were captured in a tunnel in the Cerrillos area from which they were illegally extracting turquoise early in the 20th century; and Northrop (1942:435) quoted the following story which occurred in 1910:

"Threatening him with death if he interfered with their plans of robbing the Tiffany turquoise mines, 14 miles south of Santa Fe, New Mexico, a band of Santa [sic] Domingo Indians approached the home of Manager J. P. McNulty and after leaving a guard of about 16 warriors at the mouth of the shaft, descended the 125-foot shaft by means of a rope, ascending with some of the much sought for stone.

The ownership of resource areas by individuals or by villages or other social groups was not a particularly well-developed concept among North American Indians. Feuds over ownership or use of resource areas, however, have been recorded between some California groups (Heizer and Treganza 1944). The extent of such contention elsewhere is not known. In the southwest, salt, like turquoise, was considered a precious commodity and its gift to the Pueblo Indians is sanctioned in mythological terms in much the same manner as turquoise.

Harrington (1916:535) was told that salt "was not considered the property of any one tribe... but the divine gift of Salt Old Woman, who gave of herself freely..." Turquoise deposits probably were similarly considered. However, Santo Domingo Pueblo claims ownership of the Cerrillos pits through inheritance from the former Tanoan owners (Lange and Riley 1966:109, 142), as a result of the Pueblo Revolt of 1680 when the Galisteo villages were abandoned. The present eastern boundary of the Santo Domingo Pueblo Grant lies several miles west of the Cerrillos turquoise deposits and sheer propinquity may be the strongest basis for the Domingo attitude toward the Cerrillos turquoise deposits.

Informants in the 1930s stated that the following pueblos mined turquoise at Cerrillos: Santa Ana, Santo Domingo, Cochiti, San Felipe, and San Ildefonso. These same sources claimed that Zuni was not allowed access to the Cerrillos mines (Gifford 1941:125); however, Adair (1944:129) recorded that a Zuni Indian, on a trading expedition to Santo Domingo in the 1890s, requested permission from the Domingos to mine turquoise at Cerrillos. The Zuni was referred to the Anglo owner of the mine in Santa Fe, and for five dollars was given permission.

Identification of the prehistoric miners in the Cerrillos area has depended on the identification of the tempering material used in the manufacture of pottery found at quarry sites. Pottery sherds ground on all edges suggest their use as tools and they may have served the same purpose as the tortoise shells reported elsewhere. These have been found in quantity at Cerrillos and represent a time span from about A.D. 1150 to about A.D. 1650. They have been identified petrographically by A. H. Warren of the Museum
of New Mexico. Figure 10 shows the type of sherds from the prehistoric and historic quarry sites represented at the O'Neal group of turquoise pits a short distance south of Mount Chalchihuitl.

Seventy-five percent of this pottery came from San Marcos Pueblo, several miles east of the O'Neal group; four percent came from pueblos located within 30 miles of the mines; and the remaining twenty-one percent came from sites outside that limit. San Marcos Pueblo, occupied from about A.D. 1350 until the Pueblo Revolt of 1680, was the nearest known inhabited pueblo to the mines during that period. The peak of mining activity at the O'Neal group, indicated by ninety-five percent of the sherds, took place during the 14th through the 17th centuries. A preliminary classification of sherds found in the vicinity of the Mount Chalchihuitl group indicates a similar period of peak activity. The ceramic data from the quarries corresponds in time to the data in Figures 1-4 where a sharp increase in turquoise at Middle Rio Grande sites is evident during the same period.

It is not known if the prehistoric manufacture of turquoise ornaments was the result of specialists working only with this stone, or whether the prehistoric artisan worked with such material (other varieties of stone, bone, shell, etc.) as was available to him. Individual work areas of turquoise craftsmen have seldom been encountered in the excavations of pueblo ruins but the debris from artifact manufacture, the tools used, and the thousands of fragments of worked and unworked turquoises from many ruins
attest to the presence of lapidaries who used the stone throughout the prehistoric Southwest.

At Pindi Pueblo, near Santa Fe, New Mexico, Stubbs and Stallings (1953:116-120) excavated the debris from two bead and pendant makers work. This material consisted of a few finished and unfinished turquoise and red shale artifacts, several hundred small bits of matrix and turquoise fragments, red shale bead blanks and fragments, shell beads, and miscellaneous tools used in their manufacture. Among the latter implements they recovered three minute quartz drills. Lap stones, or abraders, similar to many found in the nearby Cerrillos turquoise area were recovered elsewhere in the ruins (1953, Plates 25 and 28). Bandelier was shown a “fire drill [bow] with quartz point used for boring holes into turquoise,” at Santo Domingo in 1880 (Lange and Riley 1966: 95). He was informed by a Domingo craftsman that four months were required to drill and polish by rubbing four pairs of earrings which measured about one and one-quarter by one-half inch. An account of Aztec turquoise lapidary work is described in the Florentin Codex (Dibble and Anderson 1959).

The master lapidaries cut ... green stones ... they scraped them with a worked flint tool. And they bored them; they bored them with a metal tubular drill. Then they slowly smoothed the surfaces; they polished them; they gave them a metallic luster. And then they finished them off with a piece of wood [and very fine abrasive]. Or with a piece of fine cane [containing silica] the lapidaries polished, finished, perfected their artifacts. And the so-called round turquoise is not hard. No hard abrasive is needed to grind it down, to smooth its surface, to give it a metallic luster. And to polish it, it is rubbed with a piece of fine cane. And fine turquoise is not very hard. With just a little sand it is polished; with it, it is embellished. And also, it may be given brilliance, radiance [with] another tool called a turquoise-burnisher.

Pueblo trade depends, in part, on the adaptation by different villages to different natural, cultural and social environments. The results of such adaptation to environmental disparity can be illustrated by a partial list of items exchanged for turquoise in the Southwest during historic times: Hopi and western Keresan woven mantas, Navajo horses, pottery, corn and other foodstuffs, hides, birds and feathers, Navajo blankets, shells, salt, medicinal goods and treatment, ceremonial treatment and ceremonies. Perhaps more than any resource available to the Pueblo Indians, turquoise operated as a standard of exchange. The number and extent of mines and the widespread distribution of the material suggests a similar attitude through most of the prehistoric Southwest.

The value of turquoise was calculated by the historic Pueblos on the basis of the quality of the stone and upon the length of time taken to produce an artifact from it (Parsons 1939:36; Ball 1941: 23). A necklace of turquoise disc beads, measured from shoulder to shoulder, was estimated to be worth one Navajo horse by a San Ildefonso Indian (Gifford 1941:124). A Santo Domingo craftsman told Bandelier that the price of working turquoise was “the same as that of the stone. For instance, a stone worth $1.00 will be $2.00 when cut” (Lange and Riley 1966:107-109). The four pairs
of earrings made by this man were valued at 25 pesos.

In 1799 the estate of a Sandia Pueblo Indian contained some blue earrings of chalchiguities turquoise valued at 22 pesos, 18 strings of white turquoise at 22 pesos, 10 more at 13 pesos, and 10 of corals at 25 pesos. For comparison an embroidered bedspread was valued at 22 pesos, an ox at 25 pesos, and a copper kettle at 24 pesos (SANM, no. 251).

Many items not available through an interpueblo system of exchange were obtained from Mexico, the West Coast, and from Plains Indians to the east of the Rio Grande. Macaws and macaw or parrot feathers, shells, hides and meat products were some of the items for which southwestern turquoise was exchanged. Surprisingly, turquoise does not seem to have been used by the West Coast or other California Indians who supplied marine shells to the Southwest.

Hernando de Soto found, in the province of Guasco (somewhere in the lower Mississippi Valley) in 1542, "some turquoise and shawls of cotton which the Indians gave them to understand by signs, were brought from the direction of the sunset" (Kelly 1955:990). A historic-period Indian burial found in Coahoma County, Mississippi, which contained a turquoise bead necklace and pendant (Peabody 1904:50-51), corroborates de Soto's observation.

Turquoise has also been reported from prehistoric sites in Texas (Bell 1947:181-84), Kansas (Wedel 1959), and in Nebraska (Gunnerson 1968). The middlemen in the movement of turquoise to the plains and other eastern groups were the Jumanos, or Wichitas, and Plains Apaches. A Spanish expedition to the plains in 1598 encountered Vaquero (Apache) Indians returning from Taos and Picuris pueblos where they "sold meat, skins, fat, tallow, and salt in exchange for cotton blankets, pottery, maize, and some green turquoises which they use" (Hammond and Rey 1953:400).

Cree Indians in the Lake Superior region reportedly had turquoise ornaments (Ball 1941:25-26), and turquoise has been found in Indian sites in Ontario and Wisconsin. The Winnebagos, Sauk and Fox, Pawnees, and Wichitas participated in this widespread distribution system (Ball 1941: ibid; Kinietz 1965:403). The occurrence of turquoise east and north of the southwestern United States suggests, however, only casual interest in turquoise by the people of these areas during a time which corresponds to the peak mining period in the Cerrillos district.

That turquoise was an important item of exchange between Pueblo people and those of Mexico is supported by early Spanish accounts. Marcos de Niza in Sonora (in Saur 1932:22) recorded accounts of a people

"... who have houses with flat roofs and of many stories. These people they said were settled along the banks of a large river, where there are many enclosed pueblos and at times are wars waged between the pueblos. Also many turquoises are brought from these pueblos, which ... were to be seen among these poor people whom the friar had reached; not that those things were produced in the lands of the latter, but they brought them from these large pueblos whither they went at times to work and to gain their livelihood as the day laborers do in Spain."
In the Valle de Sonora, or Ures, Cabeza de Vaca, "saw many turquoises." According to his account he asked them where they had got these stones, and they said that these were brought from some very high sierras which lie to the north, obtained by barter for skins and feathers of parrots." He was told that in the country from which turquoise was obtained there were "pueblos with many inhabitants and very large houses" (Sauer 1932:17). What may well have been the final blow to this aboriginal exchange system was recorded by Bandelier (Lange and Riley 1966:237).

"Up to 1859, regular caravans of Pueblo Indians from New Mexico visited Sonora annually about October. They had zarapes, buffalo hides, etc., and traded these for rebosos, oranges, etc. In 1859, owing to an attempt at collection of duties, they never returned . . ."
The prehistoric evidence for this exchange system involving turquoise between Mexico and southwestern pueblo Indians is, perhaps, reflected by the occasional discovery of caches of raw or partially worked items, and whole artifacts of turquoise in situations far removed from source areas and habitation sites (see Anonymous 1935; Haury and Gifford 1959; Johnston 1966; Phelps 1967).

The most common occurrence of turquoise in archeological situations is with burials but denotes, I believe, an essentially secular consideration. The situation is not, however, particularly wide spread in the prehistoric southwest, and occurs usually in areas where grave goods are a normal aspect of the local culture. Even so, the amount of turquoise which accompanies the body is small and consists usually of a single ear bob, neck pendant, or strand of beads. Often turquoise in these situations is a minor element in bone, shell or other types of ornaments. The deposition of turquoise jewelry with the dead may, in some cases, reflect high status for the individual, or membership in a society or ceremonial group. Bandelier noted that there was no apparent difference as to rank in wearing turquoise. "Whoever finds or gets them uses them as ornaments" (Lange and Riley 1966:103). Ruth Bunzel, at Zuni noted that

The amount of turquoise worn by [a katcina] impersonator is limited only by his borrowing capacity. The way of wearing the necklaces is indicative of rank and position. Necklaces front and back indicate a Katcina of importance; necklaces doubled over and worn close to the throat are a badge of society membership (1932:1032).

One of the more spectacular funerary deposits of turquoise was excavated at Ridge Ruin in Arizona and dates from the 12th century (McGregor 1943). Among other things the body was laid to rest with a turquoise-encrusted basket (similar to one found at Pueblo Bonito in Chaco Canyon, New Mexico, from the same period; see Pepper 1920), 180 beads, four pendants, two, plugs, and more than 800 pieces of mosaic inlays. Aside from these items were twenty-five pottery vessels, 8 baskets, 423 projectile points and blades, 3600 gray stone beads, minerals, a large number of wooden objects, and beads and pendants of bone, shell, calcite, and lignite.
By contrast, a "high status" burial from Grasshopper Ruin in Arizona contained, among other things, only eight turquoise items (Griffen 1967). A burial from Hawikuh, near Zuni Pueblo, contained items suggesting that the deceased, during life, played a role similar to that of the "magician" uncovered at Ridge Ruin. Both probably were members of a stick-swallowing society and were buried with their paraphernalia, but the Hawikuh grave contained only 13 turquoise beads in addition to other items connected with the society (Hodge 1921:17).

It is doubtful, in most cases, that turquoise ornaments buried with the dead represented offerings from the living; rather they seem to have been the personal possessions of the dead. Whatever high status is indicated by the accumulation of turquoise items in graves probably should be considered ceremonial status. Personal wealth, that is high economic status, probably is not indicated. No strong sex preference is indicated by the deposition of turquoise with burials, although there is a slight bias against infants and immature adults, but this varies from region to region.

The sacred, or nonsecular, nature of turquoise also is evident from the archeological record. From kivas at Pueblo Bonito, Pueblo del Arroyo, and Chetro Ketl, in Chaco Canyon, and from a kiva near St. Johns, Arizona, turquoise objects have been recovered from under pilasters and support posts, and from sealed wall crypts and niches, evidently offerings at the time of construction (Judd 1959:125; 1954:106; Martin and Rinaldo 1960). Tiny fragments of turquoise were recovered from the bottom of a small hole in the center of the firepit in a kiva in the Chama Valley (Wendorf 1953:26); and turquoise has been found in sipapus in the Galisteo Basin south of Santa Fe, New Mexico (Museum of New Mexico, Field notes), and in the Jemez region (Reiter, Mulloy, and Blumenthal 1940). Such ceremonial occurrences, however, seem to have been the exception rather than the rule. The nonsecular nature of the stone and its uses are further evident at prehistoric shrine deposits.

A 13th century village shrine, near a large excavated pueblo ruin southeast of Santa Fe, contained a small handful of turquoise fragments. An 11th century shrine deposit excavated near Lordsburg, New Mexico, contained nearly 3,500 pieces of turquoise and other green stone items, as well as bone and shell ornaments (McCluney 1968). What is evidently a modern shrine, within the city limits of Santa Fe, New Mexico, contained treated and even plastic turquoise.

Greenwood and White (1970:298-301) described two types of prehistoric shrines and their associated artifacts, in the Mount Baldy Primitive Area in the White Mountains of east-central Arizona.

The major class [of artifacts] consists of disk beads ranging in diameter from one half to five millimeters and manufactured out of turquoise, jet, shell, and argillite.

The shrines are located on mountaintops and in springs, and the authors compare their inferred use with analogous ritual practices among the modern Zunis, particularly the solstice ceremony "in which the Priests of the Bow visit a distant mountain shrine on each of four specified days. To the shrine they carry offerings of
turquoise and sacred meal.'"

A review of this nature only highlights the major, or more ob-
vious, facets of a complex economic system in which turquoise
was but a single element. The technological processes involved in
mining or quarrying the stone, the manufacture of artifacts from
it, and the systems of exchange in which this material circulated,
were similar or identical to the exploitation, use and distribution
of a wide variety of earth resources in the repertoire of the pre-
historic Pueblo Indians.

Like these other resources turquoise was used for both sacred
and profane purposes, and like them probably had no intrinsic
sacred value (like the beads of an unblessed rosary, for example).
Its economic value seems to have increased in proportion, not only
to the quality of the stone and the kind and amount of work
expended, but to the distance it traveled from its source. This is,
perhaps, most graphically illustrated by the volume of the tur-
quoise trade to Mexico (Saville, 1922) and its accumulation at
Pueblo Bonito and other Chaco centers after about A.D. 900.

Despite a lack of detailed archeological evidence the hoarding of
thousands of turquoise ornaments at Pueblo Bonito and other pre-
historic pueblos suggests some degree of economic specialization
in the mining, manufacturing, and distribution (or collection) of
the stone. Whether such specialization took the form of resource
ownership, turquoise craft specialists, elitist ritual consumption or
removal from the exchange system, or marketing specialists, can
only be guessed at. Except possibly at Pueblo Bonito (only
because of the bulk of finished items present there) there is little
evidence to support a theory of turquoise craft specialization sep-
ate from the manufacture of similar items from other materials.
For resource ownership, ritual (perhaps elitist) removal from the
market, and turquoise traders there is better, but incomplete, ev-
dence at least on the village or regional level. It may be that craft
production of ornaments including turquoise was a village, rather
than an individual, specialization (similar to Santo Domingo
today, or Zuni). Resource ownership, if it existed, and the dis-
tribution of the raw or finished material from proprietary pueblos,
may have existed only as a result of propinquity to the source.
Such a picture is more in line with the ethnohistoric data available.

<table>
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<th>Undated</th>
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<tr>
<td>Unident. Areas.</td>
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<td>14</td>
<td>8</td>
<td>95</td>
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</table>

Figure 9: Sources of pottery found at LA 5029, Cerrillos, New Mexico (O'Neil) turquoise quarry.
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