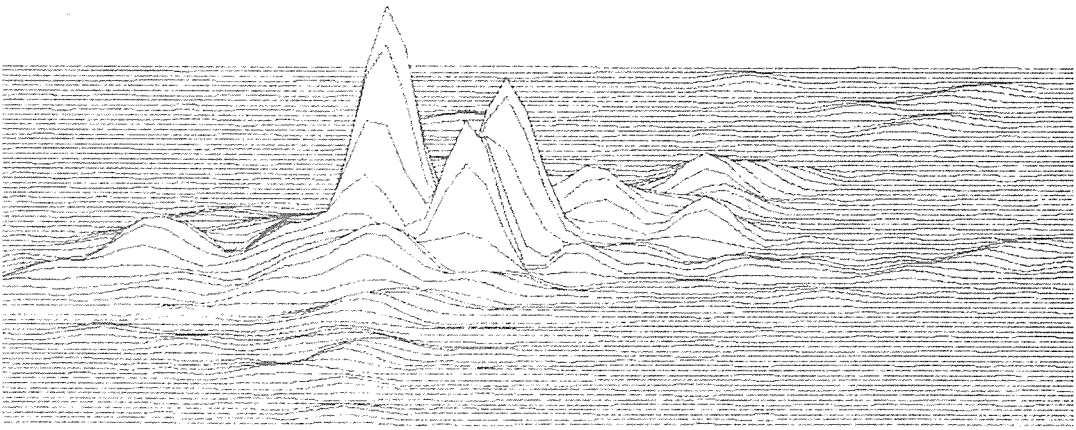
BULLETIN of the

Texas Archeological Society



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TEXAS ARCHEOLOGICAL SOCIETY

The Society was organized and chartered in pursuit of a literary and scientific undertaking: the study of man's past in Texas and contiguous areas. The *Bulletin* offers an outlet for the publication of serious research on history, prehistory and archeological theory. In line with the goals of the society, it encourages scientific collection, study and publication of archeological data.

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TEXAS ARCHEOLOGICAL SOCIETY

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TABLE OF CONTENTS

NOTES

THE COGDELL BURIAL IN FLOYD COUNTY, TEXAS

JAMES H. WORD AND ANNE FOX

ABSTRACT

This paper reports the discovery of an historical Indian burial in Floyd County, Texas. Investigations of this find, the Cogdell Burial site, produced an abundance of artifactual material including beaded garments, jewelry, blankets, a saddle and several utilitarian objects. Descriptions of these artifacts are presented.

Although the burial had been removed from its original context, information regarding the body position and burial customs was obtained. Comparisons with published accounts and unreported burials of similar age in the Texas Tech and Panhandle-Plains Historical Museums verify some of the cultural practices reported for the Comanche burials and question others. Two additional burial customs for the Comanche are suggested on the basis of archeological findings.

Research associated with the Cogdell Burial site artifact analysis indicates that a main source of Indian trade goods for this area of the south plains was through the Comanchero. Second and third-hand acquisition of European goods was provided by association with other Indian groups and by predatory raids against white settlements and aboriginal enemies.

Dating on the basis of artifact content, the time of the burial appeared to have been between 1850 and 1860.

INTRODUCTION

Late in February of 1972, D. M. Cogdell telephoned the senior author that a burial had been discovered on his ranch. He recognized the potential of the find and donated the skeletal material and associated burial offerings to the Floyd County Historical Museum. The burial was brought to town in a burlap bag. Upon opening the bag, objects definitely associated with an historic burial were revealed. Although some of the skeletal parts, wooden artifacts, leather and cloth were damaged by rodents, the numerous offerings prompted further inquiry, and an arrangement was made for the site to be visited the following Saturday. Although the burial had been removed from its context, it was hoped that careful interrogation of Bruce McFall (discoverer of the burial and son of the Cogdell Ranch foreman) and screening of the matrix would yield information concerning placement of burial offerings in relation to the body.

William J. Mayer-Oakes of the Department of Anthropology at Texas Tech University was contacted, and he sent a group of his students to assist in the necessary field work.

Prior to the interview of Bruce McFall, the senior author prepared a series of questions designed to reveal as much information as possible concerning the circumstances of the burial and the relative location of the associated burial goods. Bruce stated that he was riding a horse and observed a niche or small cave in the east face of the Llano Estacado escarpment. He noted that it was nearly filled with rocks and assumed that the roof had collapsed. Moving some of the rocks, McFall heard a metallic "clink" and upon further investigation found a brass bracelet. More rocks were removed, exposing the skull. McFall left and a day or so later returned and completely uncovered the burial. It was at this time that Sid McFall, Cogdell foreman, learned of the discovery and advised D. M. Cogdell.

While the interview was taking place, the Texas Tech students established a datum point and began mapping the burial site. Associates of the senior author began screening the material which had been thrown down the slope in front of the cave, and a considerable amount of additional cultural material was recovered.

While both authors contributed to identification and analysis, there are areas in which each assumed primary responsibility. Anne Fox analyzed and described beads, leather clothing and miscellaneous leather. James H. Word is responsible for the other portions of the report, including analysis of the saddle leather.

LOCALE OF THE BURIAL

The burial site is in a side canyon of Hall Creek, a tributary of the Pease River, in the northeastern part of Floyd County on the eastern edge of the Llano Estacado. Intruding into the Llano are the headwaters of many of the major rivers of Texas. Hall Creek flows southeasterly (Fig. 1) where it joins the North Fork of the Pease River. Short, dry tributaries of Hall Creek form a dendritic pattern, and it is one of these southerly flowing drainages that contained the burial site.

THE BURIAL NICHE

The niche selected for the burial faces west and is near the upper rim of a short canyon (Fig. 2). It is 253 cm. wide at the opening and widens to a maximum width of 315 cm. midway to the back. The maximum depth from the overhang to back is 256 cm. at a point in the southeastern part and gently narrows to a depth of 147 cm. as the back wall angles outward. The floor of the niche is slightly undulating with a pronounced dip near the rear wall. The roof is more irregular than the floor, attaining a maximum height of 128 cm. near the back.

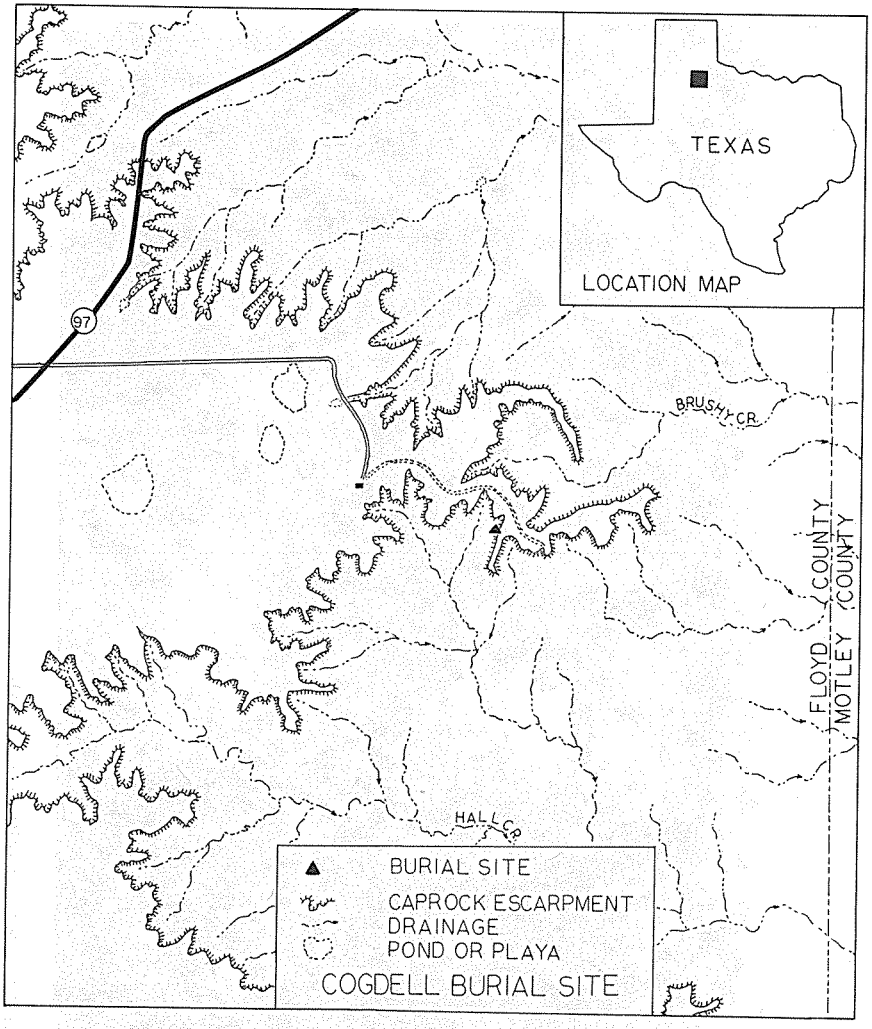


FIGURE 1. Location map of Cogdell burial site.

THE BURIAL

The depression or pit is 58.8 cm. wide and 181.3 cm. long (Figs. 3, A and B) and was utilized to accommodate the body by scooping out the original deposits to bedrock. The shoulders, torso, and hips were placed in this depression. The head was to the south and outside the pit, and the lower limbs were north of the depression.

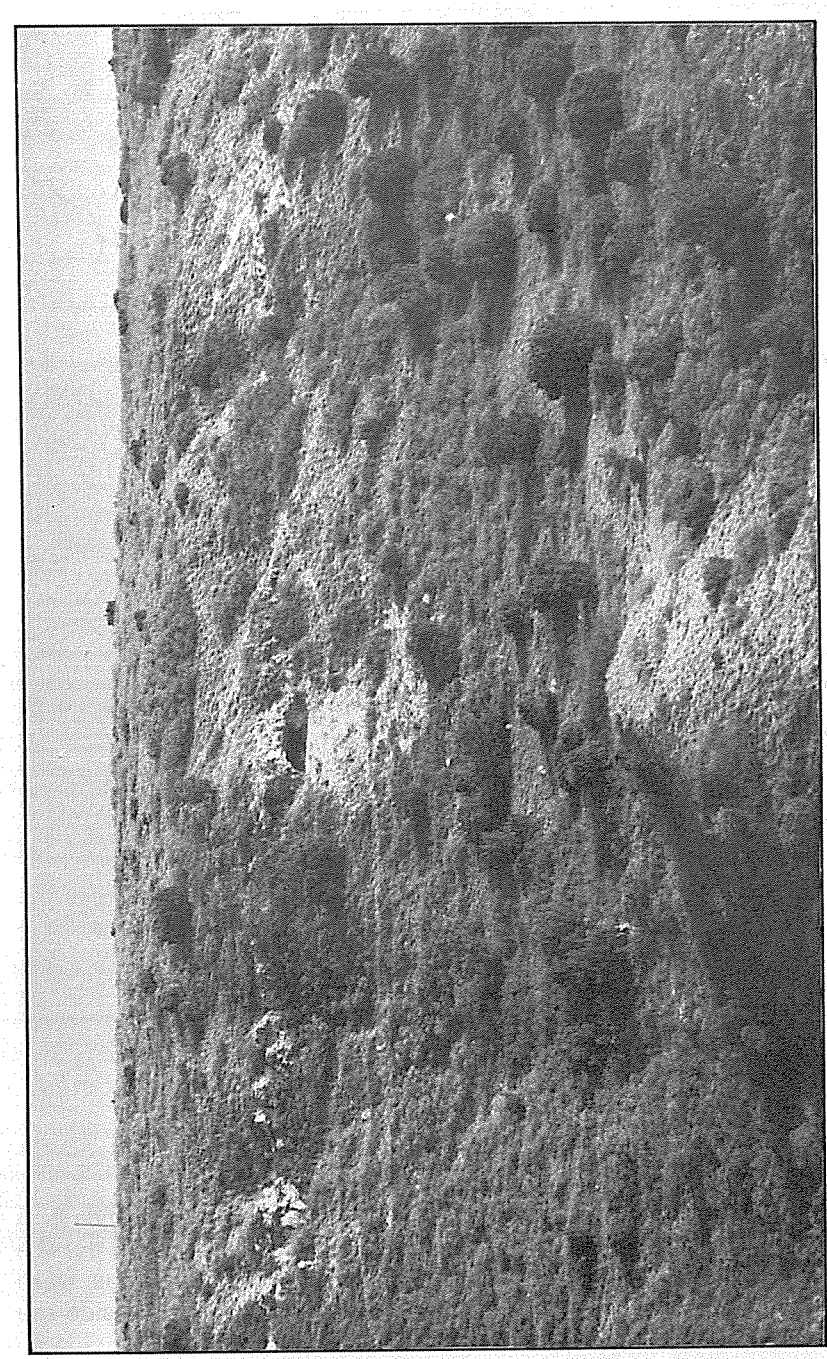


FIGURE 2. View looking east toward Cogdell burial site.

The body was placed on its left side facing west (Fig. 4). The left arm was bent sharply at the elbow with the hand over the upper pelvis. The right arm was bent less acutely and extended past the lower part of the pelvis. The right leg was extended. The left thigh angled outward and the lower leg was flexed with the foot under the right leg.

Over the chest were two travois poles broken into three nearly equal parts and, with a travois brace, these poles were placed in a fan shape with the apex of the "fan" over the chest. Limestone-caliche rocks varying from 15 to 24 cm. in maximum diameter were placed over the body to form a cairn. A small fire was built on top of the mound of rocks.

LOCATION OF ARTIFACTS

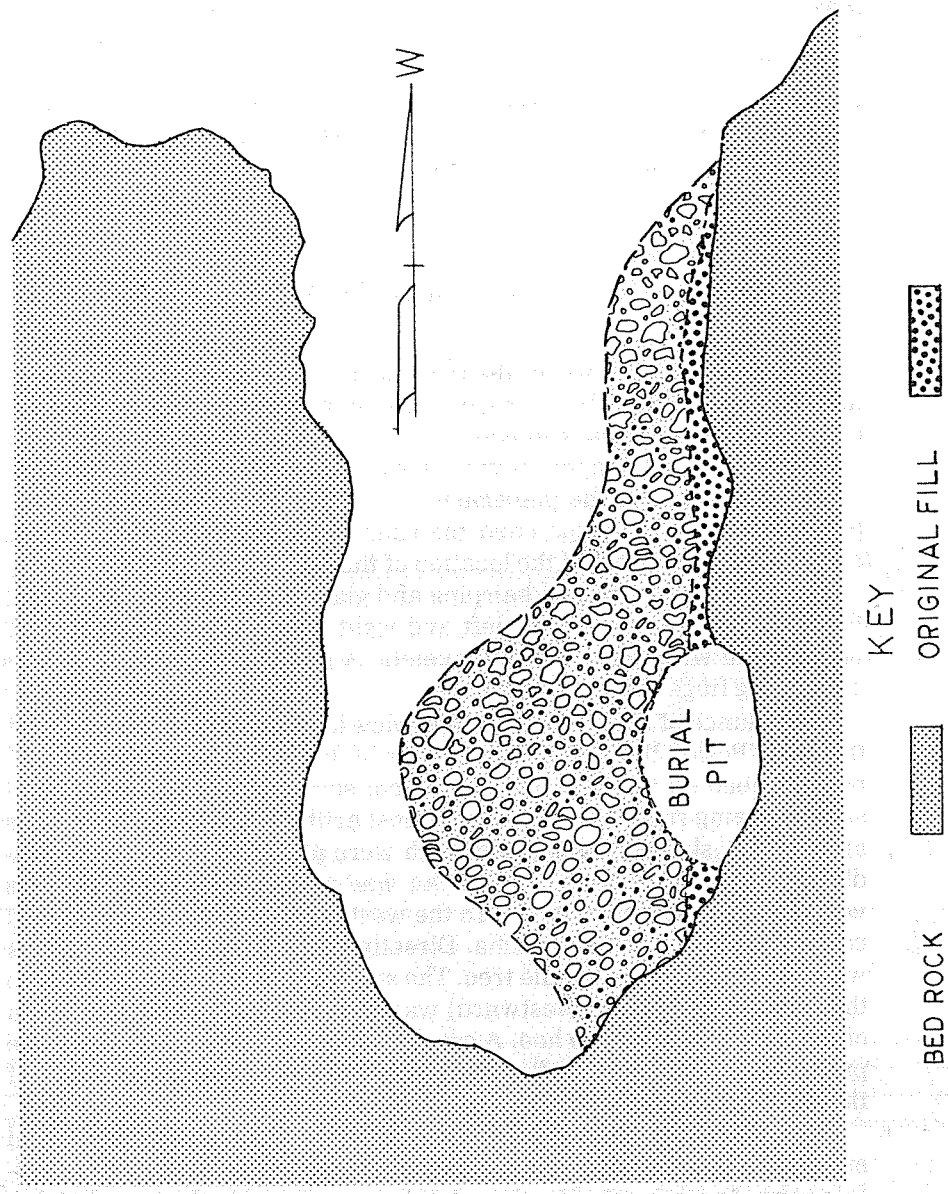
Since the body and a majority of the burial goods had been removed from their original position, the placement of burial goods is based on information gathered from Bruce McFall and from deductions based on copper stains from brass objects.

Dessicated and copper-stained flesh in the vicinity of the left ear helped to determine the placement of a series of hair ornaments. Impressions in the flesh matched the shape of the hair ornaments and provided further proof of the location of these objects.

A necklace consisting of hairpipe and glass beads was placed about the neck (Fig. 4). Above the left and right elbows and above the left hand at the wrist were brass bracelets. A gold plated brass ring was on the ring finger of the left hand.

The balance of the burial offerings were located toward the mouth of the cave. Beside the body was a cluster of artifacts (Fig. 4). These will be described as they were located from south to north. A decorated saddle rigging ring was the southernmost artifact. Just to the north was an iron "D"-shaped rigging ring. Both were probably parts of the saddle rigging. A circular silver concha was next. Two abalone gorgets were the most northern goods. To the west of the previously mentioned concha was yet another concha. Directly south of this second concha were the remains of a saddle tree. The saddle horn was to the north. To the right of the saddle (westward) was a small hand mirror and south of the mirror was an eye hoe. A concha was found on a small shelf-like projection in the north wall of the burial chamber. The provenience of the fourth concha is unknown.

The body was probably clothed in a cloth shirt, leather leggings, and moccasins. It was wrapped in a series of blankets and possibly a buffalo robe. Another set of leather clothing was found in the burial niche. These leather goods were folded with the beaded parts inside and


W
BURIAL PIT
KEY
BED ROCK
ORIGINAL FILL

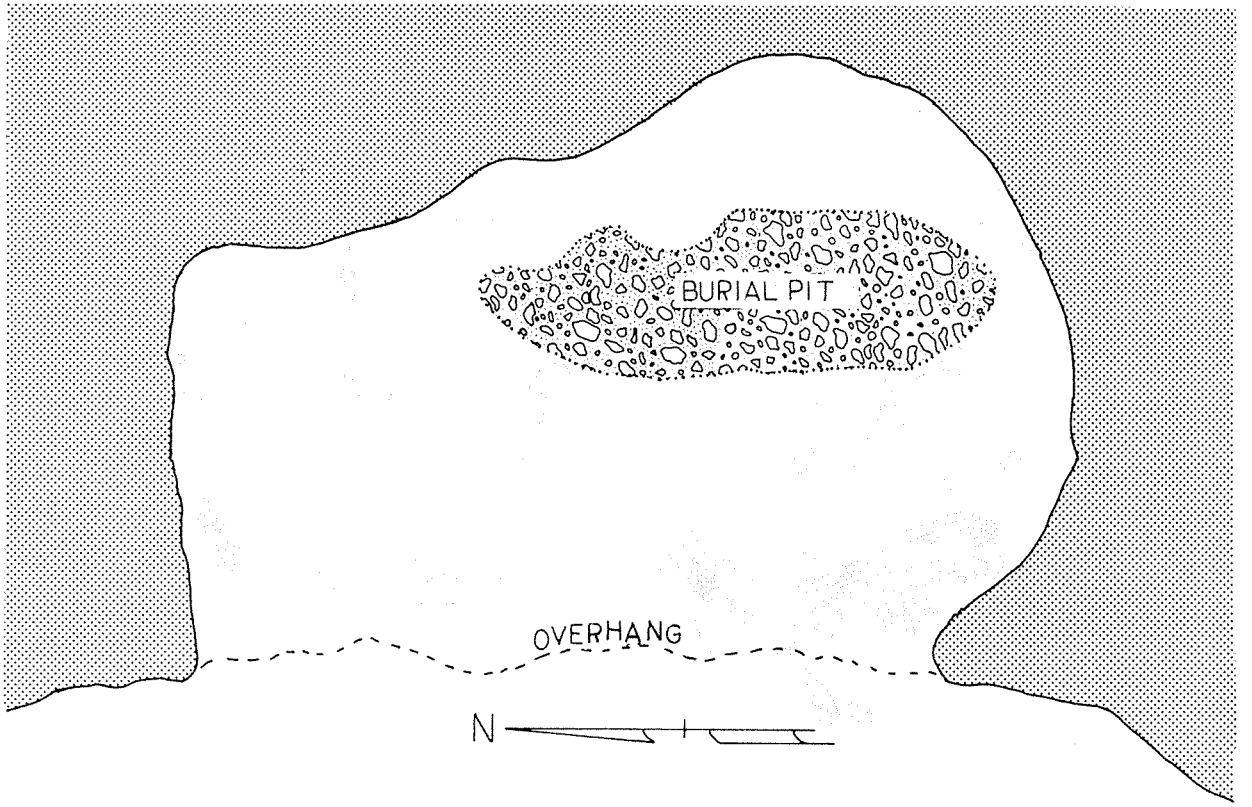


FIGURE 3. Views of Cogdell burial site. A, cross-section of burial niche; B. floor plan of burial niche.

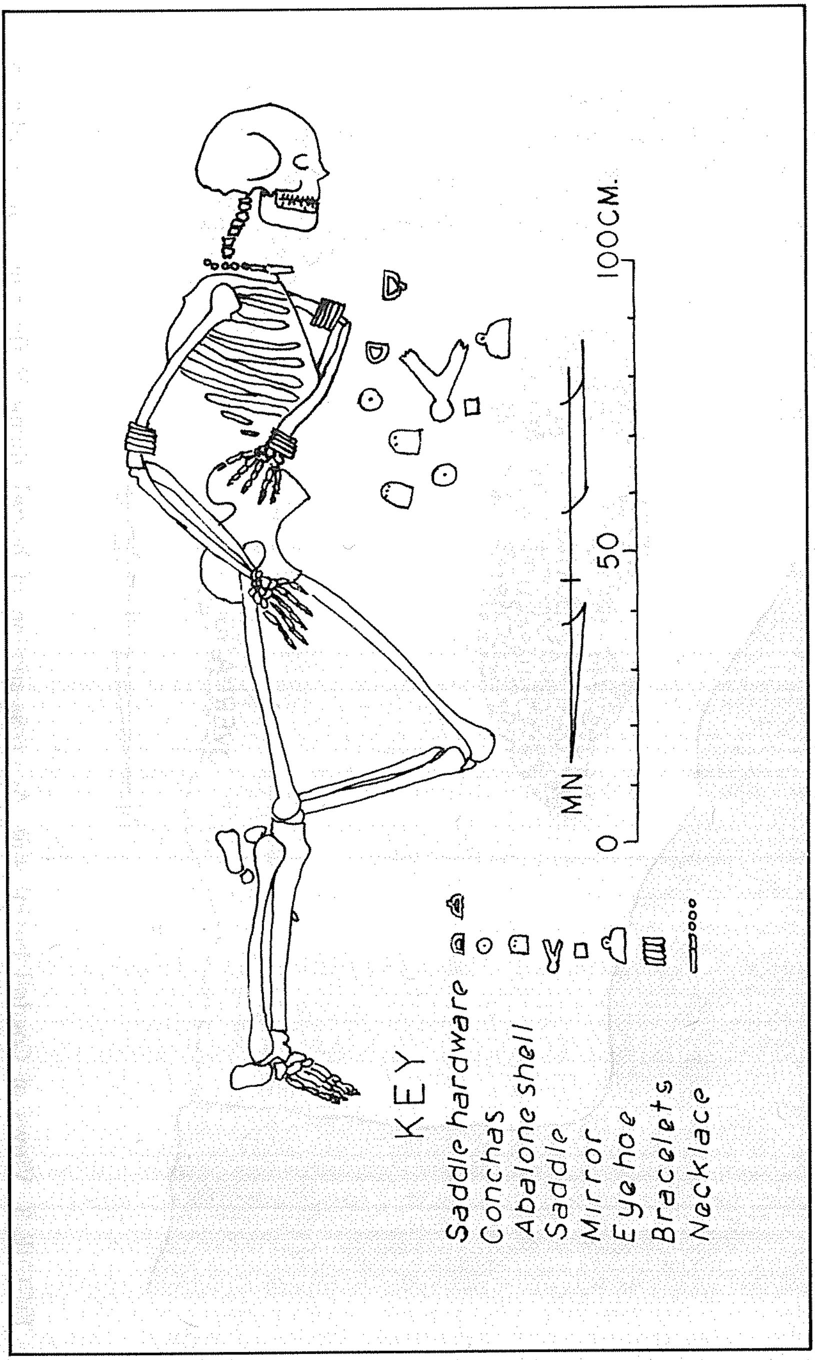


FIGURE 4. Position of Cogdell burial showing the relative location of artifacts.

when the site was first visited by the senior author, these objects were found at the northern end of the niche. McFall does not recall the location of the beaded leather goods; but he states elsewhere in our interview that as objects were discovered, they were placed either behind or beside him. If this situation is correct, the pieces of beaded clothing were originally at the feet of the deceased.

ARTIFACTUAL MATERIAL

CLOTHING. Fabrics and leather goods were found with the burial. Without question many of these represent parts of clothing. When the burial place was visited, some of these objects had been removed from their original context and placed at the north end of the burial niche. Copper stains on various garments gave clues as to their location relative to the body.

Cloth Clothing. Large fragments of a cotton shirt were recovered. It is probable that the shirt was made by folding a length of cloth and sewing down the sides with holes left for the arms. Cotton thread stitched in simple over-and-under fashion along the selvage joined the edges of the cloth to form a loosely fitting pullover shirt. The weft and warp have a thread count of 120 per 2.5 cm. The weave is simply one over one. The selvage is of plain finish. Copper stains from brass bracelets on the arms and upper body and on the shirt substantiate the location of this garment.

Leather Clothing. Most of the leather, which includes all tanned animal skins, was delivered to the junior author in the approximate state in which it was removed from the ground. Soil and rodent dung encrusted everything and there were wadded-up pieces and layers of gnawed and torn fragments, some showing blue and white beading apparently still in place on the leather.

The task of gently easing apart and cleaning these fragments was accomplished gradually over a period of time, using a dull knife and stiff brushes to scrape and chip off as much filth as possible without damaging the leather. Meanwhile, a search was made for a method of relaxing the skins in order to determine their original shape and dimensions.

After consulting a number of authorities, no consensus was reached on the method to use in softening the skins and that the only way was to go slowly and evolve the best method for each particular case. Since the ingredients for leather preservation found in most handbooks are difficult to obtain, complicated to use, and usually specified for book bindings rather than for dirty, fragile archeological specimens, it was decided to experiment first with Lexol. Lexol is a

product used at the Witte Museum in San Antonio for restoration of historical objects made of tanned leather, and recommended by Anderson (1968: 56-57). A letter from the Lexol Corporation assured the junior author that their product is "an emulsion of the purest animal fat liquors," and that it is currently being used by archeological teams in the United States and Greece. After experimenting with various methods of application, it was determined that the best technique was to lay the object out on wire mesh and apply the solution with a small paint brush, gradually stretching and flattening the leather as the Lexol soaked in. Each leather fragment was treated in this way, spread on wire mesh so that air could reach both sides, and left in a well-ventilated room for several weeks. Materials so treated were restored to their original shape and texture and were not sticky or oily when thoroughly dry. A minimum of darkening occurred in some areas, which could be reversed by gently brushing or scraping with a dull knife after the article was dry.

Identification of the animals from which the skins were taken was difficult because of their fragmentary nature and because the process of tanning and tailoring removed clues (such as hair color and growth patterns) needed for identification. Some educated guesses have been made, with the help of Ernest E. Roney, Jr., Assistant to the Director of the San Antonio Zoological Society.

In the following descriptions, fragments are sorted into groups which appear to have come from the same object on the basis of skin texture, color, thickness, and general appearance. Since all of these factors differ considerably within one object, this can only be guess work. Some attempt has been made to identify the type of garment from which the fragments came. Here again, this must be considered one person's opinion, and most identifications are open to discussion. All beading is done with sinew in lazy stitch, and in all except Article A the beading is done on a band of leather which is then attached to the garment.

ARTICLE A — Beaded Moccasin (Fig. 5, A).

Beads:	simple white	.2 cm.
	simple blue	.2+ cm.

The preserved fragment includes enough beading to suggest that the only colors used were blue and white, with a preponderance of blue, and a white stripe down the instep. The colors and pattern are unlike anything in the Witte Museum's collection (Comanche or otherwise) or observed in other published works on Indian artifacts. This, plus the fact that the beads are nearly all .2 to .3 cm. in diameter, gives the feeling of an older

piece, perhaps pre-1865. The sole is .6 cm. thick, which is unusually heavy compared to observed specimens. The skin is probably deer or antelope.

ARTICLE B — Beaded Garment (Fig. 5, B).

Beads:	simple white	.2 cm.
	simple blue	.2 cm.
	simple white	.3+ cm.
	compound white	.3 cm.

The simple white and blue .2 cm beads dominate, with the larger simple ones used mostly in the border. Twenty compound white beads are scattered throughout the body of the design. It has been impossible to determine what type of garment this was. The angle at which the beaded strip was applied to the skin does not correspond to any garment known to the authors, but it may be some sort of shirt. The skin is probably deer or antelope.

ARTICLE C — Beaded Leggings (Fig. 6, A).

Beads:	simple white	.2-.3+ cm.
	simple blue	.2-.3+ cm.
	compound white	.2-.3+ cm.

The presence of nearly 100 compound beads, plus the fact that the majority of all the beads are over .3 cm., tends to date this piece earlier than the others. There can be little doubt that this was a fragment from leggings, from the placement of the beaded strips and the length and proportions of the remaining garment fragments. Traces of fringe and ties are still present on one piece. The similarity of the bead colors and pattern and beading technique to those of a bag collected by Jean Louis Berlandier in the early 19th century (Berlandier 1969: Plate 19) and one in the collection of the Witte Museum (Fig. 6, B) are interesting to observe. It is very likely that they are contemporary. The leather is nearly identical to that of Article B.

ARTICLE D — Beaded Strip

Beads:	simple white	.3+ cm.
	simple blue	.3+ cm. (2 shades)

Only small fragments remain of a beaded strip which differs from those on the other garments in the width of the rows in which the beads are applied. The beading resembles that of Article C, however, and could be from that garment.

ARTICLE E — Pair of Moccasins.

These appear to be identical to those illustrated in Figure 32 of Berlandier (1969: 181) and identified as Comanche. They still retain the imprint of

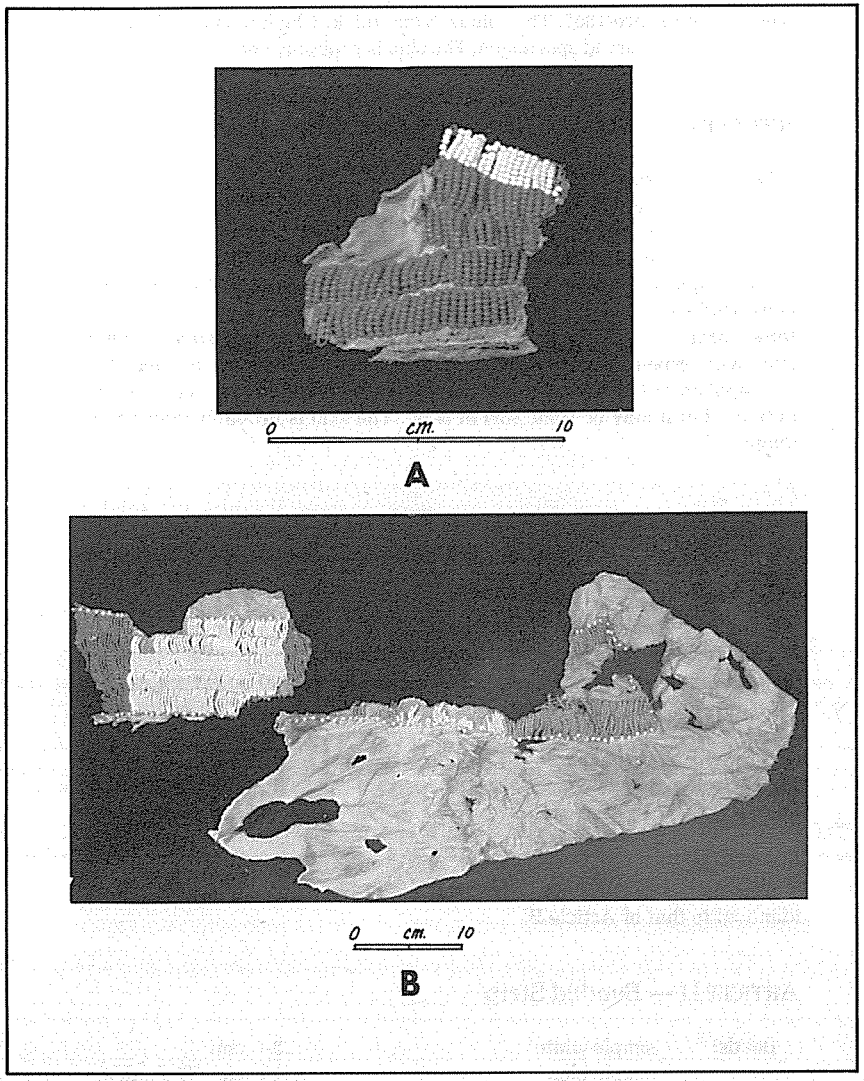


FIGURE 5. Beaded objects. A, fragment of beaded moccasin; B, fragment of beaded garment.

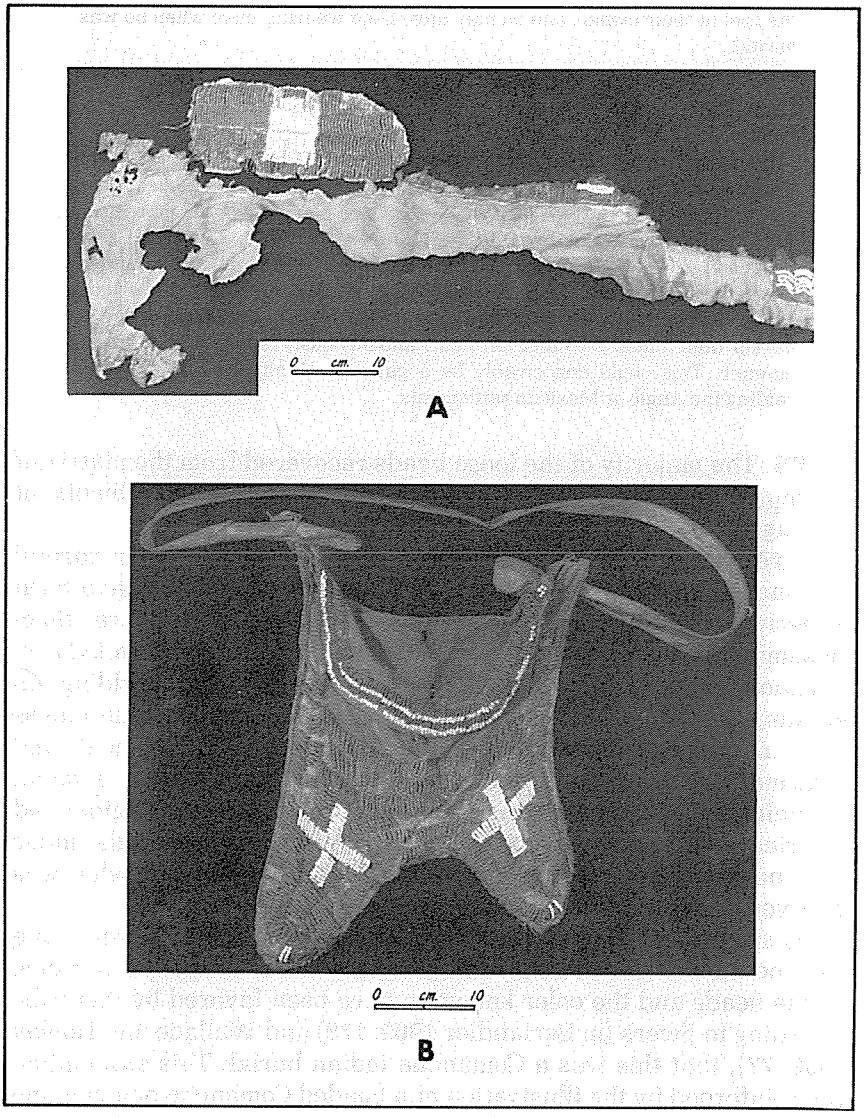


FIGURE 6. Beaded objects. A, fragment of beaded leggings; B, beaded Comanche hunting pouch in the Witte Museum, San Antonio.

the feet of their owner, and he may have been wearing them when he was buried.

ARTICLE F — Leggings.

Leggings typically have side fringes, but none are on this garment. From the cut and patterns of stress, this garment appears to have been a plain leather legging. Perhaps it was similar to those painted by Lino Sanchez y Tapia and described by Ewers in Berlandier (1696: Plate 3, 157) as "skin leggings which fit rather snugly above the knees, but which are extended into triangular fringed flaps below the knees." Several seams and a hem along two sides are sewn with a fine cotton thread, and the leather is darker than that of the other garments and obviously tanned in a different manner. This could conceivably be a garment obtained in trade or by raiding the Anglo or Mexican settlements.

BEADS. The majority of the loose beads recovered from the matrix of the burial probably came from the damaged beaded objects of clothing, so they are included and described here.

A great deal can be determined about a burial from careful examination of beads, beadwork, and leather when they have been properly cleaned and restored. While the processes are time-consuming, the results are well worth the effort. Detailed observation, examination and analysis, however, while yielding interesting results in themselves, cannot be of too much value unless they are done with an understanding of the ethnological and historical setting of the burial in question. With these points in mind, the junior author embarked on a thorough search of ethnological and historical sources which might throw light on the materials under examination. This proved to be of great help in interpreting what was observed about the artifacts.

The study of beads proceeded from a preliminary assumption, due to its location in known Comanche territory and to the preponderance of blue beads and the color known to have been favored by this tribe according to Ewers (in Berlandier 1969: 178) and Wallace and Hoebel (1952: 77), that this was a Comanche Indian burial. This assumption was reinforced by the illustration of a beaded Comanche pouch in the Berlandier Collection at the Smithsonian Institution (Berlandier 1969: Plate 19) which closely resembles one fragment from the burial in bead colors and proportions. The opportunity was taken to closely examine and compare a similar bag in the Witte Museum collection which was accessioned as an early Comanche hunting pouch (Fig. 6, B).

There is no need to elaborate upon the process of manufacture and distribution of glass and shell trade beads in the 19th century. The

subject has been thoroughly explored in previous publications, especially by Orchard (1929), Woodward (1965: 4-17), and Ewers (1957: 29-85). Terms used here are those which are generally accepted in bead descriptions. A simple bead is one homogeneous piece of glass, a compound one is formed of two or more concentric layers, and unless otherwise indicated, beads are of hollow-cane manufacture. It has been the junior author's observation that in the analysis of bead size, the length can vary as much as .2 cm. within a type on a single beaded object, especially on those made during the early 19th century. The diameter is therefore the measurement which is of most use in comparative dating, and is the only one recorded in this report.

Information on the beads from this site was collected in several ways. A complete list of beads in the possession of the original excavators was provided by them. Jim and Dot Word laboriously picked out over 64,000 beads before delivering the remainder of the back dirt (approximately 350 pounds) to San Antonio. It was obvious that the matrix was too rocky to dissolve in water and it would require a lifetime to pick out all the beads individually. Reducing the pebbly soil with muriatic acid proved too expensive and inefficient. The following method was evolved for estimating the total number of beads. Since the dirt had been packed in bags of approximately eight pounds each, 16 pounds of back dirt were measured into a large container and thoroughly mixed together. From this amount, one pound was weighed out and all the beads picked out by hand and recorded and the total number of each type of bead in this portion was projected from these numbers. Since there was no way to be sure that beads were evenly distributed throughout the back dirt, it was all weighed and examined in this manner and totals projected for each 16 pound batch.

In the following listing, the blue and white embroidery bead totals were estimated in the above manner. Since no additional necklace-sized beads were found in the sorting of back dirt, it is assumed that these totals are complete. All of the extra small blue beads (#180) and many of the small blue embroidery beads were extremely fragile, and the totals reflect only a portion of the number actually present.

Numbers and approximate dates assigned to bead types and their descriptions are those used by R. King Harris (Harris and Harris 1967: 139-162). Also included are some types recorded by him since 1967. These identifications have all been confirmed in consultation with Mr. Harris. The blue seed or embroidery beads can be divided into three sub-types according to the shade of blue and the ap-

pearance of the glass. Further studies may show some dating value in pursuing this further, but for the purposes of this report they are all added together in the totals. Numbers have not as yet been assigned to these types, and the descriptions are those of the author. Sizes refer to bead diameters as follows: large, over .6 cm.; medium, .4-.6 cm.; small, .2-.4 cm.; extra small, .0-.2 cm.

Glass Necklace Beads (over .5 cm)

Harris' Number		Totals
77.	Large, dark Bluebird Blue, translucent, donut-shaped necklace bead of simple construction. (1740-1820)	76
130.	Large, dark Bluebird Blue, barrel-shaped, translucent, faceted bead of simple construction. There are 16 to 20 facets on the surface of the bead. (1820-1836)	22
186.	Large, white, opaque, olive-shaped necklace bead of mandrel-wound simple construction. The glass is porcelain-like in texture.	27
187.	Medium, white, opaque, olive-shaped necklace or garter bead of mandrel-wound simple construction. The glass is porcelain-like in texture. (19th century)	16
189.	Medium, Harvard crimson, translucent, olive-shaped necklace or garter bead of mandrel-wound simple construction.	1
190.	Large, white, opaque, barrel-shaped necklace bead of simple construction.	50
194.	Large, Brick Red, opaque, donut-shaped, necklace bead of compound construction. The inner layer of glass is opaque white. This type is generally referred to as "Cornaline d'Aleppo". The red over white replaced the red over translucent translucent green about 1850.	24

Glass Garter or Embroidery Beads (under .5 cm)

50.	Small, black, opaque, donut-shaped garter bead of simple construction. Glass is porcelain-like in texture. (1700-1836)	8
134.	Small, dark Amber, barrel-shaped, translucent, faceted garter bead of simple construction. The facets appear to be pressed and vary from four to eight in number. (1767)	1
87.	Small, brick red, over red opaque, donut-shaped garter bead of compound construction. (1740)	1
180.	Extra small, Yale Blue, translucent, donut-shaped garter bead of simple construction. (1836-1850) Very fragile.	70+
44.	Small, white, opaque, donut-shaped garter bead of simple construction. The glass has a porcelain-like texture. (1700-1836)	55,700
45.	Small, white, opaque, donut-shaped garter bead of compound onstruction. The inner layer has a porcelain-like	

texture, and the outer layer is clear but has a slightly frosted appearance, probably due to age. (1700-1836)	180
Blue A. Small, bright blue, semi-translucent, donut-shaped embroidery bead of simple construction; may correspond to Ray and Jelks' "translucent blue." (1964: 132)	
Blue B. Small, aquamarine, translucent, donut-shaped embroidery bead of simple construction. Glass has longitudinal striations and bubbles, and beads are fragile.	
Blue C. Small, blue, translucent, donut-shaped embroidery bead of simple construction. Glass has longitudinal striations; may correspond to the "translucent aquamarine" of Ray and Jelks (1964:132)	93,000
Shell Hairpipes	
7.2 cm. long, .7 cm. maximum diameter	1
3.0 cm. long, .6 cm. maximum diameter	2

Judging from bead types alone, this burial would appear to date sometime after 1850, the approximate date of the introduction of the white-centered Cornaline (#194) into the Texas area (Harris, personal communication), and before the 1880's when shell hair pipes were replaced by bone (Ewers 1957:62).

Ray and Jelks have suggested (1964: 139-140) that seed beads used in the 18th century tended to be larger than those used in the 19th, and that there may have been a gradual change from one size to the other which could be useful in dating Indian burials. A synthesis of bead diameters from reported historic burials in the Panhandle-Plains region of Texas as reported by Ray and Jelks and by Parsons (1967: 92) is shown in Table 1.

Checking this another way, Ray and Jelks suggest that there was a gradual change in the proportions of compound versus simple white seed beads over a period of time. The result of adding the earlier Pearson Site (Duffield and Jelks 1961) in Rains County to the above sites, again using Ray and Jelks' and Parson's statistics, is shown in Table 2.

It appears, according to these methods of analysis, that the 41FL45 site should date somewhere between 1840 and 1860. It is interesting to note that projected totals show 4% of the blue seed beads and 20% of the white to measure .3 cm. and over. By Ray and Jelks' standards, this should put the date between 1850 and 1860.

The varieties of bead sizes served to reinforce Richard Conn's (1972: 9) observation that the use of the pony bead (over .3 cm.) was primarily a matter of choice rather than availability since all sizes of beads were represented. The use of the colors blue and white was also a matter of choice, though it is hard to determine who was

TABLE 1
GLASS BEAD DIAMETERS FROM HISTORIC PANHANDLE-PLAINS BURIALS

Morgan Jones Site Crosby Co.	**Watson Site** Fisher Co.	**Cogdell Site** Floyd Co.	**White Site** Yoakum Co.	**Yellowhouse Site** Lubbock Co.
1790-Early 19th	1820-1840	?	Mid Late 19th	1858-1875
.25-.45 cm. diam.	.2-.4 cm. diam.	.2-.35 cm. diam.	.2-.25 cm. diam.	.2-.25 cm. diam.

TABLE 2
PERCENT OF COMPOUND BEADS AT SIX HISTORIC BURIAL SITES

Morgan Jones Site	**Pearson Site**	**Watson Site**	**Cogdell Site**	**White Site**	**Yellowhouse Site**
100% compound	100% compound	50% compound	3% compound	No. compound	No compound

making the choice, the traders who offered them or the Indians who demanded them.

Since only one whole hair pipe bead and two fragmentary ones were found, they were probably not a part of a breastplate or a multi-stranded necklace such as those described by a trader with the Comanche in 1842 (Ewers 1957: 50) and by a member of Capt. Marcy's expedition in 1854 (*ibid.*: 51). A number of beaded awl cases and pouches in the Witte Museum collection, attributed to the Plains tribes, have two or three shell hair pipes strung on the thongs by which they were suspended from the belt. All of these objects would date after 1870 to judge from the size, colors, and patterns of the beads (Lyford 1940: 58; Conn 1972: 10), but the tradition could go back much further. Hair pipes were also worn suspended from the ears in the pre-reservation period by men of the Kiowa, Kiowa-Apache, and the Comanche tribes (Ewers 1957: 76).

Beads are a common item to be found in historic burials. Of the 13 other burials examined or reports studied, ten report beads. The Merrell burial and the child burial from the Panhandle-Plains Historical Museum did not have glass beads in the material examined. However, the circumstances of these discoveries may have been such that glass beads, if present, were not observed or were kept by those making the discovery. Mr. Walter Merrell, who was one of the individuals discovering the Merrell burial, stated that the soil containing the body was not screened (personal communication), so beads could have been present, but not observed. Bennett did not recover any beads from the Dawson County burial (1968: 78). Suhm reported a fragment of buckskin with beads still attached by the lazy stitch method (Suhm 1961: 104). Ray and Jelks (1964: 129-131) did not report any beaded objects, but the loose beads recovered probably represent a necklace, and no doubt other objects were beaded that did not survive. The Yellowhouse burial (Newcomb 1955: 187) produced evidence of beaded moccasins and the remains of a breast-plate of hair pipes were noted. Parsons (1967: 87-90) recovered loose glass beads and fragments of textiles (*ibid.*: 90-91) with beads still adhering to the cloth. The Caprock burial (Conner, Allison and Runkles, ms.) was associated with glass beads and one fragment of deer skin with beads still attached which probably represented a fragmentary clothing item. The McKaskle burial from near Stanton, Texas, yielded fragments of cloth with bead work still attached and the Biddy burial from near Paducah, Texas, produced loose beads. Hester (1968) reported the occurrence of over 100 loose blue and white glass beads with a historic burial near Ozona in Crockett County.

SADDLE. In order to acquaint the reader with saddle construction, a brief description will be given. The first process was to shape a saddle tree. Often a forked limb of adaptable shape was used for the fork. The horn and fork were of one piece. The bars and cantle were made and joined to the fork. In saddles made in the mid-part of the 19th century, the various parts were bonded with glue and nailed. They were further strengthened by covering with wet rawhide. When the rawhide shrank upon drying, the saddle frame was quite sturdy. In the better saddles, the under parts next to the horse were padded with soft leather or heavy felt to prevent injury to the horse. Often the saddle was decorated with tooled designs.

Saddle Fork (Fig. 7, A, B). It appears to have been made from the fork of a soft-wooded tree such as cottonwood. The evidence for this is in the grain of the wood and cambium extending down the inner sides of the gullet. The wood has the texture of cottonwood which is common throughout this region. Saw marks on the back of the fork indicate the saddle was commercially made. Fragments of heavy tooled leather, common to saddle manufacture, also suggest this. The actual shaping of the horn and fork appears to have been done either by a draw knife or a wide bladed chisel. The top of the horn was formed by a chisel. The gullet was definitely formed by chiseling away excess wood. The fork is badly damaged by both termite and rodent action. All narrow and angular edges are damaged by the ravages of gnawing rodents. The neck of the horn is for all practical purposes non-existent since it joins or meets the upper part of the fork. The angle of the fork would produce a narrow but low pommell. The maximum width of the horn is 8. cm. (viewed from the front). The part of the horn and saddle tree next to the rider is straight and is the part with the saw marks. The horn arcs gently forward and overhangs the neck and gullet. This is typical of the Santa Fe style saddle (Livingston, n.d.). The entire fragment is 24 cm. from the base of the fork to the top of the horn. The fork tapers slightly inward from the lower to upper part.

Saddle Cantle. A fragment of wood with two drilled holes may be a part of the cantle of the saddle (Fig. 8, A). It has the curve of this part of the saddle. The crudely drilled holes probably provide a means of attaching the rawhide undercovering to the cantle. One hole is 1 cm. from the side and top and the other is 2.5 cm. from the edge and 1.4 cm. from the top. These holes are slightly oval. It is possible that the holes represent efforts to repair the saddle. The specimen is thicker (1.2 cm.) at the lower edge in cross section and tapers to a rounding edge.

Saddle Leather. Fragments of saddle leather and rawhide were recovered from the Cogdell burial. All have been badly damaged from rodent action; however, some parts can be identified. Two fragmentary straps were recovered. One is 22.9 cm. long, to which is attached a cir-

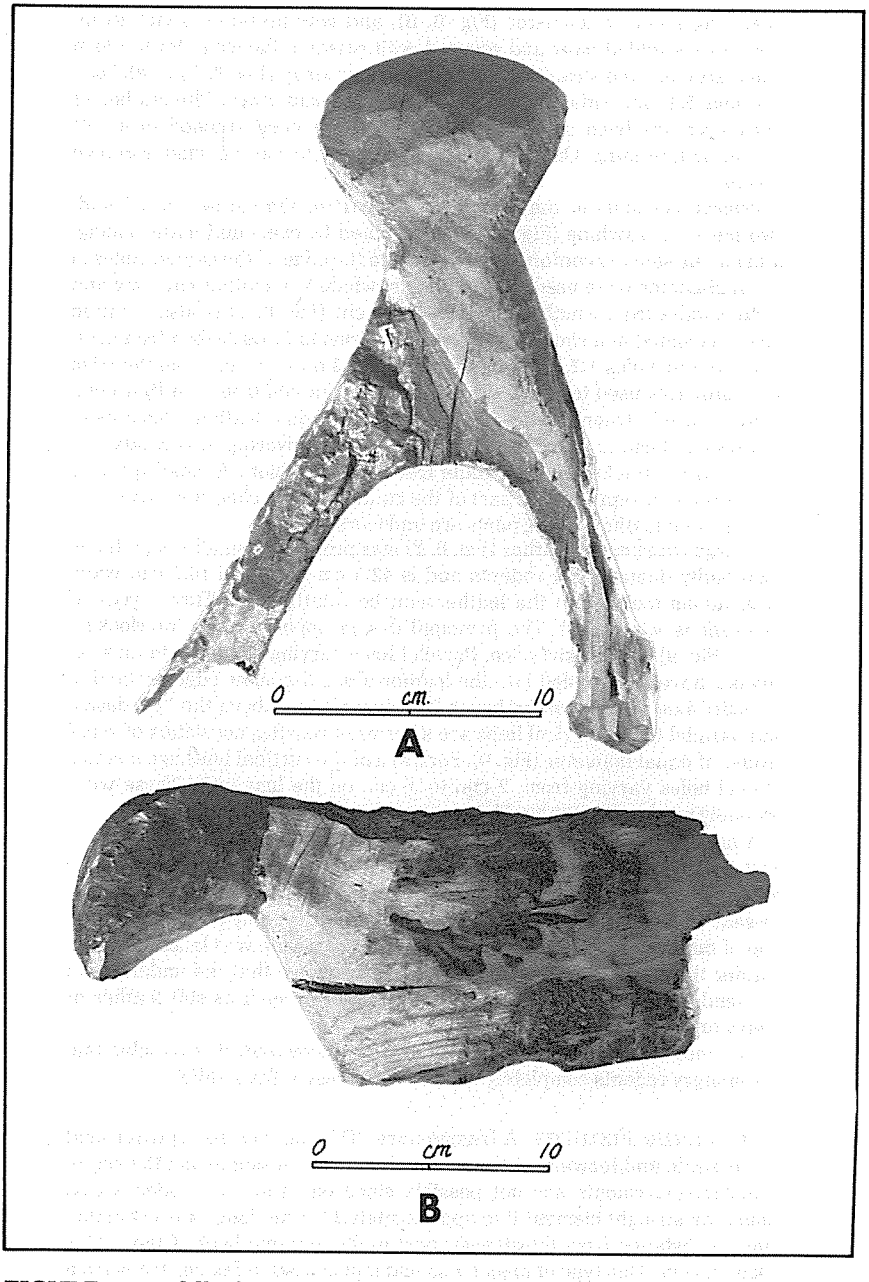


FIGURE 7. Saddle fork. A, top view; B, side view.

cular ring 9 cm. in diameter (Fig. 8, B), and was probably a girt strap. The strap is folded back and secured with rawhide thongs to form a loop which attaches the strap to the ring. The other strap (Fig. 8, C) is 40.5 cm. long and 5.4 cm. wide and was probably a stirrup strap. The leather of this object has been split and appears to have been stitched to a soft leather or felt lining. One end has been cut lengthwise for some unknown reason.

Several segments of the rawhide underpart of the cantle were found. Two pieces of rawhide (Fig. 8, D) were joined by over- and under lacing, utilizing the seam to conform the rawhide to the edge of the cantle. Holes .3 cm. in diameter were used to attach the rawhide to a leather covering and to the saddle tree. Another rawhide fragment (Fig. 8, E) is also a cantle part. It is joined in a similar manner to the previously described fragment. Two circular holes 1.2 cm. in diameter and 1.3 and 1.5 cm. from the edge were probably used to lace the rawhide to the saddle tree. The first mentioned rawhide fragment fits into a section of saddle leather. Remains of iron brads .3 cm. in diameter indicate the entire covering of rawhide and leather was attached to the saddle tree in this fashion. A small piece of wood probably represents a part of the cantle and matches one part of the rawhide and leather. These parts are undecorated.

A large fragment of leather (Fig. 8, F) was probably a saddle skirt. It has been badly damaged by rodents and is 42.3 cm. long and 14.5 cm. wide. Decorations tooled into the leather can be faintly seen. Three types of decorations were used. The principal design appears to be interlocking "S's" (Fig. 9) on the skirt edge. Parallel lines varying from two to three in number have been tooled into the leather along the outer edge vertical to the skirt axis and above the lower "S" decoration. Above the "S" design and parallel to the vertical lines are a series of rosettes consisting of small circles of equal diameter (Fig. 9). Forward of the vertical lines are a series of oval holes varying from .2 cm. to .6 cm. on the long axis. These were probably used to fasten the skirt to the underskirt of the saddle.

A badly damaged irregular leather fragment with a maximum length of 32.2 cm. and 21.1 cm. wide was probably a part of the fender. It may have been decorated with rosettes, but it is so badly weathered that this cannot be said with any certainty. One edge has been altered by cutting off a section of unknown width. A strip of leather 5.2 cm. wide was laced to it with leather thongs. Variously spaced oval holes suggest that the underside of the fender was faced with some sort of material such as soft leather or heavy felt.

No other leather parts of the saddle were recovered. It is possible that salt-hungry rodents completely destroyed the rest of the saddle.

Iron Saddle Fixtures. A fragmentary "D" ring (Fig. 10, A) was found to the inside and forward of the saddle (between the saddle and the body). Exact measurements are not possible since one end has eroded away. Along the straight element it is approximtely 11.0 cm. long. It is estimated that the distance from the straight part to the extreme back of the "D" is about 8.5 cm. This type of object was and still is used to fasten straps from the saddle to the girt or cinch.

A second piece of saddle hardware (Fig. 10, B) has the appearance of a "D" ring with specialized adaptations. A rectangular projection was made

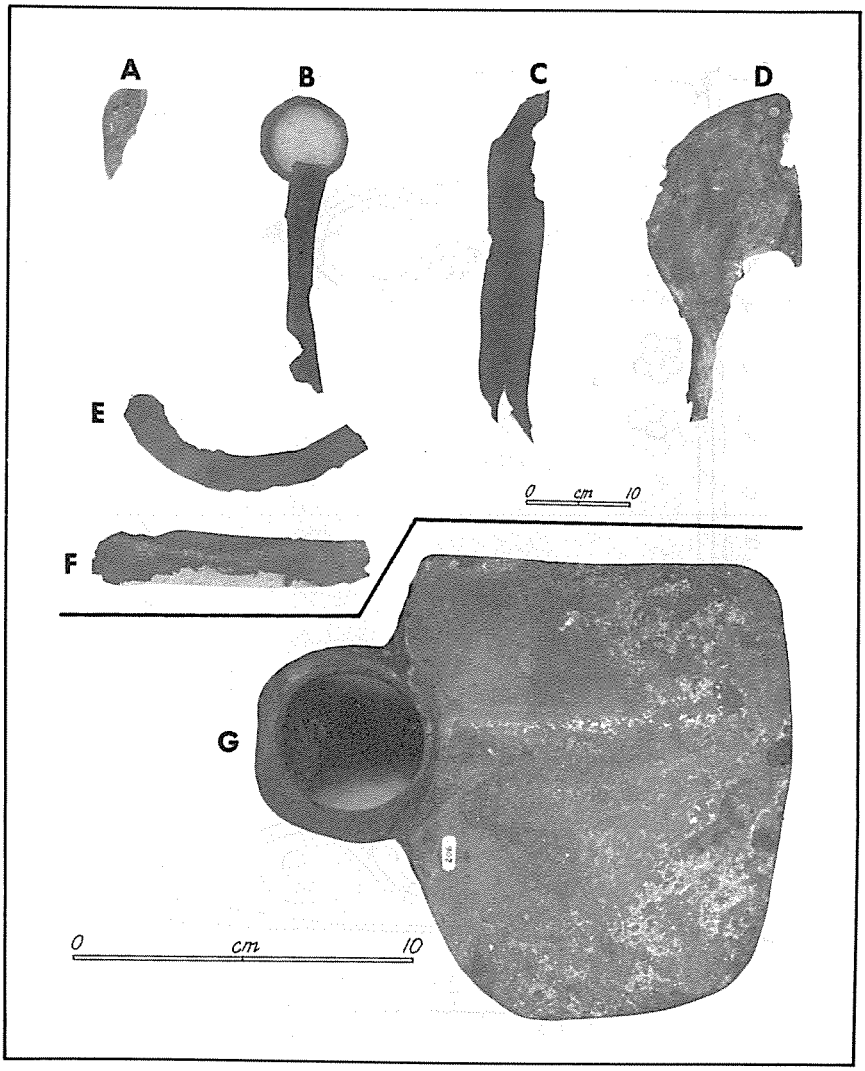


FIGURE 8. Saddle parts and iron hoe. A, fragment of wooden saddle cantle; B, leather strap ring; C, stirrup strap; D, E, rawhide saddle parts; F, saddle skirt; G, iron eye hoe.

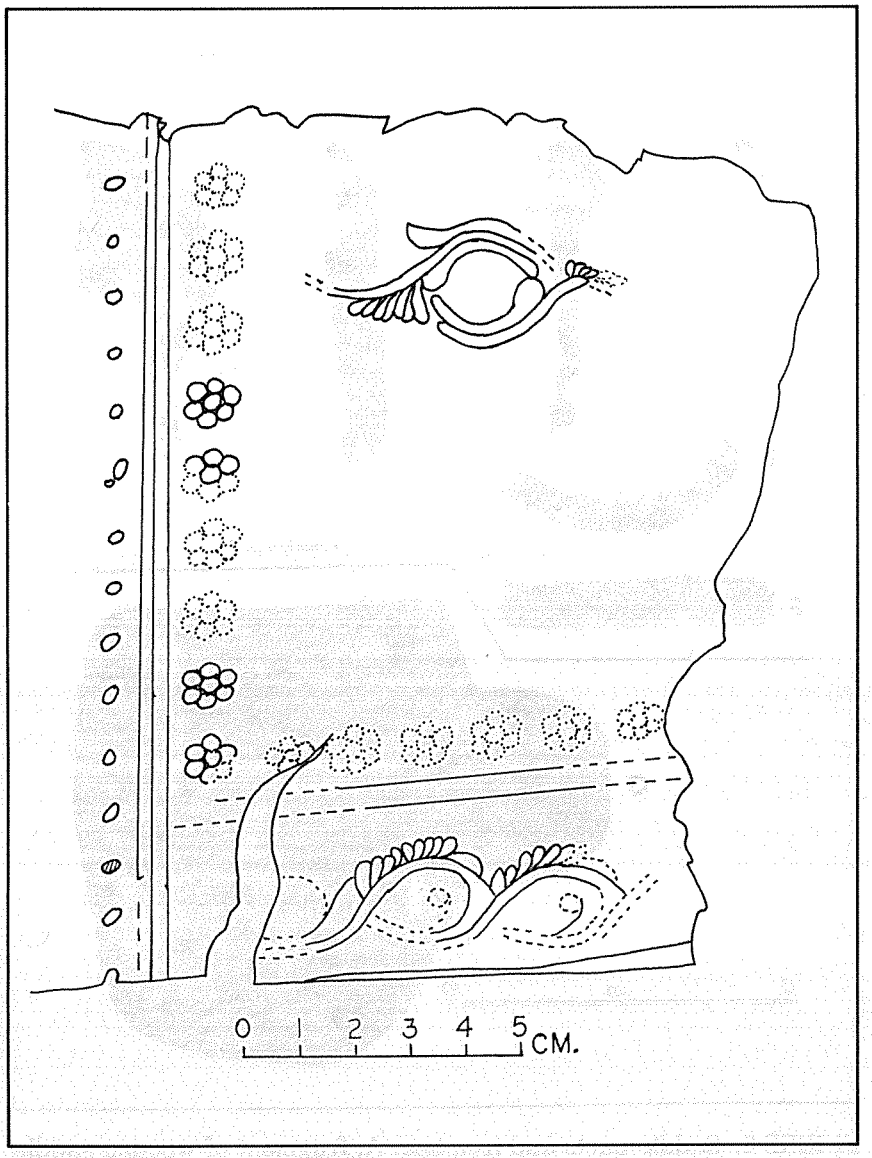


FIGURE 9. Decorated saddle skirt fragment.

on the lower curve of the "D" 2.0 cm. from each edge. The projection extends 3.1 cm. down and is 6.7 cm. wide. The lower, straight bar of this object is worn. A strap was either attached to or passed around this part. It is estimated that the original length was 11.3 cm., with a maximum width of 8.2 cm. from the lower part of the rectangular projection to the extreme back bar of the "D" ring. It is decorated by crescentic impressions .55 cm. wide from the beginning of the curved part and down both legs of the rectangular projection. They are randomly spaced and appear to have been made by a die while the object was heated sufficiently to receive an impression.

Inquiring into the possible function of this object, local rancher Charlie Lewis, descendant of a pioneer Floyd County ranching family, suggested that it may have been attached to a saddle and the rectangular part received the girt strap.

CORDAGE (Fig. 10, C). Four fragments of cordage were recovered from the burial. Their original provenience is unknown, and as a consequence their function cannot be determined. Since a bit was not found with the material recovered, it is possible that they are fragments of a hackamore. Two segments are 4.7 and 6.5 cm. long respectively and were disassociated from the two longer specimens, 19.2 and 21.1 cm. long. The long specimens appear to have been coiled into loops and are cemented at one bend of the loop by rat dung. The ends away from the loop bends are not present and were possibly gnawed away by rodent action.

The unidentified fibers are coarse, much like the fibers of bear grass, which is abundant in the area. Thirty-eight to 42 fibers were gathered together and joined in a loose Z twist to form strands. Four strands were S twisted tightly to form a four ply rope 1.3 cm. in diameter. The original diameter of the shorter pieces cannot be determined because they have loosened, but they are similarly made and were probably the approximate diameter of the longer fragments.

BRASS SALIVATERS (Fig. 10, D). Three brass objects were identified by Curtis Tunnell (personal communication) as "salivaters", without any certainty that they served this or a similar purpose. To our knowledge a Spanish bit was not recovered. Brass or copper salivaters were common in Spanish bits (Fig. 11). Three or four strips of brass or copper were looped about one or two bars across the port of the bit. They have the appearance of buckle tongues and are similar in form. Pieces of brass 5.8 to 6.1 cm. long were cut from sheet brass. The widths vary from .35 to .40 cm. and the thickness from .10 to .15 cm. The loop attaching the salivaters to the bar was formed by bending about the port bar. The distal end was doubled back .2 cm. and hammered flat. The shanks are from 2.1 to 2.3 cm. in length.

Examples of Spanish bits at the Witte Museum were examined for salivaters and the objects recovered from the Cogdell Burial are similar.

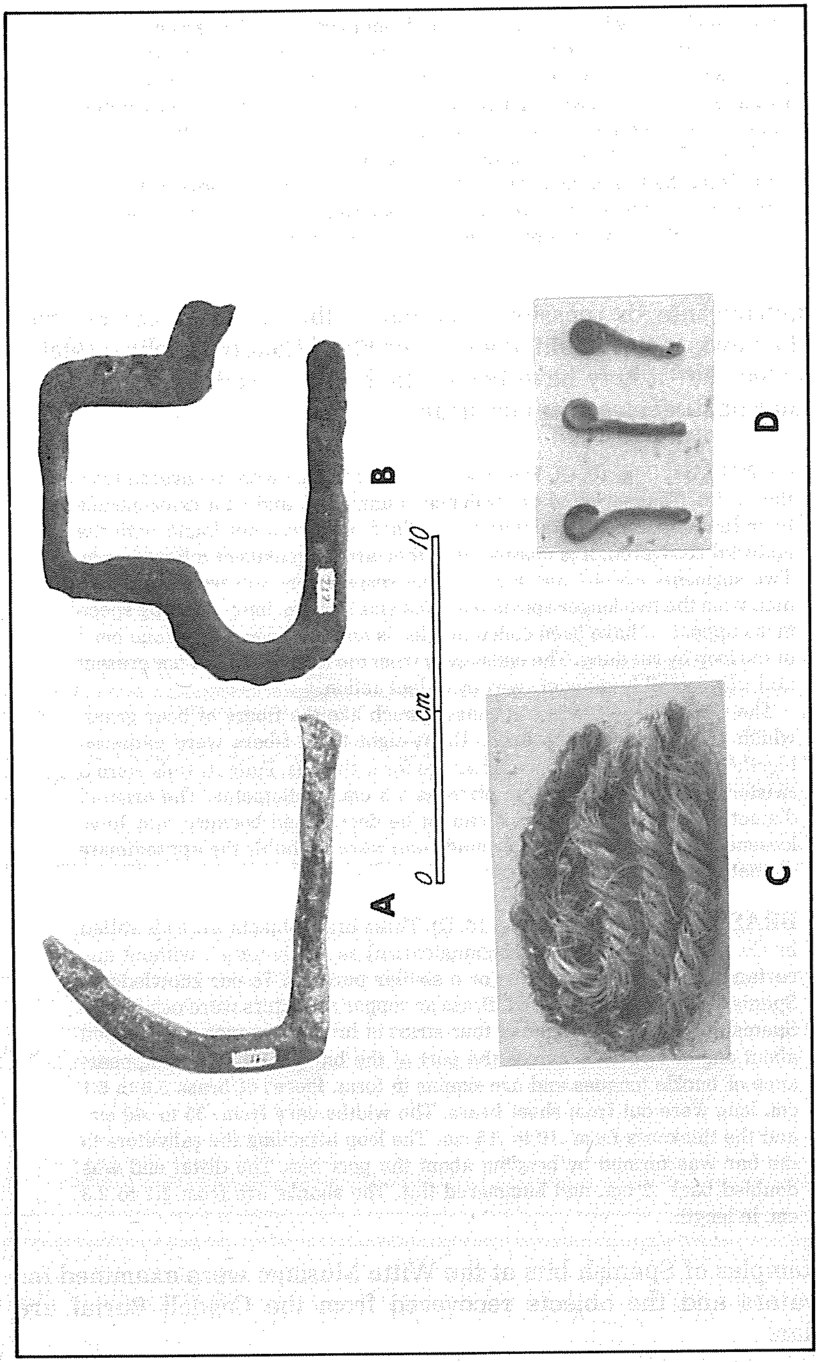


FIGURE 10. Metal and fiber artifacts. A, "D" ring; B, modified "D" ring; C, cordage; D, salivaters.

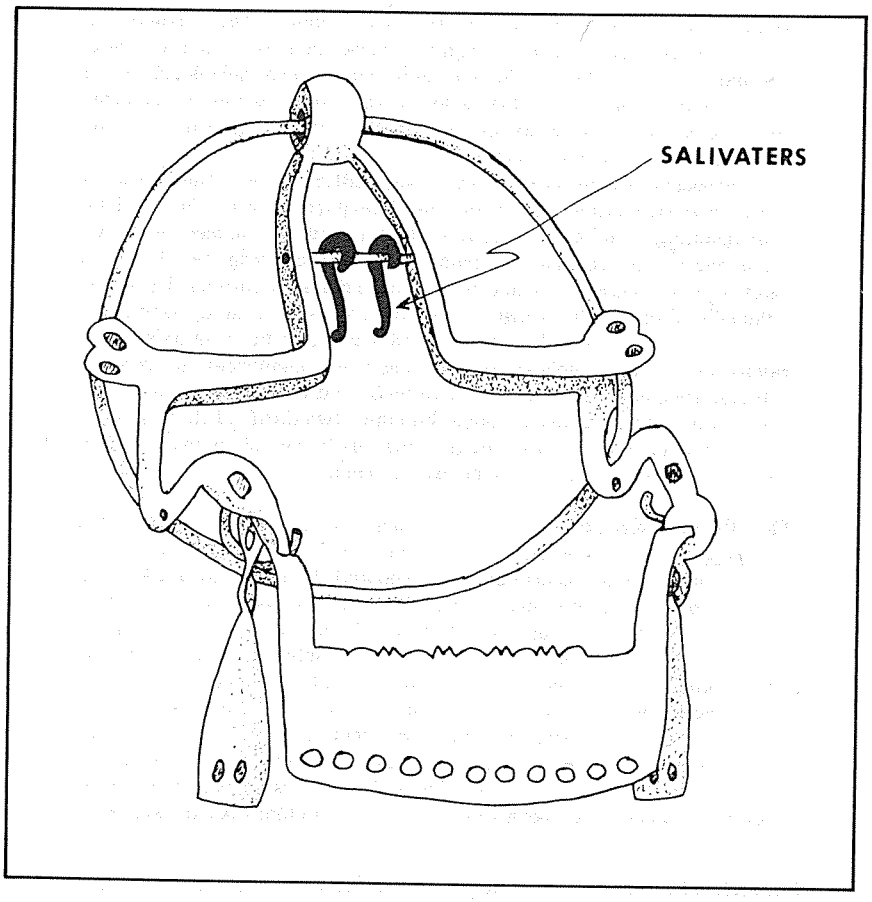


FIGURE 11. Spanish bit showing where salivaters were located.

Horse trappings are the most common denominator of all the burial goods recovered from Historic Indian interments. All but two of the thirteen Historic Indian burials examined contained horse gear of one sort or another. Only the child burial and Collingsworth County burial in the Panhandle-Plains Memorial Historical Museum did not have horse trappings.

TRAVOIS POLES. Two travois poles were each broken into three sections of approximately the same length and placed in fan shape with the apex over the chest area. One travois pole was made of lodge pole pine with diameters of 4.8 cm. at the distal end and 3.2 cm. at the proximal end. The distal part (dragging end) is beveled from wear for a distance of 24.2 cm. This part is 114.0 cm. long, the mid-section is 90.0 cm. long, and the

proximal end (hitching or tie end) is 101.4 cm. in length. The proximal end had a biconical hole burned through it 7.0 cm. from the end. The hole is oval and 1.1 cm. by .85 cm. The outside of the biconical hole is 1.5 cm. on one side and 1.4 cm. on the other side. In order to divide the travois poles into three parts, they were hacked to a depth varying from .5 to 1.0 cm. by an axe or hatchet and then snapped.

The second travois pole is shorter, being 281.5 cm. long. This specimen was made from a species of juniper. The distal part is 99.0 cm. long and the taper resulting from being dragged is 22.8 cm. long. The midsection is 94.5 cm. in length. The proximal or hitching end is 88.0 cm. long. The tie hole is highly worn and does not appear to have been made by burning. The edges of the hole where the tie thongs rubbed are depressed at an upward angle toward the most proximal part (about 15 degrees of the long axis of the travois pole). This travois is not as straight or symmetrical as the lodge pole pine specimen. The various small limbs and twigs were neatly trimmed and it is highly polished along the upper two-thirds of its length. Its 4.6 cm. diameter at the dragging end reduces to 2.6 cm. at the proximal end. The tie hole is 7.5 cm. from the proximal end.

TRAVOIS BRACE. This object appears to be a brace to keep the travois poles from spreading apart. Sometimes there were one or two additional cross braces according to the need and situation (Lowie 1936: Fig. 12). This particular specimen is 56.1 cm. long and made from juniper. It was placed with the travois poles and for this reason it is assumed that it performed this function. The ends were cut deeply, probably by an axe, and snapped off. The ends were left unsmoothed. Its entire surface has a high sheen or polish. No bark is present. It is 3.8 cm. at the larger end and 3.2 cm. at the small end. Several small scorched areas are randomly spaced on the larger end to about the center of the brace. Hack marks are randomly located over its entire surface. These scars appear to have been made by an object more like a knife than a heavier object like an axe.

PERSONAL ITEMS. This group of artifacts includes objects of ornamentation as well as objects not normally classed as clothing.

Brass Bracelets (Fig. 12, A). Fourteen brass bracelets and one fragment were recovered from the burial. All are round to ovoid in outline. The wire from which the bracelets were made is .45 cm. in thickness. The diameters of complete or reconstructed bracelets vary from 8.4 to 9.65 cm. Four are not altered in any way. Ten specimens and a fragment are flattened laterally. The flattened surfaces have the appearance of being hammered. Lengths of wire varying from 24.2 to 26.1 cm. were cut and bent. They appear to have been adjusted by leaving gaps or by overlapping. The wire was cut in four ways — by cuts from opposite sides at an angle, squarely across the wire, scored or notched and snapped, and by cutting through at an angle from one side. The flattened surfaces have partly obliterated the manner in which the wire was cut.

Ray and Jelks (1964: 135-137) recovered similar specimens at the Watson site, as well as some that were decorated. The White site

(Suhm 1962: 94-97) produced both decorated and undecorated specimens. The child burial observed at the Panhandle-Plains Historical Museum had simple, undecorated bracelets. Other unreported historic burials with brass bracelets are the Dean Ranch, McKaskle and Biddy burials from the Texas Tech Museum, and the Caprock burial (Conner, Allison and Runkles ms.). A single specimen was found in the Dawson County burial reported by Bennett (1968: 78). Brass bracelets have been found with historic burials in Crockett and northern Val Verde Counties (Hester 1968: 3-4).

Hair Ornaments (Fig. 12, B). Ten circular brass ornaments were found tied by an overhand knot in a three-ply plait of hair which was worn on the left side in the vicinity of the temple. Two others and three fragments were probably part of the hair ornament since they are of the same form and were recovered in the back dirt. The thickness varies from .25 to .30 cm. Lengths of wire, varying from 14.9 to 18.8 cm. were cut and bent to shape, resulting in diameters from 4.8 to 8.3 cm. The manner in which they were cut can not be determined since the ends have been altered in various ways. Three were flattened inside and out, resulting in rectangular cross-sections. In the others, the brass wire was unaltered except for the ends, which were tapered to a dull point. The hair ornaments are nearly perfect circle and were possibly bent about a circular object. There is no incising, notching, or other decoration.

The McKaskle burial in the Texas Tech Museum had a silver concha on the right brow which was probably a hair ornament or plate. The only other reference to hair ornaments in the vicinity is made by Woodall (1967: 83), who described a small triangular-shaped silver alloy ornament located in the temple area.

Finger Ring. The discoverer of the burial found a complete commercially made finger ring. On the assumption that the ring was gold and would bend, his science teacher squeezed it between his fingers and broke it. Dr. Frank Dougherty of West Texas State University tested the basic metal of the ring and found it to be brass plated with gold. The gold was worn off in many places with only a remnant of the plating still present. Using the fragment, it can be determined that the outside diameter is 2.3 cm., .1 cm. thick, and .3 cm. wide. It was worn on the ring finger of the right hand, as indicated by the greenish stain on the first joint of the third finger.

Dr. James A. Hanson of the Panhandle-Plains Historical Museum in Canyon and a student of the Historic Indians writes, "there is nothing really diagnostic in the goods except perhaps the ring. If it is not German silver, I think a date of 1830-1850 would be in order."

Suhm (1962: 89) reported a brass finger ring from the White site. In this instance the ring was oversized for the child remains. The McKaskle burial produced two sheet brass rings on the right hand.

Ray and Jelks (1965: 134) reported seven rings of brass wire and two of brass straps. A silver ring was recovered from the Caprock burial (Conner, Allison and Runkles ms.), and Newcomb (1955: 188) reported a copper ring from the Yellowhouse burial.

Silver Conchas. Conchas of silver are one of the most common articles found with Historic Indian burials in this area. Of the thirteen burials, six produced conchas. Four were recovered from the Cogdell Burial. Two were placed between the saddle and the body (Fig. 4), one was found on a small shelf in the northeastern part of the burial niche, and the provenience of the fourth is not known. Several viewers gave varied opinions of the metal from which the conchas were made. In order to determine the true content, a test was run by a metallurgist, and the results indicated silver of + 98%. Sterling is 92.5% pure. This does not rule out the possibility that the conchas were made from coins. Dr. James A. Hanson (personal communication) stated that in melting, silver tends to revert to a purer state.

CONCHA A (Fig. 13, A). This specimen is 5.9 cm. on one axis and 5.3 cm. on the other. Three millimeters from one edge is a square hole .15 cm. wide. Such a hole could have been made by a square nail. The edge is beveled and decorated by incised lines about the perimeter. They are about .05 cm. long and spaced from .025 to .075 cm. apart at an angle of 30 degrees from the edge. It has a consistent thickness of .225 cm. and is concavo-convex. The convex surface is well polished but has faint "wear" scratches running in various directions. An area of .5 cm. on each side of the square hole is worn and the incised marks are nearly worn away. The reverse (concave) side is slightly rough or irregular. In the central part are two openings, square on three sides. The fourth side, which faced to the outer edge, is formed by two arcs joining to form a "peak." The .4 cm. section between these openings is slightly depressed, suggesting that leather or cloth was passed through one hole, over the separating bar and back down the opposite hole. Pressure from such action could depress the separating bar. The square hole also suggests that it was at times worn as a pendant. No indication of how the concha was formed can be discerned. No stress cracks, usual in formation by a cold process such as the anvil-hammer method, are present.

CONCHA B (Fig. 13, B). This concavo-convex specimen is nearly circular, being 6.5 cm. on one axis and 6.7 cm. on the other. It is centrally perforated by a circular .4 cm. hole. On opposite sides are two elliptical holes .1 and .3 cm. punched from the convex side. On one edge is a stress crack .55 cm. long. Cut marks made by a sharp object such as a knife, varying from .1 to .7 cm. in length at an angle varying from 30 degrees to 45 degrees, are spaced from .05 to .3 cm. apart. A circular polished area 2 cm. in diameter around the central hole suggests this concha was possibly

secured by a leather washer on its convex side; it may have been attached to clothing or possibly worn as a hair plate.

CONCHA C (Fig. 13, C). This concha is 6.4 by 6.7 cm. in diameter. It is perforated by truncated triangles joined by their apices. A semicircular notch .4 cm. in diameter has been cut in the center of the base of one of the triangles. The truncated triangles were cut out by a knife or similar thin, sharp object. On each side of the narrow part of the opening are .1 by .2 cm. oval holes punched from the concave side. This specimen could easily have been secured to clothing or to a hair braid by passing a small pin through the two holes and under or through the fabric, or in a similar fashion in a hair braid. It is 2.6 cm. from the base of one truncated triangle to the base of the other and 1.4 cm. wide at the juncture of the triangles.

CONCHA D (Fig. 13, D). This specimen is also circular being 6.4 cm. on one axis and 6.7 cm. on the other. It is centrally perforated by two semicircles 2.2 cm. along the diameters divided by a bar .3 cm. wide. The bar separating the semicircles is slightly depressed, indicating that cloth was brought up through one of the holes, over the bar, and down through the other hole. It could have been utilized in a similar fashion as a hair plate. The semicircular holes were made by a series of cuts varying from .5 cm. to .9 cm. long, made with a keen edged object. The bar separating the semicircular segments was cut in a similar fashion.

It is possible that specimens B, C, and D were made from sheet metal or were cast from coin silver. To test the first possibility, the thickness of each specimen was measured by a micrometer. The result produced a thickness varying from .0052 to .0089 cm. The variation of thickness of .0037 cm. is of interest and indicates the possibility that all three were made from the same piece of material. For example, the variation in Specimen B indicates a thinning of only .0007 cm. from the center to the edge. Forming objects by the anvil-hammer method from soft, thin sheet silver would result in little variation in thickness.

Small Animal Skin. From the hair remaining, this article appears to be the pelt of a member of the weasel family, probably the long-tailed or bridled weasel, *Mustela frenata frenata*, whose range extends today across Mexico and Texas (Ford 1951: 105).

Furred pelts were used for many purposes by the Indians of the southwest. Catlin (1926: Fig. 172) painted a Comanche warrior in 1834 with a breech clout and a quiver of fur. Mason describes a number of types of fur quivers from various tribes (1893: 631-680). Another possible function for the animal skin is that it might have been part of an amulet or *pouhahante*, a combination good luck charm and oracle common among Indians of the southwestern area. Berlandier (1969:

54, 91, 116) mentions these objects several times in respect to the Comanches, explaining that they are usually small, stuffed animals or a portion of one, attached to the shield or carried around the neck or in the hair.

Mirror (Fig. 12, C). A small hand mirror 7 cm. wide by 9.15 cm. long and .3 cm. thick was found just outside and toward the forward part of the saddle fork. It may have had a frame at one time, but there is no evidence that it was in a frame of any sort. One corner has what appears to be an old break — possibly dating from the time of the burial or earlier. In any event, no fragments were recovered from the screening of the disturbed matrix. Nearly all of the silvering has eroded away and all surfaces are patinated.

Newcomb and Field (1967: 271) report that mirrors were a part of Navarette's trade goods, and de Mezieres (Bolton 1914: 132-134 and 200-202) included mirrors as a trade item. Wallace and Hoebel (1952: 280) list mirrors as one part of the goods used to lure the Comanche into coming in for treaty talks with Anglos during the mid-1850's. It is surprising that only three other mirrors have been found associated with burials. The Caprock site contained two mirrors (Conner, Allison and Runkles ms.), and the Watson site (Ray and Jelks 1964: 137) reported one mirror.

Historic accounts give instances of mirrors being used as heliographic devises in directing activities of warriors during combat and in horseback games.

Silver Buckle Tongue (Fig. 12, D). A silver object was recovered while screening back dirt on the talus slope. It has the overall appearance of a buckle tongue except the loop to attach the tongue to the buckle bar appears to have been cut off by a narrow, sharp tool such as a knife. This object is 2.6 cm. long, .55 cm. wide midway, and .5 cm. wide at the most narrow part. The sides are generally parallel but expand slightly midway between the two ends; it is .55 cm. wide at this point, and .35 cm. from the distal end it reduces to .4 cm. The distal end is rounded and is slightly turned downward. Since the proximal end has been severed, it was probably altered to serve some other purpose — possibly as a decorative object tied to a garment by the constricted part near the distal end.

Elk Tooth Pendants (Fig. 12, E). Two drilled elk teeth were recovered from the grave fill. The placement of these objects is not known; however, illustrations of Plains Indians in the collections of the Smithsonian Institution (Ewers 1957: Plate 33b) indicate that elk teeth were frequently attached to jackets or shirts.

The Cogdell specimens are biconically drilled at the root section. The holes vary from .2 to .35 cm. in diameter and the outer part of the holes vary from .4 to .5 cm. It is possible that one specimen is older than the other, as the outer edges of the hole are more worn.

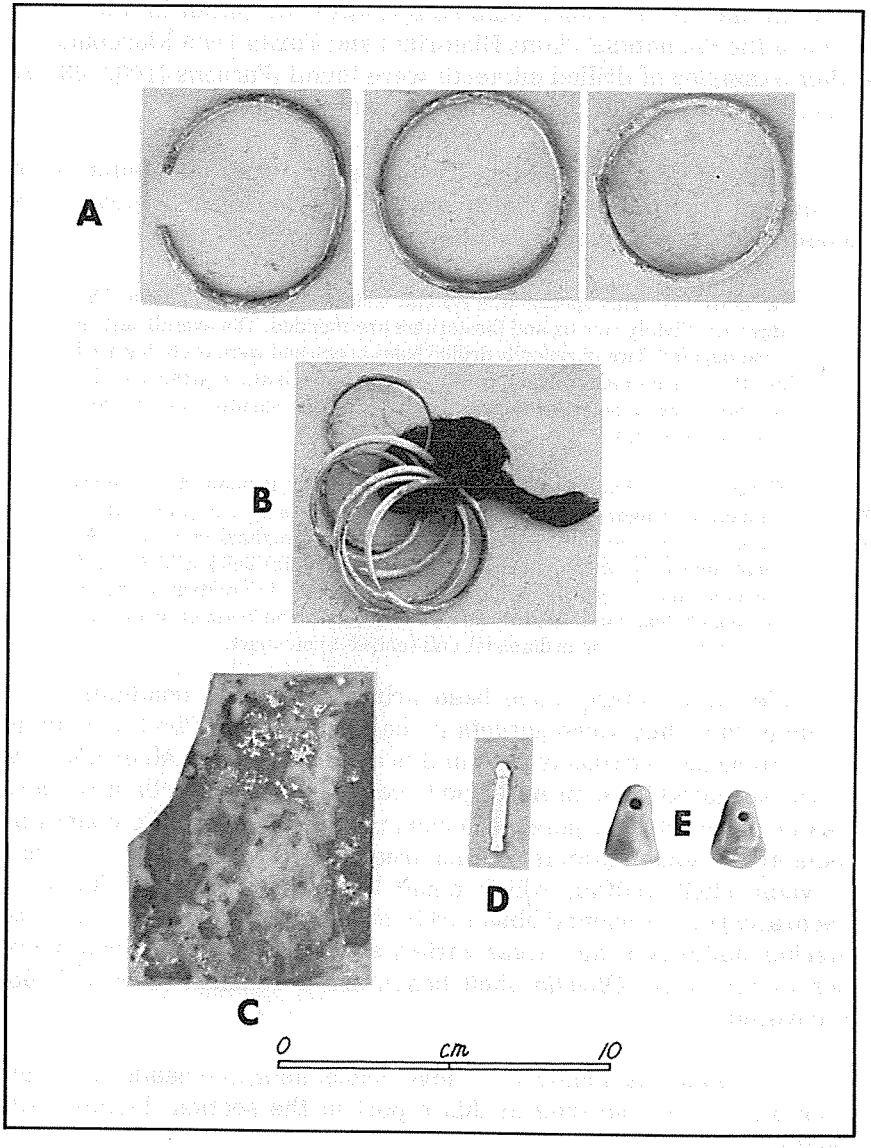


FIGURE 12. Brass bracelets, hair ornaments, mirror, buckle, tongue, elk tooth pendants. A, brass bracelets; B, brass hair ornaments in braided hair; C, mirror; D, silver buckle tongue; E, drilled elk tooth pendants.

Of all the burial goods examined by the senior author in the collections of the Panhandle-Plains Historical and Texas Tech Museums, no other examples of drilled elk teeth were found. Parsons (1967: 83-84) found three drilled elk teeth at the Morgan Jones site.

Abalone Shell Pendants. Two abalone shell pendants were recovered from near the chest area of the burial and toward the mouth of the burial chamber.

PENDANT A. This specimen is 7.3 cm. wide and 8.8 cm. in length. The edges are slightly convex and the corners are rounded. The overall outline is rectangular. Two biconically drilled holes at one end were probably used for attachment to some object, possibly to one of the leather garments. The two holes are .3 cm. in diameter. The upper end is slightly more narrow than the distal end.

PENDANT B. This specimen is slightly smaller than Pendant A. The sides are nearly straight, but are very slightly convex. It is 6.9 cm. wide and 8.7 cm. in length. The corners are rounded. At the proximal end are three evenly spaced biconically drilled holes. The two outer holes are .3 cm. in diameter and the central one is .4 cm. in diameter. In addition to the attachment holes, small decorations were drilled into the lower or distal end. These holes are .1 cm. in diameter and spaced .3 cm. apart.

While these objects have been arbitrarily called pendants, it is possible that they were gorgets or hair ornaments. Shell objects of this nature are extremely rare in this area. Abalone shell ornaments were recovered from an Antelope Creek focus burial north of Borger, Texas (Jack Hughes, personal communication), so Pacific coast objects are of some antiquity in this area. Parsons (1967:33) recovered a whelk shell artifact which could have served as a ladle or a decorative or ceremonial object. While shell ornaments of the various marine molluscs of the larger variety are rare, they occasionally occour in this area. *Olivella* shell beads are a common form of bead recovered.

Necklace. As a matter of convenience, necklace beads and shell hair pipes are described in this report in the section dealing with beads.

Blankets (Table 3). Fabrics were found with the burial. How they were placed in relation to the body is not known for certain. They were removed and placed at either end of the burial niche when the burial was disturbed by McFall. It is assumed that these fabrics were blankets in which the body was wrapped, since copper stains hint that they were wrapped about the body. In addition, a sequence of blanket wrappings can

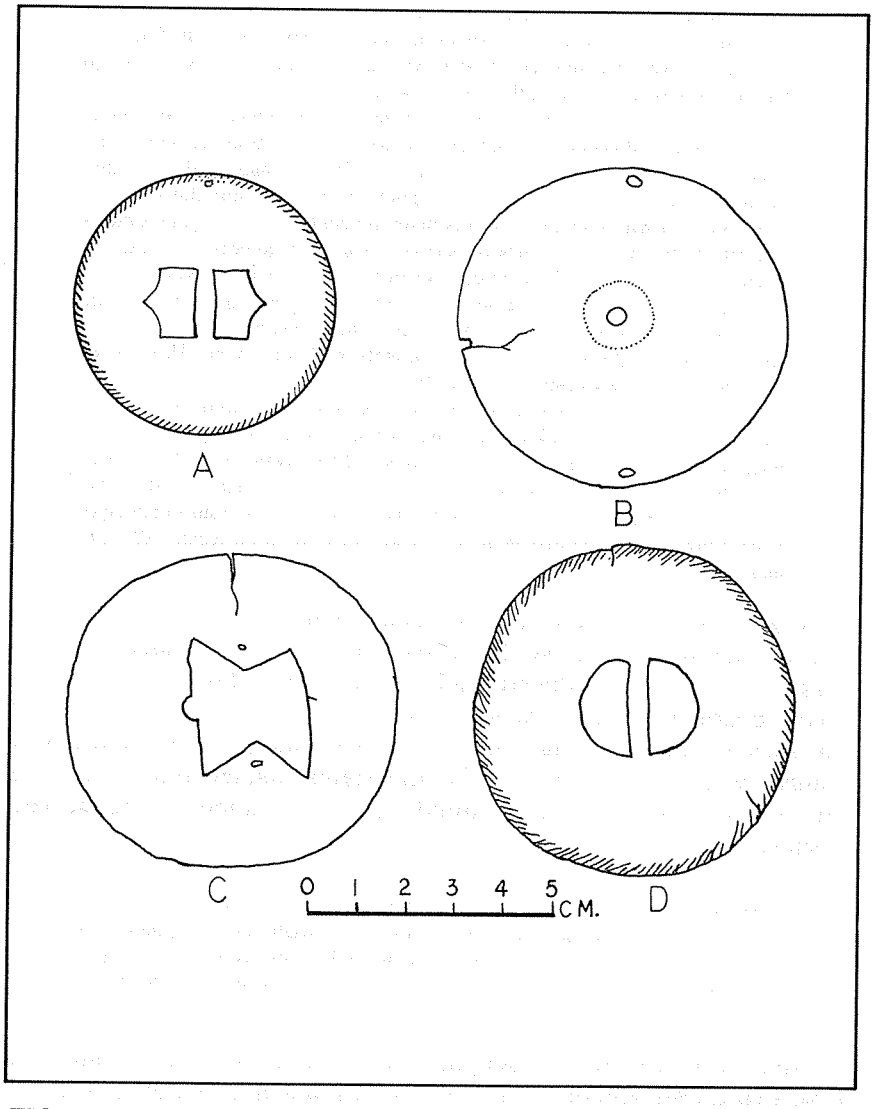


FIGURE 13. Silver conchas. A, Concha A; B, Concha B; C, Concha C; D, Concha D.

be determined because a fragment 7 cm. to 7.6 cm. thick was recovered that was cemented together in some manner (possibly by body fluids or rat urine). A red commercial blanket was next to the body and a Navajo or Pueblo blanket composed the outer layer.

The blanket fabrics were examined by Dr. Joe Ben Wheat of the University of Colorado Museum, and his analysis (personal communication) is the basis of interpretation of these two items. The fragments of a striped blanket probably represent a single object. It appears that there was a broad red and white stripe, perhaps near the center. One fragment has a red stripe with beaded or speckled weave. Several fragments have narrow alternating red and gray-tan stripes. Several fragments have yellow, gray-tan and red stripes repeated several times. Another fragment contains wide white and gray-tan stripes in a wider white-speckled red stripe. The thread count is eight per .25 cm. and the weft is 24 per .25 cm. The date of manufacture was between 1820 and 1850.

The commercial blanket is of napped diagonal twill plain weave, two over two, except the black band which is plain tapestry. Blankets of this type generally have a black band at each end. The selvage is of plain finish. The thread count is twenty-four per .25 cm. for the warp. The diagonal weft is eighteen per .25 cm. and the tapestry weft varies from thirty-eight to forty per .25 cm. Blankets of this type were made between 1825 and 1865.

Suhm (1962: 103) recovered fragments too small for identification from the White site. The W. H. Watson site in Fisher County (Ray and Jelks 1964: 137-138) produced woolen fabrics, as did the Morgan Jones burial in Crosby County (Parsons 1957: 90-91), and in both instances the fabrics were too fragmentary for identification. Examination of historic burial goods at the Panhandle-Plains Historical Museum and the Texas Tech Museum resulted in two instances of recovered fabrics.

Buffalo Robe. Numerous small fragments have traces of the wooly hair of the buffalo still clinging to them and the yellowish, glazed appearance observed on robes in the Witte Museum collection. There are several fragments which include the seam which usually ran up the center of a robe, but there is no trace of paint.

Jose Maria Sanchez y Tapia painted a Comanche in such a garment before 1828 (Berlandier 1969: Plate 2). Wallace and Hoebel (1952: 81) describe a typical Comanche robe as having no decoration except a stripe down the seam.

FAUNAL REMAINS. Placed near the feet and toward the opening of the burial chamber were the remains of what in all probability was a food offering. Of the seven bones of either *Bos* or *Bison*, five may have been cooked, which altered their appearance. The other two do not seem to have been subjected to any unusual circumstances. The unaltered bones consist

TABLE 3
ATTRIBUTES OF BLANKETS
Navaho or Pueblo Blanket

Fiber	Yarn Type	Spin	Ply	Color	Dye
Warp Wool	Handspun	Z	1	White	None
Weft (1) Wool	Handspun	Z	1	Grayish Tan	Native
Weft (2) Wool	Handspun	Z	1	Brownish Red	Native
Weft (3) Wool	Handspun	Z	1	Gold Yellow	Native
		Commercial Blanket			
Warp Wool	Machine Spun	S	1	Claret-Red	Pre-Aneline
Weft Wool (1)	Machine Spun	S	1	Claret-Red	Pre-Aneline
Weft Wool (2)	Machine Spun	S	1	Brown-Black	Pre-Aneline

of an astragalum and a second phalange. It has been the observation of the senior author that artifacts of bone are nearly always better preserved in aboriginal sites than bone scrap or waste. This is possibly due to impregnation of oils from handling. It has also been observed that bones lying beside a bone artifact often times are in a poorer state of preservation. Is this difference due to impregnation of the bone by fats as a result of either boiling or roasting? In any event, five bones were altered in some manner and in addition one large bone was severed near a joint end by sawing. It is possible that two other bones of this group could have been sawed, but due to rodent damage this can not be determined. All five have been damaged by rodents to the degree that positive identification as to *Bison* or *Bos* can not be determined (Ernest L. Lundelius, personal communication). On the other hand, the astragalum and second phalange have been but slightly damaged by gnawing, further indicating that these bones were not as attractive to rodents as were the other five.

Other examples of possible food offerings can be cited. In the White site (Suhm 1962: 106), the presence of deer or antelope bones suggest a possible food offering. Two historic burials in the collections of the Panhandle-Plans Historical Museum also contained possible food offerings. In one instance rabbit bones were found with a child burial, and in the second instance the hump section of a bison was associated with an adult male burial. With similar circumstances at the Cogdell site, there is a strong possibility that the *Bos* or *Bison* bones are a food offering, and this practice may be more common than previously believed.

In addition to the *Bos* or *Bison* bones, turkey buzzard and rodent bones were found throughout the matrix. The rocks covering the burial had been thrown out of the cave; in examining these rocks the excrement of turkey buzzards was evident, and fragments of buzzard egg shells were noted. It appears that the site of the burial was also used as a nesting and roosting place by these birds. Evidence of rodents was plentiful not only from the bones, but also by urine-cemented dung clinging to artifacts and by an abundance of rat dung throughout the deposits. None of the bird or rodent bones showed any evidence of alteration.

MISCELLANEOUS OBJECTS. Several miscellaneous objects were recovered from the fill around the burial. These are described below.

Leather. One object consists of two carefully cut, rectangular pieces of very thin leather folded one inside the other. Judging from the texture and the hair remaining, the skin may have come from the underside of a deer. The shape and construction do not suggest any known object.

Another object consisted of three layers of very thin leather laid one within the other. The leather looks and feels like that of the preceding object, but has no hair. Again, there is no clue to its use.

Wood. Two wooden objects similar in construction were recovered. While one is incomplete due to rodent gnawing, it has the appearance of the complete specimen. The complete specimen (Fig. 14, A) is 17.0 cm. long, 2.8 cm. wide with a maximum thickness of .6 cm. The ends are rounded and it is ellipsoidal in cross section. It appears to have been shaped by a knife. The rounded ends indicate that it was nearly cut through and then snapped off. Two or more were possibly made, as indicated by the cut and snap technique of the complete specimen. The wood appears to be some type of pine. The incomplete specimen is 12.7 cm. long. It has the width and thickness and cross section of the previously described specimen. The identification of these objects and their function are unknown.

Two fragments of what were probably of the same item were found. Termite action has so badly damaged the fragments it can not be determined what the object was. A limb about 2.6 cm. in diameter of an unknown species of tree was girded by a knife and either broken or cut completely through. The outer bark was smoothed by a sharp object such as a knife.

Two fragments of squared wood were found. It can not be determined what the complete object was. The bark remaining on one of the sides appears to be wild plum, of which there is an abundance along the banks of the streams in this area. The squared sides are highly polished and no cut marks are visible. It was squared by trimming three sides of a small branch, leaving the bark on the fourth side. Length measurements are of little value since the fragments are so small. The diameter is 1.3 cm. on one axis and 1.6 cm. on the other.

A branch of a fruit tree, probably wild plum, was recovered. Both ends are broken. Twigs were neatly trimmed off. Groups of cut marks are present about midway, and random cuts are irregularly spaced along the rest of this specimen. It is 23.8 cm. long and 1.5 cm. in diameter. Due to its fragmentary state, it is impossible to determine the function of this artifact.

Glass Lens (Fig. 14, B). A glass lens with a central minus correction was found in the burial matrix. McFall did not recall where it was located in relation to the body or to other artifacts. The lens was taken to school and in showing it to classmates, it was dropped. A triangular fragment .9 cm. wide along the beveled edge and 3.8 cm. long was recovered.

In order to get an opinion regarding the age and use of the lens, the fragment was sent to Mr. J. C. Sticksel, regional manager of the American Optical Company. Sticksel forwarded the fragment to Mr. E. W. Tillyer, manager of the lens division of the American Optical Company. His reply is as follows:

"After considerable analysis, it seems that the lens is a 'myodisc' and is approximately 50 years old. We base that age on two factors:

1. The glass is well annealed and these annealing techniques came into being about 1920. However, that one decision alone is not sufficient because there is a possibility that the lens was exposed to unintended heat, and, therefore, was annealed.

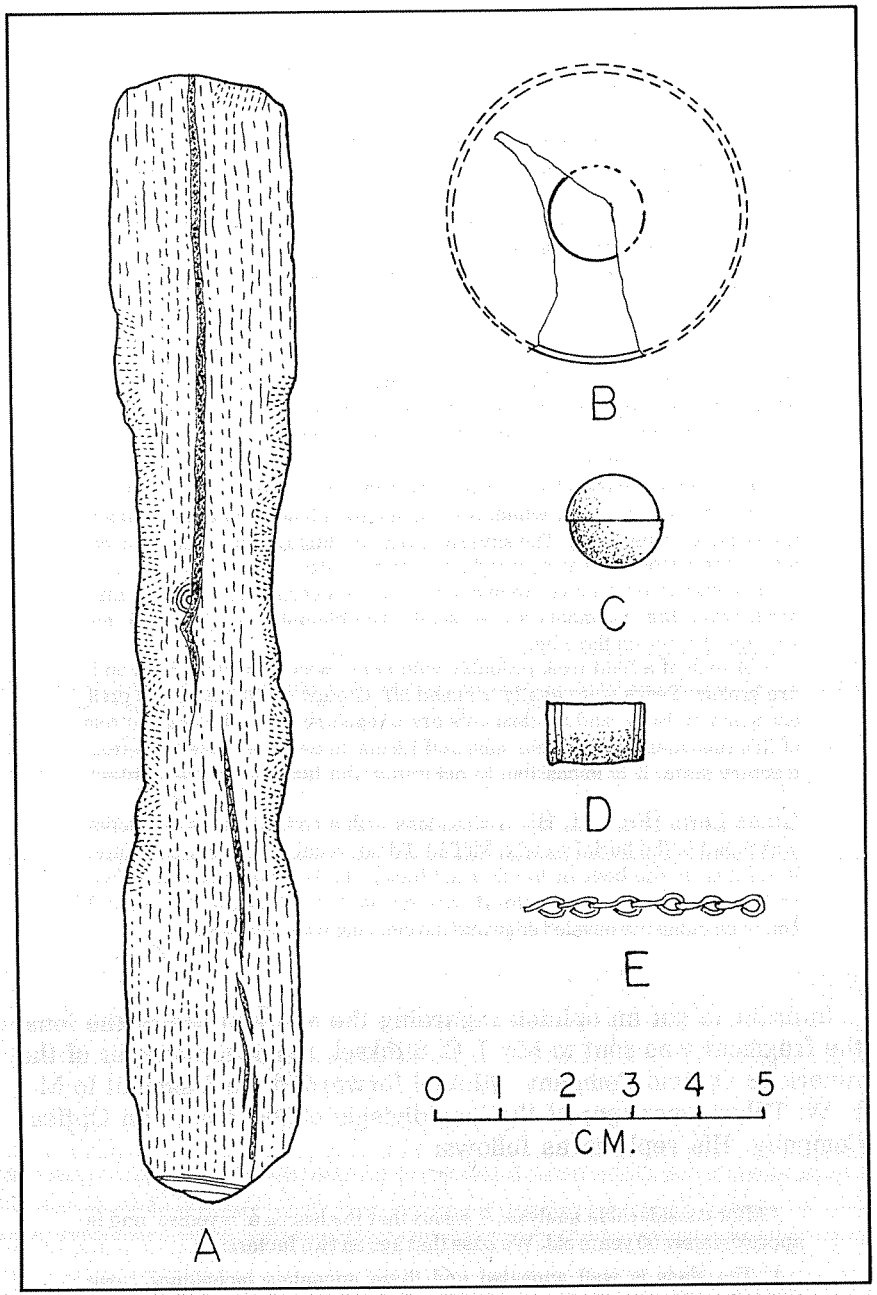


FIGURE 14. Miscellaneous artifacts. A, wooden object; B, glass lens; C, lead ball; D, brass rim pipe; E, brass chain.

2. The edging of the lens fragment was done with equipment available after 1920.

At first, I thought it was a cement wafer type lens, but after developing the whole from the fragment, it looks as though it was actually a high minus."

In order to verify the data from the American Optical Company, the fragment lens was sent to Mr. Earl F. Adams, senior product administrator of Bausch and Lomb, Opthalmic Division. Additional comments are as follows:

"The lens appears to have a rather sophisticated toric surface and compound lenses of this type have been developed in this century.

The lens was flouresced to compare with our present day crown glass and they appear to be the same. This is not particularly significant, however, as soda-lime glass compositions have been in existence for many years.

The lens fragment looks like a watch crystal or the cover for some type of small gauge. The central minus portion is a product of recent times and the bevel edge would suggest a gauge."

The reconstructed lens is 4.1 cm. in diameter and the central minus is 1.6 cm. in diameter. There is a polished bevel .015 cm. wide about the circumference.

Three questions naturally come to mind when the lens is considered. (1) The burial occurred sometime after 1920. Interviews with long time residents of this area do not reveal any such event as Indians visiting the immediate area. Ranchers check their livestock daily and it would have been difficult for such an event to have gone unnoticed. There is no ethnohistoric reason that can be found for Indians to return to this area for a burial. (2) Another possibility is that it was accidentally dropped in the burial crevice. (3) The third possibility is that pack rats found the lens close by and introduced it into the burial place. This is the most probable explanation, as pack rats had extensively used the burial niche, and the lens is not too heavy for a large rodent to have transported. In any event, the lens is inconsistent with all the other burial goods.

No other such optical object has been discovered in either published or unpublished burials in this area.

Iron Hoe (Fig. 8, G). An eye hoe was recovered east of the saddle tree and to the outside of the burial chamber. The original length of the hoe blade was approximately 18.1 cm. The width from the edge of the blade to the lower part of the eye socket is 11.8 cm. Viewing the hoe from the handle side, it can be seen that the right edge has been worn or cut away. The central reinforcing "rib" runs from the base of the eye toward the blade edge

and was the center of the hoe. The left side is 9.1 cm. wide and only 5.7 cm. to the right edge. The cutting edge of the hoe does not exhibit any unusual use, but the sides indicate that they were heavily used in a hammering or battering process. It is apparent that the right side was used more extensively than the left side since this is the narrower part as measured from the center rib. The top of the eye has been scored as though it had been used as an anvil for cutting with a chisel or other sharp edged tool.

In an attempt to discover as much as possible about eye hoes, the Scovil Hoe Company and True Temper Tool Company were written concerning the history and method of manufacture of this particular tool. The Scovil Hoe Company replied and sent samples of their hoes from the 1890 to 1905 period and from 1905 to the present. The hoe found with the burial is definitely not of Scovil manufacture.

D. W. Fisher, Plant Manager of Scovil Hoe Company, described the manufacturing process prior to 1905 as follows:

> "Our company began making hoes in 1844 and during the 1850's developed a process of making hoes that consisted of forming an eye socket, a ferrule, a throat, and a blade. Each piece was separate and hot welded together to form the semi-finished product which was then trimmed, ground, and painted. Around 1900, our process was refined from a production point, but the eye construction remained about the same as before. About 1920, we again changed the process of making hoes and machines replaced men. The hoe retained the same outward appearance, but was drawn from one piece of steel, thus making it a much stronger tool."

It is obvious that the Cogdell Burial hoe is not of Scovil manufacture since it is of one piece manufacture. Photographs of the hoe were sent to Dr. Charles E. Hanson, Director of The Museum of the Fur Trade at Chadron, Nebraska. In his reply he states,

> "The eye hoe is a type that was popular throughout most of the 19th century and occupied too long a span to be valuable for dating purposes. We have copies of pages from a Sheffield tool catalogue ca. 1815 which illustrated two patterns very similar to yours. Both were obviously made for exportation to the United States.
>
> From the examples we have here, your hoe seems typical of the 1815-1860 period."

Similar hoes have been recovered from the Merrell burial and the Merrell Comanchero site (41FL19), both of which are a short distance from the Cogdell Burial.

Lead Ball (Fig. 14, C). A lead ball was recovered from the talus slope by Jim Servatius of Plainview, Texas, and was lent to the author for examination. It appears to have been cast in a worn bullet mold, as each

half is slightly off-set. It has a diameter of 1.636 cm. along the seam of the mold and a diameter of 1.588 cm. on the axis 90 degrees to the mold seam. The spue was neatly trimmed. A ball of this size suggests a rifle or musket of approximately .65 caliber with a moderately thick patch. The surface is slightly pocked, probably the result of corrosive soil action. There is a small gouged-out rectangular area about .05 cm. deep. There are no rifling or patch impressions, which indicates that it was never fired. Since no firearms were found with the burial, no conjecture can be made of its purpose or significance.

Brass Ram Pipe (Fig. 14, D). A tabular brass object 1.45 cm. long with a .9 cm. outside diameter and a .8 cm. inside diameter was recovered in screening the talus slope. It was made from sheet brass 1.45 cm. long bent into a cylinder. It was decorated with two grooves about .05 cm. wide and spaced .15 cm. apart from each end. It has the appearance of a ram pipe from either a small caliber muzzleloading rifle such as a squirrel rifle or a small caliber pistol. However, it has no flange to accept a fastening pin to the barrel. No weapon was found with the burial, and the single lead ball of large caliber does not match the size of the ram pipe. Normally the ramrod is just slightly smaller than the bore diameter (just enough smaller to clear the bore of the weapon). How this object was utilized is not known.

Brass Chain (Fig. 14, E). A fragment of brass chain 2.5 cm. long was recovered. It was from brass wire .1 cm. in diameter and about 1.5 cm. long. A loop was made out of approximately one half the length of the wire. The resulting loop is .3 cm. (outside diameter). A similar loop was made with the other half, but at a 90 degree angle. This forms two chain loops made of one piece of wire. Another piece of wire of similar length was passed through the loop of the first double link and again bent to form a second segment of the chain. This process is continued until the length of chain is completed. This is probably a machine made chain. The widths of the loops are consistent. No other fragments of this chain were found, and its use is unknown.

GENERAL DISCUSSION

COMPARISONS OF BURIAL PRACTICES. The Morgan Jones site (Parsons 1967) in Crosby County is the only burial in northwestern Texas that has been found and reported by a professional archeologist. Unfortunately, the burial goods from this site were relatively scant and it had been badly disturbed by rodents and other animals. The other reported burials had been disturbed in varying degrees by human action.

An attempt will be made to compare burial goods and behavioral patterns of the Historic Indians (Tables 4 and 5). It is felt that this information should be made available to other researchers. The data from materials resting in repositories and the few published reports have been consolidated into a mass of data which, hopefully, will reveal characteristics heretofore unknown or not recognizable in in-

dividual reports. The senior author visited the Panhandle-Plains Historical Museum in Canyon, Texas and the Texas Tech Museum in Lubbock. The recently discovered Caprock burial is in manuscript form (Conner, Allison and Runkles, ms.) and the authors have graciously let us have a copy of the paper they are preparing for publication. The unreported burials represent seven burials, or over double the number that have been reported from this area.

Historic burials have been reported by Newcomb (1955), Suhm (1962), Ray and Jelks (1964), Bennett (1968), Hester (1968), and the previously mentioned Morgan Jones site by Parsons (1967). However, the burials reported by Hester (1968) will not be included in this analysis because burial goods are limited to only a few items and burial details were not recorded. Including the Cogdell burial there are 13 historic burials from which to draw inferences and to synthesize characteristics. Each interment contains one or more unique burial goods as well as elements in common. These minor characteristics will not be dealt with at this time for they do not seem to have a common denominator except to demonstrate that people are individuals and are not bound by rigid customs. Table 4 gives the characteristics for each burial.

One of the problems involving analysis of unreported burial traits is that only the Yellowhouse (Newcomb 1955), White (Suhm 1962), Watson (Ray and Jelks 1964), Morgan Jones (Parsons 1967), Caprock (Conner, Allison and Runkles ms.) and Cogdell burials are adequately documented as to location, position of the body and/or burial goods. As for the unreported burials used for statistical purposes, it is assumed that all the burial goods were given to the repositories, but it is probable that items were lost, given away or kept by the donors. Small objects could have been overlooked if the matrix was not carefully screened, and this is not known. The three female burials and six male burials do not indicate a great difference in burial offerings. Another possibility is that some of the burials occurred at times of stress (if it is assumed that all the burial offerings are present), or that the deceased was not a person of prominent family or tribal status, as reflected in the paucity of burial goods. On the other hand, it is a possibility that those with copious funerary offerings were highly respected.

It appears that some burial goods were consistently placed with the body. In compiling a list of burial goods, there is no way to determine if some items were occasionally left out or were of perishable nature and were not evident when the burial was discovered. For example, glass beads would probably be associated with either or both beaded garments and necklaces. Therefore, any list is probably incomplete

when the burial was found in an unsheltered place. Another factor already mentioned is the method used in recovering burial goods. If the matrix was screened, imperishable items would be relatively complete; but if the matrix was not screened, many smaller items would not be represented.

The list (Table 4) included here represents what was associated with the burials either in reports or in donations to the two museums. The most common material was horse gear of one sort or another (present in eleven of the thirteen burials). Brass bracelets and glass beads were the next most common items and were found with ten of the thirteen burials. European tools such as hoes or similar objects and fabrics were recovered in eight instances. Native-made artifacts, finger rings, conchas and hair pipes are well represented with six occurrences. Metal knives, possible food offerings and leather garments occurred in five burials, but leather garments probably should have a higher representation. Perhaps rodent action and failure to include tattered and soiled fragments of garments account for the low representation. European utensils, tinklers, buttons, hawk bells, pigment, body wrappings and shell beads or pendants have a frequency of four out of the thirteen.

It was surprising to find only three mirrors. de Mezieres (Bolton 1914) and Navarette (Newcomb and Field 1967) list mirrors as standard items of trade. Wallace and Hoebel (1952) state that goods including mirrors were used to lure the Comanches to treaty conferences, and that a warrior spent much of his time grooming and was especially proud of his hair. Equally surprising was the recovery of wooden or metal kegs and buckets and musical instruments associated with three burials. Aboriginal necklaces or pendants of perforated animal claws and teeth were to be expected. The recovery of only two European weapons may be the result of not all such items being included in the material donated to the museums. It is also possible that firearms represented articles so vital to every day need they were not commonly left as an offering. Metal pendants may have been overlooked unless the matrix was carefully screened. Those objects found only once probably represent the whim of those giving memorial gifts and it would be unusual to find all burial offerings to be consistent.

Aboriginal objects such as projectile points, bifaces, and scrapers were frequently placed with the body and may be a hold-over from more primitive times. European tools and utensils appear to be a common grave offering and metal knives were the most common of such objects observed or reported.

There are twenty-one burial traits recorded by Berlandier (1969), Wallace and Hoebel (1952), Newcomb (1961), and K. Ten Kate

TABLE 4

HISTORIC BURIAL CHARACTERISTICS

PHYSICAL TRAITS	Merrell	Child	Collinsworth	Dean	McKaskle	Biddy	Caprock
	PPHM	PPHM	PPHM	TTM	TTM	TTM	
SEX	M	?	M	F	M	?	F
AGE	Adult	Child	Adult	Adult	Adult	Child	Adult
BODY POSITION	?	Flex	?	Flex	Ext	?	Flex
NICHE OR OPEN	Niche	Open	Niche	Open	Niche	Niche	Niche
BURIAL GOODS							
Horse gear	X			X	X	X	X
Bracelets		X	X	X	X	X	X
Glass beads			X	X	X	X	X
Fabrics			X		X	X	
European tool	X			X		X	
Ind. artifacts	X			X	X		
Finger rings					X		X
Conchas	X				X	X	X
Hair pipes			X			X	
Metal knives	X			X		X	
Food offering	X	X			X		
Leather garm'ts					X		X
Euro. utensils	X					X	
Tinklers							X
Buttons					X		
Bells						X	
Pigment					X	X	
Body wrapped					X	X	X
Shell pendants					X		X
Mirror							X
Barrel-keg	X			X		X	
Perf. claw-teeth					X		
Mus. instrumts.					X	X	
Euro. weapons	X						
Ceremon'l fire					X		
Metal pendants		X			X		
Pipe					X		
Hair ornament							
TOTALS	9	3	4	7	18	14	10

TABLE 4 (continued)

HISTORIC BURIAL CHARACTERISTICS

White	Watson	Yellowhouse	Morgan Jones	Dawson Co.	Cogdell	
?	F	M	M	?	M	
Child	Adult	Adult	Adult	Adult	Adult	
?	Ext	Flex	Flex	Ext	Ext	
Open	Niche	Niche	Niche	Niche	Niche	
						Totals
X	X	X	X	X	X	11
X	X			X	X	10
X	X	X	X		X	10
X	X	X	X		X	8
X	X		X	X	X	8
X		X	X			6
X	X	X			X	6
X					X	6
X		X	X		X	6
		X		X		5
X					X	5
X		X			X	5
		X		X		4
X	X	X				4
X	X				X	4
X	X	X				4
	X		X			4
					X	4
			X		X	4
	X				X	3
						3
			X		X	3
X						3
		X				2
					X	2
						2
						1
					X	1
15	11	12	9	5	17	134

(Hester and Stross 1973a).* These traits are listed in Table 5. Only two traits are common in all four accounts; six are reported only once by one or another, five are recorded twice, and three traits are common in nine instances. However, some of these behavioral patterns can not be tested from archeological recovery. The behavioral patterns associated with burials that can not be verified are as follows: burial was the same for those killed in battle and those who died in camp; men accompanying the deceased on a raid cut their hair and wept; the bathing of the corpse; body mutilation of mourners; destruction of the deceased's possessions not included as burial goods; destruction of the tipi and a funeral dance. However, many of the burial practices can be compared either by direct evidence or be inference. These are as follows: body flexed and bound in position; face and/or body painted with vermillion; body dressed in finest clothes; wrapped in buffalo robe or blanket; flexed body buried in sitting position or on side; body taken to grave site on a horse; buried in crevice or secluded place; body faced to east; deceased's possessions buried with him; saddle and bridle included in burial goods; grave covered with rocks; ceremonial fire built; favorite horse killed; and life after death. Thus, there are fourteen burial traits reported in ethnographic accounts that can be verified from published and unpublished data and from direct evidence or by inference.

According to various accounts, beginning with Berlandier in the 1830's to 1883 (H. Ten Kate), it appears that some of the practices were abandoned, perhaps from necessity. However, even though restricted by reservation life, the Comanches apparently continued to follow traditional practices as far as possible.

Interments made while the group was permanently encamped were probably given full ceremonies (Berlandier 1969: 96). By inference it is possible that death away from the main camp resulted in abbreviated ceremonies. Wallace and Hoebel (1952: 149) report that burial took place as quickly as possible and that the body was prepared with considerable care. However, if death occurred while on the trail or on a raid, it is possible that short cuts were taken.

Wallace and Hoebel (1952: 150) and Newcomb (1961: 173) state that the body was bound in a flexed position before *rigor mortis* had set in

* Some additional burial traits, not included in the present analysis, are reported by Hester and Stross (1973b: 43-44). These were recorded by a trapper who claimed to have been a Comanche captive ca. 1820-1840. Certain of the traits are similar to those reported by Berlandier (see Table 5) during roughly the same time period. These include the killing of a favorite captive to accompany the deceased (Berlandier 1969: 96; Hester and Stross 1973b: 43).

TABLE 5
BEHAVIORAL PATTERNS ASSOCIATED WITH THE COMANCHE BURIALS

Traits	Berlandier	Wallace & Hoebel	Newcomb	H. Ten Kate
Burial Same for Battle or Camp	X			
Raid Companions Cut Hair and Wept	X			
Corpse Bathed Before Burial		X	X	
Body Flexed and Bound with Rope		X	X	
Wrapped in Robe or Blanket	X	X	X	X[1]
Body Dressed in Finest Clothes		X	X	X
Pigment on Body and or Face		X	X	X
Women and Family Slash Body and Clothes	X	X	X	X
Body Taken to Grave on Horse		X	X	X[2]
Body Buried on Side or Sitting		X	X	
Buried in Crevice or Lonely Place	X	X	X	X[3]
Body Placed Facing East		X	X	
Deceased's Possessions Buried with Him	X	X	X	X
Burned Possessions and Tipi Not Buried	X	X	X	X
Grave Covered with Rocks	X	X	X	
Gifts and Clothing Burial Goods	X	X	X	
Saddle and Bridle Burial Offering		X		
Killed Favorite Horse	X	X	X	X[4]
Killed Favorite Wife[5]	X[5]			
Built Ceremonial Fire and Danced		X		
Totals	11	17	15	9

Note 1 — Implied
Note 2 — Implied
Note 3 — Implied
Note 4 — Horses not killed in 1883
Note 5 — Abandoned after 1804

and if possible was buried in a crevice. There is no evidence of any of the bodies being bound since bindings have not been found and four bodies were either fully extended or the legs bent only slightly. Two crevice burials were flexed. Those buried on the Llano Estacado and some distance from the escarpment were flexed. In crevice burials it was noted that orientation of the face in an easterly direction depended on how the burial chamber was oriented; this is inconsistent with Wallace and Hoebel's and Newcomb's statements. In the Cogdell burial the small shelter ran north and south, but the head was facing west. In any case, none of the records indicate that the body was placed in a sitting position. The Watson site (Ray and Jelks 1964: 127) is an exception in that this female was buried in a standing position and for statistical purposes is considered extended.

The reported practice of burying a bridle and saddle with the deceased appears to be a common trait and may be symbolic of the reported custom of killing a horse near the grave (Wallace and Hoebel 1952: 152; Berlandier 1969: 96). Suhm (1962: 117) reported horse bones associated with the White site; it is the only published account of this practice, which may have been optional.

The wrapping of the body in blankets or bison robe appears to be a trait as reported by Berlandier (1969: 95), Wallace and Hoebel (1952: 150) and Newcomb (1961: 173) when there was ample time to provide a full burial ceremony. However, the unreported burials and ones interred in the open can not be used for analysis since burial wrappings may have deteriorated. The occurrence of pigment is also probably biased and should be higher on the list due to lack of trained observation and dissipation of pigment stains in non-crevice burials.

Suhm (1962: 96-97) found items such as finger rings and bracelets too large to have been worn by the deceased. The Cottle County child had oversized bracelets, files, adult sized stirrups, knives,and metal powder cans. In these two burials it seems that offerings were made which were not personal possessions of the deceased. This trait would be difficult to determine in adult burials since no out of context offerings could be discerned, but probably is a custom as reported by Wallace and Hoebel (1952: 195), Newcomb (1961: 174), and Berlandier (1969: 96). They state that outsiders who had no personal claim to share in the estate could establish a claim against the estate of the survivors by providing property of their own to be buried with the deceased.

Wallace and Hoebel (1952: 151) state that sometimes a fire was built and a funeral dance was held. It is not stated that the fire was built on the grave covering the body. However, the McKaskle and

Cogdell burials had fires built on the grave, suggesting that in some cases this was a custom. The possible use of ceremonial fires may be an indication of special status or may result from some purification ceremony.

In the Cogdell burial two travois poles were broken into three nearly equal parts and placed over the chest along with a travois brace. Wallace and Hoebel (1952: 151), Newcomb (1961: 173), and Berlandier (1969: 96) state that the tipi in which the deceased died was destroyed. The broken travois poles may be symbolic of the destruction of the tipi, or the body may have been transported to the place of burial by travois which may have been the last vestige of the tipi to be destroyed.

Suhm (1962: 106), in her report of the White site, reported faunal remains that may have been food offerings. In the examination of unreported burials three other instances were noted where faunal remains were with the body, and the Cogdell burial definitely had food offerings. The Merrell site contained the remains of a bison hump; the child burial at the Panhandle-Plains Historical Museum contained the remains of a rabbit. The McKaskle burial produced a bowl containing possible remains of food. The Cogdell burial food offerings were represented by either *Bison* or *Bos* bones which had been sawed by a steel saw and placed by the body.

There is an additional possible burial custom suggested by the Cogdell burial. There were two sets of clothing and moccasins. One set was on the body and the other folded and placed near the body. Berlandier (1969: 96) states a warrior's clothes were buried with him when circumstances permitted. The clothing on the body was of plain, every day type. Berlandier (1969: 50) reported that the Comanche were poorly dressed except when going to war. This suggests that special clothing was worn only on important occasions. The clothing placed beside the body was highly ornamented with bead work. Thus, it appears that the best and most treasured objects of clothing were not regularly worn, but were reserved for the anticipated after life of the deceased. Wallace and Hoebel (1952: 186-187) and Newcomb (1961: 188) gave a detailed account of the belief in existence beyond death in which the ideal life was anticipated. It would seem natural that the best clothing would be reserved for this great event.

Wallace and Hoebel (1952: 214) state that a Comanche wife was considered chattel. Berlandier (1969: 118) states that the Comanche were polygamous and this provided the husband with more servants. Women were bought and could be abandoned at any time. This implies that women were generally held in low esteem and served as a labor force and as a source of children. However, Wallace and

Hoebel (1952: 214) state that sometimes women were allowed in council meetings. Apparently some women were held in greater esteem than reported by Berlandier. The Caprock burial in Garza County (Conners, Allison and Runkles ms.) had an abundance of grave goods and the Watson site (Ray and Jelks 1964) had more than average burial offerings.

HISTORIC ABORIGINAL TRADE One of the least known activities dealing with Historic Indians of the southern Plains concerns trade goods or items of European derivation. One facet of this problem is: who were the traders, and did all the various tribes and clans have equal access to their goods? As far as can be determined at this date, this problem can not be resolved, but some light can be shed on this issue.

In an effort to learn as much as possible about where glass beads in particular were coming from, T. N. Campbell of the University of Texas at Austin was consulted. His thoughts disclosed three possible sources of European goods. He suggested that there was no need to have direct contact with traders. In other words, one group having a vis-a-vis access to trade goods probably had contact with more inaccessible Indians. In this way groups of Indians in remote areas could acquire trade goods by second and third hand. Newcomb (1961: 161) states that the Quahadi band of Comanche occupied the Cogdell burial area and were more isolated from the active trade areas of the French and Spanish. Goods such as glass beads, brass wire, mirrors, cloth, guns and other desirable goods could have filtered into the area from people to the east and west. It was also suggested that European goods were probably acquired through raids and by taking coveted objects from corpses of victims, either aboriginal or European. The Comanche, once they had established their domain on the southern Plains after 1780, frequently raided as far south as northern Mexico (Campbell and Field 1968: 129). Bolton (1914) in his comprehensive work on the governorship of de Mezieres cites many instances of Comanche raids as early as 1768 and as far east and southeast of their regular territory as east Texas (Grand Cado) and Bahia del Espiritu Santo, the Presidio of San Antonio, and neighboring places.

Pedro Vial (Loomis and Nasatir 1967) made several trips into the southern Plains from late 18th century to early 19th century recording several interesting observations concerning the relationships of the Comanche and the people of New Mexico. Vial stated that Spanish colonists in New Mexico lacked many of the comforts of the times. Under such circumstances it is unlikely that glamour objects such as beads and brass wire would be imported for trade to Indian groups.

Instead, goods normally brought into distant areas for every day use or locally made items would more likely be trade material.

Vial's reports offer clues as to how goods filtered down to the Comanche. Trading fairs were held with some regularity in Taos and were attended by Navahos, Cheyenne, Kiowa, Kiowa-Apache and Comanche. In addition to Spaniards, English, French and American traders were present at various times in the western Red River area. Undoubtedly there was ample opportunity for desirable goods to be acquired through these sources. It is also likely that there was a cultural interchange between groups. In such circumstances designs in beaded leather could have passed from one group to another. Many of the goods such as brass,beads, saddlery, silver, blankets, cloth, mirrors and other objects could have been available.

Almaraz's (1971) translation of the governorship of Salcedo from 1803 to 1813 reveals Comanche raids in the central Texas and San Antonio areas. Taylor and Hammons (1957) give good evidence (1817-1822) that the Comanche were actively raiding in southern settlements of Texas during Martinez's governorship. While Spanish trade with Indian groups diminished during the governorships of Alvarez and Martinez, illicit trade was taking place. Acquisition of European goods by raiding is a strong possibility if not an established fact.

It is highly probable that the Comanche had opportunities to acquire European goods from their aboriginal and European enemies and from the Apache in particular. Wedel (1959: 74) writes that by 1739 the Apaches had been displaced by the Comanche in the area northeast of Santa Fe. It is possible that some of the European goods in the hands of the Comanche resulted from such conflicts since the Apache were mortal enemies of the Comanche and their Wichita allies. The treaty with the Wichitas in the 1740's (Newcomb and Field 1967: 241) consolidated the eastern front of the Comancheria and the treaty with the Kiowa about 1790 (ibid.) provided security on the northern front. These treaties are significant since they made possible the consolidation of their territories and provided the opportunity for raids into eastern New Mexico and into the south against the Apache.

This brings up the question as to where the Commanche bands who had contact with European traders got the bulk of their trade goods. The treaty with the Wichita increased the input of trade goods. The French had established a rapport with the Wichita earlier in the 18th century. Newcomb and Field (1967: 268) state that Indians were given presents which included beads and blankets in 1761. In 1759, the French were trading guns and other items to the

Wichita (ibid.: 264). Still later, Navarette sent Calahorra presents of mirrors, clothing, hoes, beads, wire and cloth (ibid.: 271). During the governorship of de Mezieres, from 1768 to 1780, gifts were given to maintain peace on the frontier north of San Antonio. De Mezieres (Bolton 1914) gives inventories of goods which included shirts, guns, blankets, cloth, copper kettles, gun powder, balls, vermillion, glass beads, thread, axes, adzes, knives, hawkbells, tobacco, mirrors, wire and other goods. These peace offerings continued during the entire governorship of de Mezieres. While these goods were generally traded with Indian groups bordering the Edwards Plateau and East Texas, illegal trade was also active during this time. Illegal traders accepted deer skins, bear fat, and buffalo hides for their wares (Bolton 1914). It is of interest to note that, in the manifests given by de Mezieres, the most common colors of beads were blue, white, red and black; but blue and white dominated. Bolton further reports that in September, 1778, de Mezieres set out with a small escort with gifts to visit the Indians of the north.

Almaraz (1971: 12, 72, and 157) reported hostile Indians (Comanche) in the vicinity of San Antonio during the governorship of Salcedo from 1808 to 1813. Salcedo requested reinforcement from Nacogdoches for protection against the Comanches. It is interesting to note that the raids generally lessened from mid-spring through December, which probably coincided with the migration of bison. Taylor and Hammons (1957) state that the raids were so numerous that they became "old hat" and no longer merited special mentioning.

Padilla (Hatcher 1920: 53-56) reported on the Indians of the Province of Texas and listed the Comanche as the most numerous of the hostile tribes. He states that up to 1811 the Comanche were not so well armed (it is assumed he meant with firearms). However, a revolution had broken out in Mexico and the Comanche became emboldened and raided, taking great numbers of livestock and prisoners.

In 1822, the Mexican Revolution against Spain became a reality. For a number of years little was done to protect the frontiers of civilization and Indian depredations increased. By 1828, Texas was still a lightly populated region and still predominantly an Indian country (Berlandier 1969: 1). Berlandier *(ibid.: 31)* reported that in September, 1828, the arrival of Indians at frontier presidios was a special occasion. It was reported that several hundred Comanches visited Bexar for trading. It is further stated that even the most hostile Indians (Apache, Charticas, and Comanche) engaged in at least a little trade. Nacogdoches was an active trade center and furs and hides were bartered. The other Mexican presidios had neglected trade and

Berlandier stated that it was too late for them to compete. The Indians were particularly interested in knives, hardware, weapons, ammunition, and spirits. Berlandier (1969: 120) states that the Comanche had been trading in Santa Fe, New Mexico, for over a century; silver ornaments for personal adornment and horses are listed as items of trade.

American traders were also competing for the Indian trade at this time and were coming to the Indian encampments for horses taken from the townspeople. In addition to the items acquired from Nacogdoches, the American traders offered cloth and cinnabar.

The most direct trade with the Comanche of the Llano Estacado was with the Comancheros. The most complete study of this relationship has been reported by Kenner (1969). By early in the 19th century, trade had developed to the point that regular meeting places had been established. One place frequently mentioned is the Quitaque Creek area which lies but a few miles northeast of the Cogdell burial. Prior to Kenner's report, Haley (1935) published a brief paper on Comanchero trade. He mentions beads as a trade item *(ibid.: 163)*. Common goods listed for barter are ammunition, lead, muskets, knives, calico, whisky, flour and bread. Kenner (1969: 85) adds saddlery, metal arrow points and blankets. Kenner *(ibid.: 94)* reports that captives of the Comanche were ransomed by the Spanish. The ransom for a young woman was "two striped blankets, ten yards of blue cotton drilling, ten yards of cotton shirting, two handkerchiefs, four plugs of tobacco, one bag of corn, and one knife." Kenner (1969: 178) gives an inventory of goods taken in the year 1867 from a group of Mexicans (Comancheros) who lacked a trade permit from the New Mexican territorial government. The inventory includes corn meal, Mexican hard bread, butcher knives, files, vermillion, shirts, flannel, vests, iron hoops, ducking, calico, shelled corn, tea, sugar, flour, letter paper,candy and percussion caps.

Lowell H. Harrison (1965) reported on the activities of three Comancheros in the 1860's in court action brought by Goodnight and Sheek against the United States in an effort to recoup losses of cattle and horses from depredations of the Comanche. It was alleged that the Comancheros traded goods to the Comanche for stolen livestock. In sworn testimony of Tafoya (previously a Comanchero), a generalized list of trade goods is given which includes beads, flour, baked bread, cloth and calico. The testimony of Julian Baca *(ibid.: 89)* states that trade also took place with the Kiowa as well as the Comanche. This statement is of interest because all of the witnesses mention the Quitaque area just off the Llano Estacado escarpment as one of the principal trading centers and Harrison's is the only account of

Kiowas being in the vicinity of the Cogdell burial in the 1870's. Newcomb (1961: 195) states that the Comanche and Kiowa treaty was concluded about 1790 and thereafter the Kiowa, Kiowa-Apache, and Comanche shared trading territories and often raided together. However, the normal range of the Kiowa and Kiowa-Apache was generally in the northern part of the Texas Panhandle, and the Quahadi band of the Comanche was south of the Red River, as shown by Newcomb (1961: 161).

From the foregoing discussion it can be demonstrated that while the Comanche of the southern High Plains were remote from Spanish, French, English, and American traders, they probably had access to goods through second and third hand contacts as well as by raiding and warring against other Indian groups. Comanchero trade was generally of more mundane goods, but beads and other exotic materials may have been occasional trade items. War parties and raids probably provided a considerable volume of goods consisting of glass beads and brass wire bracelets; in other words, goods that could be easily transported by fast moving raiders on horseback.

CONCLUSIONS

It is difficult to account for the 150,000 beads in this burial in the light of a dozen early travelers' descriptions of the Comanches as using few beads and little decoration on their clothing. Juan Antonio Padilla in 1820 said the Comanches wore "only a breechclout," adding buffalo skins in cold weather (Padilla 1920: 54). In 1844, Josiah Gregg observed, "Comanche dress consists of the usual leggins, moccasins, flap and blanket or robe." The only mention he made of beads is that they were worn in the hair (1933: 432).

Early artists such as Sanchez y Tapia in 1828 (Berlandier 1969: Plates 2 and 3) and Catlin in 1830 (1926: Figs. 165, 168-172) show only necklace beads. Bollaert's sketch of 1844 (Berlandier 1969: Fig. 18) shows a bag similar to the beaded ones of the Berlandier and Witte Museum collections, but the drawing is too vague to be sure if it is beaded. The Berlandier collection (which could date anywhere from 1828 to 1851) contains only three beaded articles — the pouch mentioned above, a smaller pouch (Fig. 35) and a simple band on a feathered bonnet (Fig. 29). To judge from the photographs and descriptions, the beads are primarily blue and white and over .3 cm. in diameter, with the exception of the small beaded pouch which has other colors as well and smaller beads.

There is a gap of about thirty years between the time of these accounts and the start of the reservation period in 1870. After a con-

certed effort to locate early beaded items, it is the reluctant conclusion of the authors that nearly all of the preserved Comanche materials in the United States date from 1870 on. These later articles are so obviously influenced by other Plains tribes in their color and design as to make identification nearly impossible unless there is documented provenience. By this time also the bead size is almost without exception in the extra small (.2 cm. or smaller) range.

The 41FL45 site appears to fall in the little known period of early contact and trade when the Spanish traders from New Mexico, French from New Orleans, and Americans from the Mississippi were bringing in seed beads in increasing numbers, and contact between the tribes brought about amalgamation of designs and innovations in dress. For instance, it was not until after 1840 that the Comanche began to wear shirts of any kind, according to research done by Mary Jane Schneider (1969:8) in an interesting article on change and development in Plains Indian clothing.

A number of questions have yet to be answered concerning bead work of this 1840 to 1870 period.

1. Was a preference for blue and white beads limited to a few specific tribes, or was it perhaps a universal preference during this early period? Lewis and Clark found the same preference among the Indians of the Columbia River area in 1805 (Shiner 1961: 209). A site on Berrian's Island in the Columbia, which dated from the middle 1700's into the early 1800's, yielded over 600 beads, of which about 75% were blue and the rest largely white (Osborne 1957: 98). The Spanish in extensive trade with the Comanches, Lipans, and Tancahuas at San Antonio in 1808, distributed only blue and white beads in equal proportions (Curtis 1955: 74). Traders at Bent's Fort in the 1840's observed that "white and blue beads in that order were preferred by Cheyenne women," while red beads were not popular (McNitt 1962: 37).

2. Was the acceptance and use of the "pony bead" as an embroidery bead among the Comanches accomplished gradually over a period of time and, if so, can this gradual acceptance be used as a means of comparative dating of sites? More work must be done before this tentative theory can be substantiated. Materials from a number of unpublished sites in the area would appear to bear out the dating sequence, but these and other similar ones containing datable artifacts will have to be carefully analyzed before conclusions can be drawn.

3. Why are there no eyewitness accounts of these early beaded garments? Were they extremely rare or for some reason kept from the view of outsiders? Historian T. R. Fehrenbach has suggested (per-

sonal communication) that the Comanche were not particularly hospitable or communicative toward early settlers and travelers during this period, which might account for the lack of descriptions.

4. How accurately would the artifacts found in a Comanche grave reflect the date of burial? There is some evidence that treasured articles were sometimes given at death to a friend or relative, despite the tradition that a man's most treasured possessions were buried with him (Wallace and Hoebel 1952: 152). The chance of the presence of such heirloom objects is certainly great enough to be taken into consideration during analysis.

5. What was the source of these early "pony beads" and was there more than one country making them? Were all of the traders acquiring them from the same source, or might it be possible to tell Mexican from New Orleans traders' goods? Arthur Woodward (1965: 9) says that some glass beads were manufactured in France and Czechoslovakia in the early 19th century. It is also possible that glass beads were being made in Mexico, perhaps in Puebla (King Harris personal communication).

6. At what point in time did the Comanche begin to use the more complicated geometric designs prevalent in the reservation period? Only the simplest stripes, bars, and squares were used on what appear to be the earliest pieces. This corresponds with Lyford's descriptions of the earliest pony bead period among the Sioux, which was 1800-1840 (1940: 66).

7. Are there documented early beaded garments of Comanche and other Southern Plains tribes still in existence in museum collections which might help to answer these questions? Richard Conn of the Denver Art Museum has remarked on the similarity of these beaded fragments to examples of historic Jicarilla Apache and Comanche man's shirts and leggings in that museum's collection (personal communication, 1973).

An ever present problem dealing with Historic burials from this area is "to which tribe did the deceased belong?" Probabilities will be discussed, but it can not be resolved with any certainty.

About 1790 the Comanche, Kiowa, and Kiowa-Apache signed a treaty (Newcomb 1961: 195) and the three groups shared hunting grounds in the northern Llano Estacado. They also raided together. Wallace's map (1960) showing the known historic camps of the three people indicates that after 1840 the Kiowa and Kiowa-Apache were more active in the area north of the Prairie Dog Fork of the Red River.

If the burial dates between 1850 and 1860, we can narrow the possibilities considerably. Whiting's report of 1849 (Bender 1927: 130) recommended placing troops on the Red River to hold in check the

northern Comanche. No mention is made of the Kiowa or Kiowa-Apache. In Kenner's comprehensive study of Comanchero trade (1969), mention is made of a relationship between New Mexican traders and Comanche in the vicinity of the burial. Harrison's report (1965) of Goodnight's and Sheek's attempt to collect damages resulting from cattle and horse thefts by Comanche cites the testimony of three ex-Comancheros. In each instance, their activities were in the Quitaque area and principally with the Comanche. Wallace (1964: 23) states that in 1865 the Quahadi band of Comanches occupied an area along the headwaters of the Colorado, Brazos, and Red Rivers. He also states that the Kiowas had left the reservation due to unrest resulting from poor quality goods they were receiving from the federal government. At this time, they joined the Comanche and were raiding in the vicinity of Waco. Ewers (in Berlandier 1969: 135) reports in a footnote that Indian agent Fitzpatrick stated that the Kiowa-Apache in 1850 had for many years lived with the Kiowas and Comanches. Berlandier (1969: 135) places the Kiowa-Apache on the Red River by 1830. It is evident that the Kiowa and Kiowa-Apache often joined in raids on settlements. However, the Cogdell burial individual did not appear to have died from wounds since no evidence of violence was noted. It is possible that a lethal projectile missed all the bones, but it is unlikely since the rifles of this period were of large caliber. A pure lead projectile mushrooms quite rapidly and it would be fortuitous if it missed all the bones. It can be assumed that the deceased was in his own environment. The burial offerings suggest a full ceremony without duress.

No positive identification can be made from burial goods. It was hoped that beaded designs on leather clothing would be of assistance, but such articles for the estimated time of death have not survived in any appreciable number. Jack Hughes of West Texas State University and Frank Weir, archeologist for the Texas Highway Department (personal communication) feel that the alternate banding of blue and white beads suggests a northern Plains influence. On the other hand, illustrations by Berlandier and collections of Comanche beaded objects in the Witte Museum in San Antonio are similar to Cogdell burial material.

The strongest possibility is that the Cogdell burial represents a Comanche interred between 1850 and 1860.

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REFERENCES CITED

Almaraz, Felix C., Jr.
1971 *Tragic Cavalier, Governor Manuel Salcedo of Texas*. University of Texas Press.

Anderson, Adrienne
1968 The Archaeology of Mass-produced Footware. *Historical Archaeology*, Vol. II, pp. 56-65.

Bender, A. B.
1927-28 Opening Routes Across West Texas, 1848-1850. *Southwestern Quarterly*, Vol. XXXVII, No. 2, pp. 116-135.

Bennett, R. A.
1968 Dawson County Historical Burial. *Transactions of the Fourth Regional Archeological Symposium for Southeastern New Mexico and Western Texas*, p. 78.

Berlandier, Jean Louis
1969 *The Indians of Texas in 1830*. Edited by John C. Ewers. Smithsonian Institution Press.

Bolton, Herbert E.
1914 *Anthanase de Mezieres and the Louisiana-Texas Frontier, 1768-1780*. (2 Vols.). Cleveland.

Campbell, T. N. and W. T. Field
1968 Identification of Comanche Raiding Trails in the Trans-Pecos, Texas. *West Texas Historical Association Year Book*.

Catlin, George
1926 *North American Indians, Vol. II*. Edinburg

Conn, Richard G.
1972 The Pony Bead Period: A Cultural Problem of Western North America. *The Society for Historical Archaeology Newsletter*, Vol. 5, No. 4, pp. 7-13.

Conners, Mrs. R. S., Mr. and Mrs. Rex Allison, and Frank A. Runkles
ms. The Caprock Site: A Historic Indian Burial in Garza County, Texas. Unpublished Manuscript.

Curtis, Albert
1955 *Fabulous San Antonio*. Naylor, San Antonio.

Duffield, Lathel F. and Edward B. Jelks
1961 The Pearson Site: A Historic Indian Site in Iron Bridge Reservoir, Rains County, Texas. *The University of Texas, Department of Anthropology, Archeology Series*, No. 4.

Ewers, John C.
1957 Hair Pipes in Plains Indian Adornment. *Bureau of American Ethnology Bulletin 164*, pp. 29-85.

Ford, Alice (Compiler and Editor)
1951 *Audubon's Animals, The Quadrupeds of North America*. New York.

Gregg, Josiah
1933 *Commerce of the Prairies*. Southwestern Press.

Haley, J. Evetts
1935 The Comanchero Trade. *Southwestern Historical Quarterly*, Vol. XXXVII, No. 3, pp. 157-176.

Harris, R. King and Inus Marie Harris
1967 Trade Beads, Projectile Points, and Knives. A Pilot Study of Wichita Indian Archeology and Ethnohistory. Assembled by Robert E. Bell, Edward B. Jelks, and W. W. Newcomb. National Science Foundation Report, pp. 129-162.

Harrison, Lowell H.
1965 Three Comancheros and a Trader. *Panhandle-Plains Historical Review*, Vol. XXXIII, pp.73-93.

Hester, Thomas Roy
1968 Notes on Some Historic Indian Artifacts Found near Ozona, Texas. *Newsletter*, Midland Archeological Society; June, 1968, pp. 2-4.

Hester, Thomas R. and Fred H. Stross
1973a H. Ten Kate's Account of the Burial of a Penateka Comanche at Fort Sill, Oklahoma, 1883. *Southwestern Lore*, Vol. 39, No. 1, pp. 9-10.

Hester, T. R. and F. H. Stross (editors)
1973b *Ethnographic Information on the Comanches Gathered from the Mouth of a Trapper Who Was Their Prisoner for Thirteen Years (by Leon de Cessac)*. Archaeological Research Facility, University of California, Berkeley.

Kenner, Charles L.
1969 *A History of New Mexican-Plains Indian Relations*. University of Oklahoma Press, Norman.

Livingston, Phil
n.d. *Tex Tan's Cavalcade of American Saddles*. Tex Tan Western Leather Co., Yoakum Texas.

Loomis, Noel M. and Abraham P. Nasatir
1967 *Pedro Vial and the Roads to Santa Fe*. University of Oklahoma Press, Norman.

Lowie, Robert H.
1963 *Indians of the Plains*. Natural History Press, Garden City, N. Y.

Lyford, Carrie A.
1940 *Quill and Beadwork of the Western Sioux*. U. S. Office of Indian Affairs.

Mason, Otis T.
1893 North American Bows, Arrows, and Quivers. *Annual Report of the Smithsonian Institution*, pp. 613-680.

McNitt, Frank
1962 *Indian Traders*. University of Oklahoma Press, Norman, Okla.

Newcomb, W. W.
1955 An Historic Burial from Yellowhouse Canyon, Lubbock County. *Bulletin of the Texas Archeological Society*, Vol. 26, pp. 155-189.
1961 *The Indians of Texas from Prehistoric to Modern Times*. University of Texas Press, Austin.

Newcomb, W. W., Jr. and William T. Field
1967 An Ethnohistoric Investigation of the Wichita Indian Archeology and Ethnohistory. A Pilot Study of Wichita Indian Archeology and Ethnohistory. Assembled by Robert E. Bell, Edward B. Jelks and W. W. Newcomb. National Science Foundation Report, pp. 240-331.

Orchard, William C.
1929 *Beads and Beadwork of the American Indians*. Museum of the American Indian, Heye Foundation.

Osborne, Douglas
1957 Excavations in the McNary Reservoir near Unatilla, Oregon. *River Basins Surveys Papers*, No. 8. *Bureau of American Ethnology Bulletin*, No. 166.
Padilla, Juan Antonio
1920 Texas in 1820. Translated by Mattie Austin Hatcher. *Southwestern Historical Quarterly*, Vol. No. XXIII, pp. 47-68.
Parsons, Mark L.
1967 Archeological Investigations in Crosby and Dickens Counties, Texas, During the Winter, 1966-1967. *State Building Commission Archeological Program Report*, No. 7.
Ray, Cyrus N. and Edward B. Jelks
1964 The W. H. Watson Site: A Historic Indian Burial in Fisher County, Texas. *Bulletin of the Texas Archeological Society*, Vol. 35, pp. 127-141.
Schneider, Mary Jane
1968 Plains Indian Clothing: Stylistic Persistence and Change. *Bulletin of the Oklahoma Anthropological Society*, Vol. XVII, pp. 1-55.
Shiner, Joel L.
1961 McNary Reservoir: A Study in Plateau Archeology. *River Basin Survey Papers*, No. 23. *Bureau of American Ethnology Bulletin*. No. 179, pp. 149-266.
Simm, Herbert S. and Donald F. Hoffmeister
1955 *Mammals*. Western Publishing Company.
Suhm, Dee Ann
1962 The White Site: An Historial Burial in Yoakum County, Texas. *Bulletin of the Texas Archeological Society*, Vol. 32, pp. 85-119.
Taylor, Virginia H. and Juanita Hammons
1957 *The Letters of Antonio Martinez. Last Spanish Governor of Texas 1817-1822*. Texas State Library, Austin.
Wallace, Ernest
1960 *Map of the Habitat and Range of the Kiowa and Comanche Indians 1835-1867*. Texas Technological College, Lubbock.
1964 *Ronald S. Mackenzie on the Texas Frontier*. West Texas Museum Association, Lubbock.
Wallace, Ernest and E. Adamson Hoebel
1952 *The Comanches, Lords of the South Plains*. University of Oklahoma Press, Norman.
Wedel, Waldo R.
1959 An Introduction to Kansas Archeology. *Bureau of American Ethnology Bulletin*, No. 174, Washington.
Woodall, J. Ned
1967 Miscellaneous European Trade Goods. A Pilot Study of Wichita Indian Archeology and Ethnohistory. Assembled by Robert E. Bell, Edward B. Jelks, and W. W. Newcomb. National Science Foundation Report: pp. 180-183.
Woodward, Arthur
1965 Indian Trade Goods. *Oregon Archaeological Society Publication* No. 2.

Floydada, Texas
San Antonio, Texas

SKELETAL MATERIAL FROM THE COGDELL BURIAL IN FLOYD COUNTY, TEXAS

GLEN H. DORAN AND ROBERT M. MALINA

The following text describes the skeletal material from 41FL45, the Cogdell burial site.

MATERIAL

The skeleton was in excellent condition. A few elements of the hand and feet were missing. There also was slight rodent damage, especially to the orbits and nasal aperture. Greenish stains were found on the left wrist, distal end of the left humerus, several ribs and the left side of the skull. Large amounts of preserved flesh resulted in the articulation of major portions of the skeleton including the following:

I. Cranium and mandible.
II. Right scapula, clavicle, sternum, third through ninth thoracic vertebrae, right humerus, radius, ulna, lunate, triquetral, pisiform, first through seventh right ribs, and seventh and eighth left ribs.
III. Left radius, ulna, pisiform, lunate, navicular, greater multangular, and first metacarpal.
IV. Tenth through twelfth thoracic vertebrae, eleventh and twelfth right ribs, right innominate and sacrum.
V. Left innominate, femur, patella, tibia, fibula, and all the bones of the left foot.
VI. Right patella, tibia, and fibula.

The rest of the skeleton except a few hand and foot bones are present.

Measurements (Table 1) of the skeleton were taken following standard anthropometric techniques (Bass 1971). The skeleton will be displayed in the Floyd County Historical Museum and for this reason complete disarticulation was not possible. Several estimates are included when accurate bone measurements were not possible.* Other measurements were not possible due to the articulated condition of the skeleton.

The skeleton is that of a male exhibiting the classic metric and nonmetric male characteristics (conformation of pelvis, mastoids, chin, etc.). There is occasional minor lipping of the vertebrae and based upon the maturational stages of the faces of the left and right os

TABLE I

(Measurements in millimeters)

Maximum length (glabella-occiput)	176
Maximum breadth of cranium	135
Basion-bregma height	132
Minimum frontal breadth	88-90*
Bizygamatic breadth	142*
Bicondylar breadth	124
Bigonial breadth	111
Total facial height	115
Upper facial height	74
Nasal height	56*
Nasal breadth	30*
Orbital height (left)	40*
Orbital breadth (left)	45*
Humerus (left)	322
Radius (left)	238
Ulna (left)	261
Femur (right)	449
Fibula (right)	357

*Approximation, accurate within 5 mm.

pelvis (pelvic casts) age was estimated to be between 35 and 45 years. Based on regression coefficients for white males (Trotten and Gleser 1958) with the 0.06 cm. correction for individuals over 30 years of age, the stature was estimated to be between 168 and 173 cm.

DENTITION

The incisors show shoveling although this is obscured by the extreme dental attrition (dentine exposed over the major portion of the incisors). Attrition is marked in the check teeth. All but the second and third molars exhibit dentine exposure. More precise discussion of the degree of dental attrition was not possible due to the articulation of the mandible and the cranium. The right canines are both pushed labially, resulting in malocclusion.

PATHOLOGY

The skeleton appears free from pathology except for a slight buildup and honeycombing of tissue on the proximal end of the right fifth metacarpal, possibly the result of fracture or infection.

REFERENCES CITED

Bass, William M.
1971 *Human Osteology: A Laboratory and Field Manual of the Human Skeleton.* Missouri Archaeological Society. Columbia, Missouri
Trotter, M. and G. C. Gleser
1958 A revaluation of the Estimation of Stature Based on Measurements of Stature Taken During Life and of Long Bones after Death. *American Journal of Physical Anthropology*, n. s., 16 (1): 79-123.

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MAGNETIC DELINEATION OF INDIVIDUAL SHIPWRECK SITES: A NEW CONTROL TECHNIQUE

CARL J. CLAUSEN AND J. BARTO ARNOLD III

ABSTRACT

This report describes an efficient though low-cost means of controlling a magnetic survey to delineate the localized distortions created in the earth's magnetic field by the ferrous components of a Colonial period shipwreck site. The results of the application of this survey technique to a small mid-16th-century Spanish shipwreck located off the Texas coast in the western Gulf of Mexico are presented in computer-drawn magnetic contour map form and in a three-dimensional perspective rendition.

Following the magnetic survey the wreck site, which lay entirely hidden below unconsolidated bottom sediments near shore, was completely excavated utilizing underwater archeological techniques. The preliminary results of this excavation — in terms of the identification, mass and distribution of the artifactual remains creating the localized distortions recorded during the survey and their relationsihp to the rest of the artifact assemblage at this site — are discussed. In areas where shipwreck remains lie below sediments or are otherwise concealed from visual detection, the guidance provided by these in-site surveys can be of inestimable value to the archeologist in conducting efficient underwater excavations.

Finally, the design of the cultural resource surveys the United States government currently requires of private companies leasing outer continental shelf lands for oil and gas exploration is criticized in light of the results of this survey. Recommendations are made for increasing the effectiveness of these outer continental shelf surveys in terms of discovering wreck sites of these small, though culturally quite significant ships typical of navigation in the Western Hemisphere during the periods of exploration, colonization and early development.

INTRODUCTION

Experience has proven that the magnetometer, an electronic instrument capable of remote detection and measurement of localized distortions in the earth's magnetic field caused by ferrous artifacts, is the single most useful tool so far utilized for locating historical period shipwreck sites. The customary magnetometer survey, in a search mode with relatively widely spaced tracks — whether employed in the search for sunken ships by persons interested in the recovery of valuables (Potter 1972: 31-33; Meylach 1971: 227-228) or by those with an interest in the recovery of historical objects (Link 1959: 71-75), or more recently, for scientific investigation of shipwrecks as ar-

cheological targets (Breiner and MacNaughton 1965; Clausen 1966; Hall 1966; Green, Hall and Katzev 1967; Green 1970; Hays and Herrin 1970; Arnold 1974; Lenihan 1974; and Arnold and Clausen 1975) — is designed simply to locate sites. However, the contribution of the magnetometer in obtaining data useful to the archeologist need not end there. A survey with closely spaced parallel tracks confined to the general locale of an already discovered site, referred to in this report as an "in-site delineation survey", can provide a detailed preview of the site in the form of a magnetic contour map before excavation commences. In areas where shipwreck remains lie below sediments or otherwise are concealed from visual detection, the guidance provided by these in-site surveys can be of inestimable value to the archologist in conducting excavations at the site (Clausen 1966).

As always, in magnetic surveying and in archeology generally, the key to the value of the data and their full exploitation is the careful control of their acquisition. Radio and radar-based electronic positioning systems now exist which admirably fulfill the control requirements of both search mode and in-site delineation mode magnetic surveys (Arnold and Clausen 1975). These sophisticated systems are expensive but are available for use through lease or lease-purchase agreements.

A survey set up with optical surveying instruments and controlled visually and with the assistance of radio communications requires more input in man-hours, but costs far less. The subject of this report is a recently developed, simply executed, and inexpensive method for controlling the closely spaced tracks necessary for the production of a detailed contour map of the magnetic phenomena created by a shipwreck site situated close to a shoreline. Most important, accuracy is not sacrificed if care and judgment are exercised both in acquiring the data and in selecting sites to be surveyed in this manner.

We successfully utilized the method described in this report during the summer of 1972 for the in-site delineation of two of the three Spanish ships of the *flota* of 1554 wrecked in the Gulf of Mexico off Padre Island in April of that year. The wrecks — designated sites 41 KN 10(UW) and 41 WY 3(UW) — are located 600-700 m offshore in water depths ranging from 5 to 7 m. The total area covered by these two in-site delineation surveys was 55,000 m^2 and 80,000 m^2 respectively. The report also will reveal new means of treatment and utilization of these data and will comment upon both the results and their implication in the effective design of surveys to locate similar sites.

SURVEY TECHNIQUE

The survey is set up and run in essentially the following manner. A base line is established, more or less parallel to the shore, along which two sets of evently spaced, paired ranges are erected (Fig. 1). The first set, which is designated by letters, is established at right angles to the base line directly opposite the wreck site extending in both directions slightly beyond the width of the site. Further up the base line, the second set of ranges, designated by numbers, is established at an appropriate angle to the base line to guide the survey vessel obliquely over the site toward shore. As is typical of ranges in maritime use, the front member of the pair is shorter than the rear member so that both are visible from the water and can be lined up to maintain a true course. The survey tracks controlled by the second set of ranges mentioned above were spaced at 5-m intervals and run at a 45° angle both to the base line, and in this instance, to the shore. The letter ranges were spaced at 15 m for the wreck covering the smaller area and at 30 m for the largest site.

During the survey, the helmsman of the research vessel towing the sensor of the magnetometer simply keeps the track ranges visually aligned as he guides the vessel across the survey area toward the shore. During the traverse of the site along each of the numbered tracks, an observer equipped with binoculars stationed at a designated point near the magnetometer operator carefully watches the letter ranges on shore. As each pair of letter ranges comes into alignment the observer notifies the operator who indexes with an appropriately lettered event mark the chart recording of the magnetometer data being acquired. If desired, and if the sea state is anything other than calm, we recommend that the shore party set up a transit between the track ranges at the points designated "x" in Figure 1, and observe the course of the vessel as it approaches them. Using this instrument with the aid of two-way radio, the helmsman can be both checked for accuracy and given assistance in guiding the vessel along the track.

Because of the nature of the control system, a helmsman usually can maintain a course more accurately while conning a vessel toward the ranges. For this reason, but also because it was quickly discovered that considerable "noise" (up to seven gammas) was introduced in the magnetic record when running a reciprocal track seaward against the wave and swell action, all runs for data were made from southeast to northwest toward shore. The noise observed was apparently the result of several factors. In the area in which the surveys were undertaken, the coast trends generally north and south, and in the summer the predominant waves and swells ap-

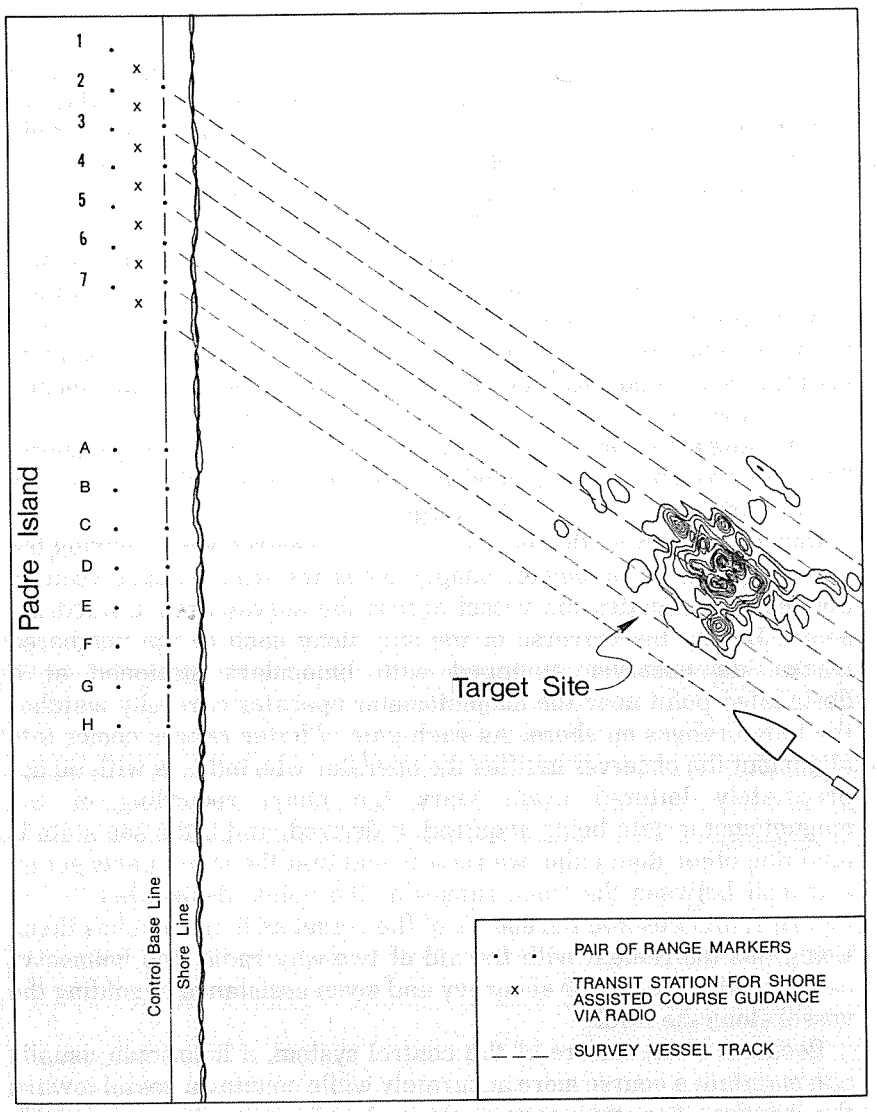

FIGURE 1. 1554 Shipwreck. Stylized plan of the control system of ranges and survey points and their relationship to the site utilized in the magnetic in-site delineation survey. The site is the 1554 shipwreck located off lower Padre Island, Texas.

proach from the southeast. Taking these seas almost "bow on" while heading away from the ranges introduced greater inconsistencies in the velocity of the vessel along the track and appreciably increased pitching, yawing and rolling of the vessel. These motions had an adverse effect particularly on the mechanical pens of the strip chart recorder used with the magnetometer and very possibly on the magnetometer. The sensor of that instrument "porpoised" somewhat at the end of the tow cable, alternately approaching the mineral sands of the bottom as the vessel was slowed by a wave and then rising toward the slight field generated at the air/water interface. Acquiring all the magnetic data on courses run on the same heading also seemed to minimize unwanted local magnetic variation attributable to geological sources. The turn-around time (i.e., the time between the completion of a successful run and the return of the vessel to a point outside the seaward boundary of the survey area, in a position and on a course to begin a new run) can also be utilized by the shore party in moving to and setting up the survey instrument on the next station.

It is, of course, the association of the magnetometer readings obtained in the above surveys with the coordinates of a grid system which makes possible the production of the contour map of the magnetic distortions created by the wreck. In reducing the magnetic data from the strip chart record in preparation for contouring, one grid axis is provided by the numbered vessel tracks. The lettered event marks along each track provide the second axis. Along this second axis the spacing of the data sample extracted for contouring should be reduced by interpolation of the distance between event marks. In the two surveys described in this report, this distance — 15 m in one instance and 30 m in the other — was divided into units closely approximating, at that angle of interception, the 5-m spacing of the numbered tracks.

It should be noted that the matrix produced by this survey system is not a right-angle grid forming squares or rectangles, but a grid forming parallelograms. This factor creates no difficulty for the investigator confined to manually contouring a site, but if the data are to be handled by a computer, the matrix must be corrected to a right-angle grid. Also, all positioning information acquired in these surveys relates to a station within the vessel and not to the sensor of the magnetometer which is the point from which the magnetic data are being collected. In our surveys the difference between these two points was approximately 50 m. This delay must be corrected for in the data prepared for entry into the computer, or the position of the wreck in reference to the survey points along the shore will be

displaced by the same distance. Computer programs already exist which will take these data and plot both two-dimensional (Fig. 2) and, for interpretive purposes, three-dimensional perspective renditions (Fig. 3).

An additional dimension can be added to the survey by running a high-resolution, recording fathometer concomitantly with the magnetometer during the traverses of the site and indexing its chart record in the same manner events are recorded on the magnetometer strip chart. These data may be used to produce a bathymetric map of the bottom in the area of the site.

Subsequent to the surveys described above, the first and smaller site surveyed — 41 KN 10(UW) located at Universal Transverse Mercator grid coordinates 669, 518^{m}E and 947,480^{m}N, Zone 14 — was completely excavated by the Underwater Archeological Research Section of the Texas Antiquities Committee during the summers of 1972 and 1973. On the basis of both archeological and archival evidence, this wreck now is believed to represent the remains of the vessel *San Esteban*, a *nao*, or possibly a *Castillian* rigged *carabela* of probably 150-250 tons, a vessel typical of the early periods of exploration and colonization in the Western Hemisphere. With the exception of the large quantities of rock ballast carried by this ship, all surviving elements of the construction of the vessel, its armament, tackle, gear and cargo, and the personal belongings of the passengers and crew were recovered — in all, a total of almost 12,000 kilos of encrusted metal and other material.

The surviving artifactual materials and the rock ballast at this site had migrated downward through the sediment and lay scattered atop a dense, level substratum of gray Pleistocene Age clay. The loose unconsolidated sediments overlying this clay in the immediate area of the wreck were approximately 1.5 m deep and consisted primarily of sand containing scattered lenses of soft silts and shell "hashes." Since the greatest elevation of any of the remains of the wreck was somewhat less than 1.5 m above the clay layer, no wreckage extended above the water/bottom interface to betray the presence of the site. Consequently, the map of the magnetic data acquired in the survey was used as the primary guide for excavation of the site. This approach was highly successful and largely obviates the need for the considerably less effective and many times unworkable (because of deep overburden), specimen-oriented approach to surveying underwater sites with induction metal detectors which has been advocated (Peterson 1965: 26, 41, 42, 44, and Plates 2-4).

Great precision could be achieved in guiding the excavations by utilizing two surveying stations on the base line ashore and simple

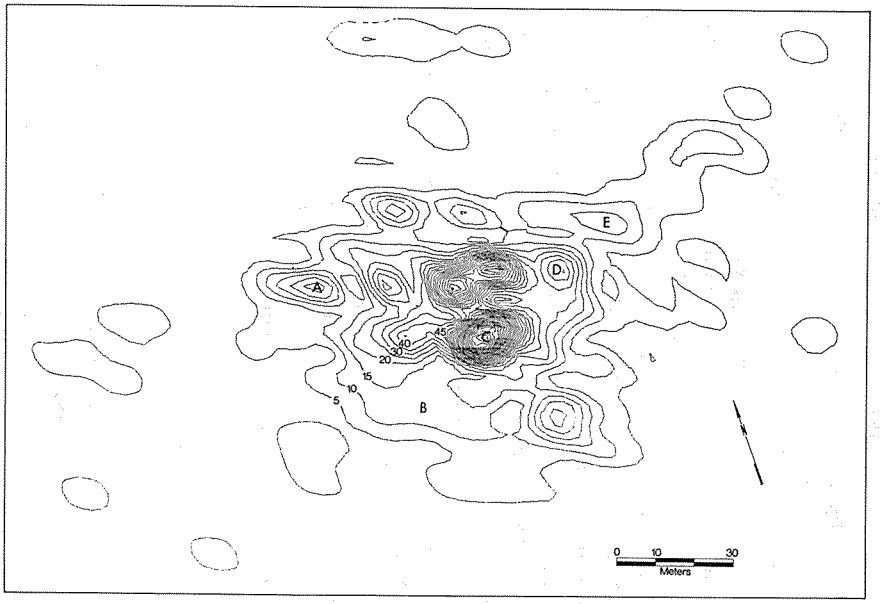

FIGURE 2. 41 KN 10(UW). A two-dimensional computer-drawn magnetic contour map of a mid-16th-century shipwreck, Site 41 KN 10(UW), located off the lower Texas coast in 6-7 m of water. The contour interval is 5 gammas. The magnetic background in the area the day the survey was run (July 24, 1972) was approximately 48,860 gammas. The sensor-to-target distance was approximately 6.5 m. The approximately 30-gamma anomaly represented by "A" is attributable to one of the seven large forged-iron anchors carried by this ship. The weight of this specimen was approximately 345 kg. The anomaly at "E" was created by a loose group of two forged-iron, hoop-barrel, *bombardetta*-type cannon and two forged-iron breech blocks or *servidors* for these weapons with a combined mass of approximately 590 kg; that at "C", a more massive distortion on the order of 125 gammas, was created by the unserviceable sheet anchor of the ship and a group of five large forged-iron breech blocks and a variety of iron ship's fastenings and smaller iron artifacts.

trigonometry, in conjunction with the magnetic contour map. In fact, on the first day of excavations during the 1972 field season, the project team was able — within minutes — to locate and identify the first target selected for examination. This was a somewhat isolated anomaly of approximately 30 gammas (Fig. 2,a) and identified as a large, mid-16th-century, forged-iron ship's anchor.

In addition, the same two stations on the survey line can be utilized as base points for establishing the provenience of artifacts and features encountered during excavation of the site. A web of sub-base points, consisting of 0.7-m lengths of serially numbered, aluminum rods driven securely into the basement clay, was established across the site as excavations progressed. The location of the sub-base points in this network was accurately determined, initially by standard surveying techniques (i.e., triangulation by theodolite sightings from the survey stations to special range rods extending vertically through the air/water interface from the sub-base point on the bottom) and by trilateration underwater, using metric tapes, from two or more already established points. The locations of all artifacts and features encountered in the wreck site were established by trilateration from two, preferably more, of these sub-base points. The position of the features was recorded both on the master site plan and in the requisite field notes. A report detailing the results of the archeological investigations carried out at this site, believed to be the earliest verified shipwreck yet found in the Western Hemisphere, and the analysis of the concomitant archival research dealing with the historical background of the 1554 fleet, is currently under preparation and is expected to be ready for publication sometime in 1976.

DISCUSSION

Virtually complete excavation and removal of all artifactual material associated with the wreck at site 41 KN 10(UW) followed the in-site delineation survey described above. The excavations permitted precise identification of the materials and the masses generating the magnetic anomalies. This enables us to comment with some precision, both on the interpretation of the magnetic signatures of shallow-water shipwrecks of wooden or composite construction and on the relationship of the distribution of the ferrous materials detected in our survey to the remainder of the artifact assemblage at this site.

All intensive distortions, up to 125 gammas, revealed by the magnetic survey, proved to represent concentrations of out-of-service

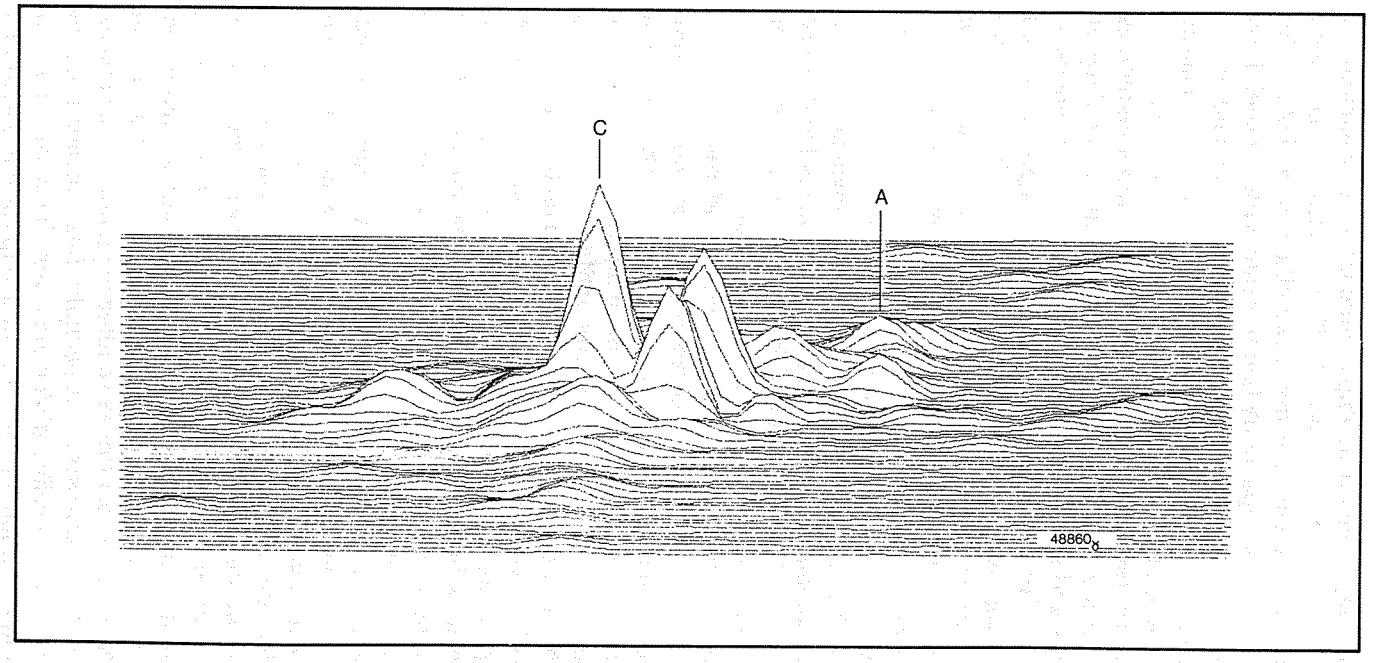

FIGURE 3. 41 KN 10(UW). A somewhat stylized, three-dimensional, computer-drawn view of the magnetic signature of the same wreck site, 41 KN 10(UW), in approximately the same scale as that depicted in Figure 2. The view is west-southwest, toward shore, from seaward of the wreck at an angle of 30 degrees to the earth's surface. The magnetic anomalies appear, for the purposes of this perspective, as rounded elevations or sharply pointed higher peaks, depending on their intensity, rising above a plain representing the local earth's magnetic field.

and/or unserviceable, forged-iron ships' anchors and armament, in various combinations (Fig. 2, c and d). These artifacts had been stored in the top few decimeters of the rock ballast in the hold of the vessel with their long axis apparently laid parallel with the keel. Less intense distortions, on the order of 15-35 gammas, were found in this wreck to be created by these same categories of artifacts but usually singly as in the case of Fig. 2, a or in pairs (Fig. 2, e). Distortions of 10-15 gammas were created by concentrations of iron ship's fastenings such as spikes, throughbolts, or small fittings such as deadeye or main brace frames and short lengths of brace chain, barrel hoops or other small iron artifacts. Flattened or gently rounded plateaus such as that existing along the southwest edge of the wreck (Fig. 2, b) were the result of a more or less even scattering of these same types of smaller iron artifacts in densities of approximately 0.34 to 1.5 artifacts per m^2 interspersed, in some instances, with scattered ballast stone in densities of 5 to 11 stones per m^2 (Clausen ms.).

The results of the survey were not faultless, however. An apparently spurious anomaly of approximately 25 gammas located just east of the anomaly (Fig. 2, a) created by the intact anchor at the northwest end of the wreck, did not directly correspond to an artifact or concentration of artifacts. So little is understood regarding the nature of the magnetic signatures created by multicomponent forged-iron anchors and cannon of the type found in these early sites, that we cannot dismiss the possibility that this anomaly was a bona fide magnetic phenomenon related to a nearby artifact. The image may also have been the result of a slight course deviation on the part of the survey vessel which went unnoticed. Another anomaly of some 30 gammas, corresponding to a second large anchor found seaward and isolated from the main body of the wreck, was displaced some 20 m to the northwest on the survey map, due to an error on the part of the observer in identifying a letter range.

From the survey and excavation of this relatively small, mid-16th-century vessel and others of later centuries with which the senior author has been involved both in Florida (Clausen 1965, 1966) and elsewhere, we find that the typical magnetic signature of a wreck of a Colonial or later sailing vessel of wooden or composite construction will consist of a central area of magnetic distortion characterized by a number of intense and generally localized anomalies surrounded and, depending upon the depth and dispersion of the wreck in some instances, interspersed by scattered smaller magnetic disturbances. In the typical pre-1850s shipwreck, especially those earlier than the 19th century, the more massive distortions, for the most part, will represent individual cannon and anchors or groups of these artifacts.

In later vessels of this period, iron winches, anchor chain, iron ballast, and the larger elements of the ship's construction (such as iron knees, breast hooks, steering gear, and heavy elements of the rigging, including cranse irons and parrels), as well as surviving industrial cargo (e.g., machinery), will contribute to, or in some cases replace, armament in these intense distortions. Throughout the entire period, the less intense distortions will represent both concentrations and scatterings of smaller iron artifacts such as ship's fastenings, spikes and throughbolts, and more minor elements of the ship's gear and rigging.

The final plan of the distribution of the artifacts recovered in the excavation of the site was unfinished at the time this report was prepared. However, a comparison of the field plan prepared during excavation of the site with the two-dimensional magnetic map provided by the in-site delineation survey represented by Figure 2, suggests that fewer than 10 of the 1,500+ individual artifacts recovered were found outside the 5-gamma magnetic contour line encompassing the main and satellite parts of the site. Furthermore, with the single exception of one large ceramic fragment, an olive jar sherd found a dozen or so meters north of the main part of the wreck, the remainder of the few artifacts found outside the 5-gamma contour were all located within a few meters of this zone, which suggests that if more accurate data could have been acquired, permitting contouring at one- or two-gamma intervals, many of these artifacts might have been encompassed within the area of magnetic disturbance.

The senior author suggested in an earlier publication that the correlation between the distribution of the ferrous components of a Colonial period vessel lost under these conditions and the remainder of the artifact assemblage at the site would prove to be very close (Clausen 1966: 79-80). However, we do not believe that this relationship is normally as close as the results of the preliminary analysis of the excavation of this mid-16th-century site suggest. Our reservations are based chiefly on two points. First, the remains of colonies of the benthic organisms *Ostrea equestris* and *Crassostrea virginica*, as well as other species of bivalves and gastropods, were discovered adhering to the upper two-thirds of the large conglomerates raised from the site, unassailable evidence that the depth of the unconsolidated sediment in the area of the wreck has varied markedly. At least once in the past the conglomerates were largely or perhaps entirely exposed long enough to permit these organisms to flourish (J. S. Holland and N. J. Maciolek, the University of Texas Marine Science Institute at Port Aransas, personal communication, 1973). Second, during excavation of the site, depressions which appeared to

be the result of scouring rather than compression, were noted in the dense gray clay on which the artifacts rested. These depressions were particularly noticeable, reaching a depth of 10-20 cm about the contact points, the flukes and rings, of the large anchors.

The evidence of variable sediment depth and scouring suggests that during hurricanes, and perhaps other intense storms, greatly accelerated alongshore transport of sediments occurs off Padre Island. Once, during a hurricane, the senior author, using scuba, dived in the surf zone near a wreck lost in 1715 off the geologically similar Florida East Coast Barrier Island system to observe the effects of the storm on bottom sediments. While observations certainly were difficult in such a situation, it was noted that the alongshore transport of sediment was remarkably accelerated. So much sand and shell was in motion along the bottom, that it was impossible to determine where solid bottom started. Approaching the bottom during the storm was analogous to swimming in the slurry created in the pipeline of a giant dredge. Under similar conditions at this 1554 wreck site it is difficult to believe that isolated ceramic and glass sherds with specific gravities not greatly unlike shells and shell fragments would not have been swept away, particularly in this area where the basement clay is level, almost featureless, and slick, and hence offers little impediment to tumbling or sliding materials. Secondly, the position of more than 85% of the artifacts recovered at this site was permanently fixed, through encasement in conglomerates weighing approximately 100-1,000 kg. These large conglomerates typically form about the iron anchors, cannon, and larger fastenings at a site as the corrosion products from these artifacts migrate out and downward through the enveloping sediment and adjacent wreck remains. This process traps sand, shell, ballast stone, and artifacts alike in a cementlike, irregularly shaped mass with the parent artifact at the core. At present, our knowledge of how rapidly this envelopment process occurs is vague. However, current estimates by experts in the field of preservation of artifactual remains recovered from shipwreck sites indicate that iron and steel artifacts begin to react rapidly and that most if not all of the formation of these conglomerates probably takes place within 10 to 20 years of the introduction of the items to the environment (Don Hamilton, Antiquities Conservation Laboratory, the University of Texas at Austin personal communication, 1975). For example, the steel axles of a child's plastic toy automobile recovered in 1967 from near a more than 250-year-old ship in the Atlantic off Florida were completely overlain with an encrustation composed of sand, shell, and the corrosion products of the steel which was identical in make-up and even color to that encasing the iron artifacts

from the nearby wreck.

It is significant that with the exception of perhaps three ceramic sherds, the remaining 15% of the artifacts recovered from the site which were not entrapped in clongomerates were objects of high specific gravity fabricated of metal — either iron, bronze, silver, lead or gold. The remainder of the sample of ceramics from the site, some 160-170 sherds representing a wide variety of types, were discovered in the preservation laboratory during the dissection of the large conglomerates. It is of interest here to note that the only means through which a representative sample of ceramic types and articles fabricated of glass could be secured at this site was by recovering the conglomerates in which they were entrapped.

Typically in shipwrecks, the artifact sample is heavily selective toward inorganic and/or inactive items capable of surviving the biological and chemical ravages of the marine environment (Clausen 1967: 44-46). All the above evidence at this site indicates a further bias toward articles fabricated of material of greater specific gravity than glass or ceramics which could not easily be moved away by storm-generated currents and concomitant sediment flow. Also, this site was discovered by treasure hunters prior to passage into law in 1969 of the Texas Antiquities Code, which now protects such cultural resources. What effect the activities of this group may have had on the artifact sample at the site is unknown.

Consequently, we urge caution in accepting the evidence of the very close relationship of the ferrous components to the rest of the artifactual remains found at this particular 16th-century wreck site, as typical for sites near shore except perhaps in this general area of the western Gulf of Mexico. The senior author has examined many wreck sites elsewhere in the Gulf of Mexico, the Atlantic, and the Caribbean where, because of different bottom and sediment types and current characteristics, even tiny sherds of glass and ceramic fragments not bound up in encrustations were present in great abundance.

Another important conclusion can be drawn from the survey data. It is commonly held that the effective strength of dipolar magnetic distortions, the type represented by most shipwreck materials, is inversely proportional to the cube of the distance. A formula for expressing this is given in Breiner (1973: 42) as $T = \frac{M}{r^3}$, "T" being the anomaly in gauss, "M", the dipole moment in centimeter-gram-second, and "r", the distance in centimeters. Taking into consideration water and sediment depth over the wreck, less sensor depth below the surface, we determined that the average sensor-to-target range during the survey of Site 41KN10(UW) was ap-

proximately 6.5 m. The largest distortion in the local earth's magnetic field measured during the survey was 125+ gammas created by the mass of wrought iron near the center of the wreck (Fig. 2) which consisted of the ship's sheet anchor and miscellaneous armament and fastenings. Using the above formula with these values, 125+ gammas at a sensor-to-target range of 6.5 m, we calculate that the strength of the distortion created by these remains would have diminished to approximately three gammas at a range of 22.5 m. At that point, the anomaly created by this wreck very likely would be indistinguishable from the "noise" level present in even the most sophisticated magnetometers typically in use for offshore surveys. In short, in deeper water, at sensor-to-target ranges in excess of 25-30 m, this wreck, for all practical purposes, would become undetectable.

The small size of the 1554 wreck which was the subject of this survey, is not at all unusual for a vessel of the periods of exploration, colonization and early development in the Western Hemisphere. Our archival research indicates that these early vessels in many instances, especially during the first century after discovery, were quite small. Morrison (1942: 120), for example, estimates the displacement of Columbus' *Capitana*, the *Santa Maria*, to have been less than 100 tons. English, Spanish, and French archival records throughout the 16th and 17th centuries clearly indicate that vessels of less than 100 tons displacement often sailed to and about the New World, and that vessels of only 200 tons displacement were common. Lacking specific historical context, it may be said that from the point of view of cultural analysis and history, the most valuable shipwrecks are those dating from the first centuries after discovery (Clausen 1967: 44-46).

COMMENT

Recently the Bureau of Land Management and the United States Geological Survey, both agencies of the Department of the Interior, have tried to formulate regulations to protect and preserve such cultural resources as shipwrecks and drowned prehistoric habitation sites in areas of the outer continental shelf under their jurisdiction. Cultural resources in these areas are considered endangered by accelerated efforts of petroleum interests to exploit the abundant fuel resources of the shelf area in response to increasing national and world energy demands.

The number of shipwreck sites on the outer continental sheld is admittedly very limited in terms of the total population of shipwrecks in the Western Hemisphere. We estimate now on the basis of both our

archival research and survey experience that less than 9% of the total number of shipwrecks lost in the New World between 1492 and 1900 are located more than 5 km from land or from submerged navigational hazard (Clausen ms.). Nevertheless, those few wrecks which are located in the deeper colder waters on the outer shelf should be less scattered and the materials in them better preserved than those sites found in shallow coastal waters; hence, when technology of recovery has advanced sufficiently, they may present archeological targets of prime importance.

In view of the economic realities of the problem, these agencies have elected to satisfy their obligations to protect these sites by requiring that the corporations responsible for disrupting the sea floor conduct surveys to locate and protect through simple avoidance these cultural resources prior to well-drilling, pipeline-laying, and related activities which would endanger the sites (U.S. Department of the Interior 1974, 1975). The most recent publication on this subject, subtitled "Minimum Geophysical Survey Requirements to Protect Cultural Resources," requires exposure of the survey area to the array of instrumentation aboard the survey vessel in parallel tracks spaced at 150-m intervals, and recommends that the sensor of the magnetometer be 6 m or less above the water bottom interface (U.S. Department of the Interior 1975).

On the basis of the findings presented in this paper, we submit that the 150-m track spacing presently required in these offshore surveys — even under the most ideal conditions (i.e., adequate functioning, accurate positioning system with programmable track plotter, magnetometer sensor altitude 6 m or less above the bottom, and a moderate sea state) — results, at best, in sampling only some 25% - 30% of the lease areas in terms of detecting these smaller, though culturally more significant early wreck sites. It is true that this assessment is based solely on the capabilities of the magnetometer, but this instrument, if properly applied, has proven over many years of application to be the only remote sensing device capable of detecting all Colonial and later period wreck sites. The other principal instrumentation the government requires in the surveys (i.e., the side-scan sonar and sub-bottom profiler) will very likely prove to be of very limited use in detecting these early sites, or for that matter, probably any wrecks of wooden construction lost for longer than 100 years. The sub-bottom profiler is employed in this instance to reveal sub-bottom features such as sediment horizons and possible disconformities which might be related to drowned land forms (former drainages of rivers and streams and perhaps former barrier island systems and associated lagoon and other embayments — prime

ecotone areas) where the probability of association with prehistoric camps or the hunting-and-gathering activities of early man would be high. Unless, by chance, the survey vessel passes directly over a buried or semiburied wreck site, or unless the survey party purposely directs the vessel over an anomaly already detected by the magnetometer, the probability is very low that this instrument would detect a wreck of the nature we are concerned about here.

The side-scan sonar also will prove of little use in detecting these older wrecks of wooden construction. At depths of 200 m or less, the structure (at least above the turn of the bilge) can be expected to have collapsed through biological and chemical action and would be scattered to some degree by currents, unless the site happens to be located in an area of very limited or no loose sedimentation. The principal use of this instrument in the present surveys is to provide an additional perspective in identifying topographic features which might relate to drowned land forms. Conventional side-scan sonar systems do not have a sub-bottom capability. Hence, like the sub-bottom profiler, it is used in this instance to determine possible areas of prehistoric occupation. Its application to shipwrecks in these surveys is limited almost solely to identifying whether magnetic or acoustical anomalies are nonburied, steel-hulled wrecks.

Consequently, we recommend dropping the ineffective blanket surveys of large areas now undertaken which, through faulty design, are missing an estimated three out of four of the important early sites (except perhaps in areas crossed by present or historically documented sea lanes, where the probability of sites presumably would be higher) in favor of more concentrated surveys. These should be made with parallel tracks spaced not more than 50 m apart and confined to the general area of disturbance the well site (plus an additional area or buffer zone of potential physical and/or magnetic disturbance around the area to be disrupted) and along pipeline routes. We also recommend that the notice stipulate that the height off the bottom of the magnetometer sensor be no greater than 6 m, and that a separate record of sensor altitude either off the bottom or below the surface (or both) be maintained during the survey (Clausen 1974). Otherwise, we predict that a disproportionate number of steel-hulled, recent shipwreck sites of limited archeological value will be discovered in these surveys at the expense of the scientifically more valuable early wrecks.

Finally, in areas where the remains of Colonial period wrecks either lie partially, or, as in the case of the 1554 site described in this report, totally buried in unconsolidated sediments, or are camouflaged by marine growth such as corals on reef areas in the

tropics or the many varieties of benthic algae common off rocky coasts at higher latitudes, the guidance afforded the archeologist by an in-site delineation survey can be of inestimable value in maximizing the cultural data collected and in raising the efficiency of the underwater operations in general. In fact, so successful has this approach proven, that we now believe it to be an essential preliminary step to the thorough and efficient excavation of virtually any Colonial period shipwreck.

REFERENCES CITED

Arnold, J. Barto, III

1974a A Magnetometer Survey of the Nineteenth-Century Steamboat *Black Cloud*. *Bulletin of the Texas Archeological Society*, Vol. 45, pp. 225-230.

1974b The Archeological Applications of Computerized Contour and Perspective Plotting. *Newsletter of Computer Arhcaeology*, Vol. 10, pp. 1-7.

Arnold, J. Barto, III, and Carl J. Clausen

1975 A Magnetometer Survey with Electronic Positioning Control and Calculator Plotter System. Paper presented to the Sixth International Conference on Underwater Archeology. Charleston, S.C.

Breiner, Sheldon

1973 *Applications Manual for Portable Magnetometers*. Geometrics, Palo Alto, California.

Breiner, Sheldon, and Michael D. Coe

1972 Magnetic Exploration of the Olmec Civilization. *American Scientist*, Vol. 60, pp. 556-575.

Breiner, Sheldon, and K.G. MacNaughton

1965 The Applications of Magnetometers to Underwater Archeology. Paper presented at the Second Conference on Underwater Archeology. Toronto.

Clausen, Carl J.

1965 A 1715 Spanish Treasure Ship. *Contributions of the Florida State Museum*. Social Sciences, No. 12.

1966 The Proton Magnetometer: Its Use in Plotting and Distribution of Ferrous Components of a Shipwreck Site as an Aid to Archeological Interpretation. *Florida Anthropologist*, Vol. 19, pp. 77-84.

1967 Some Comments on Pre-1800 Sites: Maritime. *Historical Archeology*, Vol. 1, pp. 44-46.

1974 Letter to the directors of the Bureau of Land Management and United States Geological Survey regarding Notice 74-10, dated May 10, 1974, on file in the records of the Texas Historic Commission.

Ms. Site report on the Texas Antiquities Committee's underwater

archeological research project: The Excavation of a Spanish Wreck of 1554, manuscript in preparation.

Green, J.N.
1970 A New Sea-Going Magnetometer Detector Head. *Archaeometry*, Vol. 12, pp. 167-172.

Green, J.N., E.T. Hall, and M.L. Katzev
1967 Survey of a Greek Shipwreck Off Kyrenia, Cyprus. *Archaeometry*, Vol. 10, pp. 46-56.

Hall, E.T.
1966 The Use of the Proton Magnetometer in Underwater Archaeology. *Archaeometry*, Vol. 9, pp. 32-44.

Hays, T.R., and Eugene Herrin
1970 *Padre Island Project: Report to the Texas Antiquities Committee*. Institute for Underwater Research, Dallas.

Lenihan, Daniel
1974 Preliminary Archeological Survey of the Offshore Lands of Gulf Islands National Seashore. In *Underwater Archeology in the National Park Service*, edited by Daniel Lenihan. Division of Archeology, Southwest Region, National Park Service, Department of the Interior.

Link, Marion Clayton
1959 *Sea Diver*. Rinehart and Co., New York.

Meylach, Martin, and Charles Whited
1971 *Diving to a Flash of Gold*. Doubleday and Co., Garden City, N.J.

Peterson, Mendel
1965 *History Under the Sea*. Smithsonian Institution Publication 4538. Washington, D.C.

Morrison, Samuel Elliot
1942 *Admiral of the Ocean Sea*. Little, Brown and Co., Waltham, Mass.

Potter, John S., Jr.
1972 *The Treasure Diver's Guide*. Rev. ed. (first printed in 1960). Doubleday and Co., Garden City, N.J.

U.S. Department of the Interior, Bureau of Land Management and U.S. Geological Survey
1974 Notice to lessees and operators of federal oil and gas leases in the Outer Continental Shelf, Gulf of Mexico area: minimum geophysical survey requirements to protect cultural resources. No. 74-10.
1975 Notice to lessees and operators of federal oil and gas leases in the Outer Continental Shelf, Gulf of Mexico area: minimum geophysical survey requirements to protect cultural resources. No. 75-3 (supersedes No. 74-10).

Texas Antiquities Committee
Austin, Texas

POLLEN AS AN INDICATOR OF PREHISTORIC DIETS IN COAHUILA, MEXICO

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ABSTRACT

This paper reports information derived from the pollen analysis of 47 human coprolite specimens recovered during the excavation of Frightful Cave, Coahuila, Mexico. The age of the coprolites range from approximately 7,500 B. C. to A. D. 300 and are grouped into three major categories based upon their provenience in the site. The data from these 47 human coprolites are used to: (1) reconstruct prehistoric diet patterns, (2) predict specific periods of site occupancy, and (3) distinguish between economic and background pollen types. In addition, the coprolitic data are used for making limited generalizations concerning possible vegetational changes in the Frightful Cave area during the past 9,500 years.

INTRODUCTION

Human coprolites recovered during the archeological excavation of Frightful Cave were sent to Dr. Gary F. Fry of Youngstown State University who conducted an analysis of the macrofossil contents. Small subsamples (ca. 1-2cc) of each of the 47 human coprolites were extracted by Fry and sent to the Texas A&M Anthropology Research Laboratory where I processed and analyzed them for their pollen contents.

Each of the samples was reconstituted into a moist state using the trisodium phosphate method developed by Callen and Cameron (1960). Standard 200 grain pollen counts were attempted for each sample as first suggested by Barkley (1934). In 26 of the samples it was possible to obtain counts of between 200-300 pollen grains. Of the remaining 21 samples all but seven contained between 100-200 pollen grains. Of the total 47 samples only seven contained fewer than 100 grains or were totally void of pollen. The tabulation for each of the 40 samples containing more than 100 pollen grains is shown in Figure 1.

The human coprolites from Frightful Cave are organized into three distinct categories based upon their provenience within the site. Associated material from each category has been radiocarbon dated (Stuckenrath n.d.). The coprolites recovered from the lower strata of the site are lumped into the category called "lower" and consist of 15 human coprolites that range in age from 7,500-5,000 B. C. The "middle" category contains 16 human coprolites recovered from strata which have been dated between 5,000-2,000 B. C. The last of these three categories is termed "upper" and consists of 16 human coprolites recovered from strata dated from 2,000 B. C.-A. D. 300.

	2000 BC - AD 300																5000 -				
SAMPLE NUMBER	1	2	4	5	6	11	12	14	18	23	24	25	30	36	41	42	3	7	8	9	13
POLLEN TYPE																					
Acacia				1						0·5							0·5				
Agave	11·5	6	5	1·5			13·5	30	8	20	20	5				7·5		20	3	2	
Dalea	23·5		0·5	4			4	6·5				9	5			4	14·5		3	8	1
Dasylirion	0·5			6·5			2·5				0·5		2·5			0·5	0·5	0·5			
Leucaena				1·5							0·5					1					
Opuntia		1		2		3	0·5						0·5		2·5	2	1·5	2	25	2·5	
Portulaca				1·5							4·5	9		1	60·5						
Solanum	18		0·5	1·5													57				
Umbelliferae										0·5											
Unknown A									11				62								
Cheno-Am	3·5	5	0·5	14·5		1	4	4		5	7	45·5			24·5		7	1		2	
Compositae (LS)	7·5	11	21·5	6		13	13·5	16·5	56	13·5	12	3	2	1	0·5		4·5	4	1	5	
Compositae (HS)	11·5	21	49·5	24·5		49	20	9·5	14·5	14	11	21	14·5	88	4·5	80·5	2	8	8	8	90·5
Pinus	1·5		3	2			3·5	1·5	1·5	2	11·5				1		1·5	0·5	1	2·5	
Alnus																					
Quercus	3·5	9		3		4	1			4	3	1					3·5	23	39	25	2
Celtis	3		1	0·5			1	13	1·5	5	13		1·5				0·5	2			
Juglans				0·5																	
Carya							0·5													2·5	
Ulmus												0·5									
Gramineae	8	10	13·5	13		20	33	12·5	4	24	12	4	1·5	9	2·5	1		32	11·5	36·5	4·5
Cyperaceae	0·5		0·5					1													
Artemisia		33	0·5	7·5				2·5		8·5	2				1		2	2	2		1
Typha																					
Ephedra	1	1	0·5	3									0·5		1				1·5		
Berberis	0·5																				
Caryophyllaceae												1									
Cruciferae																					
Jatropha						1															
Labiatae	1		0·5																		
Malvaceae	0·5										1		7·5								
Nolina						2															
Onagraceae				1					0·5	0·5			0·5						1·5		
Phacelia													0·5								
Prosopis	0·5						0·5												0·5		
Rhus		1								0·5							1·5				
Salix									0·5												
Verbena	1																				
Unknown	3	2	3	5		7	2·5	3	2·5	2	2	1	1·5	1	2	3·5	3·5	5	3	6	1
TOTAL PERCENT	100	100	100	100		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
TOTAL COUNT	272	101	215	208		100	229	121	215	210	218	203	206	202	180	212	149	173	214	115	219

FIGURE 1. Pollen counts of prehistoric human coprolites from Frightful Cave.

2000 BC

15	16	17	20	22	27	29	31	33	37	43
0·5	2·5									12
245	22	62		7	57·5	10	8·5	10·5		1
		7·5		1	4	1	7·5			6
	0·5	0·5		4						0·5
	0·5	1·5					1			
	0·5			2			12			
										1
								3·5		52
0·5	3·5	1		2·5	1·5		1	20		16
10·5	8·5	2		25	12·5	53	6	1·5		1
59	20·5	3·5		27·5	8·5	25	12	57·5		4
0·5	2·5	7·5		6·5	1	2·5	2			
		0·5								
	10	1·5		1		1	4·5	1		0·5
	2	1·5		5·5	6·5					
						0·5				
				0·5						
2	17·5	6·5		11	5	3	11	3		4
	0·5									0·5
0·5	2·5	1·5		1·5	1		24			
	0·5						0·5			
0·5	1						1			
							4			
	0·5									
				1						
	0·5									
						0·5				
					0·5					0·5
		0·5								
		1								
·5	4	1·5		4	2	3·5	5	3		1
00	100	100		100	100	100	100	100		100
95	164	202		200	208	165	175	247		215

7500 - 5000 BC

10	19	21	26	28	32	34	35	38	39	40	44	45	46	47
		0·5						1						
4		2·5			7·5	1·5	3·5		0·5		1	0·5		
31·5					1	0·5								
		4			6·5	0·5				1·5				
1		1·5						42	0·5	4	2·5	1		
19			0·5			1	0·5	50	0·5	39	95	135		
			905											
4		7	2·5		34	85	0·5	0·5	59·5	4		1		
		4·5	1		11		90	1	5·5	5		11		
4		43			14·5	4	2·5	2·5	20	14	1·5	72		
4·5		8·5	3			1				1				
			0·5											
14·5		2·5			2·5	1·5		2		1				
		5			2·5		0·5		4	4				
						0·5								
10		8·5	0·5		11·5	1	1	0·5	8	15				
3		8			6·5	1				9				
		1·5												
			0·5											
		0·5							0·5					
1·5			0·5											
										1				
						1								
3		2·5	0·5		2·5	1·5	1·5	0·5	1	1·5		1		
100		100	100		100	100	100	100	100	100	100	100		
130		202	200		197	194	225	219	218	187	217	212		

ANALYSIS

The pollen types recovered from these human coprolite specimens are grouped into three distinct categories: (1) economic pollen, (2) background pollen and (3) pollen that could have resulted from either economic or background sources which I have termed "special economic pollen types".

Economic pollen was found in almost all of the human coprolite specimens examined from Frightful Cave. In many cases these pollen types are represented by high percentages which suggest the intentional eating of flowers and/or pollen for its flavor, food value, or suspected medicinal effects. Some might argue that such high economic pollen counts could have been ingested as part of the normal pollen rain that settles on foods later eaten by man, or from the eating of non-floral plant foods such as leaves, stems or fruits. These alternatives have been investigated (Bryant 1969) and found to be highly improbable. Likewise, I have found (Bryant 1969) that in certain regions local drinking water sources and normal pollen rain are unlikely to account for the ingestion of more than approximately 2% of any specific economic pollen type. The only exception would be "special economic pollen types" which are from wind pollinated plants such as those from certain species of composites and taxa in the category termed "Cheno-Am".

In reviewing the data found in the coprolite specimens from Frightful Cave I shall consider the presence of any economic pollen type in a quantity of 10% or greater to represent the direct ingestion of that specific plant's flowers and/or its pollen. A lower level of 2-3% economic pollen could have been used instead of the 10% level in view of past studies of human coprolites from the Amistad region (Bryant 1974a). However, while the presence of economic pollen in percentages of more than 10% is interpreted to reflect the eating of flowers and/or pollen, low percentages below 10% may not always represent the direct ingestion of a specific plant's flowers due to the possibility of interflower contamination by insects. Therefore, if a coprolite specimen contained 10% cactus pollen and 2% agave pollen, for example, I would interpret the data to reflect the eating of cactus flowers. On the other hand, while the 2% agave pollen in that same coprolite may also reflect the additional eating of agave flowers, it is also possible that such a marginal percentage of economic pollen could have resulted from the interflower insect contamination of the cactus flower with a few agave pollen grains.

Special economic pollen types are different from economic types since their pollen could be ingested as part of the food or by accident.

Plants in this category produce large numbers of pollen grains which become airborne and float in the wind currents until they drop to the ground as one of the abundant contributors to the local pollen rain. Thus, during the summer flowering season a person could ingest a number of special economic pollen grains by a variety of methods other than direct flower eating. This could include special economic pollen types such as Cheno-Am, low-spine Compositae, and high-spine Compositae, trapped in the mucus of the nose and lungs which is later swallowed, pollen drunk as part of local drinking water sources, and pollen that settles on foods about to be eaten. However, unless either the seeds or the flowers of these types were being eaten one would not expect to find pollen percentages of this type in excess of approximately 40% (Bryant 1974a).

There are a number of pollen types found in the Frightful Cave coprolites which do not appear to have resulted from the direct eating of certain plant foods and they are termed "background" pollen types. Thus, these types tend to reflect pollen types found in the normal pollen rain of northern Mexico. Even though these background types do not reflect any ethnobotanical significance in the Frightful Cave coprolites the reader should not assume that these types are always to be considered as background species. *Typha* and *Ephedra*, for example, are classified as background types in this study yet in other studies (Napton and Kelso 1969; Riskind 1970) one, or both of these pollen types have been shown to reflect prehistoric man's dietary patterns.

Some of the background pollen types found in the Frightful Cave coprolites are useful as indicators of probable seasonality of site usage and they will be discussed later in this report. Other background types, however, are useful only as indicators of plants which at one time composed part of the local vegetation in the vicinity of Frightful Cave.

The background pollen types fall into two broad categories: (1) anemophilous — those that are produced in large numbers and are from plants which rely upon the wind to disperse their pollen, and (2) zoophilous — those that are produced in lesser quantities and are from plants which rely upon insects to disperse their pollen.

Lower Level — (7,500-5,000 B. C.)

During the early period of site occupation (7,500-5,000 B. C.) the dominate economic pollen types found in the recovered human coprolites consisted of *Opuntia, Leucaena,* and Umbelliferae. In addition large quantities of special economic pollen types such as

Cheno-Am and low-spine Compositae were recovered from coprolites dating from the early period of site occupation.

The pricklypear cactus (*Opuntia*) has a large, heavy grain which is not suited to airborne travel and thus would not be a common component of any normal pollen rain fallout. Individual flowers in this group of cacti produce a large number of anthers and pollen grains so that the eating of even one flower would incorporate hundreds or even thousands of pollen grains into a single fecal sample. In looking at the pollen data from these human coprolites (Fig. 2) it is evident that pricklypear cactus flowers were one of the more frequent food choices during the early time period of site occupation.

Cactus flower eating is not unique to the Frightful Cave area. Palmer (1878) noted that California Indians often ate freshly picked pricklypear cactus flowers and used others to flavor a type of fermented drink. In a similar study of the Pima, Castetter and Bell (1942) reported that cactus flowers were an important diet item and were ranked second only to mesquite in importance of gathered wild plant foods. Previous studies of prehistoric human coprolites also note the use of cactus flowers as food. Martin and Sharrock (1964) found high percentages of cactus pollen in human coprolite samples recovered from Basketmaker and Pueblo period sites in the Glen Canyon region of Utah. I (Bryant 1974a) also found that cactus flowers seem to have represented an important diet item for the Late Archaic inhabitants of the Amistad Reservoir area located to the north of Frightful Cave.

In reference to the frequency of use (Fig. 2) it appears that pricklypear flowers were eaten far more often at Frightful Cave during the earlier period (7,500-5,000 B. C.) of site occupation than during the later period after 5,000 B. C. This change in diet seems to have been due to some unknown cultural change in dietary preference rather than to a loss of cactus availability in the local environment. The macrofossil plant remains recovered from these same human coprolites showed no similar decrease in the eating of cactus pads and cactus fruit after 5,000 B.C.

The occurrence of leadtree (*Leucaena*) pollen in the human coprolites from Frightful Cave is most common in samples from the early period of site occupation. Leadtree pollen is found in small percentages in a number of samples from various time periods and in many instances it could be explained as resulting from possible interflower contamination by insects. The pollen data clearly demonstrate that the prehistoric peoples of the Frightful Cave area were eating a number of different types of flowers, yet in cases such as this where percentages of certain pollen types in coprolite samples are low, one cannot always determine precisely which flower types were

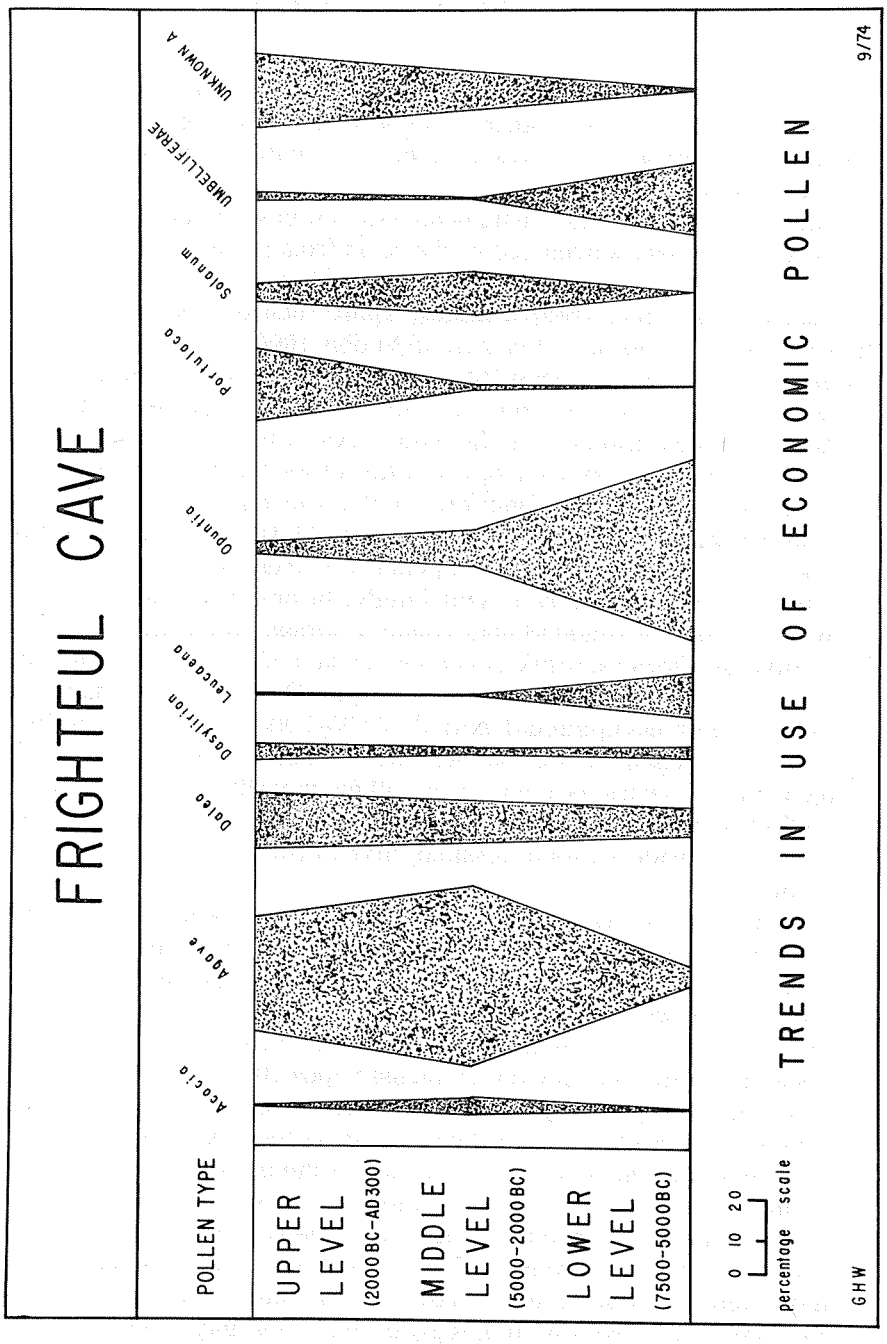

FIGURE 2. Changing importance of the use of certain economic pollen types at Frightful Cave as revealed from the analysis of prehistoric human coprolites.

eaten. In other instances, such as in sample 38 from the early period of site occupation where leadtree pollen is present in a percentage greater than 40% it is obvious that the leadtree flowers were actually eaten.

Umbelliferae plants have long been associated with man and today many of our modern spices and herbs come from plants of this group. In North America many different species of Umbelliferae were eaten as food by aboriginal groups. Ethnographic records reveal that the tubers were cooked or eaten raw (Spinden 1908), the leaves were made into salads (Chamberlin 1911), the seeds were ground and eaten (Harvard 1895), and the flowers were boiled to make tea (Brown 1868). The pollen grains from the many taxa in this plant family are similar in shape and morphology and therefore difficult to separate beyond the family level. Umbelliferae pollen was not common in these coprolite samples, yet in one sample (sample 26) from the early period of site occupation 90% of the total pollen was from some unidentified member of the Umbelliferae plant family. In order to reach such a high percentage of Umbelliferae pollen a person would have had to eat individual flowers, drink the pollen as part of a beverage (tea) or eat the leaves and flowers as part of a salad. Only in this one sample from the lower occupational period (7,500-5,000 B. C.) of Frightful Cave did the pollen record indicate the obvious use of some type of Umbelliferae flowers as food. In the other coprolite samples where Umbelliferae pollen is present it occurs in such low percentages that it could be considered as a possible interflower or background contaminant.

A number of plants belonging to the Chenopodiaceae plant family and to the plant genus of *Amaranthus* are known to have been used throughout many areas of the American Southwest and Northern Mexico (Barrows 1900; Castetter 1935; Elmore 1943; and Fewkes 1896). Collectively these plants are termed "Cheno-Am" by pollen analysts (Martin 1963) since it is almost impossible to distinguish the pollen types of this group from one another with the use of the light microscope. Suspected use of these plants as food by the prehistoric inhabitants of Frightful Cave is revealed in the pollen analysis of the coprolites. Those pollen data revealed the highest percentages of Cheno-Am pollen in coprolites dating from the earliest periods of site occupation (Fig. 1). However, the percentages of Cheno-Am pollen found in the Frightful Cave coprolites dating from occupation periods after 5,000 B. C. are low and suggest that they may have resulted from sources such as the normal pollen rain which undoubtedly settled on prepared foods about to be eaten.

There are several justifications for using high percentages of Cheno-Am pollen as indicators for prehistoric diet preferences of

these plants. Unlike most of the other economic pollen types, high percentages of Cheno-Am pollen in human coprolites could result from eating the seeds, eating the leaves, or eating the flowers. A plant's pollen does not often become mixed with its seeds yet among taxa of the Cheno-Am this does result. Among many species of the Cheno-Am group individual plants flower continuously over a number of weeks and even months. As a result, when the earliest flowers turn to mature seeds other flowers on the same plant are still in their pollination stage. Thus during the collection and winnowing of Cheno-Am seeds using aboriginal methods pollen from maturing flowers near the top of the plants can become incorporated with the mature seeds gathered from the lower portion of the plants. In addition, Bryant and Larson (1968) found in the Amistad Reservoir area of Texas large quantities of goosefoot seeds (*Chenopodium*) in the same human coprolites that contained high percentages of Cheno-Am pollen. Martin and Sharrock (1964) report similar results in their study of human coprolites from the Glen Canyon area of Utah.

Individual plant types within the family Compositae can be divided into several categories based upon differences in their pollen morphology. One of these groups is termed "low-spine" and includes those composite genera with pollen types having surface spines shorter than two microns in height. The pollen in this low-spine composite group is anemophilous (wind-pollinated) and is thus produced in great numbers and dispersed by the wind (ragweed is one of the better known members of this composite group). These attributes make low-spine composite pollen one of the more common background types found in normal pollen rains. Thus, considerable amounts of low-spine pollen up to about 40% could be expected to be inadvertently swallowed or eaten along with other foods and would not reflect utilization of these composite plants as food. Most of the low-spine pollen in the human coprolites from Frightful Cave undoubtedly falls into this category. However, in one coprolite sample (number 35) dating from the lower period of site occupation low-spine composite pollen was recovered in a percentage greater than 55% and thus strongly suggests more than just an accidental ingestion of this pollen type. In that sample the high percentage of low-spine pollen suggests the direct eating of composite plants, their seeds, and/or their flowers. A similar situation was reported in the Mammoth Cave area of Kentucky (Bryant 1975b) where large numbers of *Iva* (marsh-elder) seeds were found in the same human coprolite samples containing more than 50% low-spine composite pollen.

Middle Level — (5,000-2,000 B. C.)

The coprolitic pollen records suggest that diet patterns during the middle period of site occupation differed from those of the earlier period. *Opuntia*, *Leucaena*, and Umbelliferae were important during the earlier period yet are replaced in importance during the middle period by *Acacia*, *Agave*, and *Solanum*.

The pollen evidence suggesting the use of acacia as food is not strongly represented in the coprolitic record from any period of site occupation at Frightful Cave. Acacia pollen was found in only eight samples and reaches a significant level of more than a few percent in only one sample (Sample 43) which dates from the middle time period (5,000-2,000 B. C.) of site occupation. The 12% acacia pollen in that single sample may reflect the eating of acacia flowers, or the drinking of acacia tea. The practice of acacia flower eating by the early inhabitants of Frightful Cave admittedly is weak yet it does seem to exist, since one would not normally ingest more than about 2% acacia pollen from background sources (Bryant 1969).

Agave plants are a common component of many arid and semi-arid environments in the American Southwest and Northern Mexico. Ethnographic and ethnobotanical studies have demonstrated that these plants were utilized for making fermented liquor, used as food, and sought for their fibers. Palmer (1878) has also noted that in California, for example, the flowers were collected and eaten for their flavor and nectar contents. Approximately two hundred miles north of Frightful Cave in the Amistad Reservoir area of southwest Texas agave flowers were a common item in the prehistoric diet (Bryant 1974a). The coprolitic pollen evidence suggests that at Frightful Cave agave flowers were also one of the more important flower foods in prehistoric man's diet and reached their height of utilization during the middle occupation period. This apparent trend may reflect the increased availability of agave plants or a change in diet preference during the middle time period.

Nightshade (*Solanum*) pollen is present in only a few of the coprolite samples from Frightful Cave. Known aboriginal dietic uses of nightshades are centered mostly upon the eating of the tubers or leaves (Sparkman 1908; Castetter 1935) and no mention is made of the flowers being specifically sought as food sources. In spite of this lack of ethnographic evidence it is still possible that nightshade flowers were individually picked and eaten. The high percentages of nightshade pollen in samples 1 and 3 represent ingestion of the flowers either directly, or indirectly as part of a salad. Nightshade pollen is missing from the early period coprolite samples and is present in only a few of the middle and later period coprolites. The highest frequency

of occurrence, however, is linked to the middle period of site occupation.

Upper Level — (2,000 B. C.-A. D. 300)

During the last major period of site occupation several new economic pollen types dominate the human coprolite samples. *Dalea, Dasylirion, Portulaca* and Unknown type A pollen were found in the coprolites during the earliest two occupational periods yet did not become dominate types until the final period of site occupation after 2,000 B. C. One of the special economic pollen types (high-spine composite) was also a common type found in most coprolites but assumes importance as a diet indicator only during the upper period of site occupation.

Dalea is a legume that is commonly found in many areas of the semi-arid and arid Southwest and is a plant that would have been available for utilization by the prehistoric inhabitants of Frightful Cave. Dalea pollen is present in more than one-half of all the human coprolites from Frightful Cave that contained sufficient pollen for analysis and indicates a steady increase in use from early through late occupation periods of the site. In many of the coprolite samples dalea pollen occurs in low percentages which may reflect a minimal utilization of this flower as food. However, dalea pollen production per individual flower is low, thus proportionately one would have to eat a number of dalea flowers before its pollen would be found in abundant quantities in a coprolite.

Sotol plants, like agave, produce conspicious flowers which are easy to harvest. In the Amistad Reservoir area of southwest Texas sotol flowers were an important part of Late Archaic peoples diet. In that region I found that sotol pollen sometimes reached percentage levels greater than 60% in human coprolite samples (Bryant 1974a). In the Frightful Cave human coprolite samples, however, sotol pollen is restricted to very low counts even though it is slightly more frequent in the human coprolites from the final period of site occupation. In spite of its slight increase in certain site occupational levels it is still suspected that most, or all, of the sotol pollen found in the Frightful Cave coprolites may have resulted from sources other than the direct eating of sotol flowers. This assumption is further strengthened by the fact that there is a 81% correlation between the presence of both sotol and agave pollen in the same coprolite samples. Since these two liliaceous plants are found in similar habitats, have similar flowering periods, and are pollinated by many of the same insect species it is probable that when the prehistoric people ate the flowers of either plant they mght also have ingested a few pollen

grains of the other taxa. In any case, sotol flowers were not nearly as important a diet item in the Frightful Cave area as they were in an almost identical habitat 200 miles to the north in the Amistad region.

Purslane (*Portulaca*) pollen was found in only six of the human coprolite samples from Frightful Cave. The low percentage of purslane pollen in most of those six samples may have resulted from interflower insect contamination, yet in one sample (sample 41) dating from the upper period of site occupation the occurence of 60% purslane pollen probably resulted from the direct eating of the actual flowers. The flowers may have been picked and eaten individually or could have become accidently incorporated during the preparation of a purslane leaf salad. Ethnographic sources do not mention the specific use of purslane flowers as food yet both Rusby (1906) and Elmore (1943) state that fresh purslane leaf salads were eaten by Indian groups living in the arid Southwestern United States. Other evidence of its prehistoric use was found in human coprolite samples recovered from Pueblo I and Pueblo III levels an Antelope House, Arizona (Williams-Dean and Bryant 1975). As seen in Figures 1 and 2 the utilization of purslane as food is apparently restricted to the upper period of site occupation at Frightful Cave. Such limited usage could have been cultural or may instead reflect an increased availability of this plant in the local flora.

Unknown pollen type A is classified as an economic type because the pollen grain morphology suggests that the parent plant was a type that requires insect pollination. As such its pollen would not be expected to be found as part of the normal pollen rain of the region and thus it could only have become incorporated into the coprolite as the result of flower eating. There are no obvious clues as to which plant it may represent except that its morphology compares favorably with other pollen types of the family Leguminosae. A picture of this pollen grain is included in Figure 3 in hopes that someone may recognize it. Unknown pollen type A was recovered in coprolites dating from the middle and upper periods of site occupation yet the highest concentration seems to have occurred during the upper time period.

The high-spine group of composites includes a number of taxa of similar morpholopy all of which have pollen grains with surface spines longer than two microns. Plants in this group produce pollen that is dispersed by insects and therefore its pollen is usually weakly represented in the normal pollen rain. Although this pollen type is found in many of the Frightful Cave coprolite samples it reaches significant percentages of over 45% mainly in coprolites dating from the upper period of site occupation. In those instances of high pollen

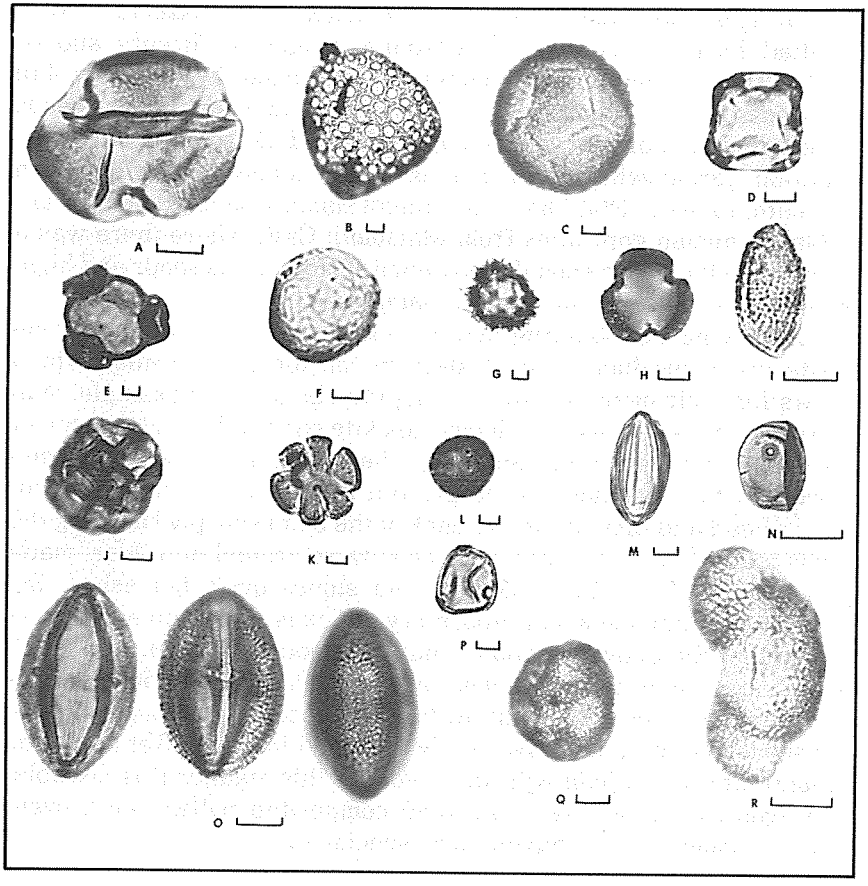

FIGURE 3. Representative pollen types found in prehistoric human coprolites at Frightful Cave. Scale by each photo represents 10 microns. Note that each pollen grain has been enlarged to a slightly different scale so that is morphological features can be more clearly seen. Pollen types include:

A. Leucaena
B. Agave
C. Portulaca
D. Alnus
E. Onagraceae
F. Ulmus
G. Compositae (high-spine)
H. Artemisia
I. Dasylirion
J. Acacia
K. Labiatae
L. Cheno-Am
M. Ephedra
N. Gramineae
O. Unknown A (three views)
P. Celtis
Q. Opuntia
R. Pinus

percentages the most probable conclusion is to assume that it resulted from the eating of high-spine composite flowers and/or seeds. This assumption is further strengthened by the coprolite macrofossil data which reveal that *Helianthus* (sunflower) seeds were found in coprolite samples 4, 11, 36, and 42 from the upper occupation period which also contained high-spine composite pollen percentages over 45%. I have also found similar correlations (Bryant 1974b) in human coprolites from Mammoth Cave where there was a 100% correlation between the presence of *Helianthus* seeds and high-spine composite pollen in the same samples.

Unlike some seed-bearing plants, members of the high-spine composite group produce seed clusters in the form of "heads" which allows for their easy harvest. Among the Apache, for example, sunflower seeds were regularly harvested late each fall by the women of the tribe (Castetter and Opler 1936). The usual harvest technique employed by the Apaches was to place a basket underneath the sunflower head and then strike the back of the head sharply knocking the seeds into the basket. Later, the seeds were ground into flour, made into a dough, and then baked on hot stones or in hot ashes. Experiments conducted in our laboratory at Texas A&M University have shown that the above method of sunflower seed collection will result in the incorporation of sunflower pollen into the ground flour. This occurs because some of the sunflower pollen becomes trapped in among the seeds and is then inadvertently collected in the basket and later ground into flour along with the seeds. In this manner it is possible, and even probable, that high-spine compositae pollen could eventually become part of a human fecal specimen.

SEASONALITY

It has been shown (de Lumley 1969; Bryant 1974a, 1974b) that the pollen contents of prehistoric human coprolites can be used to provide valuable clues as to the probable seasonality of site occupation. There are several ways in which this can be done. In human coprolite samples where there is little background pollen and much zoophilous economic pollen it is possible to suggest seasonality. It is also possible to suggest seasonality when large percentages of specific types of background pollen are present in coprolite samples. On the other hand, weak representations of certain background types or the total absence of pollen in human coprolite samples are not useful clues as to probable seasonality.

Certain indications as to the probable seasonality of site occupation can be determined from the Frightful Cave coprolitic pollen

data. However, in most cases when the determination of seasonality is based upon high percentages of economic pollen types the assumption is made that the pollen was ingested during the season when the plant was in flower. For example, in samples where large quantities of cactus pollen are present (samples 38, 40 and 44) I assume that it reflects the eating of fresh cactus flowers rather than the eating of dried cactus flowers during a later season of the year. This assumption is based upon several factors: (1) most ethnographic sources already cited report that when flowers were eaten they were generally eaten fresh, and (2) many subsistence level hunting and gathering societies did not, as a general rule, store dried foods for later use.

Lower Occupational Period — Coprolitic data from the lower occupational period (7,500-5,000 B. C.) at Frightful Cave reflect a dominant summer and fall seasonality of site usage. In addition there are four coprolite samples for which probable seasonality can not be assigned.

Five of the coprolite specimens (sample 10, 38, 40, 44, 45) from this time period reflect definite late spring or summer seasonality. In each of these five coprolite specimens *Opuntia* is one of the dominant represented pollen types and probably resulted from the direct ingestion of fresh cactus flowers during the late spring and/or summer pollination period of those plants. The assignment of seasonality for these five coprolites is also strengthened by the presence of other zoophilous pollen types such as *Agave*, *Dalea*, and *Leucaena*.

Three of the other coprolites from this lower occupational period (samples 26, 32, 35) contain data suggestive of either a summer or early fall seasonality. In coprolite specimen 26, for example, 90% of the pollen is from an unidentified taxon of Umbelliferae and 92% of the macrofossil remains are fibers from some unidentified plant. Genera of the family Umbelliferae bloom during different periods of the summer and early fall. As stated earlier, the leaves, stems, and flowers were often sought as food by early aboriginal groups in North America, therefore it is possible that both the pollen and plant fiber in coprolite specimen 26 could represent the gathering and eating of flowering Umbelliferae plants during some period of either the summer or early fall.

Fall or winter seasonality is represented by the contents of three coprolites (samples 21, 34, 39) from the lower occupational period of Frightful Cave. Each of these three coprolites contains high percentages of Cheno-Am and/or high-spine Compositae pollen. Both

pollen types could have adhered to the seeds of these plants and been ingested along with the seeds. This proposition is strengthened by the macrofossil data which show that these seed types were indeed part of the diet in these three samples. Since *Helianthus* as well as many of the Cheno-Am species mature during the late summer and early fall, their seeds could have been collected and eaten during that time period. However, the possibility of seed storage for later winter use must also be considered as a possibility. A spring and/or early summer seasonality is not likely for these three samples since they contain very little indicator pollen from those seasons.

Four of the coprolites (samples 19, 28, 46, 47) from the lower occupational period do not contain any pollen or contain such small amounts that it is not useful for the reconstruction of either diet or seasonality. Absence of pollen does not always reflect a winter seasonality as some might assume. It is true that except for *Juniperus* and certain types of grasses atmospheric pollen levels should be at their lower percentage during the winter months; yet other factors could result in the absence of pollen in human coprolites. For example, in each of these four samples the macrofossil evidence shows that the primary diet item was large amounts of plant fiber. The prehistoric inhabitants of Frightful Cave could have collected and eaten large amounts of plant fiber during any season of the year, and therefore it is not wise to try to speculate as to the season represented by these four coprolite samples.

Middle Occupational Period — The coprolites dating from the middle occupational peroid (5,000-2,000 B. C.) at Frightful Cave are similar to those of the upper period in that both groups reveal a predominate pattern of summer and early fall seasonality. The middle occupational period coprolites which indicate a late spring or summer seasonality (samples 15, 16, 17, 27, 29, 31, and 33) contain high percentages of pollen from plants (*Agave, Dalea,* and *Opuntia*) which pollinate during the late spring and summer months. Two of these coprolites (samples 27, 29) also contained large percentages of whole cactus seeds which may have resulted from the eating of a few of the previous year's mature cactus fruits still attached to the plant, or the eating of some early maturing cactus fruits.

The coprolites from this period suggesting a late summer or early fall seasonality (samples 3, 13, 22, 43) contain high percentages of whole seeds from plants which produce mature fruits in the late summer or early fall (*Asclepius, Celtis, Diospyros, Helianthus,* and *Opuntia*). In addition most of these samples lacked significant quantities of

zoophilous economic pollen and instead contained pollen types from plants such as Gramineae and high-spine Compositae which bloom in the late summer.

Three coprolites from the middle occupational period (samples 7, 8, and 9) each contained high percentages of *Quercus* pollen combined with either *Agave, Dalea,* or *Opuntia* pollen. The combination of these two factors suggests that these coprolites may represent an early spring seasonality rather than either a summer or fall season. Oak trees pollinate in the early spring yet their pollen is an airborne type that could become recycled and incorporated into coprolites dating from other seasons of the year, as is suggested for samples 16, 22, and 27. However, the complimentary association of significant amounts of economic pollen with the presence of oak pollen is interpreted to reflect a spring seasonality. The absence of coprolites reflecting a winter seasonality may have been caused by some of the same reasons mentioned earlier.

Upper Occupational Period — The coprolites analyzed from the upper occupational period (2,000 B. C.-A. D. 300) of Frightful Cave suggest primarily a summer (sample 1, 2, 12, 14, 18, 23, 24, 30 and 41) and early fall (sample 4, 5, 11, 25, 36 and 42) seasonality of site occupation. Many of the coprolites from this period assigned summer seasonality contain high percentages of economic pollen types such as *Agave, Dalea, Solanum,* and *Portulaca* which probably represent the eating of these flower types during their summer flowering season. The macrofossils recovered from these same coprolites include large numbers of *Prosopis* and *Opuntia* seeds. The *Prosopis* seeds probably resulted from the eating of mesquite pods which begin to mature in that region of northern Mexico by mid-summer while the *Opuntia* seeds could have been swallowed during the eating of cactus fruits which also begin to ripen by mid-summer.

The coprolites of this period representing a fall seasonality lack significant amounts of economic pollen and instead contain large amounts of pollen types such as grass and high-spine Compositae which bloom in the late summer and early fall. These samples also contain significant quantities of *Prosopis, Opuntia,* and *Diospyros* seeds all of which would be most available in the early fall. I doubt that these samples which I have assigned to a fall season could represent a winter diet. Persimmon fruits, mesquite pods, and cactus fruits are best eaten at maturity when the sugar content is the highest. Furthermore, if these seeds were being stored for later winter use they would probably have been ground into flour and

therefore would not have appeared in the coprolite specimens as whole seeds. Castetter and Opler (1936) note that the Apaches stored certain types of seeds (mesquite, sunflower, and screwbean) which were later ground into flour during the winter months and eaten. Baegert (1952) also noted that the Indians of lower California ground cactus seeds into flour during the winter months yet ate the ripe fruits during the fall rather than storing them for later use.

The absence of coprolites from this occupational period representing other seasons of the year could be due to either or both of the following possibilities: (1) Frightful Cave may have been occupied by prehistoric man only during the warmer seasons of the year, or (2) different hygenic habits may have been practiced during the colder seasons of the year resulting in human defecation either outside the shelter area or in regions of the shelter which were not excavated by the archeologists.

SUMMARY

The Frightful Cave coprolites provide us with one of the longest records of prehistoric man's diet anywhere in northern Mexico or the American Southwest. The coprolite macrofossil analysis combined with my pollen analysis of these same specimens has revealed that the prehistoric inhabitants of Frightful Cave ate a wide variety of foods. In some cases the diet items consisted of fruits, leaves, bulbs, and/or seeds. In other instances the people ate flowers and/or the flower pollen.

In adition to the diet information these coprolites also provided insight into the probable seasons of site occupation and limited inferences about the paleoenvironment. With the possible exception of only three specimens the coprolites from Frightful Cave indicate primarily a cycle of spring and early fall site occupancy. Furthermore, the weak representation of certain pollen types such as pine, alder, and cattails suggests an absence of these plants in the local paleovegetation of the Frightful Cave area. If these plants ever grew in the vicinity of Frightful Cave it would have to have been prior to 7,500 B. C. The pollen data can also be used to demonstrate that other plant types such as walnut, pecan, elm and Morman tea were either absent in the local vegetation composition or were present in very low quantities.

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REFERENCES CITED

Baegert, J. J.
1952 *Observations on Lower California: Notes and Translation by M. Brandenburg and C. Braumann*. University of California Press, Berkeley.

Barrows, D. P.
1900 The Ethnobotany of the Coahuila Indians of Southern California. Ph.D. dissertation on file at the University of Chicago library.

Brown, R.
1868 On the Vegetable Products used by the Northwest American Indians, as Food and Medicine, in the Arts, and in Superstitious Rites. *Botanical Society of Edinburgh Transactions* (1866-1868) Vol. 9, pp. 378-396.

Bryant, Vaughn M., Jr.
1969 Late Fullglacial and Postglacial Pollen Analysis of Texas Sediments. Ph.D. dissertation on file at the University of Texas at Austin library.
1974a Prehistoric Diet in Southwest Texas: The Coprolite Evidence. *American Antiquity*, Vol. 39, No. 3, pp. 407-420.
1974b Pollen Analysis of Prehistoric Human Feces from Mammoth Cave Kentucky. *Archeology of the Mammoth Cave Area*. Academic Press, New York, pp. 203-209.

Bryant, Vaughn M., Jr. and Donald A. Larson
1968 Pollen Analysis of the Devil's Mouth Site, Val Verde County, Texas. In: The Devil's Mouth Site, The Third Season, 1967 by William M. Sorrow. *Papers of the Texas Archeological Salvage Project*, No. 14. Austin, pp. 57-70.

Castetter, E. F.
1932 Uncultivated Native Plants used as Sources of Food. *New Mexico University Bulletin*, No. 266.

Castetter, E. F. and W. H. Bell
1942 *Pima and Papago Indian Agriculture*. University of New Mexico Press.

Castetter, E. F. and M. E. Opler
1936 The Ethnobotany of the Chiricahua and Mescalero Apache. Ethnobiological Studies in the American Southwest III. *The University of New Mexico Bulletin*: Biological Series, Vol. 4, No. 5, pp. 1-68.

Chamberlin, R. V.
1911 The Ethnobotany of the Gosiute Indians of Utah. *Memoir of the American Anthropological Association* No. 2, pp. 331-405.
Elmore, F. H.
1943 Ethnobotany of the Navajo. *University of New Mexico School of American Research Monograph* Vol. 1, No. 7, pp. 1-136.
Fewkes, J. W.
1896 A Contribution to Ethnobotany. *American Anthropologist* Vol. 9, pp. 14-21.
Harvard, V.
1895 Food Plants of the North American Indians. *Bulletin of the Torrey Botanical Club* Vol. 22, pp. 98-123.
de Lumley, Henry
1969 A Paleolithic Camp at Nice. *Scientific American*, Vol. 220, No. 5, pp. 42-50.
Martin, Paul S.
1963 *The Last 10,000 Years. A Fossil Pollen Record of the American Southwest*. The University of Arizona Press, Tucson, Arizona.
Martin, Paul S. and F. W. Sharrock
1964 Pollen Analysis of Prehistoric Human Feces: A New Approach to Ethnobotany. *American Antiquity*, Vol. 30, No. 2, pp. 168-180.
Napton, Lewis K. and G. Kelso
1969 Preliminary Palynological Analysis of Lovelock Cave Coprolites, An Archeological and Paleobiological Investigation in Lovelock Cave, Nevada. *Kroeber Anthropological Society Special Publication* No. 2, pp. 19-27.
Palmer, E.
1878 Plants Used by the Indians of the United States. *American Naturalist*, Vol. 12, pp. 593-606.
Riskind, David H.
1970 Pollen Analysis of Human Coprolites from Parida Cave. *Papers of the Texas Archeological Salvage Project* No. 19, pp. 89-101.
Rusby, H. H.
1906 The June Wild Foods of the United States. *Country Life in America* Vol. 10, pp. 202-204.
Sparkman, P. S.
1908 The Culture of the Luiseno Indians. *California University Publication in American Archeology and Ethnology* No. 8, pp. 187-234.
Spinden, H. J.
1908 The Nez Perce Indians. *Memoir of the American Anthropological Association* No. 2, pp. 165-274.
Stuckenrath, R.
n.d. Radiocarbon Dates from Frightful Cave. In: Frightful Cave, edited by W. W. Taylor (in press).
Williams-Dean, Glenna and V. M. Bryant, Jr.
1975 Pollen Analysis of Human Coprolites from Antelope House. *Kiva* (in press).

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LATE PREHISTORIC CULTURAL PATTERNS ALONG THE LOWER RIO GRANDE OF TEXAS*

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ABSTRACT

Recent research in the lower Rio Grande area of Texas has produced new information on the late prehistoric peoples of that region. In this paper, data are presented on the chronology, settlement system, subsistence regime, trade contacts, and technology of this period. Regional variations of late prehistoric culture are examined and comparisons are made with late prehistoric developments in the adjacent Chihuahuan Desert.

INTRODUCTION

Adjacent to the Chihuahuan desert to the west is the area of northeastern and southern Texas, which Blair (1950) has termed the Tamaulipan biotic province (Figure 1). The Rio Grande is a drainage common to both the Tamaulipan and Chihuahuan provinces, with the upper and middle portions (ending about Del Rio) within the Chihuahuan and the lower reaches of this river in the Tamaulipan area. The bulk of the area within Blair's Tamaulipan province is in southern Texas, and it is this portion that I will review in this paper. This region has had many labels attached to it, including "Southwest Texas," "South Texas Plains," "West Gulf Coastal Plain," the "Brush Country," and the "Rio Grande Plain." Today, the environment of the area can be described as a semiarid and megathermal, with annual rainfall varying from 46 cm to 91 cm, decreasing from east to west. The dominant vegetation pattern is a thorny brush woodland, dominated by mesquite, acacia, prickly pear cactus, and other bristly shrubs. Riparian forests of oak, elm, hackberry, ash, pecan and cottonwood can be found along the major stream courses.

Before we examine the late prehistoric manifestations of this region, it is first necessary to set these late occupations in an environmental perspective. Some ethnohistorians and archeologists have made the mistake of assuming that present-day environmental and vegetational conditions were also present in the prehistoric period. On the contrary, there is substantial historic and archeological data that much of this region was a savannah grassland, with the modern fauna supplemented by such species as bison, an-

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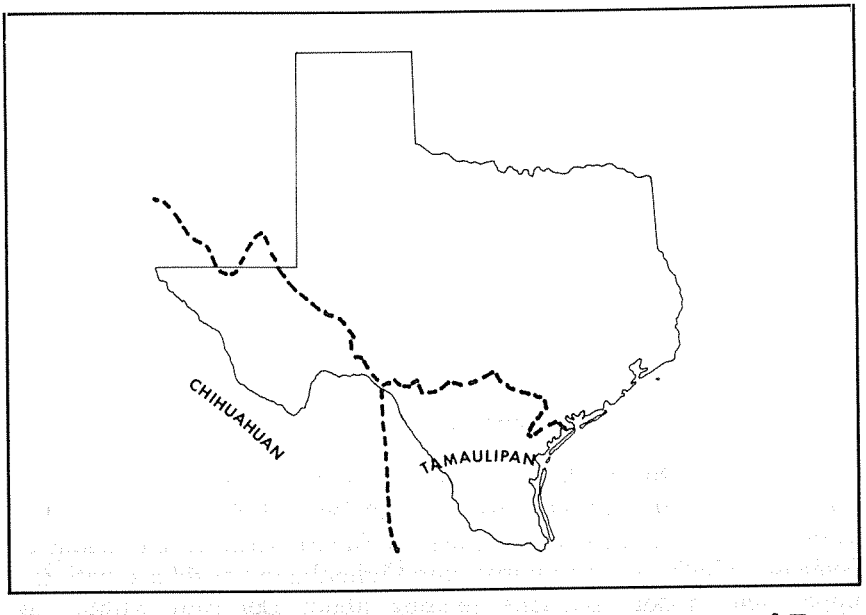

FIGURE 1. The Chihuahuan and Tamaulipan Biotic Zones of Texas and northeastern Mexico (after Blair 1950).

telope and prairie dog. The widespread mesquite forests which choke the area today are a comparatively recent phenomenon. The spread of mesquite and associated thorny plants is probably the result of several factors, including the commercial livestock industry (which led to overgrazing and the increased dispersal of mesquite seeds), short-term climatic changes, and the suppression of grassfires. The latter factor is of particular interest, and several authorities have speculated that the cessation of aboriginal burning of the grasslands was perhaps the major factor in the spread of mesquite (Harris 1966: 408; Wells 1970: 213). Of course, we should not think that mesquite was absent in the area, nor should we conjure up visions of broad expanses of grassy prairie. Given early Spanish accounts, it is apparent that mesquite was present, in upland gravel areas and scattered along the steam channels (Wynd 1944: 228). As Harris (1966: 416) has written:

> "the spread of mesquite should be seen not as an invasion of natural primary grassland, but as part of the re-occupation by woody plants of areas in which secondary grass communities had attained dominance as a result of human interference."

Still, the vegetational pattern was a far cry from that of today.

In addition to vegetational differences, it is certain that there was more surface water available in the late prehistoric than in modern times. Historic accounts confirm that the major drainages (and many of their tributaries) were perennially-flowing streams as late as the early decades of the 20th century. Overgrazing and the resultant watershed destruction led to muddy runoffs which clogged the springs feeding these creeks. Coupled with this was the lowering of the water table through intensive deep-well irrigation for farming. All of these human agencies have managed to turn the streams into dusty channels, carrying water only after local rainstorms.

In brief, the late prehistoric environment was radically different than that of today. The countryside was more open and water was more abundant. We do not have enough evidence to say if these conditions extended back into the preceding Archaic (although I suspect they did) or whether these optimum conditions were present for only a few centuries during the late prehistoric.

LATE PREHISTORY IN THE CHIHUAHUAN DESERT

Prior to looking at the late prehistoric period along the lower Rio Grande, I think it is appropriate to present a brief summary of late prehistory in the Chihuahuan desert area. Much of the Chihuahuan desert has seen little in the way of intensive archeological work, and thus our information on the late prehistoric peoples is rather sketchy.

In the lower Pecos sector, the years of salvage archeology associated with the Amistad reservoir produced a long cultural sequence, primarily reflecting a long Archaic tradition. According to the literature, arrow points appear late in this sequence, around A. D. 1300; however, Gary Moore informs me (personal communication) that he has obtained several radiocarbon dates placing the appearance of arrow points at ca. A. D. 800. These specimens, largely of the *Perdiz* and similar contracting stem forms, but with occasional *Toyah, Scallorn* (corner notched) and triangular specimens, are infrequent in occurrence. At two sites, Devil's Mouth (Johnson 1964) and Javelina Bluff (McClurkan 1968), bone tempered plainware was associated with arrow points. There are no data on late prehistoric settlement or subsistence in the lower Pecos area. However, climatic data presented by Story and Bryant (1966: 156) indicate that xeric conditions prevailed, with an increase in cedar, oak, mesquite and agave.

In the Trans-Pecos, there is a diverse, and poorly known, situation during the late prehistoric. There is the inadequately defined "Liver-

more Focus," whose traits include occupation of open campsites and rockshelters, and the use of contracting stem arrow points, small end scrapers, and beveled knives (Lehmer 1960: 125). However, the temporal and geographic extent of this cultural entity — or even whether it truly exists — remains undetermined. In the Big Bend area, late prehistoric occupations are represented by several kinds of arrow points including the *Perdiz, Toyah, Livermore* and other stemmed forms. Campbell (1967: 11) notes that settlement patterns remain the same as in earlier Archaic times.

To the west of Big Bend, there is something totally different than found in the lower Pecos and adjacent areas. In the La Junta district, at the confluence of the Rio Conchos and Rio Grande, archeological studies have revealed the remains of a sedentary population with pit houses, a variety of ceramics, and agriculture. This is the Bravo Valley Aspect of Kelley, Campbell and Lehmer (1940). To the north, in the El Paso district, the late prehistoric has a distinctly Southwestern flavor, represented by largely the Jornada Branch of the Mogollon (Suhm, Krieger and Jelks 1954).

In the western areas of the Chihuahuan desert, specifically in the Coahuila district, late prehistoric materials have been recognized by Taylor (1966) and Heartfield (1975). Taylor has defined the Jora Complex, beginning sometime after A. D. 1000, and distinguished by the occurrence of *Perdiz, Toyah, Garza*, triangular and side-notched arrow points. These projectile point forms are largely shared with the Bravo Valley Aspect. The *Garza* type has also been found in the El Paso area (Lynn *et al* 1975) and onto the Texas High Plains (Runkles 1964). Accompanying the arrow points are a variety of plain and decorated ceramics, which Taylor (1966: 83) and Heartfield (1975) link to the *El Paso* wares of Jornada Branch. Other traits of the Jora Complex include small end scrapers and various lithic and wooden artifacts (Taylor 1966: 82). Midden circles, found in late prehistoric contexts in the Trans-Pecos area, also occur in the Jora complex, perhaps indicative of a food preparation technology widespread in the Chihuahuan desert in late times.

In general, the eastern part of the Chihuahuan region (the lower Pecos, Big Bend, and Southeastern Trans-Pecos) has evidence of a late prehistoric population which changed little from the earlier Archaic patterns aside from the use of the bow and arrow and the manufacture of a limited amount of bone tempered pottery. The western part, in far western Texas and northeastern Mexico, saw the introduction of Southwestern-type cultures in the El Paso and La Junta districts, and perhaps influence of some sort on into western

Coahuila reflected by the presence of a similar arrow point tradition and diagnostic ceramics.

LATE PREHISTORY ALONG THE LOWER RIO GRANDE

A wealth of information has been obtained during the past five years on the late prehistoric occupation in the southern Texas portion of the Tamaulipan province. Most of the data are derived from excavations and surface investigations in the northwestern sector, which is that area nearest the Chihuahuan desert. Before examining these data, let us first quickly review the other late prehistoric manifestations in the region. Research in the coastal strip of southern Texas has led to the recognition of two archeological complexes dating from late prehistoric times. One is the Brownsville complex of the Rio Grande delta (Figure 2), with a material culture dominated by artifacts of shell and a sophisticated shell-working technology. In addition, the Brownsville complex appears to have had extensive trade contacts extending down the northern Mexican coast and into the desert areas of northeastern Mexico. A distinctive phenomenon associated with the Brownsville complex was disposal of the dead in special cemetery sites (Hester 1969). However, little is yet known about the settlement and subsistence systems of this complex (Prewitt 1974).

On the central and south-central Texas coast, we find the Rockport complex (Figure 2). Occupation sites are usually confined to coastal or bayshore margins. Cemetery sites, some apparently of Rockport age, are also found. The cultural inventory includes stemmed arrow points (mainly of the *Perdiz* type), sandy-paste ceramics, often decorated with asphaltum, and a core-blade industry. James E. Corbin (1974) has recently published a review of the Rockport complex; Harry J. Shafer and I have prepared, for publication later this year, a study of the core-blade technology (Hester and Shafer 1975).

The late prehistoric in the interior is less well known, except for the northwestern sector discussed below. These are numerous late prehistoric sites, characterized by the occurrence of arrow points and associated lithics, and a widely-distributed bone-tempered plain pottery (Hester and Hill 1971). There are areas, such as the Falcon Reservoir and Starr County district along the lower Rio Grande where recognizable prehistoric components are extremely rare (cf. Nunley and Hester 1975).

I want to focus the rest of this discussion on the late prehistoric evidence from the northwestern sector, primarily in Dimmit and

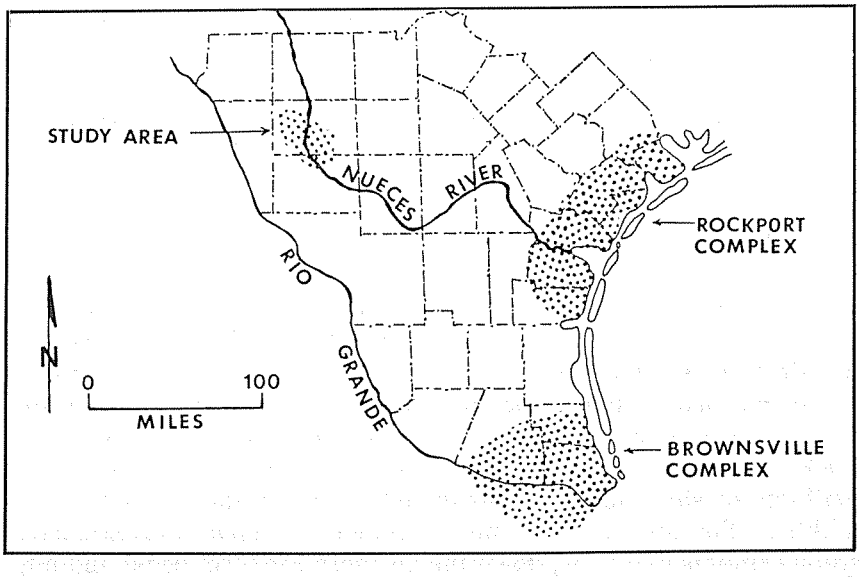

FIGURE 2. Southern Texas. The locations of the Rockport and Brownsville complexes are indicated. The study area in Dimmit and Zavala Counties (see Figure 3) is also shown.

Zavala Counties (see Figure 3; Hester and Hill 1973, 1975). The data have been derived from studies carried out by the author and T. C. Hill, Jr., an amateur archeologist, and from the work of the Chaparrosa Archaeological Project, directed by the author in northwestern Zavala County since 1970. This research has obtained information on all phases of the region's prehistory, and the available data have been summarized in numerous papers (Hester 1970; Hester 1974; Hester 1975a, 1975b; Hill and Hester 1971).

Our sample of late prehistoric sites number in the dozens, and the locations of major sites are shown in Figure 3. All of the presently documented sites are occupation loci, generally with concentrated midden deposits 10-30 cm thick. The middens yield large amounts of lithic debris, land snails, mussel shells, scattered hearthstones of sandstone and chert, baked lumps of clay, charcoal, and animal bone remains. In plan, some of the sites tend toward an oval shape, while others are linear, paralleling the stream course. Although the precise horizontal extent of most of the sites has not yet been determined, they approximate 3600 m^2.

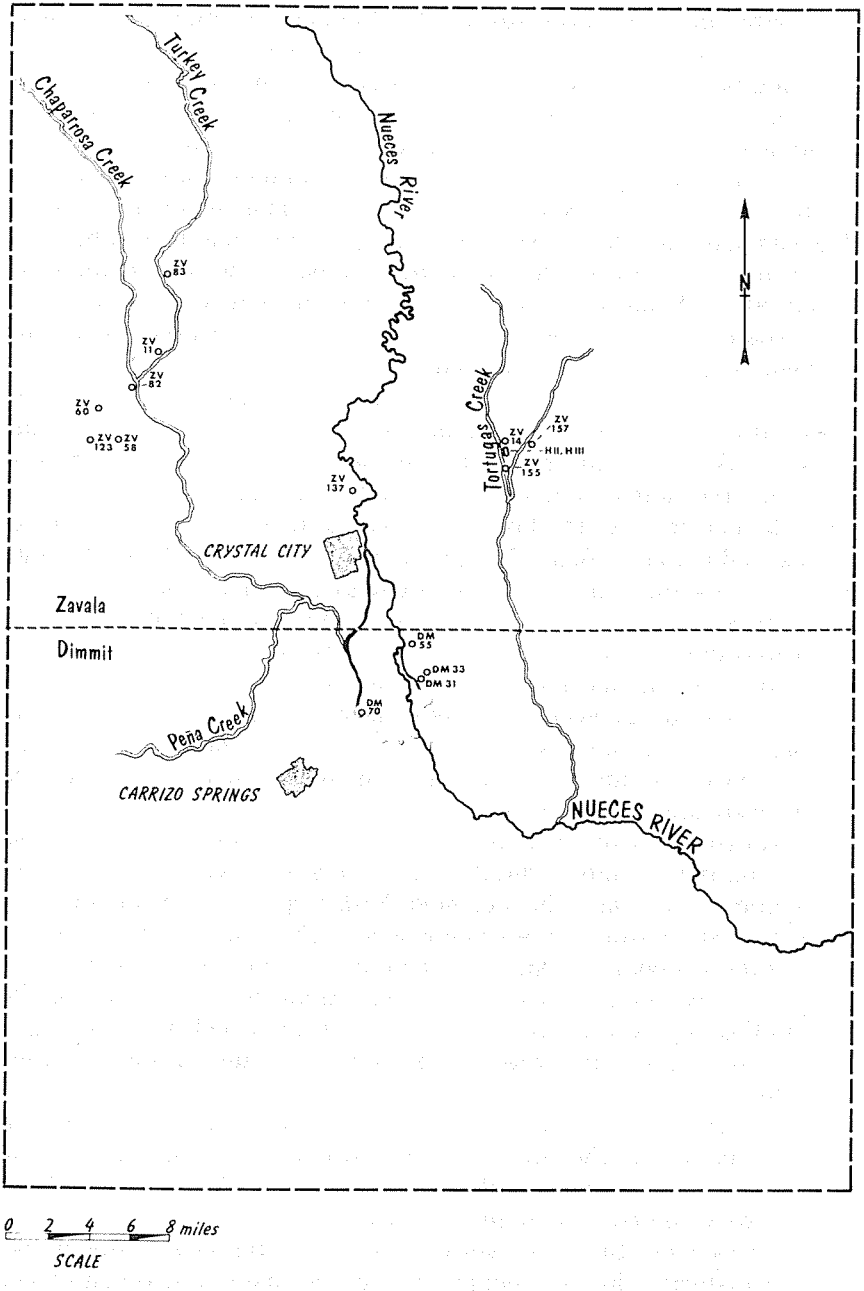

FIGURE 3. Dimmit and Zavala Counties, Southern Texas. Locations of significant late prehistoric sites are shown.

Distribution of late prehistoric settlements in the study area follow a predictable pattern. They are concentrated in riparian microenvironments on the banks of large creeks or on the Nueces River and its former channels. There is, occasionally, the re-use of older, Archaic sites but in general the late sites are horizontally separated. Their proximity to more modern stream channels may reflect the shifting of drainage patterns in late times. In some instances, Archaic deposits are found to underlie the late prehistoric middens; other Archaic sites are found in mid-floodplain and on the bordering uplands. When late prehistoric sites are not in the riparian zone, adjacent to the stream channel, they are also found in the floodplain-riparian ecotone, just back from the channel.

Intrasite patterning of the late sites remains poorly known. Horizontal, open area excavations have been carried out at only one site (41 ZV 83). Data from this site and other tested or surface-mapped sites indicate the presence of pits, sometimes filled with bone or with ash and baked clay, of workshop areas usually related to biface reduction, refuse clusters of snails and mussel shell, and hearths. Hearths will sometimes be isolated without much surrounding debris, or there are occasional clusters of hearths and concentrated debris around them. At two sites, 41 ZV 155 and 41 JW 8 (the latter outside the study area) there appear to have been areas in the site used for disposal, as large concentrations of bison, deer, antelope, and other mammalian remains have been found in what may be old erosional cuts in which trash (including potsherds, debitage, and broken points) was thrown.

In my discussion of the material culture of the late prehistoric sites, I will confine myself to data from excavated sites. The dominant projectile point form is the stemmed *Perdiz* type. Corner notched, expanding stem arrow points similar to *Scallorn* and *Edwards* also occur, as do triangular points similar to the *Fresno* type. Also included in the arrow point series is a thick, stubby form technologically resembling miniature dart points. Stratigraphic evidence suggests that these begin in the late Archaic and continue through the late prehistoric.

It is difficult to discern any internal sequence within the arrow point assemblage. There are at least two sites, elsewhere in south Texas, Berclair (Hester and Parker 1970) and 41 JW 8, which yielded only *Perdiz* points. Yet in the northwestern sector, data from excavations suggest that the several arrow point styles co-existed in the late prehistoric. This is in contrast with the Austin and Toyah phase sequence defined for central Texas. Perhaps the most convincing

evidence of contemporaneity comes from a refuse accumulation at the Tortuga Flat site in Zavala County in which triangular points and *Scallorn* co-occurred.

The lithic tool kit also includes end and side scrapers, often made on blades. Four-edge beveled lozenge shaped knives, bifacial drills, and perforators or gravers made on small flakes are known from excavated contexts.

Debitage analysis has been carried out for several later prehistoric sites. Both percussion and pressure techniques are represented, and in general, flakes are smaller than those produced in the earlier lithic industries in the region. Flakes were used for the manufacture of arrow points, scrapers, perforators, and casual cutting tools. Sometimes, only minimal edge trimming was required to shape an arrow point. A number of blades and exhausted polyhedral blade cores have been found. Some blades were used for making *Perdiz* and other arrow points, as well as some very small end scrapers; the larger blades were fashioned into end scrapers and other scraping tools. This blade technology is widespread in the south Texas, central Texas, and Texas coastal late prehistoric. Perhaps reflecting available lithic resources, the size of the blades, and the tools made on them, vary from region to region (Hester and Shafer 1975; Green and Hester 1975).

Ground and polished implements are rare. No milling slabs are reported from the late prehistoric and manos are infrequent. Hammerstones are, on the other hand, quite common, and are usually made on small cobbles of purple quartzite. A deeply engraved tubular sandstone pipe was found at one late site; at another, a rim fragment of a micaceous schist vessel was excavated.

Bone-tempered plainware pottery is associated with the late prehistoric sites and although it is not found at all sites, it has been documented at 50-75 surface sites and in excavated contexts at several others. Numbers of sherds per site vary from a half-dozen to two or three thousand. The pottery has affinities with the *Leon Plain* ware of central Texas. It is usually undecorated, though some vessels are incised or red painted, formed by coiling, with hard and well-smoothed exteriors and poorly finished interiors. Vessel shapes are poorly known, although most seem to have been small, round-bottomed jars or bowls, with loop handle and lug attachments. Ollas are known for a site in the northeastern sector of the region.

The pottery is tempered with finely-crushed bone fragments. William R. Dickinson of Stanford University has described the results of his petrographic examination of samples of the pottery:

> "Sand-sized angular fragments of broken bone form about 20% of the fired ware. The fire clay body contains scattered angular grains of quartz silt and rare subangular to subrounded grains of quartz sand. From the setting, I suppose the body is an alluvial clay of some kind. Perhaps the bone-temper technique was a last resort in the absence of generally available sandy deposits on alluvial floodplains" (Dickinson letter to T. R. Hester, March 12, 1973).

One of the most interesting aspects of research in the late prehistory of the region is the faunal information that is beginning to appear. In Table 1, faunal data for 8 south Texas late prehistoric sites are listed. Only 41 JW 8 lies outside the northwestern sector. At least forty-one individual species are represented, and the information would indicate that little in the way of potential meat resources was neglected. Large mammals, such as bison, pronghorn, and whitetail deer are present, with the latter the most common. However, in frequency of occurrence and in the number of individuals present per site, the small mammals (jackrabbit, cottontail rabbit, packrat, and cotton rat) are apparently the major meat resource. Fish, birds and reptiles also figured prominently in the late prehistoric diet, with turtles the best represented in the present data. Other food resources found at the late sites include large numbers of land snails, which, based on ethnohistoric accounts, were gathered as a food source, and the shells of freshwater mussel. The only direct evidence of plant food is in the form of hackberry seeds and charred fragments of acorns. However, we know from ethnohistoric accounts that the gathering of plant foods was perhaps the most important activity in the regional subsistence regime.

Of particular significance in the faunal lists are the presence of mammals which are no longer in the region, including bison, antelope and prairie dog. Taken together, these species support the argument for open, perhaps savannah, vegetational patterns in the late prehistoric. Conspicious by their absence are the javelina or peccary, and the armadillo. Both are considered to be recent intruders into the region, and the faunal data bear this out. Quail, a popular game bird in the area today, is also absent. These birds are rather easy to trap or snare, and their total absence in the faunal lists must indicate their absence in the late prehistoric faunal assemblage. Since these birds favor a brushy habitat, their absence may also reflect savannah conditions.

A review of the faunal tabulations reveals no recognizable predilection for any particular microenvironment for the hunting (or gathering) of animals. Bison and antelope were certainly more common in the uplands. Deer and many of the small mammals inhabited a

TABLE I.

Table 1. *Fauna from Late Prehistoric Sites in Southern Texas.* Sites 41 ZV 155, ZV 60, ZV 14, and Holdsworth II (ZV H-II) are described in Hester and Hill (1975).

Common Name	ZV 155	ZV 60	ZV H-II	ZV 123	ZV 14	ZV 152	JW 8	DM 28
*Bison	X	X		X			X	
*Pronghorn (antelope)	X						X	X
White-tail deer	X	X	X	X	X		X	
*Grey Wolf							X	
Coyote	X	X	X				X	
Jackrabbit	X	X	X		X	X	X	
Cottontail rabbit	X	X	X	X	X	X	X	
Raccoon	X						X	
Bobcat			X					
Opossum			X				X	
Grey Fox	X							
Hog-Nosed Skunk	X							
Southern Plains Packrat	X	X	X		X		X	
Cotton Rat		X	X	X	X	X	X	
Pocket Mouse			X				X	
White footed mouse	X		X					
Mexican ground squirrel						X	X	
Ground squirrel	X		X				X	
Plains pocket gopher	X						X	
*Prairie dog	X		X					
Gopher	X		X					
Box turtle	X		X		X		X	
Slider turtle			X		X		X	
Turtle	X				X		X	
Frog							X	
Fish	X					X	X	
Catfish							X	
Alligator gar		X				X		
Rattlesnake			X				X	
Bullsnake	X		X		X			
Ratsnake	X		X				X	
Water snake							X	
Racer snake			X				X	
Snake		X					X	
Horned toad	X		X					
Heron							X	
Wild turkey		X					X	
Mockingbird	X			X				
Duck	X							
Roadrunner							X	
Bird			X				X	

*Species no longer present in the region.

TABLE II.

Table 2. *Late Prehistoric and Historic Fauna from Scorpion Cave, 41 ME 7, Medina County, South-central Texas.* Numbers in parentheses indicate the total number of excavated levels in which one or more individuals were recognized. Faunal data courtesy of George Judson (San Antonio). Judson is preparing a report on the site, and the full faunal data will be published in it.

	6" Levels		
Common Name	**1**	**2**	**3**
Bovid*	(7)	(2)	(3)
Whitetail deer	(18)	(14)	(9)
Goat (domestic)	(3)		
Pig (domestic)	(1)		
Black bear			(1)
Beaver	(1)		(1)
Raccoon		(2)	
O'possum	(1)		
Ringtail (civit cat)	(4)	(3)	
Striped skunk			(1)
Cottontail rabbit	(13)	(14)	(2)
Armadillo**	(1)	(1)	
Fox squirrel	(1)		
Mexican ground squirrel		(1)	(1)
Packrat	(9)	(9)	(4)
Cotton rat	(1)	(3)	(1)
Plains pocket gopher	(2)	(1)	(1)
Cave bat	(2)		
Mouse-ear bat	(1)		
Yellow mud turtle	(1)		
Slider Turtle	(1)	(3)	
Western box turtle	(3)	(4)	(2)
Western mud turtle	(1)		
Soft Shell turtle	(1)	(1)	
Turtle sp.	(3)	(3)	
Racer snake			(1)
Rattlesnake	(1)	(2)	
Rat snake	(1)	(1)	
Bull snake			(1)
Leopard frog	(3)	(1)	(1)
Frog sp.		(1)	
Freshwater drum	(1)		
Fish sp.	(3)	(2)	
Fox sparrow		(1)	
Mockingbird		(2)	
Warbler	(1)		
Broad-wing hawk	(1)		(1)
Greenwing teal		(1)	
Duck sp.	(3)	(1)	
Wild turkey	(8)	(5)	(3)
Canada goose	(1)	(1)	

*Bovid: bison or cow. Associated artifacts in levels 2 and 3 indicate presence of bison.

**Armadillo: this is a recent introduction to the fauna of south-central Texas, probably not appearing until after A.D. 1900 (Billy Davidson, personal communication).

variety of closely-spaced microenvironments. The riparian microenvironment and the riparian-floodplain ecotone would have been the habitat of many of the small mammals, rodents, reptiles and birds. In general, most of the fauna represented in the late sites could have been obtained in the immediate site area or without venturing far from the streamside camps. As more data become available, we should be able to examine the seasonality of site occupation given the presence of migratory waterfowl and other seasonally-specific fauna.

If one compares the faunal lists from the northwestern sector with those from late prehistoric and early historic aboriginal occupations in south-central Texas and the south Texas coast, some immediate differences can be noted. For example, at Scorpion Cave (41 ME 7) west of San Antonio (see Table 2), antelope, jackrabbit and prairie dog are absent, probably reflecting local environmental conditions. Although there is the emphasis on deer and small mammals we saw to the south, there seems to have also been a preference at this site for turtles and birds. Interesting is the occurrence of Canada goose, and greenwing teal, present in the area only during winter migrations.

In examining the late prehistoric and historic fauna from the Kirchmeyer site (41 NU 11) on the south Texas coast, we note the heavier emphasis on locally available marine resources (Table 3). Bison and whitetail deer remains are present, but antelope and prairie dog are not. The small mammals were sought (and here, swamp rabbit is found along with cottontail), and there was the utilization of reptiles and birds. Note the occurrence of black bear, also present at Scorpion Cave, but absent elsewhere in the south Texas faunal record. The domesticates identified at Kirchmeyer are surface finds, linked either to European use of the site area or to the known historic Indian occupations at the site.

Speaking in highly general terms, the subsistence endeavors of the late prehistoric peoples throughout southern Texas reflect locally (and probably seasonally) available meat resources, but there is a widespread and apparently heavy use of whitetail deer, small mammals, rodents, fish, and reptiles. Bison may have appeared only cyclically in the region; we have little evidence of their presence in Archaic deposits.

There are several other aspects of the late prehistoric period that I want to very briefly mention. Mortuary practices are poorly known in the interior; flexed and extended burials seem to have been placed at random, within and outside of campsites. Along the coast, interment in discrete cemetery areas was the burial mode. Trade contacts were widespread. Interior and coastal groups exchanged a variety of materials. The people of the Brownsville complex apparently main-

TABLE III.

Table 3. *List of Identified Fauna, Kirchmeyer Site (41 NU 11), Southern Texas Coast.* The faunal remains are from various excavated and surface contexts, including late prehistoric and historic aboriginal occupations.

Bison	Rattlesnake
Horse	Box turtle
Bovid (cow or bison)	Slider turtle
Whitetail deer	Alligator
Domestic goat	Turtle sp.
Domestic pig	
Black bear	Crustaceans
Coyote	Gafftop catfish
Domestic dog	Hardhead catfish
Striped skunk	Fish sp.
Raccoon	Black Drum
Jackrabbit	Star Drum
Cottontail rabbit	Drum sp.
Swamp rabbit	Sheephead
Plains pack rat	Redfish
Cotton rat	Sea trout
Wild turkey	
Domestic turkey	
Greenwing teal	
Bird sp.	

tained trade contracts with the Huasteca. Additionally, at some interior campsites of late prehistoric date, obsidian and pottery from both Mexico and New Mexico have been found.

Population size is unknown. Both the archeological evidence and early historic records indicate that we are dealing with fairly small groups, perhaps microbands of 20-60 people.It is likely that these late prehistoric groups coalesced seasonally, as they did in early historic times, to harvest plant foods such as acorns, prickly pear fruits, and other seasonally available plant resources.

The dating of the late prehistoric in southern Texas remains imprecise. Radiocarbon dates available from five sites indicate a range from A. D. 1440 to A. D. 1760.Although the latter date would place the occupations within the historic era, the sites have produced absolutely no evidence of historic contact. I suspect that additional radiocarbon dates, some currently being processed, will push the beginning of the late prehistoric back to around A. D. 1300. In any event, the late prehistoric in southern Texas is certainly a very late phenomenon, as it was in parts of the Chihuahuan province.

CONCLUDING COMMENTS

Given the significant environmental differences between the Chihuahuan and Tamaulipan provinces, perhaps even more marked in late prehistoric times, I think there is little to be gained from a detailed comparison between cultural patterns in the two areas. We should note, however, the similarities between the late prehistoric remains from the lower Pecos and the southeastern Trans-Pecos and the materials in southern Texas. Unfortunately, so little is known about the late prehistoric in the eastern Chihuahuan area that we cannot go much beyond this generalization.

By the same token, we cannot make sweeping generalizations about late prehistoric lifeway in southern Texas. We know that the ecological relationships of that period were different from those of today, and that we cannot look at late prehistoric patterns of adaptation from the perspective of the modern environment. What appear to be two distinct adaptations were made, perhaps reflecting little more than the efficient utilization of local resources. These were the *maritime* (or coastal; Rockport, Brownsville) and *savannah* (interior) adaptations, which I have outlined in an earlier paper (Hester 1971). The savannah adaptation, found in the interior, is best known from the northwestern sector. However, there are hundreds of surface sites scattered throughout the interior which bear related cultural materials, in the form of arrow point, bone-tempered pottery and certain lithic tools. Thus, we know that this hypothesized adaptation was quite widespread and the present radiocarbon evidence also suggests that it was quite late.

What broke the long-lived Archaic pattern around A. D. 1300-1400? Beginning at this time, we can recognize changing settlement patterns and the introduction of new cultural traits, particularly arrow points, bone-tempered pottery, beveled knives, a core-blade technology, and so forth. It is possible that the new settlement trends may reflect nothing more than adjustments to shifting drainage patterns. However, the new cultural inventory is something distinctly different from that of the so-called Archaic.

Are we seeing, in this late prehistoric era, the adoption by local peoples of new traits and activities brought about by environmental changes, diffusion, or intracultural contacts? Or, are we looking at the movement of new populations into portions of the region? The source of such populations might be the Toyah phase of central Texas, in which very similar cultural inventories are found beginning around A. D. 1200 (Shafer 1971). Given my research in the region, I see no firm evidence for this latter explanation. If new groups had

moved in, I think we could recognize co-existing native peoples who did not accept these new traits. Such is not the case, with the possible exception of the Falcon Lake-Starr County districts. When one looks at the overall picture, it is obvious that the new traits of the late prehistoric are widely distributed throughout the savannah area.

Perhaps there is another process which might better explain the spread of these new traits into the region. Dillehay (1974) has observed that there was a marked expansion of the bison range around A. D. 1200-1300. He has also noted the migration of bison herds into southern Texas at this time, although when he wrote, he did not have the evidence we have recently obtained, that bison were actually present as far south as Alice in deep south Texas, 120 miles south of San Antonio. I find it interesting that the phenomenon of late prehistoric development in southern Texas coincides with the influx of bison, a faunal component which had been largely absent (given our present data) in the Archaic of this region. While I seriously doubt that any of the south Texas peoples ever became full-fledged bison hunters, they undoubtedly had to make some readjustments, particularly in their subsistence system, and perhaps even in the placement of settlements (cf. Gunnerson 1972). I think that the intrusion of bison brought with it the appearance of new cultural traits. The Plains-like culture of the Toyah phase peoples had the same kinds of artifacts that we now see appearing in southern Texas. Are these new accoutrements nothing more than diffused cultural elements from the Plains? Are we seeing here the same southward spread of Plains culture that had a century or two earlier led to the development of the central Texas Toyah phase? Although I have not thought this out in any detail, I presently favor this explanation as the major mechanism for the development of late prehistoric culture in southern Texas.

REFERENCES CITED

Blair, W. F.
1950 The Biotic Provinces of Texas. *Texas Journal of Science* Vol. 2, No. 1, pp. 93-116.

Campbell, T. N.
1967 Archaeological Survey of the Big Bend National Park. Part I. Mimeographed report submitted to the National Park Service.

Corbin, J. E.
1974 A Model for Cultural Succession for the Coastal Bend Area of Texas. *Bulletin of the Texas Archeological Society* Vol. 45, pp. 29-54.

Dillehay, T. D.
1974 Late Quaternary Bison Population Changes on the Southern Plains. *Plains Anthropologist* Vol. 19, No. 65, pp. 180-196.

Green, L. M. and T. R. Hester
1975 The Finis Frost Site: A Toyah Phase Occupation in San Saba County, Central Texas. *Bulletin, Texas Archeological Society* Vol. 44, pp. 69-88.

Gunnerson, D. A.
1972 Man and Bison on the Plains in the Protohistoric Period. *Plains Anthropologist* Vol. 17, No. 55, pp. 1-10.

Harris, D. R.
1966 Recent Plant Invasions in the Arid and Semiarid Southwest of the United States. *Annals, Association of American Geographers* Vol. 56, pp. 408-422.

Heartfield, L.
1975 Archaeological Investigations in the Charcos de Risas Desert, Coahuila. Paper presented at the conference "Prehistory of Northeastern Mexico and Texas," Monterrey, Mexico.

Hester, T. R.
1969 The Floyd Morris and Ayala Sites: Discussion and Comparison. *Bulletin of the Texas Archeological Society* Vol. 40, pp. 157-166.
1970 An Interim Statement on Archaeological Research at Chaparrosa Ranch, Texas. Report submitted to the Office of the State Archeologist, Austin.
1971 Hunters and Gatherers of the Rio Grande Plain and the Lower Coast of Texas. Paper presented at the symposium on Texas Archeology, annual meeting, Texas Academy of Science, Nacogdoches.
1974 Some Observations on Archaeology at Chaparrosa Ranch, 1974. *La Tierra* Vol. 1, No. 3, pp. 19-22.
1975a Chipped Stone Industries on the Rio Grande Plain of Texas. *Texas Journal of Science*, Vol. 26, Nos. 1-2, pp. 213-222.
1975b An Overview of Prehistoric Chronology in Southern and South-Central Texas. Paper presented at the conference, "Prehistory of Northeast Mexico and Texas," Monterrey, Mexico.

Hester, T. R. and R. C. Parker
1970 The Berclair Site: A Late Prehistoric Component in Goliad County, Southern Texas. *Bulletin of the Texas Archeological Society* Vol. 41, pp. 1-24.

Hester T. R. and H. J. Shafer
1975 A Preliminary Study of Blade Technology on the Lower Texas Coast. *Plains Anthropologist*, Vol. 26, Nos. 1-2, pp. 213-222.

Hester, T. R. and T. C. Hill, Jr.
1973 Prehistoric Occupation at the Holdsworth and Stewart Sites on the Rio Grande Plain of Texas. *Bulletin of the Texas Archeological Society* Vol. 43, pp. 33-75.
1975 Archaeology of the Late Prehistoric and Protohistoric Peoples of Southern Texas. Ms. submitted for publication.

Hill, T. C., Jr. and T. R. Hester
1971 Isolated Late Prehistoric and Archaic Components at the Honeymoon Site (41 ZV 34), Southern Texas. *Plains Anthropologist* Vol. 15, No. 54, pp. 52-59.

Johnson, L., Jr.
1964 The Devil's Mouth Site. *Archaeology Series*, No. 6, Department of Anthropology, University of Texas at Austin.

Kelley, J. C., T. N. Campbell, and D. Lehmer
1940 The Association of Archaeological Materials with Geological Deposits in the Big Bend Region of Texas. *Sul Ross State Teachers College Bulletin*, Vol. 21, No. 3.

Lehmer, D. J.
1960 A Review of Trans-Pecos Archeology. *Bulletin of the Texas Archeological Society* Vol. 29 (for 1958), pp. 109-144.

Lynn, W., B. Baskin, and W. R. Hudson, Jr.
1975 A Preliminary Archeological Reconnaissance of Selected Public Free School Lands in El Paso County, Texas. *General Land Office and Texas Historical Commission, Archeological Survey Report*, No. 13.

McClurkan, B. B.
1968 Test Excavations, Javelina Bluff, Val Verde County, Texas. Fall, 1966. Texas Archeological Salvage Project, Austin.

Nunley, J. P. and T. R. Hester
1975 Assessment of Archaeological Resources in Portions of Starr County, Texas. *Center for Archaeological Research, University of Texas at San Antonio, Archaeological Survey Report*, No. 7.

Prewitt, E. R.
1974 Preliminary Archeological Investigation in the Rio Grande Delta of Texas. *Bulletin of the Texas Archeological Society* Vol. 45, pp. 55-66.

Shafer, H. J.
1971 Late Prehistory of Central Texas. Paper presented at the symposium on Texas Archeology, annual meeting, Texas Academy of Science, Nacogdoches.

Story, D. A. and V. M. Bryant, Jr.
1966 A Preliminary Study of the Paleoecology of the Amistad Reservoir Area. Report to National Science Foundation.

Suhm, D. A., A. D. Krieger and E. B. Jelks
1954 An Introductory Handbook of Texas Archeology. *Bulletin of the Texas Archeological Society* Vol. 25.

Taylor, W. W., Jr.
1966 Archaic Cultures Adjacent to the Northeastern Frontiers of Mesoamerica. *Handbook of Middle American Indians* Vol. 4, pp. 59-94.

Wells, P. V.
1970 Historical Factors Controlling Vegetation Patterns and Floristic Distributions in the Central Plains Region of North America. In: *Pleistocene and Recent Environments of the Central Great Plains*, University of Kansas, *Special Publication* Vol. 3, pp. 211-221.

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ARCHEOLOGICAL INVESTIGATIONS OF FOUR SITES IN SOUTHWESTERN COAHUILA, MEXICO

LORRAINE HEARTFIELD

ABSTRACT

Four surface sites in the Desierto de Charcos de Risa were investigated. Artifacts spanning late Paleo-Indian to modern times were recovered. Although this region is included in the overall archeological pattern in northern Mexico, many artifact styles are specific to a small area. Among these, are pottery and projectile point styles.

INTRODUCTION

In 1967, I excavated four sites in the Charcos de Risa Desert of southwestern Coahuila, Mexico (Fig. 1) (Greene 1971). The excavations were conducted under the auspices of the Northeast Mexico Archeological Project directed by Jeremiah F. Epstein, University of Texas at Austin. Funds were provided by the National Science Foundation.

GEOLOGICAL SETTING AND ENVIRONMENT

The four sites are located in the general region known as the Laguna or Comarca Lagunera. The Charcos de Risa basin is a narrow elongated desert oriented northwest by southeast. The southern mouth opens on the Laguna Mayran and the northern on the Lagunas La Leche and Palomas. The basin is bordered on the east by the Sierra del Sobaco and on the west by the Sierra Tlahualillo. The sites are located along the dry channel of the Rio Charcos de Risa at the southern end of the desert.

The Laguna lies slightly south of the Bolson de Mapami. Eardley (1951: Fig. 338) and Maldonado-Koerdell (1964: 5) include the area in the Western Sierra Province. Interior drainage characterizes this basin-and-range region, and following rains, the basins are frequently covered by water. Salts collect in the lower parts of the basins and are observable on the surface. Active dune fields are common.

According to Tamayo and West (1964: 115), water drained into the Laguna near San Pedro de las Colonias from the Rio Nazas before it was dammed, creating many lakes. The largest, the Laguna Mayran, had a diameter of more than a mile.

According to the Koeppen Classification (Escoto 1964: 205-208), Coahuila is a true desert. The mean annual ground temperature is greater than 77° F. The difference between day and night tem-

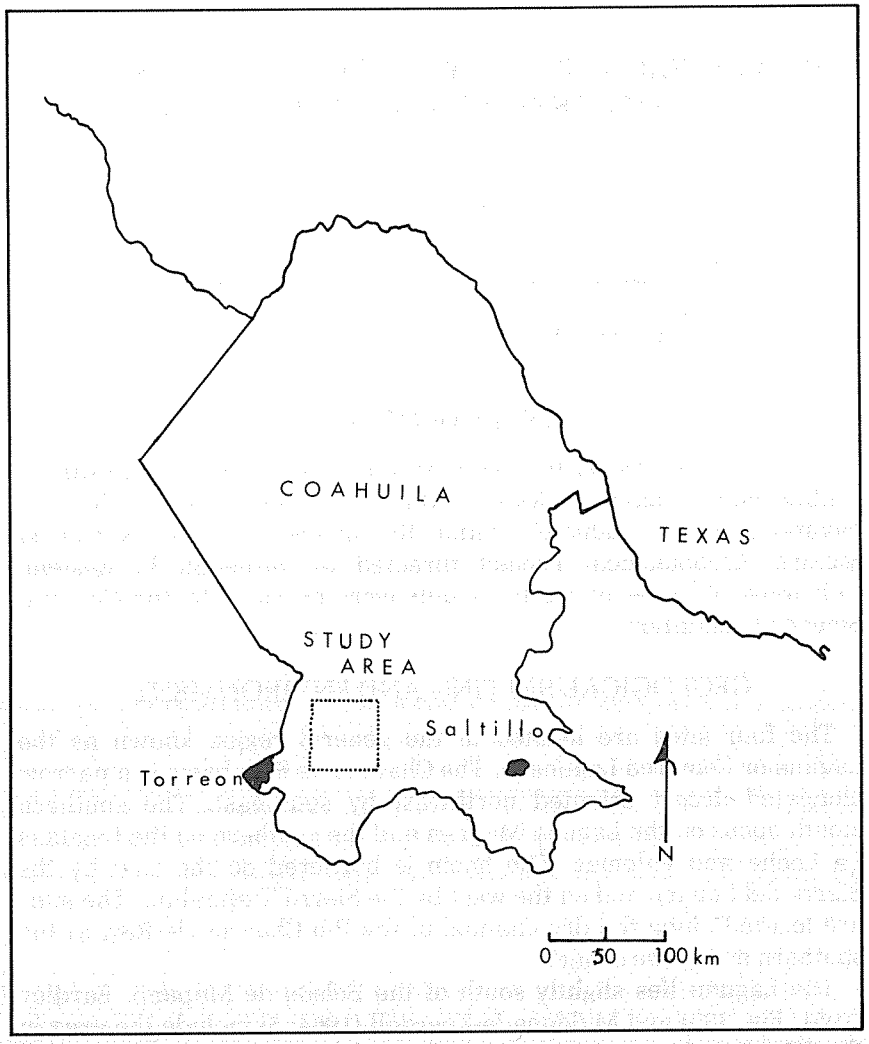

FIGURE 1. Location map of recent archeological excavations in Coahuila, Mexico.

peratures is extreme and cold winters are contrasted by hot summers. The mean annual precipitation is 25 cm. with greater than 40% variability. Thunderstorms occur most frequently during the summer (*Ibid.* 197-204).

FLORA AND FAUNA

Common flora in the Laguna includes *Agave, Opuntia, Cereus, Euphorbia, Larrea, Dasylirion* and *Prosopis* (Aveleyra *et al* 1956: 41). Many mammals are common to the area. Among these are rodents, especially rabbits and carnivores. Birds are numerous but I observed no water fowl. According to local inhabitants, deer are rare.

Early Spanish reports (Griffen 1966: 114) indicate that the area was dry except near the lake margins. Fish, water fowl, fruits and nuts were reported in the wetter areas.

HISTORICAL BACKGROUND

Before Europeans reached the Laguna region the effects of the Spaniards were felt. Horses extended the range of indigenous groups in north central Mexico resulting in a rapid change in population distribution. Later, Indians from diverse cultural backgrounds united to harrass the Spaniards, and many punitive expeditions were then mounted against the Indians. Also, missionization and its concommitant European diseases decimated the aboriginal population. Finally, deportation, assimilation and extinction obliterated the native inhabitants of the Laguna.

William B. Griffen (1966) has written an extensive study of the early historic period in north central Mexico. Readers are referred to this excellent report for greater detail.

ARCHEOLOGICAL BACKGROUND

Before 1967, only two major archeological investigations had been conducted in the study area. The first of these was in the central part of Coahuila, the Cuatro Cienegas Basin. W. W. Taylor (1956, 1966) surveyed open sites and excavated several cave deposits. Subsequently he developed a cultural sequence based on artifact typology and radiocarbon dates from the cave materials.

Aveleyra *et al* (1956) described archeological materials from caves and open sites throughout the Laguna. The most spectacular site is a rich mortuary cave, Cueva de la Candelaria.

Many archeological investigations were conducted under the auspices of the Northeast Mexico Archeological Project. In 1960,

Jeremiah F. Epstein conducted archeological surveys in Nuevo Leon and Coahuila. This was followed by excavation of the San Isidro site in Nuevo Leon (Epstein 1969). Parts of Nuevo Leon and extreme Southeastern Coahuila were surveyed by Burney B. McClurkan and Glen S. Greene in 1963. Both McClurkan (1966) and Nance (1971) excavated sites in Nuevo Leon. The central part of Southern Coahuila from the Nuevo Leon border to Torreon was surveyed by Dudley M. Varner (1967). In 1966 an intensive survey was conducted near Torreon by Ronald W. Ralph and me. Also, in 1966, William Irwin located and excavated two large sites in the Laguna Mayran. Finally, in the spring of 1967 I returned to the Laguna and excavated the four sites that are the subject of this paper.

THE SITES AND EXCAVATION PROCEDURE

The sites C-189, C-190 and C-191 are adjacent to and almost contiguous with one another. Site C-190 lies between C-189 and the riverbed; site C-191 is slightly south of C-190. These three sites consist of from 100 by 100 to 100 by 200 meters of scattered debris; cracked basalt, hearths, burials, lithic and ceramic artifacts.

Site C-198 is located several kilometers northeast of the other sites. One edge of the site is adjacent to a large mesquite stand. The surface, 150 by 300 meters is littered with debris which includes stream-rolled cobbles. Milling stones are more prevalent on the surface than at the other sites.

The sites proved to be extremely shallow. It was hoped that some stratigraphic artifact distribution would be discovered, but there was little cultural material below 10 centimeters and no artifact differentiation existed from the surface to the lower limit of the deposit. Each site was mapped and excavation units were established. Placement of the units was based on high artifact concentration and an attempt to sample different parts of each site. It was hoped that the excavation units would indicate spatial differences among the artifact assemblages. Unfortunately, this was not the case.

The lack of spatial differences (both vertical and horizontal) among the artifact assemblages within each site is a function of the unconsolidated midden matrix and erosional factors. Wind deflation of the sites lowered the artifacts onto a common (present day) surface and destroyed the vertical record. Horizontal mixing of artifact assemblages is due to lateral movement caused by sheet erosion; all of the sites are subject to widespread vertical run-off of flood waters following heavy rains.

Intensive surface collections were made at each site. A dune area between C-190 and C-191 was sampled and all specimens are treated

as members of the collection of either C-190 or C-191. For provenience detail, see Greene (1971).

FEATURES

Burials

Three burials were removed from C-189. Skeletal remains at C-191 and C-198 were not removed due to extreme decomposition from exposure and because the field season was concluded prematurely. The terminology applied to the burial descriptions is adopted from Sprague (1968: 479-485).

The remains of the first burial, Feature 6, were badly deteriorated. The axis of the skeleton was east by west with the cranium in the east. The burial was a primary inhumation extended on the back. No artifacts or pit outline were associated with the burial. No age and sex determination could be made. However, the individual was probably a small child because only the central portions of the long bones remained. These long bone fragments were small.

Two additional burials (Features 7 and 8) were lying side by side. Both skeletons were partially scattered on the surface. The maximum depth of both burials was 10 cm. below the surface.

The long axis of one burial (Feature 7) was northwest by southeast with the cranium in the southeast. The burial was a primary inhumation, extended on the back with the hands along the sides. The skull, lower limb long bones, pelvis and all but three vertebra were missing or fragmented. The outline of an irregular burial pit was evident around the lower portion of the skeleton. No artifacts were associated with the burial. The individual is believed to have been an adolescent because the vertebral epiphysis were unfused. No sex determination was possible.

The long axis of the second burial (Feature 8) was east southeast by west northwest. The cranium was in the west northwest. The burial was a primary inhumation extended on the back with the hands along the sides and the left leg crossed over the right. The individual was an adult because all epiphysis were fused. No sex determination was made. There were no artifacts nor evidence of a burial pit.

Hearths

Three possible hearths were documented during excavation of site C-189. One possible hearth was excavated at site C-190.

Features 1 and 2 from C-189 are probably parts of a single hearth. Thirty-two small (diameters range between 5 and 10 cm.) basalt rocks were scattered across an area of 50 cm. diameter. There was no apparent orderly arrangement among the stones. No evidence of fire-hardened earth, charcoal or artifacts was associated with the features.

The second possible hearth at C-189 is Feature 3. Three basalt rocks (approximate diameters, 15 cm. each) and one smaller rock were scattered across an area of 25 cm. diameter. There was no orderly arrangement, associated charcoal or artifacts.

Features 4 and 5 represent the third possible hearth from C-189. A cluster of 7 stones (diameters of 15 cm. each) were scattered within an area 29 cm. in diameter. A large charcoal fragment was recovered from among the rocks. There was no fire-hardened earth nor were there artifacts associated with this possible hearth.

The single possible hearth from C-190 was excavated. This (Feature 1) consisted of 9 basalt rocks and charcoal fragments. Seven of the stones were located along an irregular north-south axis. The two remaining stones were 23 and 30 cm. west of these. No artifacts, charcoal, or fire-hardened earth was discovered.

ARTIFACTS

Analysis of artifacts from northern Mexico is hampered by the lack of detailed comparative information. Therefore, lengthy descriptions of all artifact categories are included and related to established, culturally significant types. Since categories have been combined from the 1971 report (Greene 1971) they are carefully referenced here. All unclassifiable fragments are omitted from this report.

Because analysis of the artifacts indicated that no vertical or horizontal significance could be demonstrated, artifacts are reported only by site. Refer to Tables I, II, III, and IV for proveniences not included in the text.

Projectile Points

Primary sorting criterions are dart and arrow point categories. Mean dart point weights are greater than 2.5 grams and mean arrow point weights are less than 2.5 grams (Fenega 1953).

The outlines of the proximal or basal portions of projectile points are used to define the primary categories. These are: contracting stemmed, straight stemmed, expanding stemmed, side-notched, miscellaneous stemmed, and unstemmed. These categories are based on the observation that stem or base treatment is significant:

although obviously, not all sub-categories within a single stem treatment are contemporaneous. This is not unique. Johnson (1967) demonstrated the chronological significance of basal characteristics among projectile points from central and southwestern Texas. Stem characteristics are refelcted in the typology of central Coahuila (Taylor 1966) and are significant among the projectile point changes in northern Mexico and adjacent Texas which are summarized by Epstein (1969).

The final sorting criterion is based on common typology. Projectile points are compared to known types when possible and provisional types are described. Many point forms from central and southwestern Coahuila have been briefly described by Aveleyra *et al* (1956) and Taylor (1966) but systematic description is lacking. In order to provide comparative data, detailed descriptive information about each projectile point type, provisional type and untyped category is included in the text of this paper.

DART POINTS

A total of 167 dart points was recovered from the four sites. These include: contracting stemmed (49 specimens), straight stemmed (3 specimens), expanding stemmed (80 specimens), side-notched (17 specimens), miscellaneous stemmed (4 specimens), unstemmed (14 specimens).

CONTRACTING STEMMED

Among the contracting stemmed dart points are three types defined by Taylor (1966), one provisional type and four untyped categories.

Acatita (Fig. 2, a-c)

There are seven specimens in this provisional type. The blades are triangular with recurved or convex edges. Alternate or unifacial beveling of the blade edges is common. With one exception the stems are short, narrow and strongly contracted to slightly expanded. The exception has a long stem. Stems may be asymmetrical to the medial axis of the blade with thinned or unthinned bases. The regularly barbed shoulders are equal to or slightly longer than the stems. One shoulder of a single specimen is descending. It may have been fractured. Dimensions: length, 2.6-3.8 cm.; length of stem, 0.8-1.0 cm. and exception, 1.4 cm.; width across shoulders, 2.1-2.9 cm.; width of base, 0.6-1.1 cm.; thickness 0.5-0.7 cm.; weight, 2.3-4.3 grams. Remarks: Greene (1971) Class I, Group 5; Class III, Group 7; pages 24, 25, 33; Plate 2, m-q and 44.

Duran (Fig. 2, d-f)

These thirty specimens conform to Taylor's *Duran* type (1966: Fig. 3, bottom row left). They are characterized by opposed blade notches, barbed or

straight shoulders and bulbous stems. Most are crude and thick although two have thin broad blades. Most specimens have two sets of opposed blade notches but one set or more than two sets does occur. Dimensions: length, 2.5-4.0 cm.; width across shoulders, greater than 1.2-2.3 cm.; thickness, 0.4-0.7 cm. Remarks: Similar specimens from Poza Salada are illustrated by Aveleyra *et al.* (1956: Lam. I h,i). Greene (1971) Class III, Group 13; pages 43-49; Plates 3, ii-yy and 4, a-k. Silva and Hester (1973: 151, Fig. 2,e-q) recovered comparable specimens from eastern Durango.

Gobernadora (Fig. 2,g)

This specimen conforms to the *Gobernadora* type as illustrated by Taylor (1966: third row right). The blade is triangular, edges straight and barbs are regular. The stem is bulb shaped, expands medially and contracts to a sharply pointed bifacially thinned base. Dimensions: length, 6.3 cm.; width across shoulders, 2.9 cm.; thickness, 0.6 cm. Remarks: Greene (1971) Class I, Group 1, Subgroup 1; page 19; Plate 2,a.

Jora (Fig. 2,h)

Three specimens are comparable to *Jora* points (Taylor 1966; Fig. 3, first row). The stem is broken from one dart point. The triangular blades have concave or convex edges. Shoulders are variable, being both regularly barbed or one regularly barbed and the other descending. Bases are bifacially thinned and convex. The base of each stemmed specimen has a shallow central notch, thus differing from Taylor's examples. One specimen has an alternately beveled blade and stem. The beveling on the blade and stem are opposed. Dimensions: length, 3.8-4.1 cm.; width across shoulders, 2.6-3.3 cm.; thickness, 0.5-0.7 cm. Remarks: Aveleyra *et al.* (1956: Lam II a) also illustrates this form. Greene (1971) Class I, Group I, Subgroups 2 and 3; pages 19-20; Plate 2,b-c.

Untyped A (Fig. 2,i-j)

These four specimens have triangular blades with straight, convex or recurved edges. Shoulders are regularly barbed and shorter than the stems. Stems are straight or asymmetrical with bifacially thinned bases. On one specimen, one blade edge is unifacially notched from the tip to the shoulder. Dimensions: length, 2.8-3.9 cm.; width across shoulders, 1.8-2.2 cm.; thickness, 0.4-0.8 cm. Remarks: Greene (1971) Class I, Group 2, Subgroup 2 and Group 3; pages 20-22; Plate 2,d and i.

Untyped B (Fig. 2,k)

These are proximal fragments of two large dart points. The shoulders have small regular barbs. Stems are short, asymmetrical to the medial axis with straight edges and convex bases. The base of one is unifacially thinned. The other is unthinned. Dimensions: length, greater than 2.7 cm.; width across shoulders, slightly greater than 3.7 cm.; thickness, 0.7-0.8 cm. Remarks: Greene (1971) Class I, Group 4, Subgroup 1; page 23; Plate 2,j-k.

Untyped C (Fig. 2,l)

The thick triangular blade of this specimen has one straight and one convex edge. The convex edge is deeply notched distal to a descending shoulder. The opposite shoulder is regularly barbed. The stem edges are

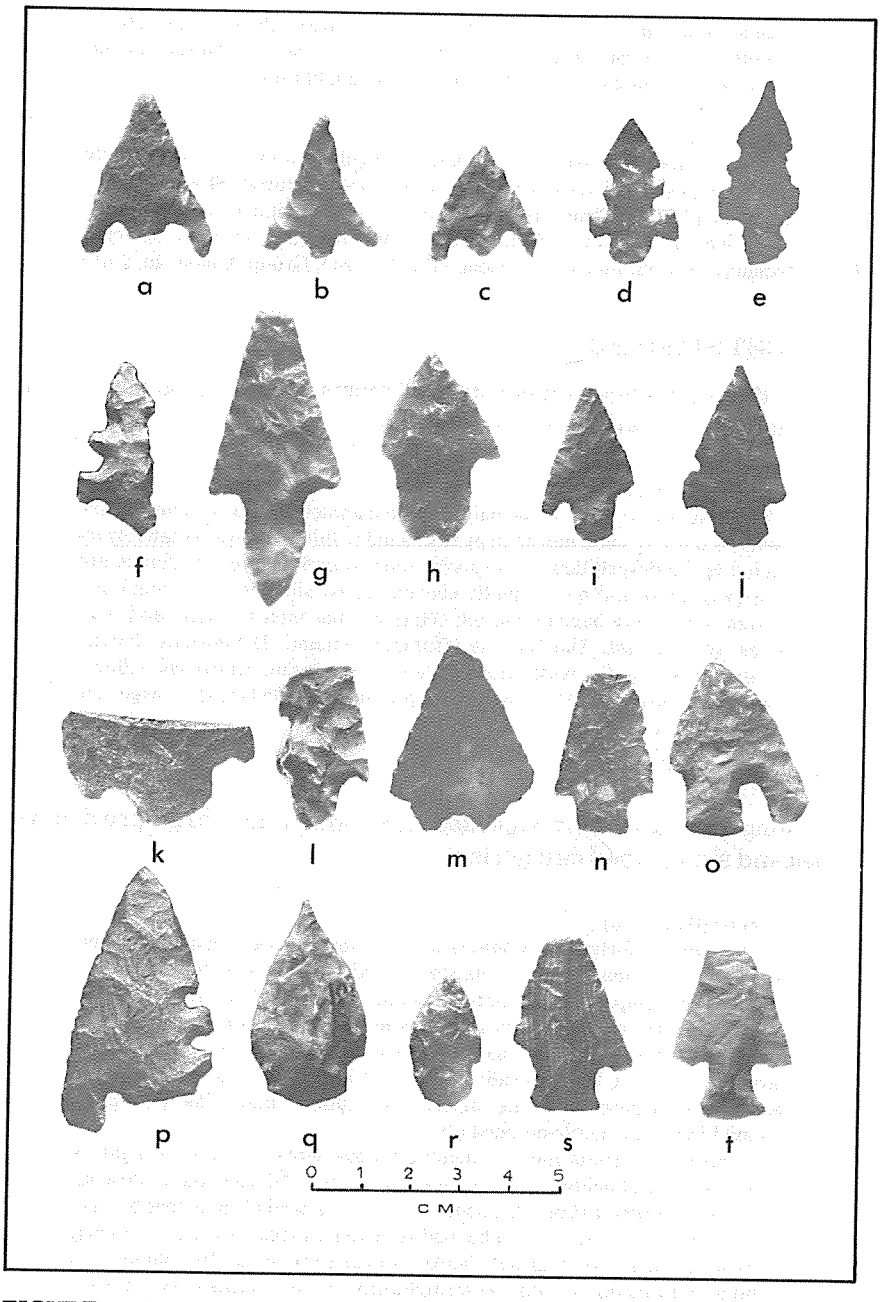

FIGURE 2. Dart Points. a-c, Acatita; d-f, Duran; g, Gobernadora; h, Jora) i-j, Untyped A; k, Untyped B; l, Untyped C; m, Untyped D; n, Untyped E; o-p, Charcos; q-r, Finesterre; s-t, Vertiente.

straight and the bifacially thinned base is convex. Dimensions: length, greater than 3.6 cm.; width across shoulders, 2.1 cm.; thickness, 0.8 cm. Remarks: Greene (1971) Class I, Group 6; page 25; Plate 2,r).

Untyped D (Fig. 2,m)

This unique specimen has a broad triangular blade with alternately beveled edges. The barbs of both shoulders are fractured. The short stem has straight edges. The base is a wide bifacially thinned notch. Dimensions: length, 4.0 cm.; width across shoulders, greater than 3.2 cm.; thickness, 0.6 cm. Remarks: Greene (1971) Class I, Group 8; page 26; Plate 2,t.

STRAIGHT STEMMED

Only three dart points have straight stems. None can be placed in a previously described or provisional type.

Untyped E (Fig. 2,n)

Of these three specimens only one is complete. Two specimens are stemless but the blade morphology is so similar that they are tentatively included in the description. All are symmetrical and well-made. Blades are long, triangular and have slightly convex edges. Shoulders are small and straight or slightly barbed. On the complete specimen the stem and base edges are straight. The base is bifacially thinned. Dimensions: length, greater than 3.5 cm.; width across shoulders, 2.4 cm.; thickness, 0.6 cm. Remarks: Greene (1971) Class II, Group I and possible Group 1; pages 26-27; Plate 2, u-w.

EXPANDING STEMMED

Among the expanding stemmed dart points are three provisional types and six untyped categories.

Charcos (Fig. 2, o-p)

Although the forty-nine artifacts in this category are considered members of a provisional type, research beyond the scope of this paper indicates that temporal and spatial bounds are definable (Greene 1971). Thus, a confirmed type is indicated. The specimens are divided into three varieties on the basis of a morphological feature: blade notching. The varieties may not be culturally significant and are presented here for descriptive purposes only. The varieties are: *Charcos* unnotched (7), single-notched (39), and double-notched (2).

Charcos dart points have triangular blades with irregular, straight or convex edges. Shoulders are asymmetrical; one undeveloped or descending, the opposite barbed. One specimen has two barbed shoulders but one is shorter than the other. The barbed shoulder ranges from short to long, narrow to wide and is usually hooked toward the stem. The blade edge distal to the weakest shoulder is straighter than the opposite edge. Bifacial or unifacial notches occur on this straighter edge. Stems vary from short to long with bifacially thinned concave, straight or convex bases. Dimensions:

length, 2.7-5.7 cm. with most between 3.0-4.5 cm.; length of stem, 0.7-1.3 cm.; width across shoulders, 1.8-3.2 cm.; width of base, 1.0-1.7 cm; thickness 0.5-0.7 cm.; weight, 2.5-7.3 grams. Remarks: Aveleyra *et al* (1956: Lam. VIc, X a-c) illustrates a similar specimen from Poza Salada and the Bolson de las Delicias. Greene (1971) Class III, Group II, Subgroups 1-9; pages 35-41; Plates 2, vv-yy, 3, a-bb.

Finesterre (Fig. 2, q-r)

There are five specimens in this provisional type. Blades are leaf-shaped or triangular with convex edges. The blade of one specimen is recurved near the tip. Shoulders are asymmetrical; one undeveloped or descending, the opposite straight or barbed. Stems are broad with convex or slightly concave bases. With one exception, bases are bifacially thinned. Dimensions: length, 1.9-4.2 cm.; length of stem, 0.7-1.0 cm.; width across shoulders, 1.7-2.5 cm., width of base, 1.0-1.8 cm.; thickness, 0.3-0.7 cm.; weight, 1.3-6.0 grams. Remarks: Greene (1971) Class III, Group II, Subgroups 10-12; pages 41-42; Plate 3, cc-gg. A similar specimen is illustrated by Taylor (1966: Fig. 5, top row, fourth from right) which he assigns to the Middle and Late Coahuila Complex.

Vertiente (Fig. 2, s-t)

These five specimens comprise a provisional type. Blades are triangular with straight or concave/convex blade combinations. Shoulders are barbed and shorter than the stems. With one convex exception, stem edges are straight or concave. Bases are concave and bifacially thinned. Although stems are expanding, they are not bulbous. Dimensions; length, greater than 3.6-greater than 4.0 cm.; length of stem, 0.8-1.2 cm.; width across shoulder, 2.2-2.8 cm.; width of base, 1.2-1.6 cm.; thickness, 0.5-0.7 cm.; weight, greater than 2.1-greater than 6.1 grams. Remarks: Greene (1971) Class III, Group 2; page 29; Plate 2, aa-ee. These dart points are similar to some Middle and Late Coahuila Complex specimens (Taylor 1966: Fig. 5).

Untyped F (Fig. 3, a,b)

These thirteen specimens are all fragments and may be members of previously described types. All are irregularly shaped with long narrow stems and barbed shoulders. Stems of two specimens are bulbous. Dimensions: length, 2.2-3.5 cm.; width across shoulders, 1.6-greater than 2.9 cm.; thickness, 0.4-0.9 cm. Remarks: Greene (1971) Class III, Group 3, 5, and 6; page 29-33; Plate 2, ff-nn, pp, qq.

Untyped G (Fig. 3, c)

This specimen has a broad leaf-shaped blade with edges constricted near the tip. Shoulders are barbed and shorter than the stem. Stem edges are concave and the base unthinned. Dimensions: length, 3.2 cm.; width across shoulders, 2.5 cm.; thickness, 0.9 cm. Remarks: Greene (1971) Class III, Group 4; page 32; Plate 2, oo.

Untyped H (Fig. 3, d)

This is a proximal fragment of a large projectile point. The blade is broad and the shoulder barbed. The stem edge is concave and the bifacially thinned base convex. Dimensions: length, greater than 3.3 cm.;

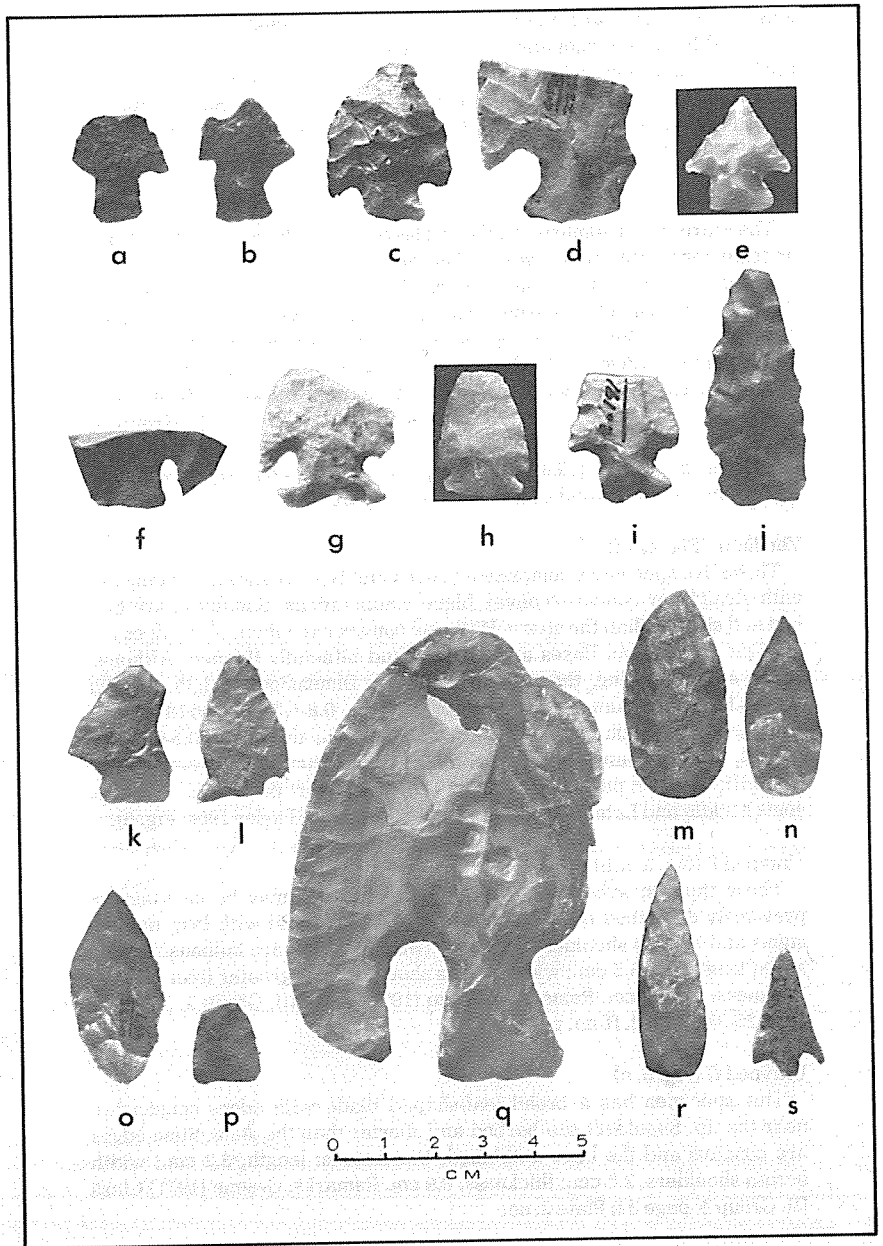

FIGURE 3. Dart and Arrow Points. a-b, Untyped F; c, Untyped G; d, Untyped H; e, Untyped I; f, Untyped J; g, Untyped K; h-i, Ensor-like; j, Untyped L; k, Untyped M; q, Charcos-like; l, Untyped N; m, Abasolo; n, Catan; o, Lerma; p, Matamoros; r, Untyped O; s, Untyped P.

thickness, 0.8 cm. Remarks: Greene (1971) Class III, Group 12; page 43; Plate 3, hh.

Untyped I (Fig. 3, e)

This short dart point has been reshaped. The broad blade has recurved edges. Shoulders are barbed. Stem edges are convex and the irregular base is thinned. Dimensions: length, 2.6 cm.; width across shoulders, 2.3 cm.; thickness, 0.6 cm. Remarks: Greene (1971) Class III, Group 8; page 34; Plate 2, ss.

Untyped J (Fig. 3, f)

These three specimens appear to have been fractured during manufacture. They are thin proximal fragments with broad stems, narrow notches and barbs that are the same length as the stem. Dimensions: length of stem, 0.5-1.1 cm.; thickness, 0.4-0.6 cm. Remarks: Greene (1971) Class III, Group 1: pages 27-28; Plate 2, x-z.

Untyped K (Fig. 3, g)

Both of these specimens have distinctive concave bases. Shoulders are barbed and stem edges convex. Dimensions: length, greater than 2.9 cm.; width across shoulders, greater than 1.2-slightly greater than 2.8 cm.; thickness, 0.5-0.6 cm. Remarks: Greene (1971) Class III, Groups 9 and 10; pages 34-35; Plate 2, tt-uu.

SIDE-NOTCHED

Side-notched dart points include specimens of one previously described type and two untyped categories.

Ensor-like (Fig. 3, h-i)

There are thirteen specimens in this type (Suhm and Jelks 1962). Blades are leaf-shaped and shoulders barbed. Bases are convex and slightly less than or equal to the width of the shoulders. The larger stems are slightly wedge-shaped. *Ensor*-like dart points are larger and more symmetrical than the *Scallorn*-like specimens. There is more variety among these than *Ensor* type specimens illustrated by Suhm and Jelks (*Ibid.*). Dimensions: length, 2.7-4.1 cm.; length of stem, 0.8-1.6 cm.; width across shoulders, 1.6-2.4 cm.; width of base, 1.3-2.1 cm.; thickness, 0.4-0.8 cm.; weight, greater than 1.2-4.8 grams. Remarks: Greene (1971) Class IV, Groups 1, 2, and 4; Subgroups 1-3; pages 49, 50-52; Plate 4, 1, m-o, s-w. Suhm and Jelks (1962) describe the *Ensor* dart point type. Taylor (1966: Fig. 5, third row, fourth from right) illustrates a similar specimen among Middle and Late Coahuila Complex projectile points.

Untyped L (Fig. 3, j)

These three specimens are crude, asymmetrical and thick in cross-section. With one exception (unnotched), shoulder notches are shallow and shoulders descending. Bases are bifacially thinned. Dimensions: length, 4.3-4.8 cm.; width across shoulders, 1.8-1.9 cm.; thickness, 0.6-0.9 cm. Remarks: Greene (1971) Class IV, Groups 8 and 9; pages 60-66; Plate 4, xx-yy.

Untyped M (Fig. 3, k)

This dart point has a broad blade and stem. The blade is short. One shoulder and blade edge are broken. The other stem edge is straight and the shoulder barbed. One stem edge is straight and the other convex. The base is bifacially thinned. Dimensions: length, 2.8 cm.; thickness, 0.5 cm. Remarks: Greene (1971) Class IV, Group 5; page 55; Plate 4, gg.

MISCELLANEOUS STEMMED FORMS

There are only two categories of miscellaneous stemmed forms. Although one category includes a specimen that is comparable to specimens in a defined type, the others cannot be compared to known forms.

Charcos-like (Fig. 3, q)

This specimen is similar to the *Charcos* type but is extremely large. Dimensions: length, slightly greater than 9.1 cm.; width across shoulders, greater than 5.1 cm.; thickness, 1.0 cm. Remarks: Greene (1971) Eccentric Form Class II; page 120; Plate 11, g.

Untyped N (Fig. 3, l)

The three specimens in this category are unique. The first dart point has one descending shoulder and adjacent concave stem edge. The opposite shoulder is barbed with a short stem. It appears to be a tang jutting from the blade edge (Fig. 3, n). The second specimen has a triangular blade with one unnotched edge. The opposite edge is notched. The final specimen is a proximal fragment. One blade edge is straight with a small projection or tang near the basal junction. The opposite blade edge is concave and unnotched. The bifacially thinned base is notched near the junction with the concave blade edge. Dimensions (in order of description); length, 2.8, 2.9 cm.; width across shoulders, 1.9, 1.7 cm.; thickness, 0.6, 0.5, 0.7 cm. Remarks: Greene (1971) Class V; pages 62, 63; Plate 4, zz; Plate 5, a,b.

UNSTEMMED

Among the unstemmed projectile points are four previously defined types and one untyped category.

Abasolo (Fig. 3, m)

Four specimens conform to the *Abasolo* type as described by Suhm and Jelks (1962). Dimensions: length (one specimen). 4.5 cm.; width, 1.7-2.1 cm.; thickness, 0.6-0.9 cm. Remarks: Greene (1971) Class VI, Group 8, Subgroups 1 and 2; page 67; Plate 5, m-n. MacNeish includes similar specimens among the *Abasolo Round Base* category from the Sierra de Tamaulipas (1958: 62-64; Fig. 23, 15-21). Taylor (1966: Fig. 4, top row left) includes similar specimens among Espantosa points of the Early Coahuila Complex.

Catan (Fig. 3, n)

There are four specimens comparable to the *Catan* type (Suhm and Jelks 1962). None are beveled. Dimensions: length, 2.9-3.7 cm.; width, 1.4-1.7

cm.; thickness, 0.5-0.7 cm. Remarks: Epstein (1969: 18-20, Fig. 4, A-F) describes *Catan* points from Nuevo Leon. Greene (1971) Class VI, Group 8, Subgroups 4-6; pages 68-69; Plate 5, p-r. MacNeish (1958: 68-69) describes *Catan Round Base* specimens from Tamaulipas. Silva and Hester (1973: 150, Fig. 2, a-c) recovered *Catan* points from the Robles site in eastern Durango.

Lerma (Fig. 3, o)

Two specimens correspond to the *Lerma* type (Suhm and Jelks 1962). One specimen is extremely small. Dimensions: length, 4.0-6.3 cm.; width, 2.0-2.3 cm.; thickness, 0.9-1.5 cm. Remarks: Epstein (1969: 22-23, Fig. 4, P-S) reports *Lerma* points from Nuevo Leon. Greene (1971) Class VI, Group 7; page 66; Plate 5, k-l. MacNeish (1958: 62) describes *Lerma* points from Tamaulipas. Taylor (1966: 67; Fig. 3, row 2; Fig. 4, row 1 and 2 left) includes similarly shaped specimens among *Fragua* and *Espantosa* points and assigns them to the Early Coahuila Complex. Silva and Hester (1973: 150, Fig. 2, d-f) found *Lerma* type dart points on the Robles Site in eastern Durango. As part of a varied surface collection, the specimens can not be dated.

Matamoros (Fig. 3, p)

Three dart points are classified as *Matamoros* type (Suhm and Jelks 1962). Dimensions: length, 1.8 cm.-greater than 1.8 cm.; width, 1.4-1.5 cm.; thickness, 0.3-0.4 cm. Remarks: Epstein (1969: 23-24; Fig. I-K) discusses *Matamoros* points from Nuevo Leon. Greene (1971) Class VI, Groups 1 and 6; pages 63, 65-66; Plate 5, c, d, j. MacNeish (1958: 68) reports *Matamoros Triangular* points from Tamaulipas.

Untyped O (Fig. 3, r)

This is a thick, crude elongate dart point. Edges are steep and concave. The bifacially thinned base is convex. Dimensions: length, greater than 1.7 cm.; width, 1.5 cm.; thickness, 0.3 cm. Remarks: A similar specimen is described by Epstein (1969: 35; Fig. 4, T) as Miscellaneous, C: Long, Narrow, Round Base. Greene (1971) Class VI, Group 8, Subgroup 3; page 6; Plate 5, o.

ARROW POINTS

A total of 49 arrow points were recovered from the four sites. These include: contracting stemmed (nine), side-notched (thirty-four specimens), unstemmed (six specimens).

CONTRACTING STEMMED

Among the contracting stemmed arrow points are three untyped categories. No specimens comparable to known or provisional types were recovered.

Untyped P (Fig. 3, s)

There are seven specimens in this category. Due to the morphological variety among these artifacts, I hesitate to classify all as members of a

single type. They may represent a hodgepodge of unfinished or rejected specimens of several types. All are crude and asymmetrical having been made by modifying only the flake edges. Five specimens have regularly barbed shoulders, two have one barbed and one descending shoulder. Four have a single unifacial notch on one blade edge. One has a unifacial notch on both blade edges. These specimens are comparable to some flake points attributed to the Coahuila or Jora Complexes by Taylor (1966: Fig. 6, first row left). Dimensions: length, 2.1-3.7 cm.; width across shoulders, 1.6-2.2 cm.; thickness, 0.2-0.7 cm. Remarks: Greene (1971) Class I, Group 2, Subgroup 2; page 21; Plate 2, e-h.

Untyped Q (Fig. 4, a)

This specimen is similar to the dart points described in category Untyped A. Dimensions: length, greater than 2.3 cm.; thickness, 0.7 cm. Remarks: Greene (1971) Class I, Group 4, Subgroup 2; page 23; Plate 2, l. This specimen may be comparable to a Middle and Late Coahuila point illustrated by Taylor (1966: Fig. 5, fifth row left).

Untyped R (Fig. 4, b)

This specimen has a long narrow triangular blade with one straight and one recurved edge. Shoulders are asymmetrical and descending. The long stem has concave edges and an unthinned base. Dimensions: length, 3.9 cm.; width across shoulders, 1.5 cm.; thickness, 0.5 cm. Remarks: Greene (1971) Class I, Group 7; page 26; Plate 2, s.

SIDE-NOTCHED

Side-notched arrow points are comparable to three known types and one provisional type. One of the known types, *Scallorn*, has not previously been described in Coahuila.

Diaz (Fig. 4, c-e)

The three specimens in this provisional type are thick. Cross sections at mid-blade are almost circular. Blade edges are irregular and alternately beveled. Shoulders are descending. The stems are irregular with concave edges. Only one base is bifacially thinned. Dimensions: length, 2.7-2.9 cm.; length of stem, 0.7-1.1 cm.; width across shoulders, 1.3-1.8 cm.; width of base, 1.2-1.6 cm.; thickness 0.6-0.7 cm.; weight, 1.8-2.5 cm. Remarks: Greene (1971) Class IV, Group 3; pages 50-51; Plate 4, p-r.

Harrell (Fig. 4, f-g)

These three arrow points conform to the *Harrell* type as defined by Suhm and Jelks (1962). Dimensions: length, 2.4-2.9 cm.; width across shoulders, 1.0-1.2 cm.; thickness, 0.3 cm. Remarks: Greene (1971) Class IV, Group 7, Subgroup 8; page 59; Plate 4, ss-uu. These may be related to a *Sierra Madera* specimen illustrated by Taylor (1966: Fig. 27, first row center) and possibly related to *Toyah* arrow points.

Scallorn-like (Fig. 4, h-i)

These twenty-six specimens conform to the morphological characteristics described for *Scallorn* arrow points (Suhm and Jelks (1962).

However, *Scallorn* points have not been previously reported in Coahuila. Dimensions: length, 1.9-3.0 cm.; width across shoulders, 1.4-1.7 cm.; thickness, 0.3-0.5 cm. Remarks: Greene (1971) Class IV, Group 4, Subgroups 4-9 and Groups 6-7; Subgroups 1-7; pages 52-59; Plate 4, x-z, aa-ff, hh-rr Taylor (1966: Fig. 6, top row right and Fig. 27) illustrates similar specimens among Coahuila and Jora Complex projectile points.

Toyah or *Sierra Madera* (Fig. 4, j)

These two specimens are comparable to *Toyah* arrow points (Suhm and Jelks 1962) or *Sierra Madera* projectile points (Taylor 1966: Fig. 27, top row and second row left). They are thicker and cruder than the *Harrell* points with proportionately smaller blades and larger stems. Shoulders are descending. Dimensions: length, 2.7 cm.; width across shoulders, 1.4-1.5 cm.; thickness, 0.4-0.6 cm. Remarks: Similar projectile points from Poza Salada are illustrated by Aveleyra *et al.* (1956: Lam. IV. c-d; Lam. X, d). Greene (1971) Class IV, Group 7, Subgroup 9; page 60; Plate 4, vv-ww.

UNSTEMMED

Only two unstemmed categories of arrow points were found. Both are comparable to known types.

El Muerto or *Fresno* (Fig. 4, k)

Five arrow points are *El Muerto* type (Taylor 1966: Fig. 27, fourth row) which are assigned to the Jora Complex. Blades are thin and triangular with straight or concave bases. One long and narrow specimen has finely serrated blade edges. Bases are bifacially thinned. Dimensions: length, 1.8-2.9 cm.; width, 1.5-1.7 cm.; thickness, 0.3-0.4 cm. Remarks: These are similar to specimens from Poza Salada (Aveleyra *et al* 1956: Lam. IV, h-n). Greene (1971) Class VI, Groups 2, 4, 5; pages 64-65; Plate 5, e, f, h, i.

Garza (Fig. 4, l)

Only one specimen is a *Garza* arrow point (Runkles 1964). Dimensions: length, greater than 1.7 cm.; width 1.5 cm.; thickness, 0.3 cm.; Remarks: Greene (1971) Class VI, Group 3; page 64; Plate 5, g. Similar specimens described by Taylor (1966: Fig. 27, second row right) as *Cienegas* points have a notched concave base. The base of this specimen is notched but not concave. He assigns *Cienegas* points to the Jora Complex.

SUMMARY AND CHRONOLOGICAL PLACEMENT OF PROJECTILE POINTS

A total of 216 projectile points were recovered from the four sites in the Desierto de Charcos de Risa. Both dart and arrow point forms are represented and include specimens of thirteen previously defined types, five provisional types and eighteen untyped categories.

Although stratified deposits from the Charcos de Risa were not encountered, comparison of similar projectile point forms from surrounding areas enables the presentation of a chronologically ordered

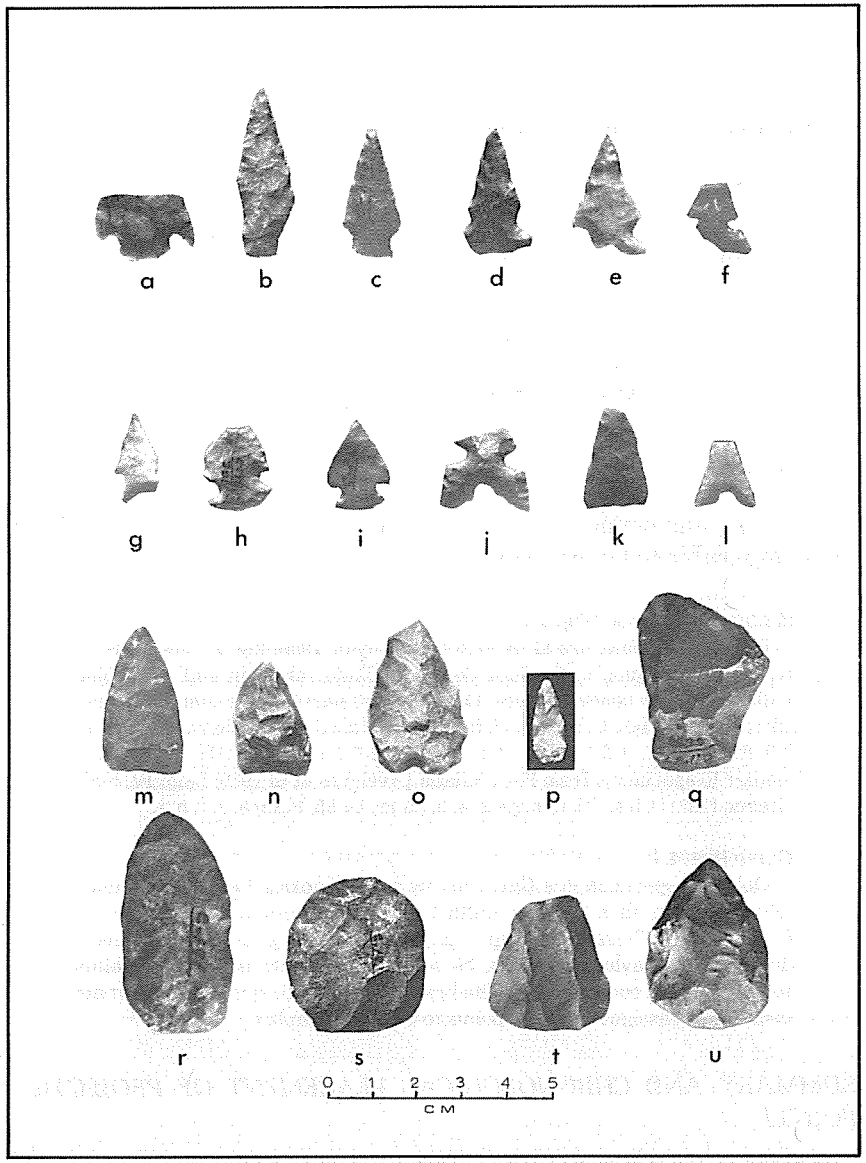

FIGURE 4. Arrow Points and Bifaces. a, Untyped Q; b, Untyped R; c-e, Diaz; f-g, Harrell; h-i, Scallorn-like; j, Toyah or Sierra Madera; k, El Muerto or Fresno; l, Garza; m, Symmetrical Gouge; n, Irregular Gouge; o, Notched Gouge; p. Narrow Elongate Implement; q, Assymetrical Thin Biface; r, Elongate Thin Biface; s, Subcircular, Suboval and Teardrop Thin Biface; t-u, Leaf-shaped to Triangular Thin Bifaces.

TABLE I. PROVENIENCES OF PROJECTILE POINTS

PROJECTILE POINTS	C-189	C-190	C-191	C-198	Total
Dart Points					
Contracting Stemmed (Total)	14	22	5	8	49
Acatita	1	2	2	2	7
Duran	9	15	2	4	30
Gobernadora	0	1	0	0	1
Jora	1	2	0	0	3
Untyped A	1	1	1	1	4
Untyped B	0	1	0	1	2
Untyped C	1	0	0	0	1
Untyped D	1	0	0	0	1
Straight Stemmed (Total)	0	2	1	0	3
Untyped E	0	2	1	0	3
Expanding Stemmed (Total)	16	16	14	34	80
Charcos	11	4	6	28	49
Finesterre	0	2	3	0	5
Vertiente	1	3	0	1	5
Untyped F	3	4	2	4	13
Untyped G	0	1	0	0	1
Untyped H	0	1	0	0	1
Untyped I	0	0	1	0	1
Untyped J	1	0	2	0	3
Untyped K	0	1	0	1	2
Side-Notched (Total)	1	8	6	2	17
Ensor-like	0	6	6	1	13
Untyped L	1	2	0	0	3
Untyped M	0	0	0	1	1
Miscellaneous Stemmed Forms (Total)	0	2	1	1	4
Charcos-like	0	1	0	0	1
Untyped N	0	1	1	1	3
Unstemmed (Total)	0	4	1	9	14
Abasolo	0	2	0	2	4
Catan	0	2	0	2	4
Lerma	0	0	0	2	2
Matamoros	0	0	1	2	3
Untyped O	0	0	0	1	1
Arrow Points					
Contracting Stemmed (Total)	0	6	2	1	9
Untyped P	0	6	1	0	7
Untyped Q	0	0	1	0	1
Untyped R	0	0	0	1	1
Side-Notched (Total)	1	18	8	7	34
Diaz	0	1	1	1	3
Harrell	0	2	0	1	3
Scallorn-like	1	13	7	5	26
Toyah or Sierra Madera	0	2	0	0	2
Unstemmed (Total)	0	4	2	0	6
El Muerto or Fresno	0	3	2	0	5
Garza	0	1	0	0	1

sequence. This sequence is based on projectile point stem and base characteristics discussed by Taylor (1966) for the Cuatro Cienegas Basin in central Coahuila, Epstein (1969) for northern Mexico and adjacent Texas, and Johnson (1967) for central and southwest Texas. The southwest Texas sequence is further supported by Dibble (1967) and Story and Bryant (1966). Although the projectile point sequence is established, absolute chronological dates are difficult to confirm and should be regarded as estimates in this paper.

References to the Altithermal climatic period are based on Antevs (1955, 1962) but no effort is made to determine the applicability of the concept in northern Mexico. Nance (1972) regards Altithermal climatic conditions to have been a factor affecting cultural developments in northern Mexico. Bryant (1974) discusses the pollen record in the Amistad Reservoir of southwest Texas and considers the possibility that Post-Glacial climatic change was gradual and increasingly arid.

A lengthy cultural succession is indicated by projectile point comparisons. Points ranging from late Paleo-Indian to late prehistoric times are included among the sample recovered from the Charcos de Risa.

The earliest projectile points recognized are two *Lerma* and four *Abasolo* specimens. Both types are unstemmed dart points. *Lerma* dart points are associated with Late Paleo-Indian, pre-Altithermal times. Nance (1972: 171-175) notes that *Lerma* points have been dated between 7,500 B.C. and 5,000 B.C. The terminal date in northeastern Mexico is uncertain but the *Lerma* type probably does not persist after 5,000 B.C. *Abasolo* is more difficult to place temporally but appears to post-date *Lerma*. Epstein (1972:54) points out that in Tamaulipas and Nuevo Leon, *Abasolo* may post-date the Altithermal (5,000-2,500 B.C.). The major problem seems to be one of type recognition. Taylor (1966: Fig. 4, top row left) illustrates specimens of the *Espantosa* type which are comparable to the *Abasolo* points recovered from the Charcos de Risa. Taylor recovered these among Early Coahuila Complex materials indicating a pre-Altithermal association. Thus, if the four *Abasolo* specimens from the Charcos de Risa are related to Taylor's *Expantosa* points, a pre-Altithermal, pre-5000 B.C. time is indicated. If the *Abasolo* specimens are representative of the defined type, they postdate the Altithermal and 5,000 B.C. (Suhm and Jelks 1962:165).

Following late Paleo-Indian, pre-Altithermal times, there appears to be a gap in the cultural sequence in the Charcos de Risa. No Early Archaic (Altithermal) projectile points have been recognized in the sample. Johnson (1964: Table 1, Fig. 25) dates the Early Archaic in

southwestern Texas between 5,000 and 3,000 B.C. At Arenosa Shelter Early Barbed dart points were associated with a C-14 date of 3410±170 B.C. (Dibble 1967). Story and Bryant (1966) place Early Barbed forms between 7,000-4,000 B.C. and *Nolan* and *Pandale* between 4,000-2,500 B.C. The hiatus in the dart point sequence reflected in the sample from the Charcos de Risa is not unexpected. Epstein (1972: 54, 55) discusses the apparent absence or recognition of occupation in northern Mexico during Altithermal times and Nance (1972) considers the problem in detail.

In the Charcos de Risa, the stemless Late Paleo-Indian projectile points are followed by typically Middle Archaic contracting stemmed dart point forms. A total of 49 contracting stemmed dart points are among the sample. Seventy percent (34) are comparable to types described by Taylor (1966) indicating similarity between the Charcos de Risa and Central Coahuila during the Middle Archaic part of the Coahuila Complex. These types are: *Duran* (30 specimens), *Gobernadora* (1 speciman), and *Jora* (3 specimens). The seven provisional type Acatita points and eight specimens from untyped categories A-D appear to be forms confined to the Charcos de Risa and are not represented in the sample Taylor recovered from the Cuatro Cienegas Basin. It should be noted that arrow point form, untyped category Q is comparable to dart point form untyped category A. A larger sample is needed to determine the range of form and weight among similar dart and arrow points.

Concrete dates from the Middle Archaic in Coahuila are problematical. In Nuevo Leon, McClurkan (1966: 70) reports contracting stemmed *Gary* points are approximately 1,200 A.D. and *Shumla* points from A.D. 100 to A.D. 200. MacNeish includes *Gary* points in the artifact assemblage of Tamaulipas from 200 or 150 B.C. until A.D. 500 but did not find *Shumla* type points. Johnson (1964: Fig. 25) places contracting stemmed types *Almagre, Langtry,* and *Shumla* in the Texas cultural sequence between 3,000 B.C. and sometime after 2,000 B.C. Story and Bryant (1966: Table 1) place *Almagre, Langtry* and *Val Verde* types between 2,500 B.C. and 1,000 B.C. Absolute dates for the Middle Archaic in Coahuila will, of course, depend on excavation of stratified deposits and recovery of radiocarbon samples.

Contracting stemmed dart point forms are followed by expanding stemmed, corner notched dart points which probably mark the inception of the Late Archaic. A total of 80 dart points were recovered: three provisional types and six untyped categories are represented. Only 12 percent (5 provisional type *Finesterre* and five provisional type *Vertiente* specimens) are comparable to forms recovered by

Taylor in Central Coahuila. This indicates divergence of specific attributes but adherence to the overall projectile point form among the inhabitants of southwestern and central Coahuila during these times. The remaining corner notched specimens are provisional type *Charcos* (49 specimens) or Untyped categories F-K (21 specimens). One exceptionally large artifact may be associated with the *Charcos* point style. It is described as a Miscellaneous Stemmed *Charcos*-like specimen. Although confirmation is lacking the *Charcos* projectile point form may have persisted throughout the Late Archaic and possibly later.

During the Late Archaic, side-notched dart points appear later than the corner-notched forms (Johnson 1964: Fig. 25). In the Charcos de Risa this form is represented by thirteen *Ensor*-like and four Untyped categories L and M dart points. Taylor (1966) illustrates side-notched *Ensor*-like specimen among Middle and Late Coahuila Complex projectile point styles.

The Late Archaic is difficult to date by inference and no direct dates can be provided for Coahuila. In nearby Nuevo Leon, McClurkan (1966: 70) found no comparable expanding stemmed corner-notched forms. However, he has dated the side-notched *Ensor* type from A.D. 600 to A.D. 1,000 or later. In Texas, Johnson (1964: Fig. 25) indicates that corner-notched and side-notched dart points span the period from sometime before 1,000 B.C. until after 1,000 A.D.

Arrow points, commonly accepted as markers of Neo-Indian times are a complex assemblage in the Desierto de Charcos de Risa. They include: (1) corner-notched forms; three provisional type Diaz, three *Harrell*, twenty-six *Scallorn*-like, two *Toyah* or *Sierra Madera* type. (2) unstemmed forms; five *El Muerto* or *Fresno* type, one *Garza* type. Only the provisional type *Diaz* specimens are not comparable to Jora Complex points illustrated by Taylor (1966), suggesting widespread projectile point similarity throughout Coahuila during late times.

The problem of relating arrow point forms and late dart point forms in Coahuila is expressed by Taylor's (*Ibid.*) hesitancy to place a terminal date on the Coahuila Complex and a firm beginning for the Jora Complex. Apparently, the Jora Complex begins sometime after A.D. 1 (Taylor, 1966: Fig. 30). McClurkan dates arrow points in the NL92 deposits in Nuevo Leon by A.D. 800 (1966: 70). Story and Bryant (1966: Table 1) note the introduction of arrow points in southwestern Texas between A.D. 1000 and A.D. 1600.

Internal chronological divisions among arrow point forms is also problematical. McClurkan (1966: 70) found both stemmed and side notched specimens at NL92 but could not stratigraphically separate

the types. It should be noted that the form most common among the Charcos de Risa Sample, *Scallorn*-like, was not recovered in Nuevo Leon.

According to Suhm and Jelks (1962) *Scallorn* arrow points slightly postdate (A.D. 500 to A.D. 1200) the *Ensor* type (100-200 B.C. to A.D. 500-1000). The relationship and dates of these two forms in Coahuila is an interesting problem. Also, in Texas (*Ibid.*) *Scallorn* apparently pre-dates *Harrell, Toyah, Fresno* and *Garza* types.

Two unstemmed dart point forms, *Catan* and *Matamoros* specimens were recovered. These can not be placed in the chronological scheme at this time. Epstein (1972: 55) notes that triangular points in northeastern Mexico span Archaic and early Neo-Indian times and can not be used as time markers. Taylor (1966) did not find these types in Coahuila but current research indicates that *Catan* and *Matamoros* are important among projectile point forms in Coahuila.

Bifaces

GOUGES

Symmetrical (Fig. 4, m)

This triangular specimen has convex sides, a pointed distal end and biconvex cross section. The concave proximal end is the result of flake removal from the central surface. Compared to the other gouges this specimen is well made. Dimensions: length, 3.4 cm.; width, 2.0 cm.; thickness, 0.6 cm. Remarks: Greene (1971) Thin Bifaces, Class II, Group 4, Subgroup 2; page 88; Plate 7, j.

Irregular (Fig. 4, n)

Both of these specimens are triangular with irregular edges. One specimen is bifacially thinned. The other is bifacially modified only on the proximal end, that is the end from which the ventral flake was removed. Dimensions (in order described): length, 3.8 and 4.6 cm.; width, 2.6 and 2.4 cm.; thickness, 1.0-1.3 cm. Remarks: These specimens are similar in shape, but smaller than the *Clear Fork Gouges* described by Epstein (1969: 39-42, Fig. A-I). Greene (1971) Thinned Bifaces Class III, Group 4, Subgroup 2 and Group 8; pages 89-90; Plate 7, k, o.

Notched (Fig. 4, o)

The distinguishing feature of these three thick, triangular specimens is a notched concave proximal end. Dimensions: length, greater than 2.8-5.9 cm.; width, 2.5-3.5 cm.; thickness, 0.6-1.6 cm. Remarks: Greene (1971) Thinned Bifaces Class III, Groups 1 and 2; pages 96-97; Plate 7, p-r.

NARROW ELONGATE (Fig. 4, p)

There are five shaft-shaped implements. One end of each specimen is pointed; the opposite is irregular or convex. Dimensions: length, 2.0-4.8

cm.; width, 0.8-2.0 cm.; thickness, 0.3-0.9 cm. Remarks: Greene (1971) Narrow Elongate Implements: page 119; Plate 11, c-f.

THIN BIFACES

With the exception of the asymmetrical bifaces, all of the forms grade into the succeeding category. Divisions are an attempt to minimize variation among specimens of each category.

Asymmetrical (Fig. 4, q)

These forty-six specimens are the thickest of the thin bifaces. They were shaped by percussion. Cortex remains on the surfaces of some specimens. Two specimens have one pointed end. Two have short wide stems. Dimensions: length, 1.9-8.3 cm.; width, 2.0-5.1 cm.; thickness, 0.8-2.7 cm. Remarks: Greene (1971) Thin Bifaces Class I, Groups 1-3; pages 80-82; Plate 5, x-z, aa-bb, 6, a.

Elongate (Fig. 4, r)

There are twenty-four artifacts in this category. Shapes range from specimens with convex ends, one slightly narrower than the other two specimens with one convex end and one pointed end. Some are unthinned and others well thinned. Cortex is evident on some surfaces. Dimensions: length, 3.2-7.0 cm.; width, 2.8-5.2 cm.; thickness, 0.5-3.2 cm. Remarks: Greene (1971) Thin Bifaces Class II Group 1; pages 82-84; Plate 6, b-l.

Subcircular, Suboval and Teardrop (Fig. 4, s)

The outlines of these eleven specimens range from subcircular to suboval to almost teardrop shaped. All are thick and crude with irregular edges. Cortex remains on some specimens. Dimensions: diameter, 4.0-4.3-4.9 X 5.9 cm.; thickness, 1.1-2.2 cm. Remarks: Greene (1971) Thin Bifaces Class II Group 2; pages 84-85; Plate 6, m-o)

Leaf-shaped to Triangular (Fig. 4, t-u)

These fifty-four specimens range from leaf-shaped to slightly teardrop shaped to triangular. Proximal ends are straight, irregular or convex. Cortex remains on some surfaces. Only fifteen specimens are thinned. Dimensions: length, 3.3-6.9 cm.; width, 2.4-4.0 cm.; thickness, 0.6-1.7 cm. Remarks: Greene (1971) Thin Bifaces Class II Group 3; pages 85-88; Plate 6, p-v, 7, a-i.

THICK BIFACES

Eight specimens are heavy implements made from cobbles or large flakes. They are characterized by bifacial edges struck by percussion from around a portion of the circumference. The side opposite the bifacial edge is blunt. All have semicircular outlines. Three are fragments. Dimensions: circumference, 7.0 X 7.9-10.7 X 12.3 cm.; thickness, 2.8-3.7 cm. Remarks: These specimens seem to correspond closely with Epstein's continuous edge bifaces, group A and B (1969, pages 48-50, Fig. 8). Greene (1971) Thick Bifaces Class I; pages 98-99. McClurkan (1966, Fig. 17, p. 49) reports heavy choppers but they tend to have a rectangular outline. MacNeish also reports sub-rectangular choppers (1958: 85; Fig. 29, 13-14).

Unifaces

SERRATED

One specimen has a symmetrical leaf-shaped blade with convex edges. One edge is irregularly serrated. One shoulder is straight. The opposite shoulder and the base are fractured. Dimensions: length, equal to or greater than 3.4 cm.; width across shoulders, greater than 2.7 cm.; thickness, 0.3 cm. Remarks: Greene (1971) Eccentric Form Class I; page 120.

STEMMED (Fig. 5, a)

This is a proximal fragment of a stemmed uniface. It is side notched with a concave, bifacially thinned base. The edges of the ventral face are slightly modified. Dimensions: length, greater than 3.0 cm.; width across shoulders, greater than 2.5 cm. Remarks: Aveleyra *et al* (1956: 75-77; 172-172; Lam III) illustrates and describes similar specimens. Greene (1971) Thin Unifaces Class V; page 116; Plate 10, g.

SUBTRIANGULAR

Large (Fig. 5, b)

These five specimens were shaped by percussion with pressure flaking confined to the edges. Three specimens have ventrally thinned striking platforms at the broad end. The pointed ends of two specimens are striking platforms. Two specimens were made from cortex flakes and three from secondary flakes. Dimensions: length, 4.6-5.4 cm.; width, 2.6-3.4 cm.; thickness, 1.0-1.1 cm. Remarks: Greene (1971) Thin Unifaces Class I Group 1; Subgroup 1; page 101; Plate 8, a-c.

Small (Fig. 5, c-d)

Twenty-one specimens have a subtriangular outline. Most were shaped by percussion with little or no ventral edge modification. Bulbs of percussion and striking platforms are present on both broad and pointed ends. Dimensions: length, 2.4-5.4 cm.; width, 1.7-3.4 cm.; thickness, 0.4-1.3 cm. Remarks: Greene (1971) Thin Unifaces Class I Group 1, Subgroups 2 and 3, Groups 2 and 3, Fragments; pages 101-104; Plate 8, d-p.

SUBCIRCULAR AND SUBOVAL (Fig. 5, e)

Fifty-nine specimens are made from cortex or secondary cortex flakes. The outlines of some specimens are not modified. Some have steep edges. Many specimens have minimal ventral modification. All were chipped by percussion. Dimensions: circumference: 2.1 X 3.3-7.7 X 8.2 cm.; thickness, 0.9-2.4 cm. Remarks: Greene (1971) Thin Unifaces Class II; Plates 8, r-v, 9, a-k.

THICK

These six thick heavy implements were made from cobbles or large flakes. Each is characterized by a predominately unifacial edge around the entire circumference or a portion thereof. Dimensions: circumference, 8.5 X 9.0 cm.; thickness, 2.8-4.3 cm. Remarks: Greene (1971) Thick Unifaces: pages 117-118; Plate 10, h-i, 11, a-b.

MODIFIED FLAKES

Two hundred and thirty-five flakes exhibit one or more modified edges. Dimensions: length, 1.5-10.0 cm.; width, 1.8-7.0 cm.; thickness, 0.4-2.6 cm. Remarks: Greene (1971) Thin Unifaces Classes III and IV; pages 111-115; Plates 9, l-n, 10, a-f.

Cores

Three categories of cores were recovered from the sites. Because additional flake removal from the cores would be impractical or yield exceptionally small flakes, all of the cores are considered exhausted. Therefore, flake scars on the cores are reminiscent of flakes which were least desirable. Specimens from two categories have been secondarily modified.

ROUND-OVAL (Fig. 5, f)

These twelve cores were fashioned from round or oval cobbles as well as large primary flakes. They are subcircular in outline with biconvex cross sections. Cores from which flakes were struck in regular succession around the circumference tend to have a dorsal and ventral apex. On the other hand, cores from which flakes were struck from two opposing edges of the circumference tend to have a dorsal and ventral longitudinal ridge. Cortex remnants are sometimes evident on the apexes or as blunt obstructions at right angles to the edge. These cores are bifaces. One specimen is limestone. Dimensions: circumference, 5.6 X 8.7 cm.; thickness, 3.2-5.6 cm. Remarks: Greene (1971) Cores Class I; page 122-125; Plate 11, i-l.

SUBCYLINDRICAL (Fig. 5, g-h)

The twenty-four cores in this category are made from cobbles or large initial flakes. They are subcylindrical to subconical in longitudinal cross section. The central faces are either natural or prepared striking platforms with slightly convex, flat or concave surfaces. Scars of the flakes struck from these platforms taper toward the dorsal ends. As a result, the dorsal surface of a core is either a sharp apex or an irregular face smaller in diameter than the ventral platform. The sides are long and essentially straight, bearing the scars of the removed flakes. Some specimens are battered. Dimensions: length, 2.6-5.3 cm.; ventral diameter, 2.2 X 2.9-7.2 X 7.9 cm.; dorsal diameter, not measurable-2.2 X 5.9 cm. Remarks: Greene (1971) Cores Class II; pages 125-130; Plates 12, a-j.

IRREGULAR (Fig. 5, i-j)

The eleven specimens in this category consist of asymmetrical pebbles and one large flake from which flakes have been removed in a non-patterned fashion. There are cortex remnants on ten specimens. Irregular edges on each specimen indicate attempts to prepare a platform or shape an artifact. Thus, additional evidence is needed to determine if these specimens are cores or pebbles discarded after initial efforts to shape them failed. Three specimens are battered. Dimensions: length, width and

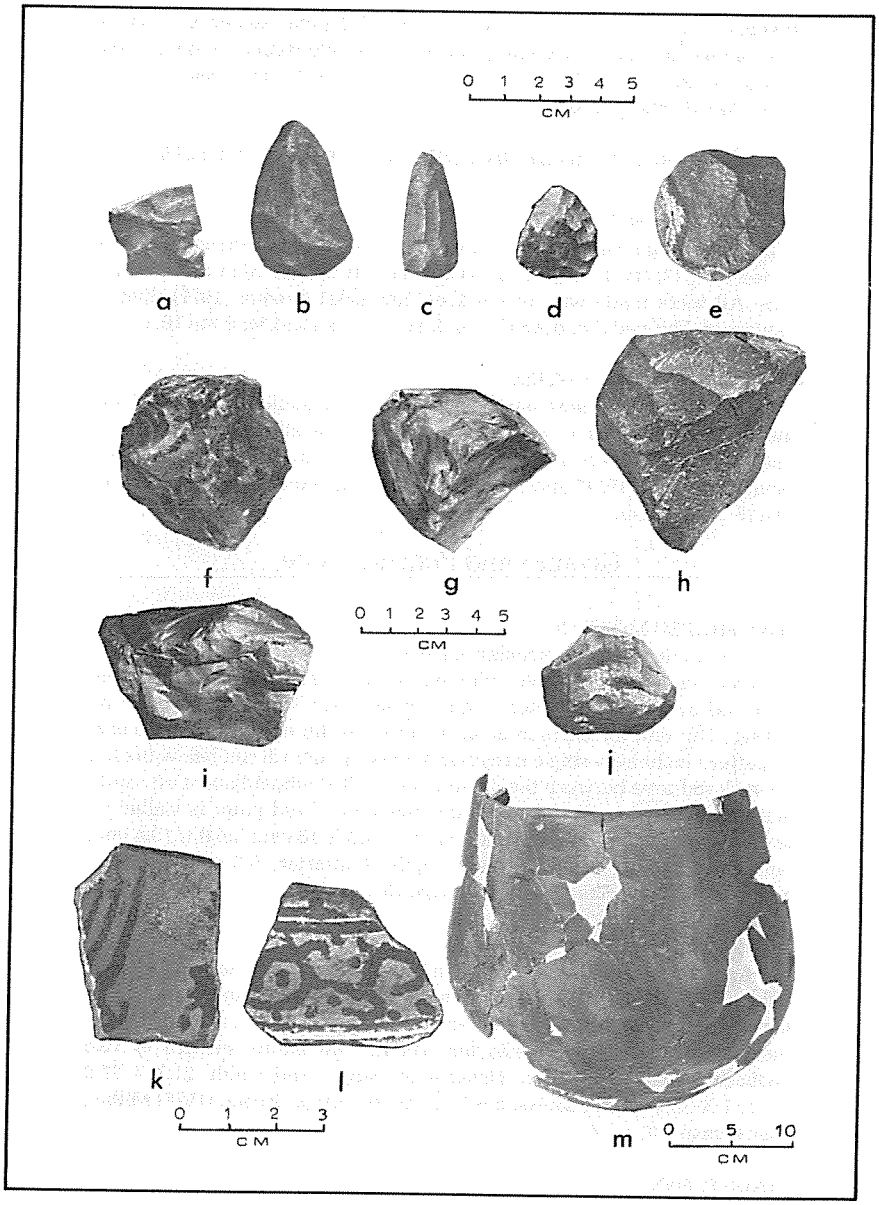

FIGURE 5. Unifaces, Cores and Pottery. a, Stemmed Uniface; b, Large Subtriangular Uniface; c-d, Small Subtriangular Uniface; e, Subcircular and Suboval Uniface; f, Round-Oval Core; g-h, Subcylindrical Cores; i-j, Irregular Cores; k-l, Chalchihuites-like Pottery; m, Arenal Red Washed Jar.

thickness, 4.2 X 3.8 X 2.5 cm. and 3.7 X 3.0 X 2.2 cm. Remarks: Possibly these can be compared to Epstein's Core-like Pebble Bifaces and Core-like Angular Bifaces (1969: 52-53: Fig. 9, D, E). Greene (1971) Cores Class III; pages 130-131; Plate 12, k-l.

Special Features on Chipped Stone Artifacts

BEAK LIKE PROJECTIONS

The twenty-eight beak like projections or gravers were formed: (1) on the pointed end, (2) on a corner, (3) on the side at the junction of two flake scars. All were made on thin unifaces. Remarks: Greene (1971) Special Features on Chipped Stone Artifacts Class I; pages 132-134; Plate 10, c.

SEMI-LUNATE CONCAVITIES

Twenty-eight specimens have semi-lunate concavities cut into a continuous edge. Three have two concavities. Two also have beak like projections. With the exception of a single thin biface, all are on thin unifaces. Remarks: Greene (1971) Special Features on Chipped Stone Class II; pages 134-135; Plate 13, a.

Ground and Pecked Stone

BOWL SHAPED MORTAR

This is an irregularly circular limestone bowl with a flat base and restricted rim. The lip is flush with the rim. The interior is conical with the wider end at the mouth. Interior and exterior surfaces were shaped by pecking. The interior surface is smoother than the exterior. The incised rim pattern includes a single irregular horizontal line 1.8 cm. below the lip. The enclosed zone between the lip and line is filled with adjacent alternate point-up/point-down triangles. A faint remnant of red paint is visible on the body. Dimensions: maximum diameter, 14.6 X 16 cm.; height, 10.4 cm.; diameter of mouth, 8.6 X 8.7 cm.; depth of interior, 5.3 cm. Remarks: Greene (1971) Bowl Shaped Mortar; page 137.

MILLING STONES

Of the four milling stones, three are large slabs of rock and one is a flat cobble. None shows evidence of intentional shaping. One specimen has an elongate ground depression, another has a circular depression. Three are limestone and three are vesicular basalt. The entire surface of two specimens is slightly ground. Dimensions: length and width, 21.7 X 27.0 cm.-31.1 X 35.2 cm. thickness, 5.6-11.2 cm. Remarks: Greene (1971) Milling Stones; page 137.

HANDSTONES

Single Grinding Surface

There are eight specimens in this category. Six are limestone, one vesicular basalt and one is of unidentified lithology. All have a single flattened grinding surface. Some have been shaped by pecking, others are unshaped cobbles. Dimensions: length and width, 9.9 X 12.8 cm.-10.4 X 10.6

cm.; thickness, 4.2-6.2 cm. Remarks: Greene (1971) Handstones, Class L; pages 137-139; Plate 13, b-c.

Double Grinding Surface

This subrectangular, tabular cobble has two parallel grinding surfaces. Corners are rounded. One grinding surface is smoother than the other. It is possible that one surface was flattened for shape and not for an additional grinding surface. The material is unidentified. Dimensions: length and width, greater than 12.8 X greater than 8.2 cm.; thickness, 5.2 cm. Remarks: Greene (1971) Handstones Class II; page 139; Plate 13, d.

STONE MAUL OR PESTLE

One end is wider than the other on this ovate limestone specimen. The surfaces are convex with gently rounded edges. All surfaces are pecked, the wider end being smooth with large pits. Dimensions: diameter, 8.3 X 10.6 cm.; height, 6.7 cm. Remarks: Greene (1971) Possible Stone Maul or Pestle; page 139; Plate 13, e.

BEADS

All of the seven stone beads are disc shaped. With one oval exception all are circular. Each specimen has a single perforation drilled from one or two sides. Dimensions: diameter, 0.7-1.4 cm.; diameter of perforation, 0.4-1.0 cm.; thickness, 0.2-0.7 cm. Remarks: Stone beads similar to these specimens are common in the Laguna region (Aveleyra *et al.* 1956, p. 124). Greene (1971) Beads; pages 141-142.

SPHERICAL GROUND STONE FRAGMENT

The outer surface of this specimen is ground smooth and engraved with a design of diagonal lines. A portion of the design has been rubbed or ground smooth. The color is light green and the type of stone undetermined. Dimensions: diameter, 3.2-3.3 cm. Remarks: Greene (1971) Possible Spherical Ground Stone Fragment; page 143.

TUBULAR PIPE FRAGMENT

Both ends of this cylindrical limestone artifact are fractured. It is slightly cone shaped. The outer surface is rough and pitted and longitudinal striations are visible on the surface of the perforation. Dimensions: length, 4.9 cm.; diameter, 3.9 and 3.0 cm.; diameter of perforation, 1.4 cm. Remarks: Greene (1971) Tubular Pipe Fragment; page 143; Plate 13, g. McClurkan (1966, p. 56, Fig. 21, c) reports two cylindrical pipe fragments from Cueva de la Zona de Derrumbes in Nuevo Leon.

Pottery

ARENAL

Temper and Paste

These specimens comprise a provisional type. The temper consists of clear and vein quartz. Occasional mica and feldspar particles occur. Particle shape ranges from subangular to subrounded; and size from small to

TABLE II. PROVENIENCES OF OTHER LITHIC CATEGORIES

	C-189	C-190	C-191	C-198	Total
BIFACES					
Gouges (Total)	2	1	1	2	6
Symmetrical	0	0	0	1	1
Irregular	1	1	0	0	2
Notched	1	0	1	1	3
Narrow Elongate	1	3	1	0	5
Thin Bifaces (Total)	21	37	25	52	135
Asymmetrical	14	9	9	14	46
Elongate	2	9	3	10	24
Subcircular	2	1	5	3	11
Triangular	3	18	8	25	54
Thick Bifaces	2	1	1	4	8
UNIFACES					
Serrated	0	1	0	0	1
Stemmed	0	0	0	1	1
Subtriangular (Total)	2	7	8	9	26
Large	1	1	2	1	5
Small	1	6	6	8	21
Subcircular and Suboval	18	22	8	11	59
Thick	1	2	1	2	6
Modified Flakes	81	52	25	77	235
CORES					
Round-Oval	1	4	5	2	12
Subcylindrical	2	11	5	6	24
Irregular	5	3	3	0	11
SPECIAL FEATURES ON CHIPPED STONE					
(Total)	16	18	8	14	56
Beak-like	8	9	5	6	28
Semi-Lunate	8	9	3	8	28
GROUND AND PECKED STONE					
Bowl Shaped Mortar	0	0	0	1	1
Milling Stones	1	0	0	3	4
Hand Stones (Total)	2	0	0	7	9
Single Grinding	1	0	0	7	8
Double Grinding	1	0	0	0	1
Stone Maul	0	0	1	0	1
Beads	2	1	3	1	7
Spherical Fragment	1	0	0	0	1
Tubular Pipe	0	1	0	0	1

large with medium to large particles most abundant. Although the concentration of temper ranges from sparse to abundant, abundant is by far the most common. In most sherds the paste is nearly obscured by the vast number of temper particles. The paste is fine and soft.

Texture: Compact to very friable depending on the amount of temper present. Friable sherds are the most common.

Color: Various shades of buff, brown, black and red are represented. Considerable variation on a single sherd is common.

Core: Cores vary from darker in the center than on the edges to light or dark throughout.

Wall thickness: 9.4-1.6 cm.

Lip and rim: Inverted, straight, everted with thinned, unthinned and thickened lips.

Method of manufacture: Coiling.

Special features: Sherds have perforations or mending holes.

Remarks: Greene (1971) Pottery Class I; pages 144-148; Plates 13, h, 14, a-d, Fig. 8; Tables 2-7.

Arenal Plain

Number of specimens: Total 3,022. C-189: body, 1,480; lip, 181; total, 1,661. C-190: body, 231; lip, 31; total, 262. C-191: body, 184; lip, 29; total, 213. C-198: body, 814; lip, 72; total, 886.

Shape and size of vessels: A portion of a small vessel with a globular body and constricted rim was recovered from the dune surface between sites C-190 and C-191. Height is approximately 18.8 cm. and the wall thickness ranges from 0.6-0.9 cm. Three fragments of a possible open spout were recovered from the surface of site C-190. One conical leg fragment was recovered from the surface of C-189.

Arenal Red Washed

Number of specimens: Total 337. C-189: body, 10; lip, 8; total, 18. C-190: body, 184; lip, 9; total, 193. C-191: body, 106; lip 4; total, 110. C-198: body, 13; lip, 3; total, 16.

Shape and size of vessels: Portions of four vessels, two large jars and two bowls were found. The first jar (Fig. 5, m) includes 85 sherds from the surface of C-190. The vessel has a globular body, slightly thickened base, constricted neck and a straight thinned rim. Interior and exterior surfaces are smeared with red wash. Dimensions are: body diameter, 29.3 cm.; neck diameter, 25.2 cm.; diameter of mouth, 22.6 cm.; height, 28.3 cm.; wall thickness, 0.7-1.0 cm. Thirty eight sherds of a jar were recovered from the dune surface between C-190 and C-191. The lip is thinned and the neck strongly inverted. Four opposed pairs of perforations apparently were made to mend a fracture. The vessel diameter is approximated between 35 and 40 cm. and the wall thickness ranges between 0.6-0.8 cm. Redwash is visible on exterior and interior surfaces. A portion of one bowl recovered from C-191 indicates a globular body and constricted neck. Red wash occurs on interior and exterior surfaces. Diameter of the mouth is in excess of 37.0 cm. and the wall thickness ranges between 0.5 and 0.7 cm. A second bowl was recovered from the dune surface between C-190 and C-191. Twenty-three sherds revealed a globular body and slightly thickened base. The lip is thinned and the rim inverted. The diameter exceeds 33.0 cm. The

wall thickness is between 0.7 and 1.9 cm. Decoration: Red wash applied to interior and/or exterior surfaces. It appears to have been smeared with a cloth or handful of weeds for red wash occurs in broad bands or covers an entire portion of a vessel. It is frequently difficult to distinguish between sherds washed red or fired red. The frequency of red wash on interior surfaces indicated bowls or jars with large orifices. The large size of some vessels of this type is confirmed by the particially restorable vessels described.

Arenal Incised and Punctated

Number of specimens: Total, 529. C-189: body or body and plain lip, 338; decorated lip, 67; appendages, 1; total, 406. C-190: body or body and plain lip, 26; decorated lip, 3, total, 29. C-191: body or body and plain lip, 5; decorated lip, 1; total, 6. C-198: body or body and plain lip, 52; decorated lip, 36; total 88. Decoration: Sherds are incised and/or punctated. The body sherds are described among six categories: (1) circular punctations (Fig. 6, a); (2) double rings of circular punctations (Fig. 6, b); (3) diagonally opposed rows of parallel incised lines (Fig. 6, c); (4) irregular linear punctations, usually in rows as if made with a comb (Fig. 6, d); (5) combination of linear punctations and incised lines as in categories 3 and 4 (Fig. 6, e); (6) combination of circular punctations and incised lines as in categories 1 and 3 (Fig. 6, f). There are six incised lip designs: (1) alternating rows of parallel lines (Fig. 6, g); (2) diagonally placed rows of parallel lines, may be fragments of category 1 (Fig. 6, h); (3) simple zig zags (Fig. 6, i); (4) chevrons (Fig. 6, j); (5) single horizontal line bifurcating the lip (Fig. 6, k); (6) bifurcated chevrons (Fig. 6, l).

There is a total of 528 sherds (omit the appendage); of these, 120 are lip sherds. Of the lip sherds, 107 are decorated and 13 are plain. The body portions of 437 sherds are decorated. Among the lips occurring with decorated bodies, 13 of the lip surfaces are plain and 16 are decorated.

Arenal Variant

These sherds are distinctively more compact than the Arenal sherds previously described. Plain, red washed and incised sherds occur.

The plain sherd numbers are: Total, 48. C-189: Body, 10; lip, 0; total, 10. C-190: body, 4; lip, 1; total, 5. C-191: body, 24; lip, 3; total, 27. C-198: body, 5; lip, 1; total, 6. Lips and rim occur as straight or everted and thinned or unthinned.

The red washed sherd numbers are: Total, 13. C-190: body, 9; lip, 2; total, 11. C-191: body, 1; lip, 1; total, 2. Thinned lips with everted and inverted rims occur. The red wash is present on interior and/or exterior surfaces.

The incised sherd numbers are: Total, 8. C-190: body, 1; lip, 0; total, 1. C-191: body, 5; lip, 0; total, 5. C-198: body, 1; lip, 0; total, 2. Design category 3, parallel incised lines that are diagonally opposed, and category 4, irregular and slightly linear punctations are represented. Shape and size of vessels: No restorable vessels were recovered. A single vessel leg was found which is a horse shoe-shaped projection modeled from the side of a vessel. The open end is almost flush with the vessel wall and the closed end of the horse shoe is raised. The vessel wall adjoining the appendage is incised with irregular lines. The pattern is too fragmentary to be defined.

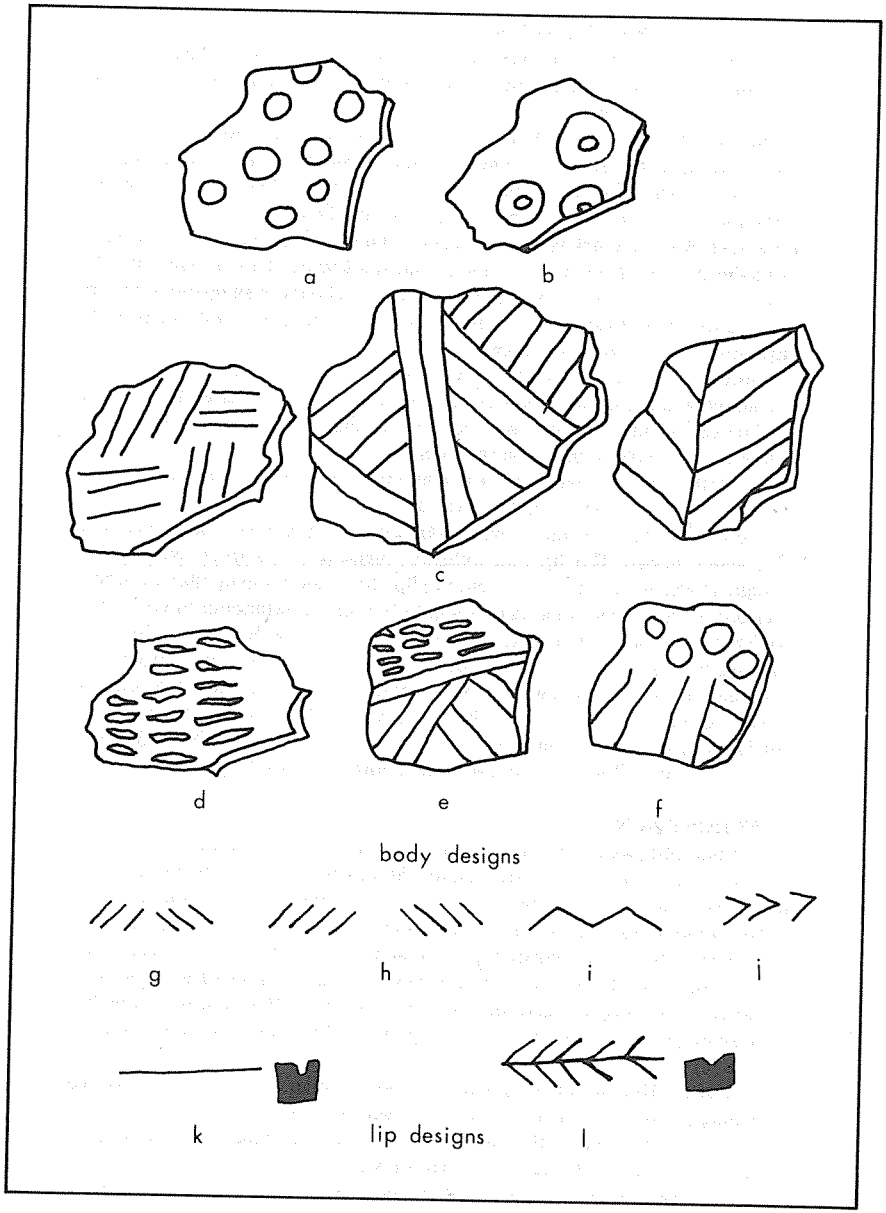

FIGURE 6. Decorative Motifs of Arenal Incised and Punctated Pottery. a-f, Body Designs; g-l, Lip Designs.

CHALCHIHUITES-LIKE POTTERY

These five sherds are definitely intrusive and are comparable to Chalchihuites wares. Chalchihuites ceramics span A.D. 300 or 500 to A.D. 1350 (Kelley 1966: 102, 109).

One sherd, suggestive of a bowl with smoothed interior, has an unthickened base that sharply undercuts the vessel side. One subconical leg extends from the base at the junction of base and side. Wear on the bottom of the leg indicates that the appendage was angled away from the body of the vessel. A single dark red line encircles the vessel at the junction of base and side; the upper margin is sinuous and the lower, straight. On the side above the line a fragment of red paint remains. The leg is smeared with red paint. Interior and exterior surfaces are smoothed and slightly lusterous. Unpainted areas are buff and gray.

Another sherd is a base and body fragment or a base and rim fragment. It is sharply angular in cross section. The sherd is buff or orange with two red horizontal lines on the lower part of the sherd. An irregular fragment of a pattern occurs on the upper portion.

Two buff colored sherds have fragments of red designs on the interior surfaces. One of these is illustrated in (Fig. 5, k).

One sherd (Fig. 5, l) has an everted thin lip and appears to be a fragment of a short vessel. The lip and exterior surface are painted with a red design. There is a thick line around the lip. Just below the lip there are two horizontal lines. The upper has a single tick mark extending towards the lip. The lower has tick extending down. Two unticked horizontal lines occur below the first set. The panel between this lower set contains an irregular scroll pattern and scattered circular dots. There is a thin shallow groove on the exterior surface. The sherd was snapped but the fracture did not follow the groove. Number of specimens: Total, 5. C-190: body, 3; total, 3. C-198: body, 1. Remarks: Greene (1971) Pottery Class X.

CONCHOS PLAIN

Temper and paste: Although large and medium sized white particles are visible on the surface and throughout the interior of each sherd, they are less frequent and smaller than those in *El Paso Brown* and *El Paso Polychrome*-wares. Clear and vein quartz are the most frequent temper particles. Mica and feldspar are present. Particle shape ranges from subrounded to subangular. Particle size range is from small to large with large particles slightly smaller than those of the *El Paso* pottery. Medium and small particles are the most abundant. The paste is platy, fine or granular.

Texture: The texture range includes compact to slightly friable specimens. No sherds are as friable as some of the *Arenal* specimens.

Color: Color is one of the most consistent and striking features of these sherds. They are dark buff to reddish brown.

Core: Cores are very distinct in this type. They are thick and dark grey.

Wall thickness: 0.5 to 0.8 cm.

Lip and rim: One everted rim has an unthinned lip, another straight rim sherd has a thickened lip.

Method of manufacture: Not determined.

Special features: None.

Decorations: The dark red on the surfaces of some sherds may be red wash or paint.

Number of specimens: Total, 73. C-189: body, 6; lip, 2; total, 8. C-190: body, 65; lip, 0; total, 65.

Remarks: Greene (1971) Pottery Class III; pages 151-152. These sherds were compared to *Conchos Plain* sherds collected by J.C. Kelley and stored in the Texas Archeological Research Laboratory, Austin, Texas. Schackelford (1955) assigns *Conchos* pottery to the time between A.D. 1200 to A.D. 1800.

EL PASO BROWN AND EL PASO POLYCHROME WARES

Temper and paste: The most distinctive feature of this class is the temper. Large white particles are evident on the surface and throughout the paste of each sherd. Clear and vein quartz, the most abundant temper particles, range from subangular to angular. Some of the temper may have been crushed. The paste ranges from platy to granular.

Texture: Ranges from compact to slightly friable. No specimens are as friable as *Arenal* pottery.

Color: Shades of brown, red, buff and black occur.

Core: Most cores are dark gray or black but some sherds are light throughout.

Wall thickness: 0.3 to 0.8 cm.

Lip and rim: Rims are everted with thinned or thickened lips.

Method of manufacture: Not determined.

Special features: One specimen has a possible circular perforation. Another specimen has a ground and snapped edge.

Shape and size of vessels: No indication.

Decoration: 105 sherds are plain; 4 have a possible red wash; 11 are brushed; 1 is incised and 1 is covered with black paint.

Number of specimens: Total, 123. C-189: body, 7; lip, 0; total, 7. C-190: body, 17; lip, 3; total 20. C-191: body, 68; lip, 9; total 77. C-198: body, 16; lip, 3; total, 19.

Remarks: Greene (1971) Pottery Class II; pages 148-150. These specimens were compared to *El Paso* sherds from near Samalayuca, Mexico and loaned by Vernon R. Brook. *El Paso* ware is commonly reported from adjacent areas of southeastern New Mexico, Texas and northern Mexico (Vernon Brook, 1971: personal communication). Hester and Hill (1969) report similar sherds from south Texas. Taylor (1966: 63, 83) reports *El Paso Brown* sherds probably associated with Jora Complex and Late Coahuila Complex. McGregor (1965: 359-360) places *El Paso Brown* and *El Paso Polychrome* pottery between A.D. 900 and A.D. 1400 and associates them with Mesilla, Dona Ana and El Paso phases of the Jornado Branch of the Mogollon.

SANTIAGO

Temper and Paste: The specimens in this provisional type have a temper of assorted minerals, primarily clear and vein quartz. Particle shape ranges from subangular to subrounded; size, from small to large with medium sized particles most abundant. The amount of temper ranges from moderate to abundant with moderate most common. The paste is granular or occasionally platy.

Texture: Ranges from slightly compact to friable. Most sherds are slightly friable.

Color: Shades of buff, brown, red and black are common.

Core: Cores may be light or dark throughout or darker in the center.

Wall thickness: 0.5 to 0.9 cm.

Lip and rim: With one exception, all have everted rims with thinned, unthinned or thickened lips. The exception is thinned and straight.

Method of manufacture: Coiled.

Special features: One sherd has been ground to a disc shape. There is no perforation.

Shape and size of vessels: No indication.

Decoration: Body sherds are plain or red washed on either or both surfaces. The lips and rims of some sherds are red washed. On the exterior of one sherd two verticle stripes extend from a red lip.

Number of specimens: Total, 660. C-189: body, 270; lip, 16; total, 286. C-190: body, 181; lip, 12; total, 193. C-191: body, 87; lip, 10; total, 97. C-198: body, 73; lip, 11; total, 84.

Remarks: Greene (1971) Pottery Class IV; pages 152-153. Although some of the sherds grade into *Arenal* on one extreme and *Conchos* on the other, I feel that they are separable on the basis of temper, texture and core characteristics.

SUMMARY AND DISCUSSION OF POTTERY TYPES

A total of 4,818 potsherds was recovered from the four sites in the Charcos de Risa. They include intrusive as well as locally manufactured ceramics.

The most numerous pottery category is 3,957 sherds of provisional type *Arenal*. Four varieties are included: undecorated, 3,022; red washed, 337; incised and punctated, 529; variant, 59. On the basis of numbers and wide distribution, this provisional type is considered indigenous. Seriation studies beyond the scope of this paper indicate that *Arenal* pottery may be the earliest in the sample and the varieties may be temporally significant. Undecorated vessels are common throughout the sequence. Incised designs appear to be overlapped or replaced by punctated designs and in later times, only undecorated and red washed varieties persist. *Arenal* variant is a compact variety that includes undecorated, red washed and incised and punctated sherds. The compactness may be a result of increased firing temperature and reflect refined technique.

The other provisional type, *Santiago*, also appears to be locally manufactured. A total of 660 sherds (undecorated and red washed) were recovered. Seriation indicates that this type did not appear until after linear incised pottery of the Arenal provisional type disappeared.

The termination of provisional types *Arenal* and *Santiago* is unknown but correlation with dated intrusive types indicate that both types survived until after A.D. 1200-1300.

Among the intrusive pottery are five sherds comparable to Chalchihuites wares. Chalchihuites types occur between A.D. 300 or 500 and A.D. 1350 (Kelley 1966: 102, 109).

Seventy three *Conchos Plain* sherds were recovered. These date between A.D. 1200 and A.D. 1800 (Schackelford 1955). *Conchos Plain* is considered an intrusive type but future research may extend its range into southwestern Coahuila.

Intrusive, *El Paso Brown* and *El Paso Polychrome* wares were also found. The sample includes 123 specimens; 105 undecorated, 4 possible red washed, 1 black painted and 11 brushed. These occur in far west Texas, adjacent New Mexico and Mexico between A.D. 900 and A.D. 1400.

The combined time span of the three intrusive ceramic categories are from as early as A.D. 300 or 500 (Chalchihuites-like) to A.D. 1800 (*Conchos*). However, the three wares overlap temporally between A.D. 900 and A.D. 1350. There is no evidence that all of the intrusive types reached the Charcos de Risa during this brief span.

Other Ceramic Artifacts

PIPE FRAGMENTS

Three cylindrical pipe stems and one bowl fragment were recovered. The paste of the stem fragments is hard and smooth. Temper is sparse and consists of small sand grains. The paste and temper of the bowl fragment is comparable to *Arenal* pottery. Greene (1971) Pipe Stems and Possible Pipe Bowl Fragment; page 162. Mason (1937: 134-141; Figs. 2, a, 3) reports 1 pipe stem from Pueblito, 5 km. south of Durango City, and another from Arroyo Quelito near Zape. MacNeish (1958: 130) reports a pipe stem fragment from Tamaulipas and attributes it to the Los Angeles Component.

CLAY BALLS AND HEMISPHERES

There are a total of 40 specimens. Thirty-seven are clay balls shaped by rolling the clay between the palms. There is considerable range in size (diameters of 1.9-3.6 cm.) and degree of roundness. Surface finishes range from smooth to rough. The surfaces of three specimens are scratched. One specimen has a single groove incised around the circumference. One other specimen has several deep furrows on the surface made while the clay was wet. Three specimens are hemispheres. Apparently, these were made by cutting clay balls in half and grinding the flat side smooth. Thirty four specimens are comparable to *Arenal* pottery. Five others are comparable with *Arenal* Variant and one with the temper and paste of the pipe stems. Greene (1971) Clay Balls and Hemispheres; pages 162-164. MacNeish (1958: Fig. 43, e) illustrates an incised and punctated clay ball.

SPINDLE WHORLS

Biconical

Sixteen specimens were recovered. One is so small that it may be a bead. All are biconically shaped with a single perforation through the ver-

tical axis. They are crude and surfaces are eroded. The surfaces of three specimens are scratched. One specimen was mashed while wet. The temper and paste of 13 specimens corresponds to *Arenal* pottery. Two are comparable to the temper and paste of the pipe stems. The height and width ranges from 1.8 X 2.3-2.2 X 3.8 cm. with one exception, 1.0 X 1.6 cm. Greene (1971) Spindle Whorls, Class I; pages 164-165; Fig. 15, c. Mason (1937, page 136, 138) reports biconical spindle whorls from a site located on the Nazas River near Hervideros, Durango.

Discs

There are seven perforated potsherd discs. All are irregularly circular with crudely ground edges. Four specimens were made from *Arenal* pottery, one from *Arenal* Variant and one from *Santiago* pottery. Greene (1971) Spindle Whorls, Class II; page 166.

FIGURINES

The sample consists of four cylindircally shaped figurines. The tops of the heads are flattened. Three specimens have no arms or legs. Two of these have lower ends larger in diameter than the upper or head ends. The nose of one specimen (Fig. 7, a, b) is a small vertical wedge. There are: eyes on either side of the nose; two nostrils beneath the nose; and below the nostrils, a mouth. All are small circular punctations. The lower portion of the second specimen (Fig. 7, c, d) is divided into two distinct legs. Above the abdomen is a single, deep, circular perforation. There is a deep fracture on one side of the upper front. The wedge protruding from one side may represent an arm, a turned head, or a breast. There are no eyes, nostrils or mouth. The third specimen (Fig. 7, e) has punctated eyes, nostrils and mouth as well as a vertical wedge nose. The nose of the last specimen (Fig. 7, f) is a small beak. There is one eye (the other may be eroded); a fracture in the nostril region; and no mouth.

The temper of three specimens is sparse, fine sand and the paste is dense and fine. The temper and paste of two specimens is slightly finer than *Arenal* pottery. Greene (1971) Figurines; pages 166-167; Plate 15, d-i. Shafer (1975) discusses clay figurines recovered from southwestern Texas. These anthropomorphic forms may include males as well as females. They are associated with the Middle Archaic period. Association of the southwestern Texas forms with the Charcos de Risas specimens in unconfirmed.

CLAY CYLINDERS

Twentythree irregularly shaped cylinders were recovered. All are fractured on at least one end. They may represent coil fragments, figurine parts and possibly vessel legs. None are decorated. Nineteen specimens have temper and paste identical to Arenal pottery. The paste of the remaining specimens is compact and fine and the temper is fine and sparse sand. Greene (1971) Miscellaneous Clay Cylinders, page 68.

DAUB

Fifty-one specimens appear to be daub. They are small amorphously shaped clay lumps with grass and stick impressions on the surfaces. These may be fragments from burned clay covered brush structures or clay lined hearths. Greene (1971) Daub; page 168.

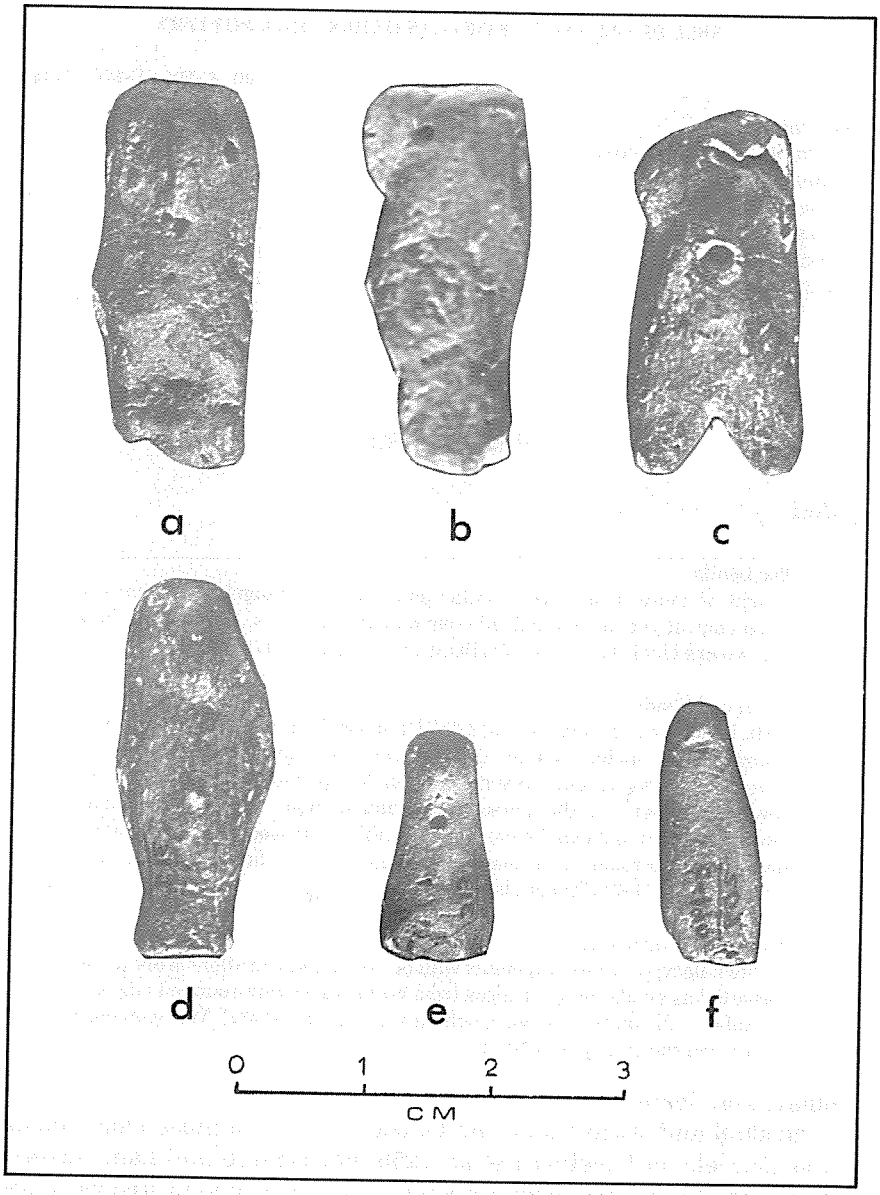

FIGURE 7. Figurines.

TABLE III. CERAMIC ARTIFACTS OTHER THAN POTTERY

	C-189	C-190	C-191	C-198	Total
Pipe Fragments	0	3	0	0	3
Clay Balls and Hemispheres	9	13	3	15	40
Spindle Whorls (Total)	1	15	2	5	23
Biconical	1	14	1	0	16
Discs	0	1	1	5	7
Figurines	0	4	0	0	4
Clay Cylinders	8	5	0	10	23
Daub	28	2	3	18	51

Shell and Bone

SHELL

Disc Beads

Eight of these beads are circular and one is rectangular. All have a single central perforation drilled from one or both sides. Seven are white and two are black. Greene (1971) Beads, Class I; pages 170-171.

Gastropod Beads

Six beads are *Marginella* and *Olivella* shells from which the apex was removed. The shells include: *Olivella undatella* Lamark, 4 specimens; *Olivella* sp., 1 specimen; *Marginella* sp. of *M. apicina* Menke or *M. curta* Dowerby (Peter Rodda personal communication 1969). Four other specimens were fashioned from unidentifiable gastropod shells. Both apex and base were removed so that the beads consist of the cylindrical body whorl. Greene (1971) Beads Class II; pages 171-172.

Pelecypod Fragments

Five pelecypod valve fragments with one or two perforations were found classified as beads. Shape ranges from rectangular with rounded edges to irregular with dubious edge modification. Greene (1971) Miscellaneous perforated shells; pages 172-172.

Remarks on Beads

The shell and stone beads can be compared with those from Cueva de la Candelaria (Aveleyra *et al.* 1956: pp. 118-128 and Lam. 43-44). Beads were found strung on bracelets, necklaces, and in strings of eccentric patterns. Also, they were found on *flores* (rattle-like objects of fiber and wood), strung on a shaft of wood, and forming mosaic-like patterns on the base of *guardpuas*. The marine shell beads recovered from Candelaria are *Olivella sama*, a Pacific shell, and *Marginella apicina*, a Gulf of Mexico gastropod (*Ibid.*, p. 126).

BONE

An irregular-elongate, flat bone fragment has a single perforation. The perforation is located in the center of the flat surface and was drilled from both faces. The fragment is eroded and was broken when recovered. Greene (1971) Bone: page 173.

Historic Artifacts

Fragments of modern bottles, pottery, metal and plastic were recovered from the surfaces of sites C-189 and C-198. Cartridge cases and a spent bullet are among the artifacts from C-198, C-190 and the dune surface near C-190. None date earlier than 1895.

Sixty-four of the pottery specimens are indistinguishable from pottery used today. However, much of that pottery was used in the area during early historic times. It is notable that all but ten sherds were recovered from C-198.

Two sherds of tin-enameled earthenware of probable nineteenth century origin (Tunnell 1966) were recovered from C-198. Both have green exteriors and cream white interiors. The glaze of both surfaces has bubble holes. Greene (1971) Historic Artifacts, pages 174-180.

TABLE IV. SHELL AND BONE

Shell (Total)	5	7	6	6	24
Disc Beads	2	2	4	1	9
Gastropod Beads	2	1	2	5	10
Pelecypod Fragments	1	4	0	0	5
Bone	1	0	0	0	1

FAUNAL REMAINS

Gastropods (John Clark: personal communication, 1969) include *Heliosoma trivolis* (Say), *Rabdotus alternatur marias* (Albers), *Rabdotus sp.* and *Pseudosuccinea columella* (Say). The pelcypod *Uniomerus tetralasmus* (Say) was identified by Henry Van der Schalie (personal communication: 1969). All live in ponds, sloughs or lakes. Van der Schalie suggests that the pelecypods may represent the southernmost range of the species.

Vertebrate remains include: *Canis latrans, Citellus spilosoma, Lepus californicus, Odocoilus virginianus, Sigmodon hispidus* and *Sylvilagus floridanus* (James E. Corbin: personal communication, 1969). Medium and large bird bone fragments were recovered.

DISCUSSION AND CONCLUSIONS

Comparison and internal analysis has revealed much about the cultural sequence and artifact associations in the Desierto de Char-

cos de Risa, Coahuila, Mexico. In the following sections, discussion of the artifact sequence and conclusions are presented. These include brief summaries of the projectile point and pottery sequences presented within the text of the artifact descriptions as well as; lithics other than projectile points, ceramics other than pottery, shell and bone artifacts, historic artifacts and faunal remains. Comments on cultural processes in the Charcos de Risa concludes this section. A statement of major problems and concluding remarks close the paper. Hopefully, the brief problem section will help the reader understand the difficulties facing researchers concerned with the prehistory of northern Mexico.

Summaries and Comments

THE PROJECTILE POINT SEQUENCE

The projectile point sequence will be briefly recounted in this section. It is based primarily on comparisons with established sequences in surrounding areas discussed by Epstein (1969), Johnson (1964 and 1967), Taylor (1966), Dibble (1967) and Story and Bryant (1966).

The earliest projectile point forms recovered in the Charcos de Risa are stemless, leaf shaped dart points: *Lerma* and possibly *Abasolo*. Similar dart point forms were found (Taylor 1966) in the Cuatro Cienegas Basin and related to the Early Coahuila Complex. *Lerma*, a late Paleo-Indian form, has been dated in northern Mexico as early as 7,000 B.C. and probably persisted no later than 5,000 B.C. (Nance 1972). Thus, it appears to be confined to the time of the pre-Altithermal climatic interval.

As expected, no expanding stemmed Early Barbed dart points were recognized in the sample. These are dated during the Early Archaic period in Southwestern Texas from 5,000 B.C. to 3,000 B.C. (Johnson 1964 and 1967) or 7,000 B.C. or 4,000 B.C. (Story and Bryant 1966). Slightly later dart point types, *Nolan* and *Pandale* were not found. Epstein (1972) and Nance (1972) consider the absence of Early Archaic dart point forms to be an apparent gap in the cultural sequence during Altithermal times.

Late Paleo-Indian stemless dart points are followed by typically Middle Archaic, post Altithermal, contracting stemmed dart point types. Seventy percent of these forms are comparable to projectile point types recovered by Taylor (1966) in the Cuatro Cienegas Basin of Central Coahuila. Dates for the Middle Archaic in Texas are inferred and should be regarded as estimates. Johnson (1964) dates the Middle Archaic in Texas between 3,000 B.C. until sometime after 2,000 B.C. In Nuevo Leon, McClurkan (1966: 70) dated *Shumla* type

dart points from A.D. 100 to A.D. 200 and *Gary* points at approximately A.D. 1200. Story and Bryant (1966: Table 1) place Middle Archaic dart point types between 2,500 B.C. and 1,000 B.C.

Expanding stemmed, corner notched dart points are evidence of Late Archaic occupations in the Desierto de Charcos de Risa. Only 12 percent of the specimens are comparable to forms recovered by Taylor (1966) in Central Coahuila indicating less homogeneity between the two regions during the Late Archaic (Middle and Late Coahuila Complex). This speculation is further supported by the large number of provisional type *Charcos* points, a well developed, but regionally confined dart point style.

In Texas, the later part of the Late Archaic is marked by the appearance of side notched dart point forms (Johnson 1964). The sample from the four sites in the Charcos de Risa includes *Ensor*-like and 4 untyped categories of side notched dart point forms. Taylor (1966) includes an *Ensor*-like form among Middle and Late Coahuila Complex points.

Dates for the Late Archaic are uncertain. In southwestern Texas, the Late Archaic began before 2,000 B.C. and persisted later than 1,000 B.C. (Johnson 1964). In Nuevo Leon, McClurkan (1966) found no comparable corner notched forms but the slightly later side-notched *Ensor* type was recovered and dated from A.D. 600 to A.D. 1000.

Arrow points, representing late prehistoric times, include both side notched and stemless forms. With the exception of provisional type *Diaz*, all are comparable to forms recovered from Central Coahuila (Taylor 1966). Efforts to place arrow point stem or base attributes into a sequence are premature. Although *Scallorn* type appears to predate *Harrell, Toyah, Fresno* and *Garza* types in Texas (Suhm and Jelks, 1962) McClurkan was unable to stratigraphically discriminate among arrow point forms recovered from NL92 in Nuevo Leon.

Both *Catan* and *Matamoros* dart points were recovered from the Charcos de Risa. These stemless forms can not be placed in a temporal framework. Epstein (1972) discusses the uncertain position of triangular points within the northern Mexican chronological scheme.

OTHER LITHIC ARTIFACTS

Both bifacial and unifacial chipped stone artifacts were recovered and several forms are comparable to specimens from nearby regions. Many of the bifacial and unifacial categories probably represent blanks and preforms; stages within the tool manufacturing sequence.

Among the bifaces are symmetrical, irregular and notched gouges. The irregular specimens are similar in form but smaller than *Clear Fork* gouges recovered from the San Isidro Site in Nuevo Leon (Ep-

stein 1969). *Clear Fork* gouges have been associated with Paleo-Indian projectile point forms, but because the sample from the Charcos de Risa is small (2 specimens) and divergent in size it should not be considered evidence of these early times in southwestern Coahuila. Eight thick bifaces were recovered. They may be comparable to forms in Nuevo Leon (Epstein 1969; McClurkan 1966) and Tamaulipas (MacNeish 1958). No chronological associations are evident. The only unifacial form comparable to examples elsewhere is a single stemmed specimen. Similar artifacts were recovered from the adjacent Laguna region by Aveleyra *et al.* (1956).

It is difficult to place bifacial and unifacial artifacts within a temporal framework at this time. However, Taylor (1966: 67) suggests that, in Central Coahuila, bifacial implements occurred earliest, then gave way to both bifacial and unifacial forms which were later replaced by a predominance of unifacial forms. Finally, retouched flakes replaced unifacial forms in frequency. Portions of this sequence are supported by finds at the San Isidro Site in Nuevo Leon (Epstein 1969: 119-120).

Three categories of cores were recovered from the four sites. Most appear to be exhausted. These remains indicate that chipped stone tools were manufactured on the sites. None of the cores can be placed within a chronological framework and the location of the stone quarries is undetermined.

Among the ground and pecked stone artifacts are: a bowl shaped mortar, unshaped milling stones, hand stones, and a stone maul or pestle. All are evidence of plant food preparation on the sites. None of the artifacts can be dated.

Disc-shaped stone beads are similar to undated specimens recovered from the adjacent Laguna (Avelyera *et al.* 1956). Other stone artifacts include a tubular stone pipe and a spherical ground stone fragment. Tubular stone pipe fragments were recovered from NL92 in Nuevo Leon (McClurkan 1966) but no spherical ground stone objects have been reported from nearby sites.

THE POTTERY SEQUENCE

Apparently, two types of pottery were manufactured by the prehistoric inhabitants of the Charcos de Risa. The earliest, provisional type *Arenal*, includes several varieties which may be temporally significant: (1) Plain vessels were probably manufactured throughout the sequence. (2) Incised designs may be temporally overlapped or replaced by punctated design elements. (3) Although the inception of red washed decoration is undetermined, this technique persisted un-

til the end of the Arenal sequence. The compact variety, *Arenal* Variant, may be the result of more intensive firing techniques. The temporal significance is undetermined.

A slightly later, locally manufactured pottery is provisional type *Santiago*. It appears that this pottery was not manufactured until after linear incised pottery of provisional type *Arenal* was no longer made.

Although no absolute dates can be associated with *Arenal* and *Santiago* pottery, correlation with intrusive types suggests that both provisional types persisted later than A.D. 1200-1300.

The intrusive pottery includes Chalchihuites-like, *Conchos*, and *El Paso Brown* and *El Paso Polychrome* ceramics. A lengthy time span is covered by these wares: A.D. 300 or 500 to A.D. 1800. The intrusive pottery overlaps chronologically between A.D. 900 and A.D. 1350 but there is no evidence that all three were introduced into the Charcos de Risa during this time.

OTHER CERAMIC ARTIFACTS

Cylindrical pipe stems and a bowl fragment were found. Although pipe stems have been reported from Durango (Mason 1937) and Tamaulipas (MacNeish 1958) it is impossible to make cultural or temporal associations.

Other clay artifacts difficult to place within an absolute temporal span are: clay balls and hemispheres, biconical spindle whorls, and circular discs fashioned from potsherds. The paste of most of these artifacts is comparable to the paste of *Arenal* pottery and probably contemporaneous. One potsherd disc was made from a *Santiago* sherd.

Four cylindrical clay figurines were found. Three specimens have recognizable heads with facial features. One specimen has two legs, no recognizable face and a possible arm, nose or breast. Based on examples from southwestern Texas (Shafer 1975), the Charcos de Risa specimens may represent three male and one female forms. By association with dated projectile points, Shafer correlates several southwestern Texas figurines with the Middle Archaic. Although similar to the Texas specimens, none of the Charcos de Risa specimens are identical and none have been found in the region between Texas and southwestern Coahuila. Thus, on the basis of the small sample and lack of supportive comparisons, I am hesitant to place the anthropomorphic figurines from the four sites within a specific time period.

Numerous clay cylinders appear to be remnants of coils, figurines or vessel legs. The paste of most specimens is identical to *Arenal* pot-

tery paste. This is additional evidence that *Arenal* pottery was manufactured on the sites.

Daub specimens are the only evidence of constructed features such as living structures or hearths. No associated pit or floor outlines were found.

SHELL ARTIFACTS

Two categories of shell beads were recovered; circular and rectangular disc shaped, *Marginella* and *Olivella* shells with removed apexes. Similar specimens were found in nearby Cueva de la Candelaria (Aveleyra *et al.*, 1956). Taylor (1966: 83-84) attributes these and other elaborate materials from the Laguna region to the Mayran Complex. He states that these artifacts may have some time depth and persisted until approximately A.D. 1500.

The *Marginella* and *Olivella* shells include Pacific and Gulf of Mexico species. These, considered with intrusive pottery indicate widespread external contacts.

HISTORIC ARTIFACTS

Most of the historic artifacts are indistinguishable from articles commonly used in the region today. However, two sherds of tin-enameled ware are probably of 19th century origin. These may be earlier because a mission was established in the Laguna during the 16th century (Griffen 1966).

FAUNAL REMAINS

Few faunal remains were recovered. These include gastropods, species usually associated with standing water. Small mammals, deer and bird skeletal material was also found. Little can be concluded but, damper climatic conditions during parts of the past may be indicated.

Cultural Processes in the Charcos de Risa

On the basis of the materials recovered from the four sites, the Desierto de Charcos de Risa was occupied by prehistoric peoples throughout a long time span extending from Late Paleo-Indian to historic times. Undoubtedly, climatic conditions fluctuated through time but analysis of these changes is beyond the realm of this report. The continuity of occupation of the four sites is undetermined. With the exception of the Early Archaic Period there is no evidence that the sites were or were not abandoned seasonally or for long periods of time. During the Early Archaic the area may have been abandoned or

suffered severe population depletion. The gap in the cultural sequence is based on negative evidence; lack of radiocarbon dates and the absence of Early Barbed points which are markers of the Early Archaic in southwestern Texas. We must not neglect the possibility that other projectile point forms such as leaf-shaped stemless or contracting stemmed dart points occurred in southwestern Coahuila during the Early Archaic or Altithermal times and that there is no gap in the cultural sequence.

The archeological evidence indicates that during Archaic times the inhabitants of the Desierto de Charcos de Risa were mobile hunters and gatherers with no permanent settlements. The lifestyle was comparable to the lifestyle of Archaic peoples throughout arid northern Mexico and adjacent Texas. Some of the inhabitants of the region may have maintained an Archaic-like economy during post-Archaic times. Locally manufactured pottery, spindle whorls, and inferences from the historic records are evidence that some form of agriculture may have been practiced during post-Archaic times. There is no evidence of permanent settlements which suggests that dependence on planted foodstuffs was marginal.

Outside contact is indicated by the presence of intrusive pottery from the north, south and west although these items may have reached the Charcos de Risa through a complex trade network. The intrusive ceramics date the time of exterior contact between A.D. 300 or 500 to A.D. 1800.

Problems

There are numerous problems in Coahuila archeology today. Nearly all can be attributed to two factors: (1) There are few written reports and these contain little descriptive detail; (2) Few stratified cultural deposits have been excavated.

1. It may be difficult or impossible to locate stratified deposits in the future. Most cave deposits have been looted or mined. Surface sites are subject to wind deflation and sheet erosion.

2. Climatic regimes are not well defined in this vast region. Geochronological, paleobotanical and faunal analysis are needed.

3. There are discrepancies in the absolute dates between Texas and northern Mexico although general artifact sequences seem consistent.

4. There is no confirmed evidence of man or his activities during the Middle Archaic (Altithermal) period.

5. The projectile point sequence is not confirmed by stratigraphic evidence. Major considerations are: the place of triangular points in

the temporal and spatial framework, the local development and intrusion of arrow points, and development of a model of lithic implement production and function reflecting changes in time and space.

6. Lithic associations are restricted to projectile points. Little is known about the other items in the lithic assemblage.

7. Although intrusive ceramics can be dated in a general manner, specific dates and associations with local ceramics and other artifacts is conjectural.

8. Most artifact comparisons have been made with materials recovered from Tamaulipas, Nuevo Leon and adjacent Texas. Western and southern affiliations (Zacatecas, Durango, Chihuahua, and southern Texas) have rarely been considered.

9. Several internal problems are specific to Coahuila. Burial practices are not conclusive; association between open site burial and mortuary caves (such as Candelaria) are unknown. The sparse evidence of Spanish influence is unsettling. Projectile point form diversity between southwestern and central Coahuila is not adequately described.

Closing Remarks

A general model of the cultural sequence in the Desierto de Charcos de Risa has been presented. A list of problems is included. These are not all of the problems but they indicate the vast amount of research still to be done. Hopefully, future investigations will answer many of the questions posed and add much needed detail to the model of prehistoric settlement in southwestern Coahuila.

REFERENCES CITED

Antevs, E.
1955 Geologic-Climatic Dating in the West. *American Antiquity*, Vol. 20, pp. 317-335.
1962 Late Quaternary Climates in Arizona. *American Antiquity*, Vol. 28, pp. 193-198.

Aveleyra Arroyo de Anda, L., M. Maldonado-Koerdell, and P. Martinez del Rio
1956 Cueva de la Candelaria. Vol. 1, *Memorias del Instituto Nacional de Anthropologia e Historia*, No. 5.

Bryant, V.M.
1974 Late Quaternary Pollen Records from the East Central Periphery of the Chihuahuan Desert. Manuscript, Anthropology Research Laboratory. Texas A & M University.

Dibble, D.S.
1967 Excavations at Arenosa Shelter, 1965-1966. Report Submitted to the National Park Service by the Texas Archeological Salvage Project, University of Texas at Austin.

Eardley, A.J.
1951 *Structural Geology of North America*. New York.

Epstein, J.F.
1969 The San Isidro Site: An Early Man Campsite in Nuevo Leon, Mexico. *Archaeology Series*, No. 7, Department of Anthropology, The University of Texas at Austin.
1972 Some Implications of Recent Excavations and Surveys in Nuevo Leon and Coahuila. *The Texas Journal of Science*, Vol. 24, No. 1, pp. 46-56.

Escoto, J.A.V.
1964 Weather and Climate of Mexico and Central America. *Handbook of Middle American Indians*, Vol. 1, edited by Robert Wauchope and others, pp. 187-215.

Fenega, F.
1953 The Weights of Chipped Stone Points: A Clue to Their Functions. *Southwestern Journal of Anthropology*, Vol. 9, No. 3, pp. 309-323.

Greene, L.H.
1971 Archeological Investigations in the Desierto de Charcos de Risa, Coahuila, Mexico, M.A. thesis, University of Texas at Austin.

Griffen, W.B.
1969 Culture Change and Shifting Populations in Central Northern Mexico. *Anthropological Papers of the University of Arizona*, No. 13.

Hester, T.R. and T.C. Hill, Jr.
1969 Mogollon Ceramics from Southern Texas. *The Artifact*, El Paso Archeological Society, Vol. 7, No. 3, pp. 11-15.

Johnson, L., Jr.
1964 The Devils Mouth Site. A Stratified Campsite at Amistad Reservoir, Val Verde County, Texas. *Archaeology Series*, No. 6, Department of

Anthropology, The University of Texas at Austin.

1967 Toward a Statistical Overview of the Archaic Cultures of Central and Southwestern Texas. *Texas Memorial Museum Bulletin*, No. 12.

Kelley, J.C.

1966 Mesoamerica and the Southwestern United States. *Handbook of Middle American Indians*, Vol. 4, pp. 95-110.

McClurkan, Burney B.

1966 The Archeology of Cueva de la Zona de Derrumbes: A Rock Shelter in Nuevo Leon, Mexico. M.A. thesis, University of Texas at Austin.

McGregor, J.C.

1965 *Southwestern Archeology*. University of Illinois Press.

MacNeish, R.S.

1958 Preliminary Archeological Investigations in the Sierra de Tamaulipas Mexico. *Transactions of the American Philosophical Society*, Vol. 48, pp. 1-209.

Maldonado-Koerdell, M.

1964 Geohistory and Paleogeography of Middle America. *Handbook of Middle American Indians*, Vol. 1, edited by Robert Wauchope and others, pp. 3-30.

Mason, J.A.

1937 Late Archeological Sites in Durango, Mexico from Chalchihuites to Zape. Twenty-fifth Anniversary of Studies, Vol. 1. *Publications of the Philadelphia Anthropological Society*, University of Pennsylvania Press, pp. 127-146.

Nance, C.R.

1971 The Archeology of La Calsada: A Stratified Rock Shelter Site, Sierra Madre Oriental, Nuevo Leon, Mexico. Ph.D. dissertation, University of Texas at Austin.

1972 Cultural Evidence for the Altithermal in Texas and Mexico. *Southwestern Journal of Anthropology*, Vol. 28, pp. 169-192.

Runkles, F.A.

1964 The Garza Site: A Neo-American Campsite Near Post, Texas. *Bulletin of the Texas Archeological Society*, Vol. 35, pp. 101-126.

Schackelford, W.J.

1955 Excavations at the Polvo Site in Western Texas. *American Antiquity*, Vol. 20, No. 3, pp. 256-262.

Shafer, H.J.

1975 Clay Figurines from the Lower Pecos Region, Texas. *American Antiquity*, Vol. 40, No. 2, Pt. 1, pp. 148-158.

Silva, P. and T.R. Hester

1973 Archeological Materials from a Nonceramic Site in Eastern Durango, Mexico. *Contributions of the University of California Archeological Research Facility*, No. 18.

Sprague, R.

1968 A Suggested Terminology and Classification of Burial Description. *American Antiquity*. Vol. 33, No. 4, pp. 479-485.

Story, D.A. and V.M. Bryant
1966 A Preliminary Study of the Paleoecology of the Amistad Reservoir Area. N.S.F. Research Report (GS-667).
Suhm, D.A. and E.B. Jelks
1962 Handbook of Texas Archeology: Type Descriptions, *Texas Archeological Society Special Publication* No. 1 and the *Texas Memorial Museum Bulletin*, No. 4.
Tamayo, J.L. and R.C. West
1964 The Hydrography of Middle America. *Handbook of Middle American Indians*, Vol. 1, edited by Robert Wauchope and others, pp. 84-121.
Taylor, W.W.
1956 Some Implications of the Carbon-14 Dates from a Cave in Coahuila, Mexico. *Bulletin of the Texas Archeological Society*, Vol. 27, pp. 215-234.
1966 Archaic Cultures Adjacent to the Northeastern Frontiers of Mesoamerica. *Handbook of Middle American Indians*. Vol 4, edited by Robert Wauchope and others, pp. 59-94.
Tunnell, C.
1966 A Description of Enameled Earthenware from an Archeological Excavation at Mission San Antonio de Valero (The Alamo). *State Building Commission Archeological Program Report*, No. 2, Austin.
Varner, D.M.
1967 An Archeological Investigation of Hearths in Northeastern Mexico. M.A. thesis, University of Texas at Austin.

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THE CLEAR FORK GOUGE REVISITED*

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ABSTRACT

Clear Fork Gouges, their attributes and covariation of attributes are examined in an attempt to determine morphological and functional regularities as well as relationships with endscrapers. As might be expected, the relationships are statistical and force the archeologist to work with relatively high numbers of specimens. The gouge is a generic entity and any attempts to divide it into stylistic or morphological types must procede with caution.

INTRODUCTION

After years of field work, Cyrus Ray (1941) described a stone implement and named it the *Clear Fork Gouge*. Considering the time and the contemporary quality of Texas archeology, his morphological descriptions and historical considerations of this phenomenon were more than adequate. He defined the gouges in terms of 441 specimens. Nearly 90% of these were triangular in outline. Nearly 60% were made on bifaces, and practically all had bits with a "scooped-out" appearance. He related these gouges to a "Clear Fork Culture", a concept which fortunately has not been pursued. Apparently, his placement of the gouge as later than what we now call Paleo-Indian and earlier than arrow-points and pottery is largely supported. All in all, his observations were very perceptive. Forty-five years after his initial impressions of 1928, there is not much to add except for quantitative reporting and more analytical work.

The definition worked very well for the area around Abilene, but soon collectors began to recognize the form farther east, southeast, and northwest. The question began to arise as to whether similar forms near Fort Worth, San Antonio, and Tyler were the same thing as Ray's gouge. At the same time, many students began to speculate as to the use or uses of the gouge. Unfortunately, the questions were not followed up with a scientific rigor, and new type names were submitted without the proper attention paid to form, function, association, or time. Speculations as to use remained unsupported.

*About the time this paper was submitted in 1973, three studies of these subtriangular flaked stone implements were published. Hester, *et al.* (1973) made an analytical study of possible functions while Howard (1973) did experimental work. Chandler (1974) conducted an analysis of wear patterns on a sample from the Falcon area. Hester's findings verify my own conclusions of hafting and the studies of Howard and Chandler do not conflict with my own hypotheses.

In 1968, I collaborated in a study of gouges from the Acton site (Blain *et al.* 1968). Since we defined the class in terms of Ray's work, it is reasonable that we found our gouges to be very much like his.

A second collection of gouges and scrapers, over 300 in number, was obtained from Webb County in south Texas. It was only an uncontrolled surface collection, but showed enough consistency and regularity to permit the formulation of several initial hypotheses. For the most part, I was interested in the question of how well the concept of gouge fitted the concept of morphological type, and how shapes and sizes of these artifacts varied geographically and temporally.

The third collection was made available through the courtesy of R. K. Harris of Dallas. This group was from the McClean site near Abilene, Texas. It is believed that these most nearly conform to Ray's original "type" specimens.

METHODOLOGY

Certain measurements were taken in a standard manner. Length was understood to be the maximum distance measured from the distal end or bit to the proximal end (Figure 1, A). The width is measured at the bit and is always at right angles to the length (Figure 1, A). Thickness is measured at the bit to the maximum height of the flaking that created the bit. (Figure 1, B). It is measured at right angles to the ventral face of the tool. The edge angle is measured on the bit with one arm of the goniometer resting on the ventral face of the tool and the other tangent to the axis of the bottom rows of stepped retouch flakes (Figure 1, C). If the edge is undercut by wear or resharpening, the arm is held parallel to the bottom row. This angle is difficult to read because each flake varies somewhat. Thus, it is registered as 70-74 , 75-79 , or 80-84 , etc.

The next set of attributes are recorded by observation. As we had recorded in 1968 (Blaine *et al.* 1968), gouges and similar tools are made on bifaces, inverse flakes with the cortex forming what we might regard as the ventral face, and flakes (or blades). The latter may be retouched on the ventral face by thinning or truncating the bulb of percussion.

Flakes usually curve along the striking axis so that the ventral face is incurvate or excurvate. In addition, lateral edges of these flakes are chipped, ground, or both.

The next series of observations concerned bit wear as an indicator of use. No simple measurements or observations would suffice here; neither were there guidelines in any published work on stone tools. Within the large group of gouges and scrapers from Webb County,

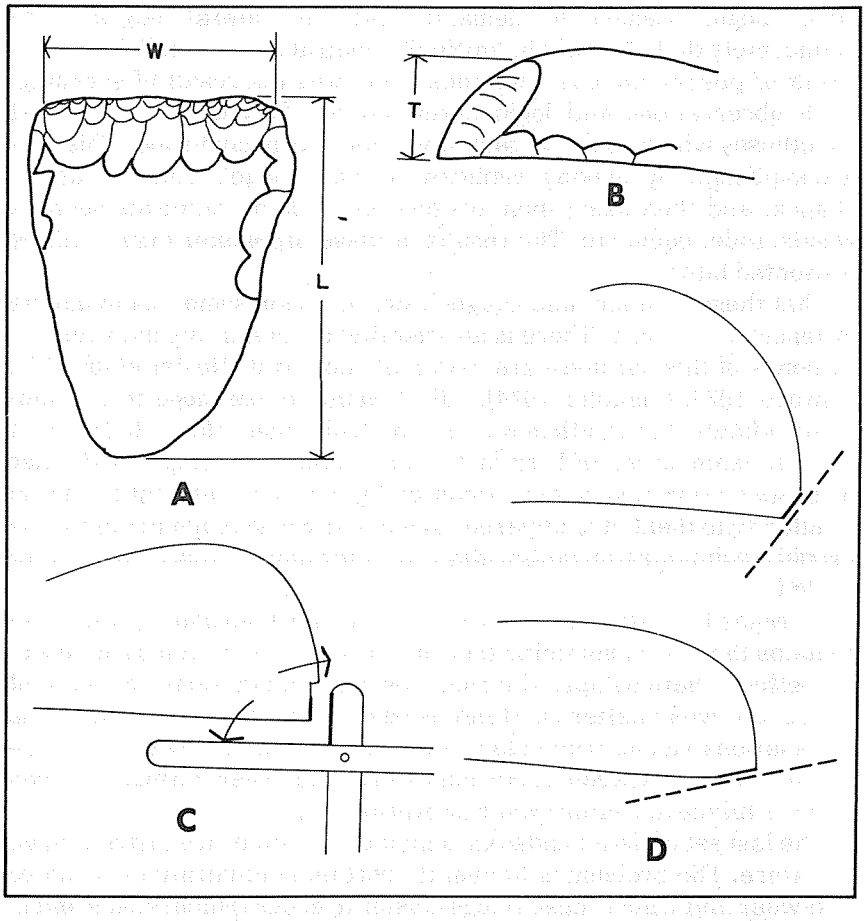

FIGURE 1. A, methods of recording length and width. B, method of recording thickness. C, method of measuring edge angle. D, Different positions of use wear; top is scraping and bottom is planing.

there were many shapes, attributes, apparent wear patterns and, seemingly, many regularities. The initial study consisted of examining approximately 500 specimens under the binocular microscope until certain ideas began to take form.

Wear could be isolated as several kinds and in several places. Lateral edges were blunted by chipping and then ground with a rotary-all-over motion. Facets of polish occurred either on the ventral surface aft of the bit or at the apex of the bit and the ventral surface. Tiny rows of flakes on the bit seem to undercut and spoil the cutting

edge. Logic seemed to demand that the lateral edges were deliberately dulled (to aid in hafting?), ventral surface polish was the result of push-plane use, and apex wear was the result of scraping. Such observations and logic permitted the formulation of several hypotheses which could be partially if not rigorously tested. This was accomplished by making replicas of the "gouge" and "scraper" shapes, and then using them on several kinds of materials such as woods, hide, bone, etc. The results of these preliminary tests will be presented later.

That these scrapers and gouges were hafted in some sort of handle is almost a certainty. There is no scientific proof nor any indisputable evidence of this but there are data that support it (Hester *et al.* 1973; Howard 1973; Chandler 1974). All attempts to use these tools hand-held indicate the inefficiency of that technique (Howard 1973). A careful examination of both faces, along flake scar ridges and other high spots revealed a few areas of light wear, but there was no regularity to them. It is apparent to me that we have not acquired the proper techniques of observation to determine if these tools were hafted.

In regard to attributes, both metrical and morphological, there remains the task of matching them in search of co-variances or cause-and-effect relationships. The most obvious combinations are those of shape and wear patterns. Standard statistical tests were run on the associations among triangular shape and "scraper" wear or "push-plane" wear; between flake curvature and wear forms; between flake or biface and either wear or overall shape.

The last set of data needed to complete this study are distributional in nature. The problem is to identify certain configurations of shape and wear and where these things cluster in geographical space and in time. This is not as easy as it sounds since not all archeological reports agree on which attributes constitute a gouge and which make an end scraper. In addition, dating is most precarious since most dates on artifacts are indirect and many decisions are made on the style of points present. Jack Hughes (personal communication) believes the *Clear Fork Gouge* to be of early Archaic, or possibly Paleo-Indian age in the Texas Panhandle. Most workers in central and south Texas believe it to be Archaic (e.g. Hester and Kohnitz 1975).

RESULTS

Webb County "gouges" vary considerably in length. The mean length is 47.8 mm., with a standard deviation of about 10. The range is from 26 mm. to 70 mm. The mean width is 38.7 mm. with proportionate variations. The mean thickness is 12.3 mm. and the angle of the bit is

about 66°. These figures vary only minutely from those of Hester *et al.* (1973). About 83 percent of the tools are on flakes that are either excurvate, or else have been flaked to produce a ventral face that is longitudinally convex. Most of the ventral faces have been flaked; in fact, 65% of the gouges have been made on bifaces.

The observations made so far might seem to be a bit premature since I have not yet defined what a "gouge" is. It is only after running many attribute covariance tests that enough regularities appeared to justify using the term with any confidence. Clear-cut facets of flat polish on the ventral surface are closely associated with the triangular outline, slightly convex or straight bit, thick bit which has a "scooped-out" appearance. A series of measurements shows that the polish is a result of movement against the abrasive agent at an angle around 25°. Further, the movement is the result of the bit (distal) end moving forward. If the contraption for hafting has the bit facing the operator, then the tool is drawn toward him.

The first statistical test was made with 201 specimens that showed wear. Of these, 74 had scraper facets and 127 had push-plane facets. Divided another way, 88 specimens were triangular with relatively straight bits and 113 were oval with convex bits. If the two classes in the first division are proportional to the two classes in the second division, then the attributes are random.

	Scraper Wear	Push-Plane Wear	Total
Oval outline	59	54	113
Triangular outline	15	73	88
Total	74	127	201

$X^2 = 26.32$

A standard chi-square test shows that at a 95% probability randomness of the variables should be rejected. In simplest words, there is a high probability that the triangular shape is linked with push-plane wear.

A second test compared scraper wear with a concave longitudinal ventral face and push-plane wear with a convex ventral face. The number of specimens available for this study was 157 and the breakdown was as follows:

	Concave	Convex	Total
Scraper wear	22	44	66
Push-plane wear	11	80	91
Total	33	124	157

A chi-square value of 10.4 rejects the hypothesis at the .99 level that the variables are independent.

Thus, "scraper" wear is associated with an oval shape, a convex bit and an incurvate flake or blade. "Push-plane" wear is associated with a nearly straight bit on a more or less triangular outline and an excurvate flake or blade.

The group of objects that we are calling gouges are sometimes made on bifaces that look like preforms for projectile points, sometimes on large flakes, and sometimes on pebbles. In the third form, the cortex face corresponds to the ventral face of a flake. This last form is apparently never used for scrapers. In a test to compare flake and biface forms with wear patterns the following data were used.

	Scraper Wear	Push-Plane Wear	Totals
Flake	35	33	68
Biface	9	13	22
Total	44	46	90

$X^2 = .92$

The low value of X^2 indicates a high probability of independence of the variables. In other words, both flake and biface forms were used randomly for scraping or planing.

In comparing flake or biface forms with triangular and oval outlines clear associations are evident.

	Triangular Shape	Oval Shape	Totals
Flake	35	66	101
Biface	39	6	45
Total	74	72	146

$X^2 = 33.6$

Biface forms tend to covary with triangular outlines and flakes with oval outlines.

A fairly simple hafting device permitted the use of either gouge (low angle pushplane) or scraper (high angle drawing motion) with considerable downward pressure and a constant angle (Figure 1, D). Both scraping and planing motions were done, independently of course, on scrap shoe leather, bois d'arc wood, deer antler and green beef bone.

The first lesson learned was that it takes more work than I had imagined in order to produce wear on an edge. Approximately 2000 strokes of about 15 to 30 cm. in length, under heavy pressure barely made a small polished facet on the ventral surface of a pushplane when used on hard leather. Heavy scraping on hard leather introduced some nibbling undercutting of bits, but no polished facet. It is believed that hides stretched in frames might produce this kind of wear, but green hides are difficult to obtain. Ethnographic examples are frequent (Lowie 1954: 58-9; Davis 1969: 54).

Both kinds of wear, pushplane polish and nibbling scraper deterioration, appeared to be identical to forms isolated among the hundreds of original specimens examined. At magnifications up to 600x, no apparent differences could be detected. This is not proof, but it is infinitely better than purely inductive reasoning. Many more experiments are needed.

Moving from the area of south Texas to the north, the next major collection of associated pushplane-scraper tools is from the Acton site about 25 miles southwest of Fort Worth, Texas. The same general relationships among endscrapers and gouges, length-width ratios, shapes, and technology tend to appear in the Acton material as did in the Webb collection. The Acton specimens are just slightly smaller in all dimensions, have the same mean edge angle and close to the same ratios of bifaces, flake curvature and edge grinding as were recorded in south Texas.

The small sample of 25 gouges from the McClean site show larger size overall. They are 50% longer, 15% wider, and 10% thicker. Other observations do not vary significantly from means established for Webb or Hood Counties, nor do the standard deviations.

Since there is reasonable support for the hypothesis that the *Clear Fork Gouge* has regular parameters of shape, size, and use marks and since we know its spatial and its temporal distribution, the question arises as to its status as a *type*. The answer must be no. The variation within the form is large enough that each specimen must be examined for wear patterns, manufacturing techniques and other attributes, designating it as a type does not make it a research tool. More importantly, we do not know anything about ethnic affiliations of this phenomenon. At best, the *Clear Fork Gouge* is a generic type with a range of shapes and varied manufacturing techniques. As such, it differs significantly from the end scraper. It is not a functional type since it was used both as pushplane and as scraper. It is not an historic-index type since we cannot relate it to real or artificial societies of the past. Thus, when we use the name *Clear Fork Gouge*, we may think of the range of shapes reported by Ray (1941) and of two ac-

tivities, planing and scraping. If really well designed research programs support other associations, they will add to our understanding.

From descriptive data, I will turn to speculation in hope that these ideas may lead to directed research on the overall problem. My feeling is that the primary use of the *Clear Fork Gouge* was in thinning bison hides. I feel that the distribution in space represents the southern area of bison exploitation during the period we call the Archaic. I am not able to visualize a group of ethnic tribes occupying all of this area from just north of Monterrey, Mexico to southern Oklahoma, nor do I believe this to be necessary.

Testing of the bison-gouge relationship will necessitate a more careful reporting of artifacts and their context. The internal structure of sites, especially regarding concentrations of activity related tools and debris, must be recorded. Presence and absence of bones together with their context will be important. Better dating methods are needed. Radiocarbon dating is too expensive and point styles are not reliable except where extensive tests have been made. My feeling is that the use of consecutive typological analyses (morphological, functional, stylistic) reported in a statistical manner may help the studies. Naturally, this would mean more work and a closer cooperation among specialists in different fields.

Testing of reasons for the temporal range of *Clear Fork Gouges* would be difficult. It is hard to imagine why the implement did not survive into the late prehistoric era.

Despite a few apparent temporal and areal exceptions, the form known as the *Clear Fork Gouge* appears to have continuous distribution. It is restricted to the Archaic period and to a dumbbell shaped area running from south central Oklahoma to north central Mexico (Figure 2). This area is constricted in the center along the Balcones escarpment near Austin and San Antonio. Although large flint artifacts are exceptionally abundant in the Hill Country around Uvalde, Llano and Fredericksburg, *Clear Fork Gouges* are conspicuously rare.

Morphologically speaking, the *Clear Fork Gouge* is distinct from the large endscraper of the Archaic Period. Functionally, however, only a strong statistical probability links gouge with low-angle push-plane activity and the end scraper with high-angle scraping. The definition unfortunately must employ some non-metrical terms such as "bit straight to slightly convex," edges "straight to slightly convex," longitudinal cross-section "usually biconvex." These attributes are the ones most frequently associated with wear patterns indicative of the push-plane motion. In addition, the *Clear Fork Gouge* may be made

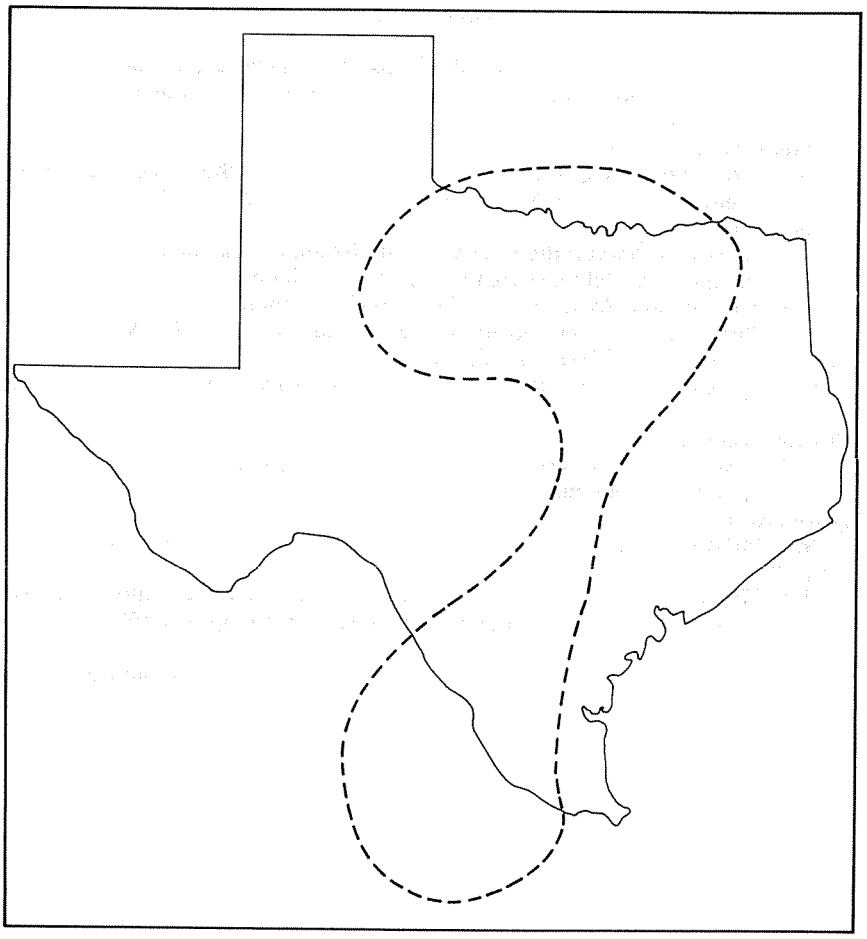

FIGURE 2. Primary distribution of *Clear Fork Gouges*. Single occurrences are not noted.

on a biface or a flake. The bifaces are rarely "well finished," but instead, usually look like preforms in the percussion state. Flakes usually have bulbs truncated or thinned by chipping. Cortex on the dorsal face is almost non-existent. The strongest attribute is still the isosceles triangle with the bit on the short side. Also, the bit is the thickest portion of the tool.

REFERENCES CITED

Blaine, Jay C., R. K. Harris, Wilson W. Crook, Jr. and Joel L. Shiner
1968 The Acton Site. *Bulletin of the Texas Archeological Society*, Vol. 39, pp. 45-94.

Chandler, C. K.
1974 Use Wear Analysis of "Clear Fork" Tools From the Falcon Reservoir Area, Southern Texas. *La Tierra*, Vol. 1, No. 4, pp. 15-21.

Davis, Christoper
1969 *North American Indian*, Hamlyn Publishing Co., London.

Hester, Thomas Roy, Delbert Gilbow and Alan D. Albee
1973 A Functional Analysis of "Clear Fork" Artifacts from the Rio Grande Plain, Texas. *American Antiquity*, Vol. 38, No. 1, pp. 90-96.

Hester, Thomas R. and Harvey Kohnitz
1975 Chronological Placement of "Guadalupe" Tools. *La Tierra*, Vol. 2, No. 2, pp. 22-25.

Howard, Calvin D.
1973 A Study of the Clear Fork Gouge. *Bulletin of the Texas Archeological Society*, Vol. 44, pp. 51-60.

Lowie, R. H.
1963 *Indians of the Plains*. American Museum Science Books, New York.

Ray, Cyrus
1941 The Various Types of the Clear Fork Gouge. *Bulletin of the Texas Archeological and Paleontological Society*, Vol. 13, pp. 152-156.

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AUSTIN PHASE BURIALS AT THE PAT PARKER SITE, TRAVIS COUNTY, TEXAS

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ABSTRACT

A Neo-American cemetery site in the rolling prairie country in central Texas east of Austin yielded remains of at least 17-20 human burials. Nearly all of the ten recognizable burials were flexed on their back or side, with skull to the north, and faced either east or west. Aboriginal grave goods consisted of deer antler, a marine shell pendant, and possibly *Scallorn* arrow points. The burials are tentatively identified as early Austin phase, dating about A.D. 800-1000.

INTRODUCTION

The Pat Parker site was brought to the attention of the Department of Anthropology of The University of Texas at Austin in 1960 by the landowner, who found human bones eroding from a slightly raised area beside the creek near his home. Controlled limited excavation under the aegis of the Department of Anthropology uncovered several human burials, artifacts, and other cultural debris presumably attributable to an early Austin phase occupation. The purpose of this report is to describe and evaluate the site.

THE SITE

The Pat Parker site (41 TV 88) is in northeastern Travis County, northeast of Austin, on a small rise in the bottomland beside a tributary flowing eastward into Gilleland Creek. This is a large drainage system flowing southward into the Colorado River 16 miles east of Austin. The site is about 7 miles east of the Balcones Escarpment, the eastern edge of the Edwards Plateau, in an area of open rolling prairie locally dissected by the major creek drainages. Grasslands abound in the prairie areas, now mainly farmlands, while the bottomlands along the creeks are often forested and in brush. The site is on a small knoll about 100 feet south of the creek. Deposits consist of a black midden nearly devoid of burned rocks. Flint cobbles and pebbles occur naturally over an area of several acres surrounding the site, but not on it. Construction of a stock tank

abutting the northwest side of the excavation area led to the discovery of the burials.

EXCAVATION PROCEDURES

Horizontal and vertical locations were referenced to an arbitrary datum at the site. Excavation followed a grid of 5-foot squares excavated in 6-inch levels. Ten squares were excavated to an average depth of two feet. No differentiation of natural zones was recognizable. All excavated deposit was loosened by trowels and screened through ¼-inch mesh hardware cloth. All flint, bone, shell, and considerable historic Euro-American debris was collected. Notes, drawings, maps and photographs made during excavation are on file at the Texas Archeological Research Laboratory in Austin.

THE MIDDEN

The midden was apparently about 60 feet east-west along the creek and 30 feet north-south perpendicular to the creek, although its blending with the surrounding soils made accurate delimitation impossible. Certainly it constituted at least the recognizable nucleus of the site. Aside from occasional chipped stone manufacture debris (flakes, cores), tools, and similar artifacts (unfinished objects, by-products), the midden content was nearly entirely a black or dark brown compact soil, almost clay-like — the typical blackland vertisol-type soil. Below about 2-3 feet, soil became lighter, more compact, and seemingly totally void of occupational debris. Hearths and other activity features, other than burials, were not encountered. Internal soil changes, including burial pits or outlines, for the most part were not visible. This necessitated excavation in arbitrary horizontal and vertical units. The rarity of heat-fractured limestone rocks is not surprising, since no limestone outcroppings occur nearby. Since research was oriented entirely toward the recovery of burials, other portions of the site were not tested.

HUMAN REMAINS

Ten recognizable burials (Fig. 1) were exhumed from an area about 10 x 10 feet and about 1.5 feet deep. Either a large mass grave pit or individual graves were dug into an existing midden of black soil containing flint flakes and animal bone fragments. Grave fill

was midden soil; no grave pits or grave outlines were recognizable in the field. Burial numbers given here are the field catalog numbers. Burial data are presented in Tables 1 and 2. In most cases, field notes record the presence of various artifacts near a skeleton without giving the precise location; those comments are included in the following descriptions.

Burial 1. Four individuals are represented: a 12 year old female (?), a 25 year old male, a 30 year old male, and a 35 year old male with pronounced muscle attachments. Two disturbed fragmentary male skeletons, one on top of the other, were oriented with the skulls to the north and facing west. The distal part of a *Darl* point was near the pelvic region of one individual. Unusually large deer antler fragments from one animal were aligned north-south as if placed on top of the bodies or beside them. Additional fragments from the same antler were between Burials 1, 3, and 4, and appeared to be in direct association with those burials, suggesting that several people were buried at the same time in a common grave. The proximity of the individuals to each other and the similarity of skeleton orientation and position also suggest mass burial.

Observations: Many loose teeth have medium wear, and one molar is heavily worn. One worn molar has caries and a worn premolar has a large abscess at the base of the crown. Incisors are shovel-shaped.

Burial 2. A loosely flexed skeleton of a 15 year old female lay on her back with the skull, arms, and legs on their left side. The skull was oriented northward with the face to the east. An associated marine shell pendant (Fig. 6,a) was possibly originally attached to the right wrist. A *Darl* point and a *Scallorn* point were found near the skeleton.

Burial 3. This 40+ year old male was fairly tightly flexed on its left side. Both hands were folded under the chin, and the skull was oriented to the north, facing east.

Observations: Incisors are strongly shovel-shaped.

Burial 4. A heavily muscled adult male was oriented northward, facing east. The body was tightly flexed on its left side with legs to the east.

Burial 5. A semi-flexed adult lay on its right side, oriented northward. The initial discovery pit removed the upper portion of the skeleton. A *Scallorn* point (Fig. 2,a), a probable *Scallorn* distal fragment (Fig. 2,b), and a *Darl* point were found near the skeleton.

Burial 6. An infant (possibly fetal) is represented by a few skull fragments found in a disturbed area.

Burial 7. A heavily muscled adult male was oriented northward, lying loosely flexed on its left side and facing east.

Burial 8. An adult was oriented northward, with the skull facing west. It was tightly flexed on its right side with the hands drawn up under the chin. An arrow point fragment was found with the skeleton.

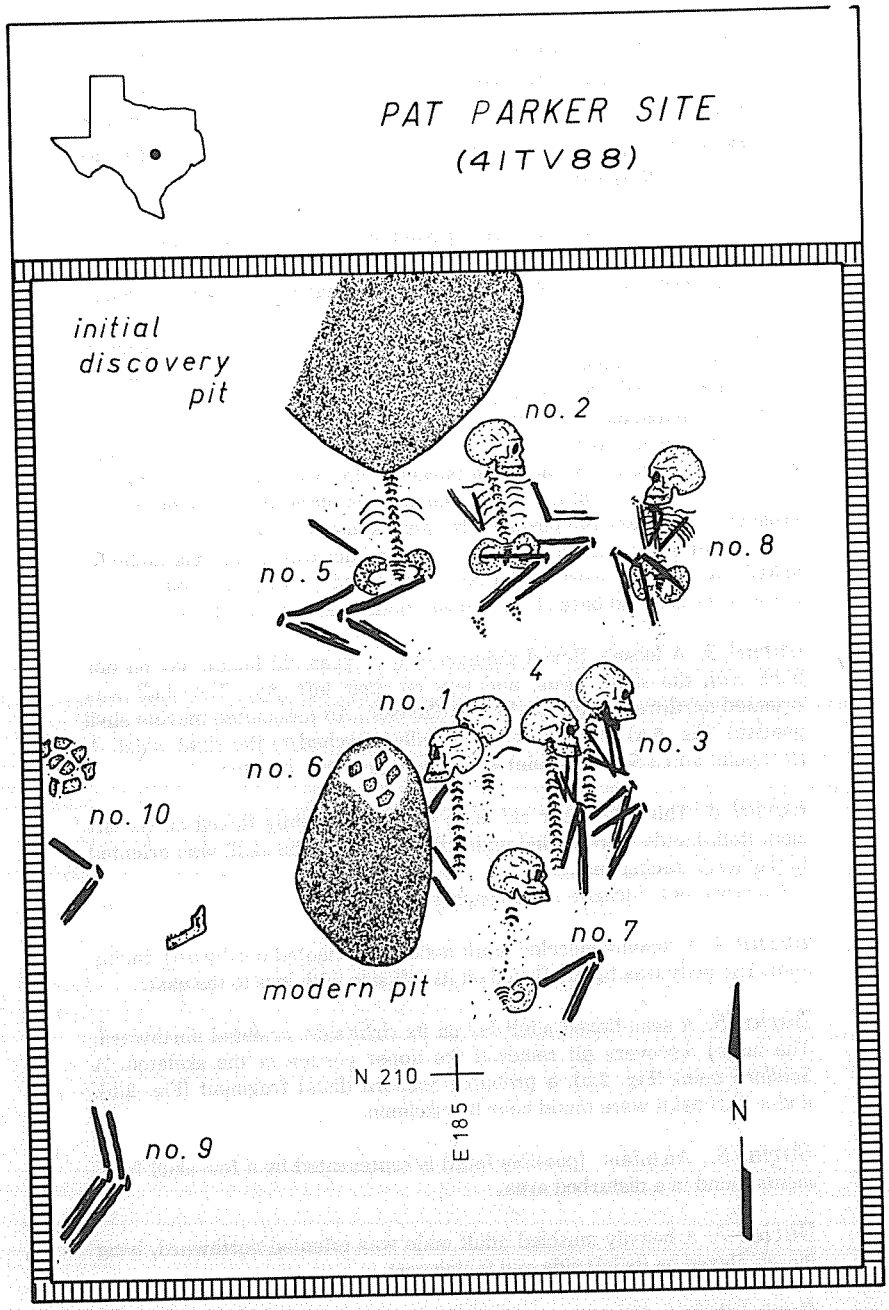

FIGURE 1. Excavation plan, showing locations of burials. No burial pit outline was evident.

Burial 9. An adult was oriented northward, loosely flexed on its left side, and faced east.

Burial 10. A 35 year old male was oriented northward, loosely flexed on its left side, and faced east.

Additional Material. At least six individuals, including two fragmentary skulls, are represented by the bones from the initial discovery pit. All the skeletal material is fragmentary and some may belong to any of the burials excavated by the university personnel. One of the two skulls and some upper limb and torso bones must belong to Burial 5. Individuals not represented in other parts of the excavation (as evidenced mainly by pelvis and patella fragments) include a child, a 15 year old adolescent, and at least two adults.

DISCUSSION. Skeletons in a recognizable position include Burials 1 (two individuals), 2, 3, 4, 5, 7, 8, 9, and 10. The Burial 6 infant bones represent another individual. Additional nonarticulated bones raise the number of individuals in the excavated portion of the site to at least 17 and perhaps 20, both male and female, ranging in age from newborn to over 40.

Most burials are fairly consistent in pattern. Individuals were moderately to tightly flexed, usually (six of the ten articulated skeletons) on their left side facing east. Orientation was consistently northward. Individuals of Burial 1 and probably 3 and 4 were interred together. The compactness of the entire burial area, the closeness of the burials, the overlapping features between some burials (i.e. the antlers with Burials 1, 3, and 4), and the uniformity of interment indicate that the site is a cemetery, and seems to suggest that most, if not all, individuals were interred during a very short period, possibly at one time. The cause or causes of death are unknown.

Burial offerings (at least the recognizable nonperishable ones) apparently were rare. A perforated marine shell probably was attached to the adolescent girl. Two *Scallorn* points from the initial discovery pit may have been associated with the burials, though not assuredly actual grave goods. Other projectile points (*Scallorn* and *Darl*) found near the graves may have been placed in the graves or may have been accidentally included in the grave fill.

OSTEOLOGICAL OBSERVATIONS

The postcranial material from these burials is fragmentary and has not been analyzed. Cranial material is in poor condition; the reconstructed skulls are warped, and measurements for the two adults

TABLE I.

Burial No.	Sex	Age	Orientation	Position	Lying on which side	Facing
1	male	35	north	flexed	right	west
1	male	30	—	—	—	—
1	male	25	north	—	right	west
1	female?	c.12	—	—	—	—
2	female	15	north	flexed	back, left	east
3	male	40+	north	flexed	left	east
4	male	adult	north	flexed	left	east
5	—	adult	north	flexed	right	west
6	—	infant	—	—	—	—
7	male?	adult	north	flexed	left	east
8	—	adult	north	flexed	right	west
9	—	adult	north	flexed	left	east
10	male	35	north	flexed	left	east
Parker	—	child	—	—	—	—
Parker	—	15	—	—	—	—

Table 1. Burial data from the Pat Parker Site.

and one adolescent are approximate. Mandibles are in better condition and their measurements are accurate. Mandibles are all rugged, but none is exceptionally so. Age was determined by criteria of McKern and Stewart (1957); sex and mensuration follow the criteria of Montagu (1960).

The mental foramen of the 40 year old male from Burial 3 seems pathological in being 7 mm in diameter. The mandibular third molars are impacted on the same individual. Dental wear is generally excessive in all teeth at the site; secondary dentine is often evident.

The congenital absence of the mandibular third molars on four of the eight mandibles complete enough for observation is noteworthy. Both lower molars were congenitally absent from the mandible of the adolescent female Burial 2. Only the lower left molar was absent in another female. Both lower molars are missing from the male Burial 10, and the molar was missing from the right mandible (the only part recovered) of a male in Burial 1. Dahlberg (1949:170-172) has suggested that congenital absence of the third molar might be a useful genetic trait, and he documents a wide range of percentage differences for various groups (*Ibid.* Table 34). Goldstein (1948:72, Table 6) reports 12% congenital absence of one or more mandibular third molars for 173 Texas Indians. Thus, the small sample from the Pat Parker site demonstrates considerably greater congenital molar absence than is usual for Texas Indians.

Of the dozen incisors recovered, most lower incisors were weakly or not at all shovel-shaped. Most upper incisors were weakly to medium shovel-shaped.

One restorable male skull has Wormian bones and a complete Inca bone. Two female skulls have Wormian bones, and an Inca bone is present on the skull of Burial 2. The male skull is wide; the two female skulls have narrow vaults.

Cranial and mandibular measurements are shown in Table 2, together with measurements of an Austin phase skull from the Kyle site in Hill County (Jelks 1962) for comparison.

THE ARTIFACTS

Artifacts from the site were divided for description in a traditional manner according to material and then into categories generally describable as fineness of workmanship. Historic materials follow aboriginal debris, since the interest in this report is strictly on the Indian occupation. Thus, the artifactual order is ceramics, chipped stone (shaped tools followed by debitage), non-chipped stone, bone, shell, and the variety of historic materials.

TABLE II.

Burial number	1	1	1	10	means	2	discovery pit	Kyle #2
Sex	male	male	male	male	male	female	female	female
Age	adult	25	35	35	32	15	adoles.	30-35
Cranial measurements								
Maximum length	—	—	—	—	—	182*	174*	188.2
Maximum breadth	—	—	—	—	—	126*	116*	136.4
Auricular head height	—	—	—	—	—	—	108*	110.7
Minimum frontal diameter	—	—	—	—	—	90*	—	92.6
Height of symphysis	—	—	34	—	34	29	—	26.3
Gonion-Menton (combined)	—	76	80	77	78	70	—	—
Mandibular measurements								
Height ascending ramus	52	59	61	—	57	48	—	—
Minimum ramus width	—	32	34	33	33	30	—	—
Thickness between M1-2	15	14	16	14	14	15	—	—
Angle lower jaw	30*	36	30	35*	33	32	—	—

Table 2. Cranial and mandibular measurements from the Pat Parker Site and an Austin phase burial from the Kyle site (Jelks 1962). Angle measurements in degrees, all other millimeters. * designates approximate measurements.

Artifacts were generally scattered throughout the small excavated portions of the midden. The nature of this portion of the site is a shallow deposit seemingly perforated with burial pits, historic pits, and relatively modern filled gullies. Artifact locations therefore probably are mostly secondary. Artifact distribution tables for this situation are meaningless and therefore are not presented.

Aboriginal Pottery (6 sherds)

Six sherds are from, at most, two vessels of the same type.

Vessel form. Presumably medium-small jar or fairly deep bowl. Rim very slightly outcurved, direct, with a flattened lip. Walls 5-6 mm thick; lip 4 mm wide.

Exterior surface. Floated and very well polished; buff, tan, and reddish-tan.

Interior surface. Finely smoothed to well-polished; buff to dark gray. One sherd has a naturally red interior surface (not slipped).

Paste. Contains a fair amount of quartz sand and some small inclusions of red material (presumably clay). Appearance ranges from a light-colored shale-like texture to what appears more like a very fine mud (30x).

Core. Light gray to light red.

Temper. Sand if anything, probably none. Looks as if sand was part of the clay and was not intentionally added. No bone or shell.

Provenience. Five sherds from surface; one from the uppermost six-inch level.

Remarks. Appearance, thickness, and outwardly observable attributes are similar to sherds recovered by Tunnell (1962:111) from the Oblate Site in Comal County (Texas Archeological Research Laboratory collections, Austin). Microscopically (30x) the pastes are radically different: the paste of the Oblate sherds is tempered with bone fragments; the paste of the Pat Parker sherds is a fairly homogenous clay.

Arrow Points (n = 21)

The 14 finished arrow points are all expanding-stem points (Fig. 2), here referred to as *Scallorn* (Suhm *et al.* 1954:506-507). Two points (Fig. 2,a-b) from Burial 5 in the initial discovery pit are made either from limestone or from flint which has since desilicified and turned chalky, possibly from chemical action. The predominance of concave-base forms in deposits with *Darl* points suggests that this variety is an early form of *Scallorn*. Dimensions: 19-42 (est.) x 11-15 x 3-4 mm.

Four bifacially flaked unnotched specimens (Fig. 3) seem equivalent to Jelks' (1962) *Granbury* and *Fresno* types, but probably are *Scallorn* preforms (Sollberger 1970). Dimensions: 22-49 (est.) x 12-17 x 3-5 mm.

Three distal fragments were also found (Fig. 2,n).

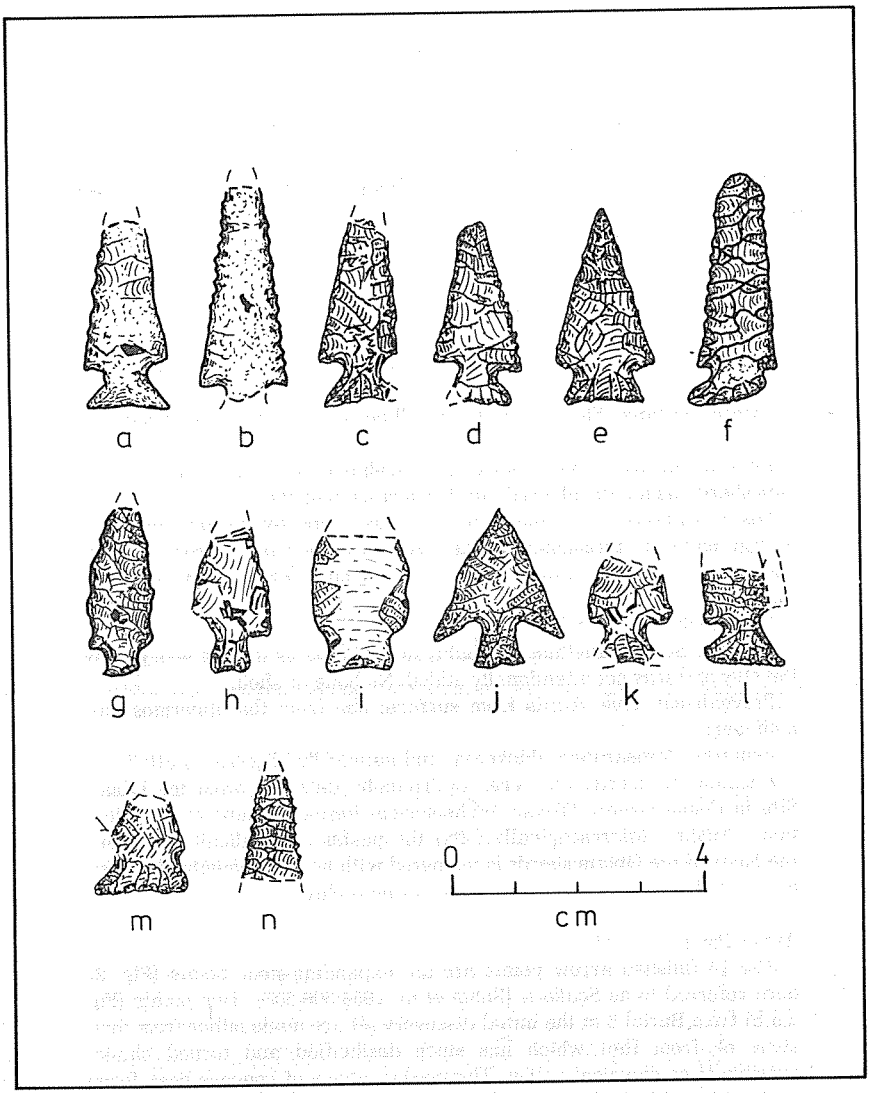

FIGURE 2. Expanding-stem arrowpoints.

Dart Points (n = 27)

This fairly coherent grouping of Transitional Archaic-Neo-American dart points is characterized by rectangular to expanding stems, straight to concave bases, and fine pressure retouch. The sample consists of 15 *Darl* points (Fig. 4,a-k), 3 *Fairland* (Fig. 4,m-n), 7 distal blade fragments (Fig. 4,l), and 2 medial fragments.

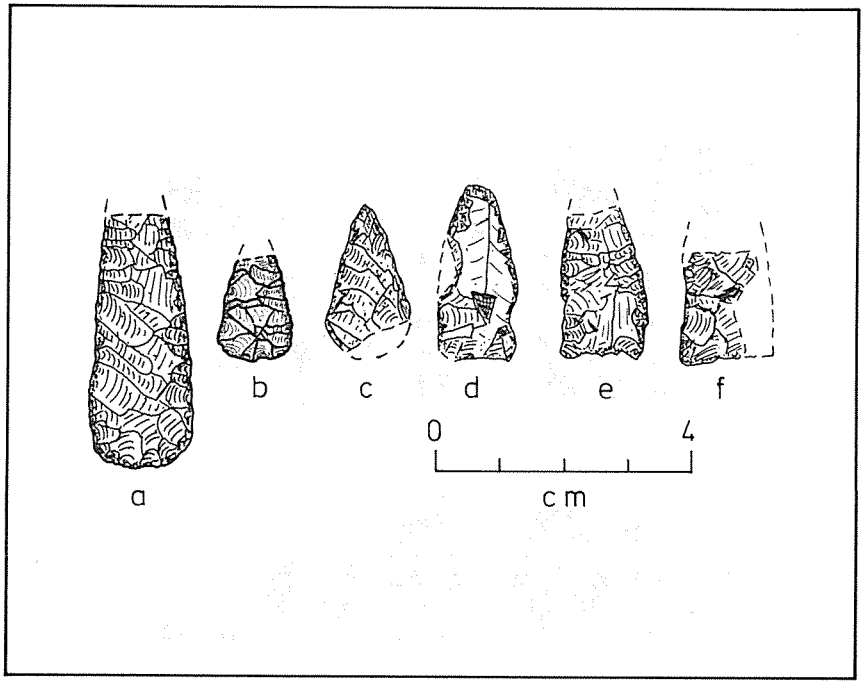

FIGURE 3. Unnotched arrowpoints.

Unnotched Thin Bifaces (n = 29)

These are thin, moderately well-worked pointed bifaces with no stem.

Form A (n = 2; Fig. 5,c) is wide, thin, and well-worked, has straight blade edges and is widest at the base. The concave base has fairly sharp basal corners. Dimensions: 89 (est.) x 38-45 x 7-8 mm.

Form B (n = 3; Fig. 5,d) is narrow, rectangular in outline, and has nearly straight blade edges. The straight to slightly convex base has definite, though rounded, basal corners. These are similar to the narrowest specimens of Jelks' (1962:45) *Cleburne* type knives.

Form C (n = 3; Fig. 5,a-b) is very small, teardrop-shaped, widest at the midblade, and has convex blade edges, a rounded base, and no basal corners. These are similar to the smallest specimens of Jelks' (1962:45) *Cleburne* type, but are smaller, and also to his *Granbury parker* arrow points. They are somewhat thicker and more crudely worked than the arrow points from Pat Parker, and are probably preforms. Dimensions: 25-43 (est.) x 18-26 x 4-6 mm.

Form D (n = 2) are large, wide, fairly thin proximal fragments widest about one-third of the way from the base. They have convex blade edges and slightly concave to straight bases with rounded basal corners. Dimensions (est.): 57 x 34 x 9 mm.

Medial and distal fragments (n = 19) are not identifiable to form.

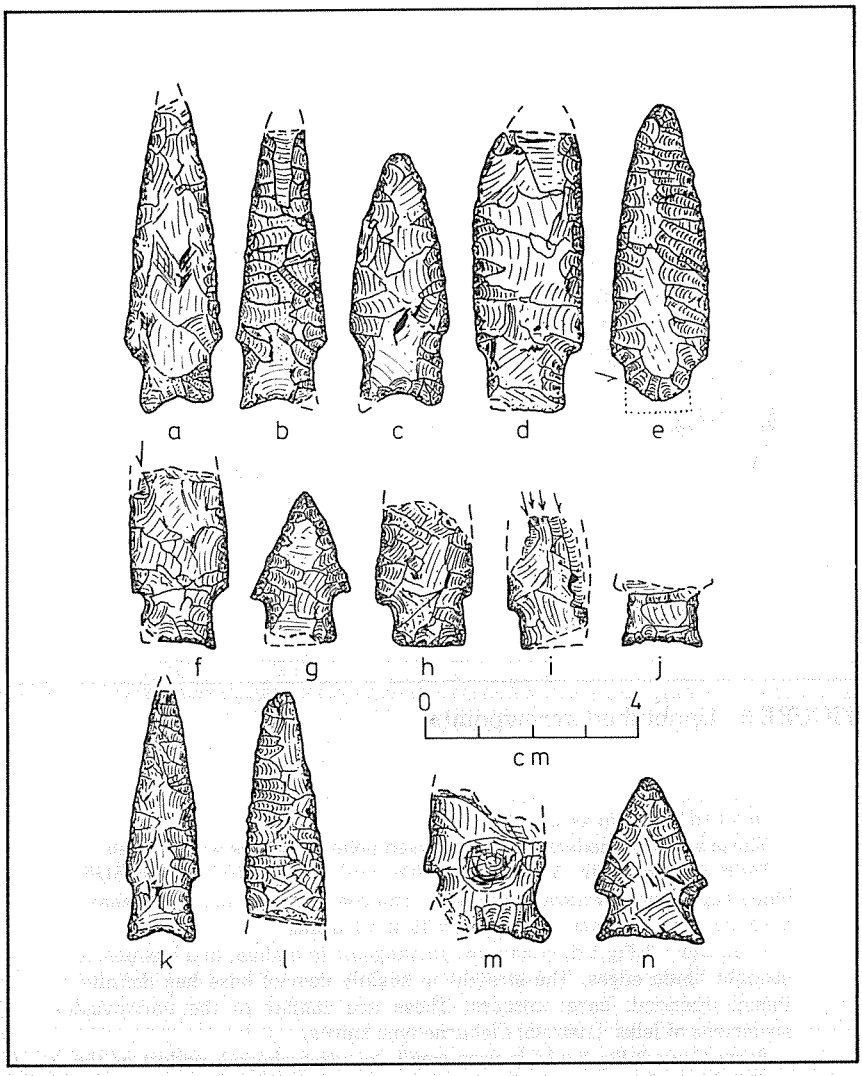

FIGURE 4. Dart points. a-k, *Darl;* 1, *Darl* blade fragment; m-n, *Fairland.*

Scrapers (n = 17)

Flakes with retouch on one or more edges of one face are grouped according to location and shape of the retouched edge. The term "scraper" is used here in the traditional descriptive sense, and may or may not equate with the actual tool function.

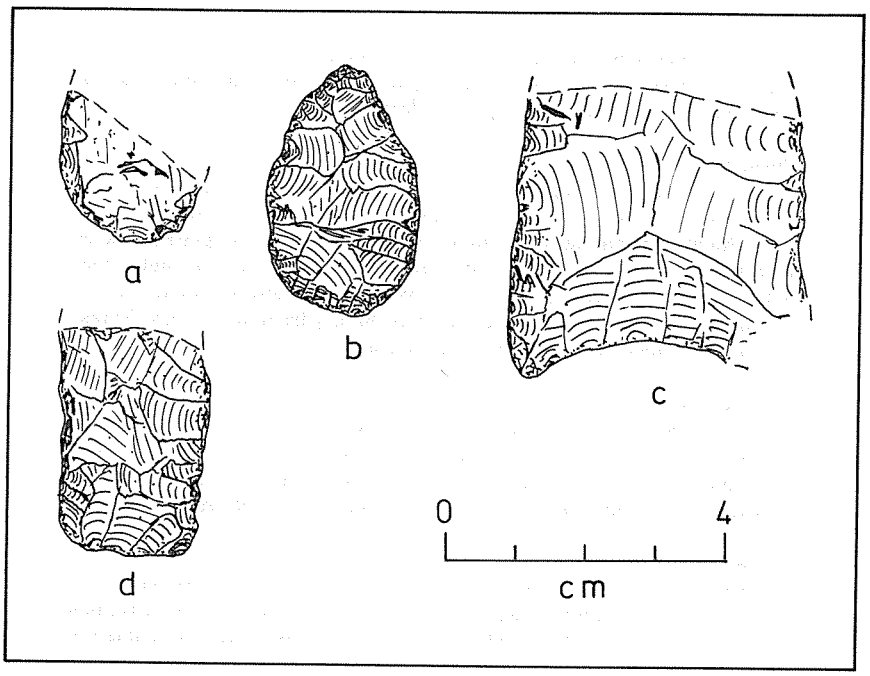

FIGURE 5. Thin bifaces. a-b, Form C; c, Form A; d, Form B.

Form A (n = 1) are snub-nose scrapers made from initial cortex flakes, are elliptical in outline, and have one end steeply beveled. Dimensions: 60 x 40 x 15 mm.

Form B (n = 1) are "spokeshaves" or "notches" with a small, steeply beveled semicircular concavity 6-15 mm wide (average 9 mm) and unifacially chipped on one or more edges of a cortex flake. Two flakes have double concavities, one next to the other on the same edge. Four flakes are additionally retouched.

Form C (n = 4) are small secondary flakes, not intentionally shaped, with minor retouch on one or more edges. They average 40 mm in length.

Large Drills (n = 2)

These are the larger Archaic-type drills (as opposed to small Neo-American flake drills) with narrow shafts. One fragment with a triangular base is 65 mm wide and 21 mm thick (max.), and was probably originally 80 mm long. Another appears to be a thin Kinney or Tortugas-like dart point with a concave base, dully pointed basal corners, and straight lateral edges. The distal half is reworked into a drill shaft 10 mm wide and 5 mm thick. The complete specimen probably was about 50 mm long; the base, 28 mm wide. Uniform flaking on the latter specimen suggests it is not a reworked dart point, but is an intentional drill form.

Graver (n = 1)

A small core with a natural beak-like projection presumably was used as a graver (or perhaps as a small drill or punch). Numerous minute use scars on the lateral edges near the tip are evidence of use.

Burin (n = 1)

Intersecting burin facets form a chisel-like edge which appears to have been intensively used. Several dart points and thin biface fragments have burin facets originating from either a worked edge or a snapped break. A few scrapers have burin facets originating from a steeply, unifacially retouched edge. Several specimens exhibit considerable wear on the distal, chisel-like edge; the edge wear is dulling (rounding, micro-flakes, etc.) as if the tools were used in a chiseling motion.

Choppers (n = 5)

Four large pebbles have large flakes bifacially removed to form crude, curved cutting edges. Cortex remains on one or both faces on three specimens and the edges are extensively battered. The remaining specimen is a large initial cortex flake with one edge ventrally retouched.

Flakes and Cores

Several hundred flakes with no retouching or use marks are part of the normal detritus of flintnapping. At least 18 cores have variable attributes and range in size from 25-130 mm. Analysis of flakes and cores has not been done.

Manos (n = 6)

These are mostly fragmentary handstones or mullers. Three are of friable red granite, two are of quartzite, and one is of limestone. One specimen has grinding facets on both faces and no marginal pecking; one face is ridged, the other convex. Another has at least three convex and three concave grinding facets 25 mm in diameter. Another has mildly convex grinding facets on both faces. The limestone mano is triangular in cross-section and has been burned.

Steam-worn Pebbles (n = 3)

One quartzite and two limestone pebbles are 42-57 mm in maximum dimension. No areas of pecking or grinding are visible.

Bone Needle (n = 1; Fig. 6,b)

A small smoothed bone sliver 5 mm wide has a small biconical hole 2 mm in diameter near the rounded proximal end. The distal end is broken, and the shaft is undecorated. Present length is 16 mm; total length was probably at least 35 mm.

Marine Shell Pendant (n = 1; Fig. 6,a)

The left valve of a heavy, though small, ridged bivalve mollusc, probably of Gulf coast origin, was found on top of the left forearm of the 15 year old girl of Burial 2. It is 49 mm from end to end, 48 mm from beak to outer lip (margin), and 17 mm thick. The upper part of the umbo has been perforated, removing the beak, by a wide, deep conical hole 9.7 mm wide at

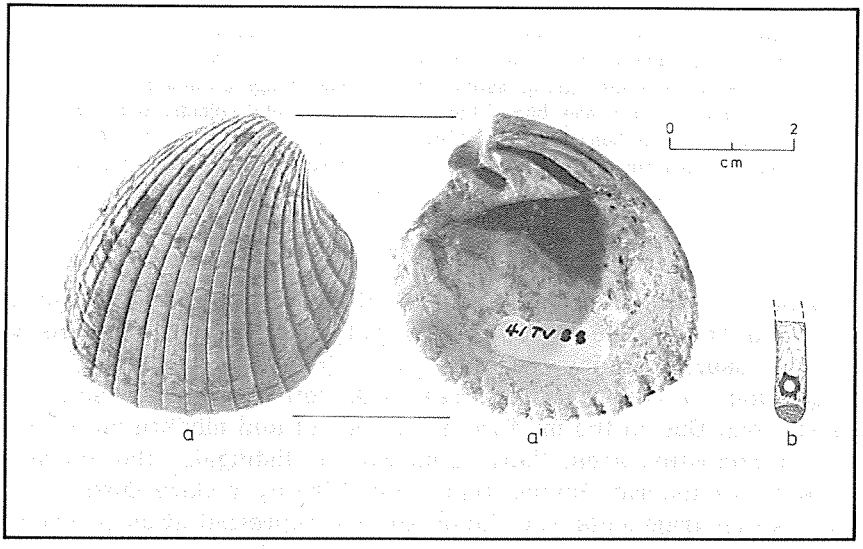

FIGURE 6. Shell pendant from Burial 2, and bone needle.

the outer edge and 1.3 mm wide where it breaks into the interior of the clam; the shall is 7 mm thick at this point. Although the perforation may be cultural, it could be due to a boring marine gastropod. Shells, especially cockles, often occur naturally along the coast, perforated in this manner, although the cockle umbo is thinner than this shell and the perforation is usually more narrowly conical. Identification is based on criteria set forth by Morris (1951) and comparison with reference collections at the Texas Archeological Research Laboratory in Austin.

The shell belongs to the *Arcidae* family form *Neotia ponderosa* (the Ponderous Ark), and eastern coast type commonly found in deep water (and washes onto beaches) from Cape Hatteras southward to the West Indies, and rarely as far northward as Cape Cod. It is also similar to such *Cardiidae* family forms as *Dinocardium robustrum* (the Great Heart Cockle) and *Trachycardium muricatum* (the Common Cockle), but the Pat Parker specimen is heavier and has fewer ribs (24) than most *Cardiidae* (the old term *Cardium* us no longer used). The beak also turns forward, causing the ribs to curve forward a great deal, while the cockles usually have central beaks and straight ribs. In addition, cockles have conspicuous up-curved teeth on the ribs, a feature absent on the Pat Parker specimen.

Historic Materials

The Pat Parker Site was evidentally used as a trash dump by non-Indian occupants. European and Anglo-American articles were abundant on the surface and in the upper excavated levels. Ceramics consisted mainly of white-paste earthenwares (transfer, hand-painted, stamped, feather edge, plain) and patinated glass bottle fragments. Three mold-made clay pipe

bowl fragments were also found. Other items include mother-of-pearl buttons, harmonica fragments, combs, round and square nails, fence staples, a bridle bit, stirrup, saddle and harness trappings, metal bucket fragments, an iron hoe, barrel hoops, and other metal objects, many of which have not been identified. Such perishable materials as textiles, modern corn remains, and various seeds presumably post-date Indian occupation, probably near the middle or end of the 19th century.

FAUNAL REMAINS

A partial sample of bones was identified by Ernest L. Lundelius, Jr. (Department of Geology, The University of Texas at Austin): bison or cow, deer, opossum, cottontail rabbit (*Sylvilagus* sp.), cotton rat (*Sigmodon hispidus*), unidentified bird, soft-shell turtle, and domestic pig. Due to the mixture of aboriginal and modern materials in the excavated area, there is no way to distinguish the animals used by prehistoric Indians from those killed by modern Europeans. Deer antler fragments were abundant and represent at least five or six antlers, all attributable to the aboriginal occupation. As mentioned earlier, a cache of antler fragments was near Burials 1, 3, and 4. Additional distributional information is unavailable.

Shell remains include numerous complete and fragmentary shells of unidentified freshwater mussels, apparently obtained locally for food. None show alteration or use. The pendant described above from a Ponderous Ark shell (Burial 2) came from the Gulf coast.

DISCUSSION

Artifactual and skeletal materials from the Pat Parker site seem attributable to an early Neo-American occupation probably near the beginning of the Austin phase. Presumably this would be sometime around A.D. 800-1000 (Greer 1974:37; Prewitt 1974:22-32). Detailed evaluation of the late Historic occupations and debris is beyond the scope of this paper.

Placing the occupation in the Austin phase is based on traits generally believed to be representative of that period (Jelks 1962): *Scallorn* points, *Granbury* preforms (?), thick drills, and the carryover of *Darl* and *Fairland* dart points from the Transitional period. Although the relationships between burials and artifacts in the surrounding matrix are tenuous, some *Scallorn* points seem to be directly associated with skeletons, especially Burial 5. Two points found by the landowner during the initial discovery, probably near the head of Burial 5 may be burial inclusions. Aboriginal pottery was on the surface and in the upper six inches of deposit, and may represent a later occupation, perhaps Toyah phase. Other Toyah

phase traits, however, such as *Perdiz* arrow points, *Covington* knives, and small flake drills are lacking at the site.

Placement in the early part of the Austin phase is due to the suggested contemporaneity at the site of the *Scallorn* and *Darl* points. The two types were found together, both immediately adjacent to skeletons, and also in nonburial areas of the excavation. The possibility exists that the two types occurred together because of deposit mixing, but the simplest explanation seems to be contemporaneity. Even so, it is unknown whether the two styles are used by a single group or represent different groups. Although *Darl* is a type most common to central Texas, *Scallorn* is a major type not only in central Texas but also along portions of the Texas Gulf coast and the coastal plains (Suhm *et al* 1954:506; Corbin 1974). Some sort of coastal contact, possibly no more than indirect trade, is clearly indicated by the perforated marine shell from Burial 2.

At least one additional explanation of the burials must be considered. The shallow depth of the skeletons (1.5 to 2 feet below the present surface with little noticeable recent erosion) suggests that the graves were dug from somewhere near the present surface. Since the skeletons are clearly Indian and were buried by Indian customs (orientation and position), the burials might be the result of the most recent Indian activity at the site; that is, they might be equated with the most recent Indian artifacts or, less plausibly, they might be representative of a group leaving no recognizably late material remains.

The problem here is in designating the latest Indian artifacts. The *Scallorn-Darl* assemblage appears to be a coherent group of associated types not followed at this site by other projectile point types. The pottery, however, probably belongs to a later group, for data are accumulating to indicate that pottery is very rarely associated with *Scallorn* points. To our knowledge, the only site in central Texas which may have pottery definitely associated with *Scallorn* is the Wheatley site in Blanco County (Greer 1974), a single component site presumably representing an overlap period of the Austin and Toyah phases. *Scallorn* points at Wheatley seem smaller and different in outline from those at Pat Parker (other Wheatley forms include *Perdiz, Eddy, Cuney*, and a wide rectangular-stem form). The pottery at the Wheatley site has a coarser paste with some sand and shell temper. Sherds from the Oblate Site in Comal County (Tunnell 1962) are remarkably similar to those from Pat Parker and likely are part of an assemblage containing a distinctive form of *Perdiz* with prominant, sharp barbs and a long, wide and pointed stem with convex edges. The Oblate Site also contained a concave-base

Scallorn form similar to the south-central Texas *Edwards* type (Sollberger 1967; Hester 1971:67-68), which seems to predate pottery. It seems probable that the Pat Parker sherds are the only diagnostic remains of a late *Perdiz* (late Toyah phase?) visit. If so, the burials could date to this later period.

Turning to the burials, where position could be determined all the bodies were oriented with the heads to the north (which is also toward the adjacent creek). It is uncertain whether the direction the body faced (six east and four west) was of any importance.

Two Austin phase burials were recovered at the Kyle site in Hill County (Jelks 1962:21). A 30-35 year old female lay on its left side, oriented to the northwest, and faced northeast. This situation is almost identical to most of the Pat Parker individuals. The other Kyle burial was a 3-4 year old child, also flexed on its left side, but orientation and direction the skeleton was facing are not given. Neither of the Kyle burials had associated grave goods.

Stephenson (1970) reports additional Hill County burials which are probably attributable to the Austin phase. Burial 1 in Pictograph Cave is a child 3-4 years of age, flexed on its left side with the head to the east (*Ibid.* p. 124). Burial 1 in Sheep Shelter (*Ibid.* pp. 193-196) is an adult male, flexed, with the head to the east. Burial 2 is a male (?) child, flexed, with the head to the west. Burial 3 is a double burial with an adult male and an adolescent female semi-flexed on their right side facing northwest and the heads to the northeast. Burial 4 is a male (?) child, flexed, with the head to the southwest. None of the burials had associated grave goods.

Another burial presumably attributable to the Austin phase is reported from the Cottonwood Terrace site on the Colorado River in Burnet County (Benfer and Benfer 1965). The skeleton is a 28 year old male oriented northward and tightly flexed on its left side facing east. It was covered by five very large granite rocks; a bifacial granite mano lay directly on top of the skull. A *Scallorn coryell* was "in the crumbling bone beneath and immediately surrounding the cervical-thoracic junction of the vertebral column" (*Ibid.* p. 32).

Hester and Collins (1969) have reported what they believe to be Austin phase burials from the Frisch Auf! site in Fayette County. Their results may be summarized as follows: (1) Two skeletons were represented by two skulls and the postcranial material from one individual. Both were oriented southward, presumably flexed on their right side facing generally east. Two nearly identical *Scallorn sattler* arrow points were against the ribs, obviously grave goods. (2) One skeleton of a child was oriented southward, flexed on its right side

facing east. No grave goods were associated. (3) An infant was oriented southward in a flexed position. Grave goods included a utilized antler tine fragment (flaking tool?), a smoothed and shaped section of petrified wood of almost the same form as the antler, and an unaltered freshwater mussel shell. (4) A broken carnivore baculum from disturbed fill is believed to be from a grave.

The Loeve-Fox site (Prewitt 1974) is an Austin phase cemetery on the San Gabriel River in Williamson County, northwest of Pat Parker. About 25 burials (mostly single) were placed at different times in an area about 10 feet square (though perhaps larger). The earlier burials were loosely flexed; the later were tightly flexed, perhaps to preserve the limits of a well defined cemetery area. Most were oriented with heads to the north and lay on either side. Grave goods were essentially absent; a conch shell object was associated with one individual. *Scallorn* points and fragments imbedded on or between bones in fatal positions indicate violent deaths.

Reported burials must be carefully evaluated before hypotheses regarding Austin phase burial patterns are proposed. Jelks reports that the Kyle site burials are undoubtedly assignable to the Austin phase on the basis of their stratigraphic position. The geographic location of the site is certainly in keeping with the Edwards Plateau image for Austin phase concentration. The same is true for Stephenson's burials from the same area, although Pictograph Cave Burial 1 and Sheep Shelter Burial 4 are presumed late Austin phase and may actually be early Toyah phase.

The Cottonwood Terrace skeleton from Burnet County is west of the Balcones Fault and is in the area for which the Austin phase was originally defined. A problem of interpretation exists with the uncertainty of assignment of Cottonwood Terrace to the Austin phase as a cultural unity. During excavation it was uncertain whether the *Scallorn* point found near the vertebrae was a grave good, or was the cause of death. The only safe inference is that the individual must have died during the time *Scallorn* points were in use. Another item worth noting is the treatment of the body during burial: a mano was placed on the skull, and the body was covered with large rocks. Both practices are common local traditions, probably with considerable time depth, and are found over much of Texas (Greer and Benfer 1963:234). Although large stones are essentially absent in the vicinity of Pat Parker and also Frisch Auf!, the Hill County sites (Kyle, Pictograph Cave, Sheep Shelter) are limestone rock shelters. The absence of stones covering the burials (presuming the lack of mention in the reports indicates the absence of stones) seems sig-

nificant. Only Burial 1 in Pictograph Cave was covered with hearthstones and ashes, after a fire pit was cleaned out to put the body in.

There also seem to be few problems with the assignment of Loeve-Fox or other nearby sites in Williamson County (Prewitt 1974) to the Austin phase. The area is within currently accepted boundaries for the Austin phase, and there can be no doubt that some of the people were killed by someone using *Scallorn* points. Presumably the victims were enemies of Austin phase groups. Prewitt believes the victims and the survivors who constructed the cemetery were Austin phase peoples (he prefers an interpretation of intra-Austin phase warfare or the culling out of undesirable members of a group by the dominant majority). The early dates and the general consensus that only Austin phase groups making *Scallorn* points lived in the area during this general A.D. 800-1200 period would seem to support him. There are, however, other possibilities, such as conflicts with other peoples, whether or not they hunted with *Scallorn* points or the more recently introduced *Perdiz*.

Frisch Auf! presents a problem of phase identification because of the location of the site. Several skeletons in a small area of the site seem to date from a very short period. Two nearly identical *Scallorn* points occur as grave goods with one burial and link the *Scallorn* form with the burial traits. Unfortunately, the site's location in Fayette County places it in the intermediate prairies between the lower, eastern coastal plains and the hills of the Edwards Plateau west of the fault line. Previous workers (e.g. Kelley 1951:137) have pointed out the unique nature of this intermediate area and have warned against including such sites in adjacent archeological areas without considerable caution. It is therefore uncertain whether the Frisch Auf! burials belong to the central Texas Austin phase, such coastal entities as the Rockport or Galveston Bay phases, or some other cultural unit — whether a unique, local manifestation or an unrecognized complex from an adjacent area. The southern orientation of the skeletons and the number and variety of grave goods suggest that something different is going on, but the significance of the variation cannot be evaluated at this point.

The Pat Parker site falls into the uncertain category also. The admixture of *Scallorn* and *Darl* points suggests a time near the introduction of *Scallorn* in the Travis County area. The difficulty of evaluating the association of projectile point types with any burial, however, restricts a definite linking of burials with any particular point style, such as *Scallorn*. Although pottery was found in upper levels, data from other sites indicate the introduction of pottery at a later

date and suggest that we should dissociate the sherds from the points — actually from all the other artifacts at the site, a rather uncomfortable position. Recent Anglo materials reflecting farm life were mixed in the upper levels also, and in general there was considerable disturbance in the burial area (deposits outside the burial area were not adequately tested). This mixing also supports the explanation that the sherds are later than *Scallorn* points and recently have been mixed into subsurface deposits.

Having thus set up at least two questionable aboriginal occupations, and taking into account the shallowness of the burials, one could argue for a much later, post-Austin phase date for the burials, or even a post-*Darl* occupation by later Austin phase groups using only *Scallorn* points. The presence of the marine shell as a grave good indicates coastal contacts which, as with Frisch Auf!, confuses the situation slightly, since the type and degree of interaction between central Texas and the coastal areas are presently unknown. Several marine shells and coastal sherds have been found in sites near the Colorado River in Travis, Burnet, Llano, and San Saba counties (e.g. Jackson 1938:111, 112, 117; Prewitt 1974:55-67), so it is known that coastal contacts were experienced by at least some central Texas groups.

Harry J. Shafer (personal communication 1975) and Elton Prewitt (1974; personal communication 1975) have suggested an extension to Shafer's (1971) central Texas model. They see designated cemtery areas as a pattern well established at least by the Austin phase in the Blackland Prairie of central Texas. These cemetery areas are isolated horizontal units (rockshelters or open sites) in which several individuals were placed, seemingly at different times. The burial areas often seem to be limited to a well defined area about 10 feet in maximum diameter and used over a fairly long period of time, perhaps 100 years or more. This, to us, seems to indicate some sort of formally marked and bounded area, such as a house or fenced area, recognizable to and understood by possibly several generations. Examples for the cemetery hypothesis seem to include mainly Loeve-Fox, Pat Parker, Frisch Auf!, Harte-Overcash (Polecat Hollow), and a few others (see Prewitt 1974 for a more comprehensive review of central Texas burials).

Shafer also views the situations at Aycock Shelter (Watt 1936) and the Asa Warner site (Watt 1956) as examples of what he terms "Austin-Toyah cemeteries". These last two sites, both located near Waco, contain *Perdiz* points, in some cases inside the body cavities, but no *Scallorn*. According to Watt (1936), Aycock apparently con-

tained a Transitional period midden (*Darl, Ensor,* and related projectile point forms) into which burials (containing *Perdiz* points) were placed. Watt (1956) describes Asa Warner as a Toyah phase occupation (with burials) with considerable contact with east Texas, as evidenced by pottery and ear spools, among other things.

The Harte-Overcash Site is a deep, stratified open site in Travis County about six miles south of Pat Parker. Of interest here are the burials near the surface, mostly scattered (though some may be intentionally grouped) around the extensively occupied portion of the site (areas outside the area of concentrated occupational debris were not tested). The burials are probably Neo-American in age (because they are shallow), but associations are uncertain. The materials and contexts have not been analyzed and it is not known whether the burials could be considered a cemetery situation utilizing an existing midden, patronizing a selected and recognized area for burial, whether their placement here is simply haphazard burial within an existing midden, or some combination of the two (E. Mott Davis, personal communication 1975).

The cemetery hypothesis should be carefully considered. With the inception of the Austin phase (the traditional beginning of the Neo-American period, which should designate a cultural change as well as an elaboration of materials), quite possibly not just arrowpoints (and by implication the bow and arrow) were introduced into the local Transitional phase (of Shafer 1971) of central Texas, but probably a number of other cultural alterations took place as well. One of these could have been a more formal designation of burial areas, whether or not they were set aside from the occupation area. Formal cemeteries of this sort, likewise, might tend to suggest larger, more permanent villages, but this is speculation. Cemeteries seemingly continue into the Toyah phase.

Prewitt (1974) has pointed out the commonness of marine shell objects (e.g. conch shell pendants) being found with at least one of the burials at each site. These obviously indicate some sort of contact with the Gulf coast, and he suggests that these objects may relate to status. If so, we could be dealing with something like formerly designated burial plots for an extended family or some other kind of distinguishable social groups. Extensive testing at such sites as Loeve-Fox might reveal additional cemetery areas and make possible hypotheses regarding such things as intrasocial composition or the distribution of families or social groups within a camp.

An important question regarding such cemetery situations as those reported by Watt (1936, 1956) and Prewitt (1974), however,

revolves around who was being buried and by whom. *Perdiz* points clearly were the cause of death in some individuals (e.g. Asa Warner and Aycock Shelter), but this does not necessarily mean that they are totally within a post-*Scallorn* time period or cultural pattern. *Scallorn* points also have been the direct cause of death at some sites (Cottonwood Terrace, Loeve-Fox, and others; see Prewitt 1974:55-67). Even assuming that the use of *Scallorn* points died out shortly after the introduction of *Perdiz* points (and the myriad of other Plains-oriented Toyah phase traits), there easily could have been a time during which the two point styles were both in use in the same area (e.g. the Wheatley site, Greer 1974). Next we must assume that for this particular case, the designated, specially chosen projectile point forms are equatable with cultural phases, and that these phases are equatable with different peoples (see Frison *et al.* 1974 for alternate assumptions). There seems to be considerable evidence for this interpretation (as discussed by most of the people in the bibliography). Burials from sites indicating agression and/or violent deaths could be from a time in which Austin and Toyah phase groups were in contact. For instance, Austin phase people could have been killed with Toyah phase weapons and buried according to practices similar to other Austin phase sites (flexed position on either side in a very shallow pit, oriented with the head usually to the north). Had the initial contact between the two groups been unfriendly, such burial situations might be expected to occur rather commonly. Ethnohistoric discussions (Kelley 1955:989 from Bolton 1912:16; Bryan 1956) and archeological reports (Aynesworth 1936; Prewitt 1974) might be of use to someone constructing and evaluating a model of the agressiveness of Toyah phase peoples and their relationships with other cultural groups.

Prewitt (1974:50; personal communication 1975) does not believe that inter-phase warfare is a reasonable possibility, and prefers to consider (1) internecene warfare involving territorial rights among people of a single cultural pattern (e.g. the Austin phase) and (2) genocide to relieve the group of responsibility for supporting aged, sick, or otherwise unproductive members of the society. We strongly prefer the warfare interpretation and see no reason to reject either inter- or intra-phase conflict.

FINAL STATEMENT

The significance of the Pat Parker site lies mainly in its contribution of data regarding Austin phase burial customs. Unfortunately, these phase-wide patterns, if such actually existed, are uncertain at

this time due to the difficulty of assigning burials with certainty to Austin phase groups. Simply comparing burials containing *Scallorn* points is inadequate, due to the probability of unrecognized subdivisions of the Austin phase. The basic cultural units and their local manifestations or technofacies (Frison *et al.* 1974) must be defined in terms of content, time, space, and external relations before we can compare social aspects and hope to arrive at meaningful generalizations regarding central Texas groups.

At present the general pattern for late burials in central Texas is one in which burials are often clustered in relatively small, apparently formally designated cemetery areas. Of particular interest are groupings about 10 feet in diameter on open sites of scattered (horizontally extensive) midden debris. These groupings appear to have been marked for several years during their use in some recognizable and understood way, such as being a fenced-off area, a small house, or an area beside surface markers. Graves probably were shallow, and appeared either as single or multiple burials. Apparently individual graves were not marked, as indicated especially well at Loeve-Fox and Aycock where skeletons were cut through by later graves. Violence of some yet undetermined character is indicated by projectile points commonly being the cause of death. Burial goods are rare, although any site with a rather large number of individuals usually has some sort of marine shell (Gulf coast) jewelry, indicating direct or indirect contact with the Gulf coastal environment or with coastal peoples. Deer antler also seems fairly commonly included in the burial area. Future studies undoubtedly will add more to this model in terms of social aspects and temporal and areal differences.

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REFERENCES CITED

Aynesworth, K. H.
1936 Flint Arrowhead Wounds of Bones as Shown in Skeletons in Central Texas. *Bulletin of the Central Texas Archeological Society*, Vol. 2, pp. 74-79.

Benfer, R. and A. Benfer
1965 An Austin Focus Burial. *Texas Engineering and Science Magazine*, Vol. 1, No. 1, pp. 31-32.

Bolton, H. E.
1912 The Jumano Indians of Texas, 1650-1771. *The Quarterly of the Texas State Historical Association*, Vol. 20, pp. 66-84.

Bryan, F.
1956 Early Texas Travelers. *Central Texas Archeologist*, Vol. 7, pp. 56-108.

Corbin, J. E.
1974 A Model for Cultural Succession for the Coastal Bend Area of Texas. *Bulletin of the Texas Archeological Society*, Vol. 45, pp. 29-54.

Dahlberg, A. A.
1949 The Dentition of the American Indian. In: *The Physical Anthropology of the American Indian*, pp. 138-176. The Viking Fund, Inc. New York.

Frison, G. C., M. Wilson, D. J. Wilson
1974 The Holocene Stratigraphic Archaeology of Wyoming: An Introduction. In: *Applied Geology and Archaeology: The Holocene History of Wyoming*, by M. Wilson (Ed.). *The Geological Survey of Wyoming, Report of Investigations*, Vol. 10, pp. 108-127.

Goldstein, M. S.
1948 Dentition of Indian Crania from Texas. *American Journal of Physical Anthropology*, Vol. 6, No. 1, pp. 63-84.

Greer, J. W.
1974 Archeological Investigations at the Wheatley Site, Blanco County, Texas. Report submitted to the Texas Historical Commission. Austin.

Greer, J. W. and R. A. Benfer
1963 Langtry Creek Burial Cave, Val Verde County, Texas. *Bulletin of the Texas Archeological Society*, Vol. 33, pp. 229-251.

Hester, T. R.
1971 Archeological Investigations at the La Jita Site, Uvalde County, Texas. *Bulletin of the Texas Archeological Society*, Vol. 42, pp. 51-148.

Hester, T. R. and M. B. Collins
1969 Burials from the Frisch Auf! Site: 41 FY 42. *The Texas Journal of Science*, Vol. 22, No. 3, pp. 261-272.

Jackson, A. T.
1938 The Fall Creek Sites. *The University of Texas Publications 3802. Anthropological Papers*, Vol. 3, No. 1, Austin.

Jelks, E. B.
1962 The Kyle Site: A Stratified Central Texas Aspect Site in Hill County, Texas. *Department of Anthropology, The University of Texas at Austin. Archaeology Series 5.*

Kelley, J. C.
1951 Stephenson and Krieger on "Culture Chronology in Texas". *American Antiquity*, Vol. 17, No. 2, pp. 137-139.
1955 Juan Sabeata and Diffusion in Aboriginal Texas. *American Anthropologist*, Vol. 57, No. 5, pp. 981-995.

McKern, T. W. and T. D. Stewart
1957 Skeletal Age Changes in Young American Males. Technical Report EP-45. Quartermaster Research and Development Center, Environmental Protection Research Division, U.S. Army. Natick, Mass.

Montagu, M. F. A.
1960 *A Handbook of Anthropometry*. Charles C. Thomas, Pub. Springfield, Ill.

Morris, P. A.
1951 *A Field Guide to the Shells of our Atlantic and Gulf Coasts*. The Riverside Press, Cambridge.

Prewitt, E. R.
1974 Archeological Investigations at the Loeve-Fox Site, Williamson County, Texas. *Texas Archeological Survey Research Report* 49.

Shafer, H. J.
1971 Late Prehistory of Central Texas, 500 B.C. - 1700 A.D. Paper presented at the 74th Annual Meeting of the Texas Academy of Science, Stephen F. Austin State University, Nacogdoches, Texas.

Solberger, J. B.
1967 A New Type of Arrowpoint with Speculations as to its Origin. *The Record*, Vol. 23, No. 3, pp. 16-22. Dallas.
1970 Preforms are not Projectile Points. *Bulletin of the Oklahoma Anthropological Society*, Vol. 19, pp. 151-154.

Stephenson, R. L.
1970 Archeological Investigations in the Whitney Reservoir Area, Central Texas. *Bulletin of the Texas Archeological Society*, Vol. 41, pp. 37-286.

Suhm, D. A., A. D. Krieger, and E. B. Jelks
1954 An Introductory Handbook of Texas Archeology. *Bulletin of the Texas Archeological Society*, Vol. 25,

Tunnell, C. D.
1962 Oblate: A Rockshelter Site. In: *Salvage Archeology of Canyon Reservoir: The Wunderlich, Footbridge, and Oblate Sites*, by L. Johnson, Jr., D. A. Suhm, and C. D. Tunnell. *Bulletin of the Texas Memorial Museum*, No. 5. Austin.

Watt, F. H.
1936 A Prehistoric Shelter Burial in Bell County, Texas. *Bulletin of the Central Texas Archeological Society*, Vol. 2, pp. 5-27.
1956 Archeological Materials from the Asa Warner Sites. *Central Texas Archeologist* Vol. 7, pp. 7-29.

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NOTES ON SOME ARCHEOLOGICAL MATERIALS FROM THE PALO DURO CREEK AREA OF HANSFORD COUNTY, TEXAS

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ABSTRACT

This paper reports on a private collection of artifacts from Hansford County, Texas, an area which is almost unknown in the Texas archeological literature. Even though this collection is small and was not obtained under controlled conditions, it nonetheless represents a useful index of the cultural materials found in this remote area of the state.

BACKGROUND

Relatively little archeological material has been reported from the upper tier of counties of the Texas Panhandle. This region is not included in the Jelks, Davis, and Sturgis (1960) review of the archeology of the state, nor in Kelley's (1964) subsequent report on the Llano Estacado. Kelley (1964: 1) limited her study to the Llano Estacado proper which she defined as being bounded on the north by the Canadian River. Collins (1971) recently reviewed the archeology of the area but similarly restricted his study to the Llano Estacado, focusing primarily on the southern edge of the area.

Known archeological sites in the northeastern Texas Panhandle include a "Panhandle Pueblo" site at the Handley Ranch on Wolf Creek in Ochiltree County, and the Lipscomb Bison Quarry site in Lipscomb County (see Figure 1). Wormington (1957) locates the Lipscomb site eleven miles southwest of the town of Lipscomb, Texas. Wedel (1961) reports that eighteen *Folsom* projectile points were recovered at this site in association with a mass of fossil bison bone. Almost all of the 21 articles listed by Campbell (1960) for Lipscomb County deal with this one site.

The Handley Ranch village site in Ochiltree County is the major site which has been reported for the area in the literature (Holden 1929: Moorehead 1931, 1933; Ellzey 1966) and is generally now considered to be a Panhandle Aspect site (Baerreis and Bryson 1966; Collins 1971; Bousman n.d.). It has recently been the subject of a verbal report by Rolla Shaller (1973) who summarized prior studies. This site and the Lipscomb Bison Quarry site are the only archeological sites which are fairly well reported in the three county area, although other sites are known to local collectors.

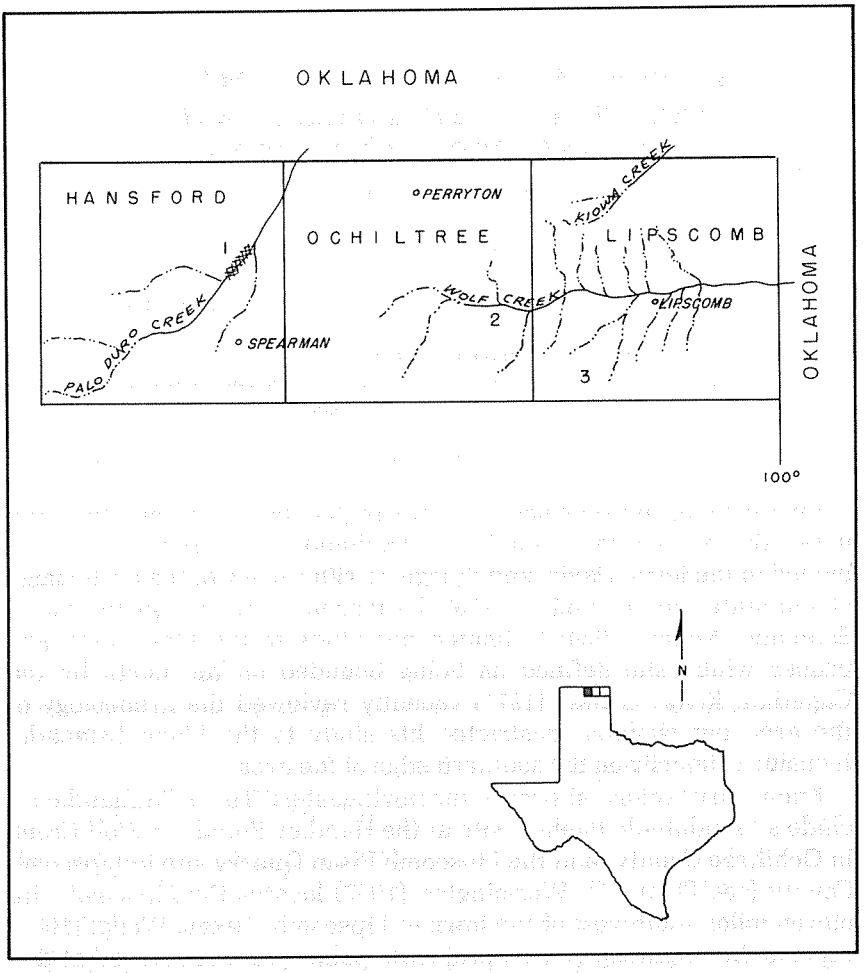

FIGURE 1. Archeological sites in the northeastern Texas Panhandle: 1, area on Palo Duro Creek; 2, Panhandle Aspect village on the Handley Ranch; 3, Lipscomb Bison Quarry site.

This paper will deal with a collection of artifacts found in Hansford County, along Palo Duro Creek (see Figure 1). Studer's field map of the Panhandle shows no sites in the county (1931: 142). Campbell's bibliography of Texas archeology (1960: 186) notes only two articles with any reference to Hansford County and these deal with rock art and flint gravers from the general area of the northern Panhandle.

These articles are dated 1940 and 1942; apparently no work has been done in the county since that time.

The Texas Archeological Research Laboratory in Austin has no record of any site for Hansford County (Dorris L. Olds, personal communication 1972). This lack of published material or even site reports from Hansford County represents a serious gap in the archeological record of the Panhandle.

The specific area of concern for this report lies north of the town of Spearman, Texas. This is a very rugged area where the Palo Duro Creek has cut a substantial canyon. The creek lies at about 2850 feet where the top of the canyon rim is from 3000 to 3050 feet above sea level. The main creek bed is joined by a number of side streams and washes, so that it is very difficult country to survey. The creek bed varies from a very sandy soil to gravel and rock, and its appearance changes considerably after the occasional major thunderstorms.

Since so little is reported of this county in the archeological literature, it appeared to be a good area for surveying amateur collections in order to define the archeological problems of the area and assess the need for future research. As Heizer (1974) has noted, archeological resources are finite and professional and serious amateur archeologists will be increasingly dependent on such collections for data in the future. The initial step in documentation of collections is, of course, to locate and secure the cooperation of local collectors.

Mr. Robert Cochran is a local Hansford County collector. In August, 1969, we visited this area of Palo Duro Creek, and recovered two of the specimens discussed later in this report (Figures 2,c and 4,c). The remainder of the artifacts reported here were collected by Mr. Cochran and his son over a period of several years.

THE ARTIFACTS

The sample reported here is quite small and yet, since they are the *only* artifacts reported from Hansford County, they provide information on the local prehistoric cultures which has not previously been available. The specimens are shown in Figures 2 through 4. Metric measurements are given in Table 1. The metric data is a very abbreviated version of the standard data elements developed by Binford (1963) as adapted by Luchterhand (1970). The specimens reported here are neither complete enough nor numerous enough to warrant inclusion of all the data recommended by Luchterhand.

Large Projectile Points — Figure 2 illustrates the larger points from this collection. These specimens are significantly greater in mean

length, width and weight than are the small projectile points shown in Figure 3. (Means tested with 5 values of 3.957, 5.566, and 4.555; all significant at $p < .01$). As can be seen in Table 1, the thickness of projectile point specimens ranged from .2 cm to .5 cm; mean thickness for the large points was .4166 cm and for the small points was .3269 cm, but this difference is not significant at the $p < .01$ level, largely due to the variability of the smaller points which themselves range from .2 to .5 cm. The significant differences in length, width and weight suggest that their grouping into the two categories of large and small points is valid. These groupings correspond to the popularly named classes of dart points and arrow points (Suhm and Jelks 1962).

Figure 2, a and b — These specimens are fairly large, expanding base dart points which are made of Alibates dolomite. Similarly shaped projectile points have been reported from Archaic Bison Kill sites in Hall and Donley Counties (Tunnell and Hughes 1955; Collins 1968a); from late Woodland sites in Hutchinson and Potter Counties (Hughes 1962; Green 1967); and from the Roy-Smith site, a Panhandle Aspect locality in the nearby Oklahoma Panhandle (Schneider 1969). Thus, these expanding base dart points are somewhat typical of finds in the Texas and Oklahoma Panhandle areas but they are apparently not diagnostic of any single period since they are reported from Archaic, Woodland and Panhandle Aspect sites.

Figure 2, c — This specimen is also an expanding stem projectile point but is unusual enough to deserve separate comment. It is also made of Alibates material and feels smoothed on the base. This may be due to natural causes since it was found in the stream bed in tumbled gravel. Instead of straight-in notching, as on the other expanding stem points, the notches on this specimen are a combination of angles which suggests that more than one step was involved in preparing the notches. This unusual type of notching has not been reported on any other Panhandle specimen.

Figure 2, d — One shoulder of this point is rounded and the other, which is broken, appears to have been barbed. It is also made of Alibates material but is primarily a light gray in color with faint maroon and tan streaks.

Figure 2, e and f — These two specimens are smaller than the other dart points and have bulb-shaped bases. The barbs and general shape of these points are similar to the attributes of one variety of the *Williams* point type. Bell (1960: 96) illustrates such bulbar bases for some *Williams* points and notes that the type occurs in eastern Oklahoma. He also reports that the type shares some characteristics with the *Castroville, Palmillas* and *Marcos* point types.

Small Projectile Points — Figure 3 illustrates a series of small expanding stem projectile points, which show considerable variability in size and shape.

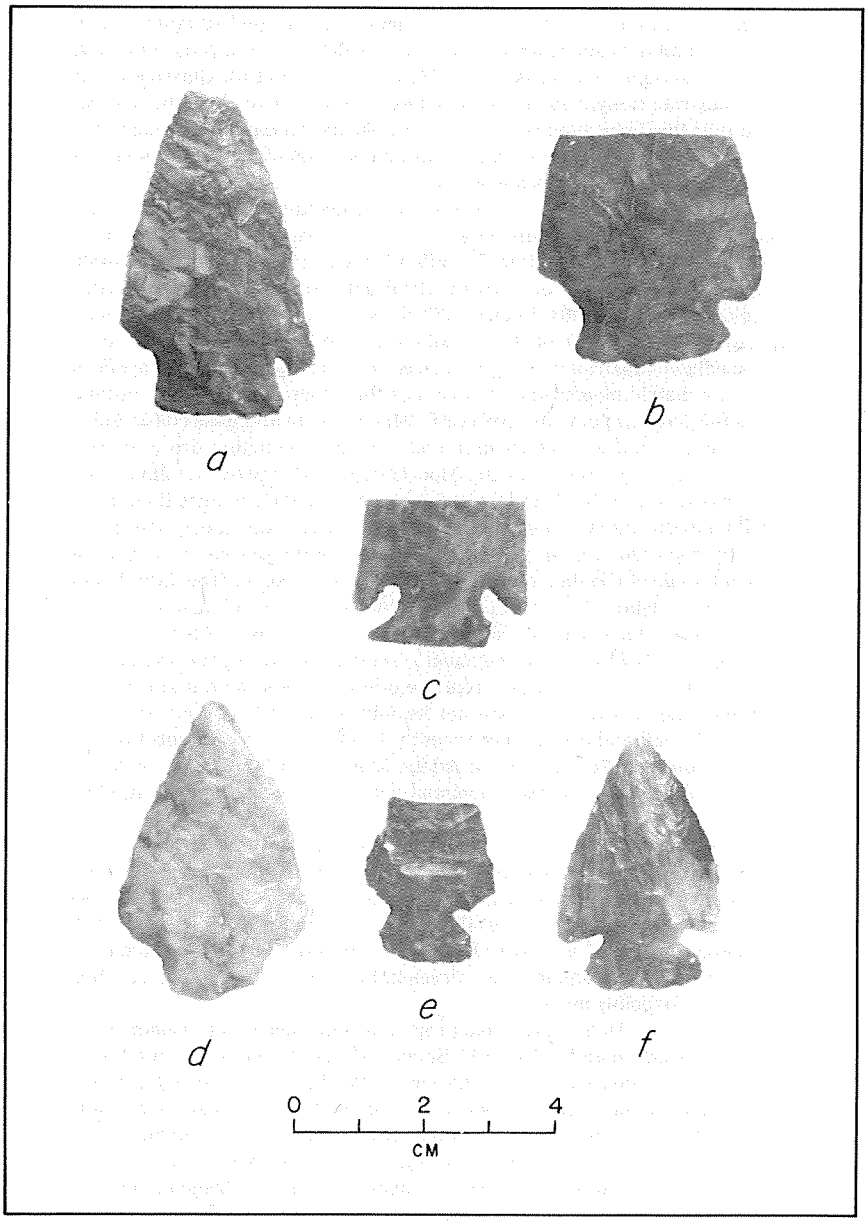

FIGURE 2. Large projectile points: a-c, expanding stem points; d, rounded stem point; e-f, bulbar base points.

Figure 3, a and b — These are very small corner-notched points. They are very similar to specimens recovered at CR-1 (A175) in Moore County, Texas (Glasscock and Glasscock 1955: Plate 17, t and n). Glasscock and Glasscock report eight such points including one made of obsidian, and observe that this point type is "rare" in the Texas Panhandle although they are said to occur frequently in the sand hill section of West Texas and in the headwaters area of the Red River.

Figure 3, c through e — These small projectile points appear to be similar to the *Scallorn* point type (Suhm and Jelks 1962). *Scallorn* points have been recovered at late Woodland sites in the Texas Panhandle (Hughes 1962; Harrison and Griffin 1975) but are not reported from later complexes (Duffield 1964; Keller 1975) of the area. Thus, such points would appear to be diagnostic of the Woodland period for this area of the state. The specimen illustrated as Figure 3, e is exceptionally small for a *Scallorn* point; its metric measurements are less than those given as the normal range for *Scallorn* points by Bell (1960: 84) and Suhm and Jelks (1962: 285).

Figure 3, f and g — Triangular points without notching are most frequently said to be *Fresno* points. Moorehead (1931: Figure 41) illustrated similar points from the Handley Ranch, Duffield (1964) reports them from the Panhandle Aspect sites in Hutchinson County, and Lintz (1972) has recently reported similar points from the McGrath site near Guymon in the Panhandle of Oklahoma. Such points are also reported from late Woodland sites (Hughes 1962) and from site components which are later than the Panhandle Aspect at the Black Dog Village site (Keller 1975).

Figure 3, h — This crude specimen resembles a *Toyah* point (Suhm and Jelks 1962). It is quite distinct from the other points in both material and workmanship. *Toyah* points are not usually reported from the vicinity of the Texas Panhandle but have recently been reported in Lamb County, Texas (Randall 1970) and at the Adobe Mound site (41AD3) in Andrews County, along with *Fresno*, stemmed and side-notched points (Collins 1968b).

Figure 3, i and j — These two points appear to be *Washita* points (Bell 1958), a type which occurs widely in the Panhandle-Plains area. *Washita* points are frequently found in the Panhandle Aspect (Duffield 1964) as well as in the Custer Focus (Lintz 1974) and the Washita River Focus (Bell 1973) in adjacent areas of western Oklahoma. Duffield (1964) has pointed out that their relative frequency decreases in later sites where the proportion of *Fresno*-like points increases.

Figure 3, k — This thick, rough projectile point somewhat resembles the *Young* type (Suhm and Jelks 1962). Suhm and Jelks estimate that the *Young* type has the same cultural affiliation as the *Scallorn* type but Duffield (1964) reports *Young* points associated with *Fresno* and *Washita*-like side-notched points at the Medford Ranch site and the Spring Canyon site in Hutchinson County, where no *Scallorn* points were recovered.

Figure 3, l and m — These specimens are too fragmentary for classification but they are both made of materials probably not native to the Panhandle-Plains area. The point illustrated as Figure 3, l has some resemblance to the *Trinity* point type; it is made of a tan colored chert and has a high glossy sheen which suggests that it may have been heat treated. The specimen shown as Figure 3, m is made of an orange-tan flint which is unusual for this area.

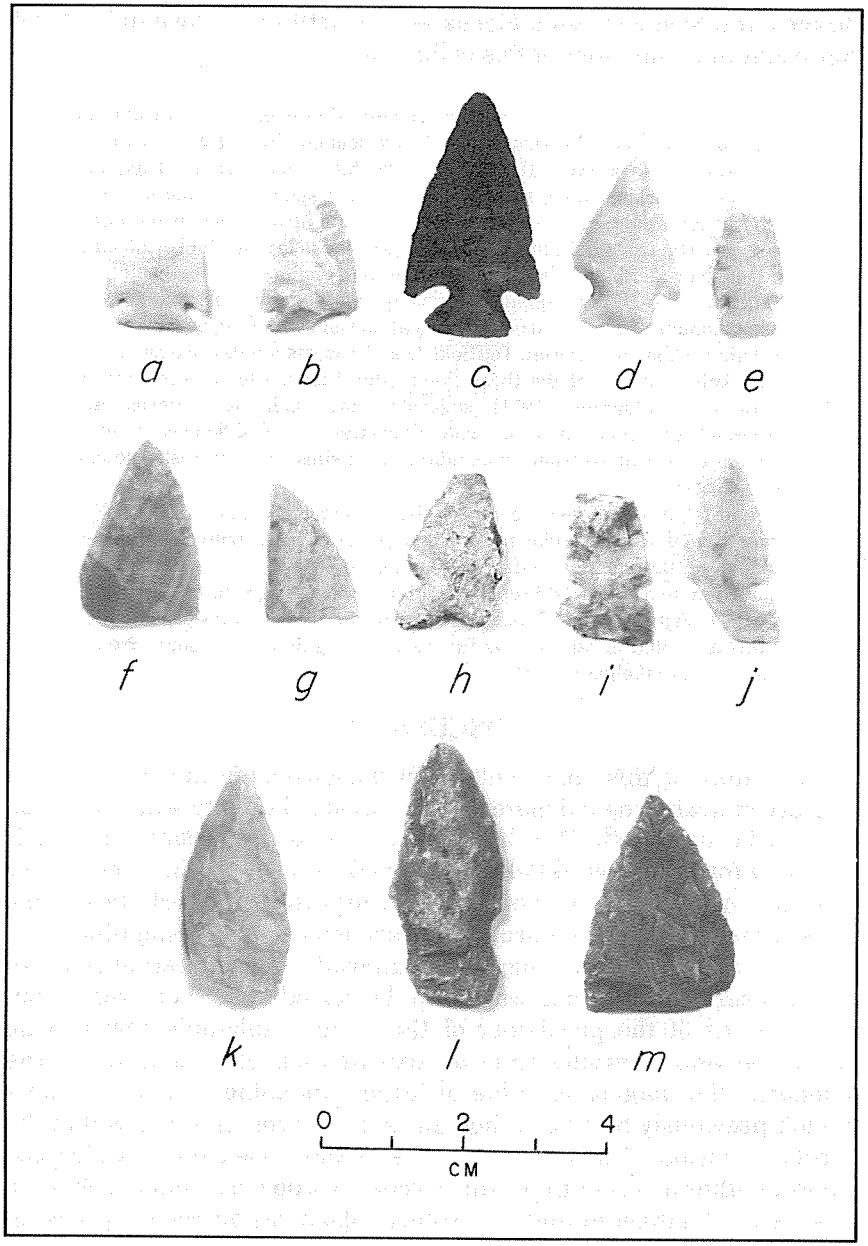

FIGURE 3. Small projectile points: a, b, corner notched points; c-e, expanding stem points; f, g, triangular points; h-j, notched triangular points; k-m, unclassified points.

Bifaces and Miscellaneous Pieces — The artifacts shown in Figure 4 represent the remainder of this collection.

Figure 4, a through c — These fragments of bifaces are interesting in terms of material and workmanship. The specimen illustrated as Figure 4, a is made of a dark brown flint, has a fairly thick cross section (.8 cm) and has fine reworking along its edge. Figure 4, b shows a biface made of Alibates material which is very thin (.4 cm) and also has excellent workmanship. The fragment illustrated as Figure 4, c is larger, thicker (.8 cm), and much cruder but is also made of Alibates dolomite.

Figure 4, d — This complete biface is of a mottled grey color but there is a small amount of dark maroon speckle at one end which suggests that it is probably Alibates material. Duffield (1964) reports similar specimens as ovate knives at two of the three Panhandle Aspect sites at the Sanford Reservoir. Sollberger (1971) suggests that such oval knives are unretouched forms which become alternately beveled knives, a form frequently recovered from Panhandle Aspect sites, through resharpening of its edges.

Figure 4, e — The piece is an excellent example of an end scraper. The reverse face of this specimen is a single plane with the bulb of force very evident at the smaller end. The leading edge is finely worked and is somewhat dulled. Duffield reports similar scrapers from Hutchinson County (1964: Figure 16, D-F), but this type of scraper is widespread in the Plains area and is reported as far away as the middle Missouri area of North Dakota (Lehmer 1971).

DISCUSSION

The study of this small collection demonstrates that there are a variety of archeological materials in Hansford County which can and should be analyzed. This becomes a critical issue since a dam is planned for this area of Palo Duro Creek and yet no sites are on record, nor are there any reports in the literature to alert state agencies of the need for a comprehensive archeological investigation.

Even with the limited amount of material reported here, there are several serious questions which can be raised about our present understanding of the prehistory of the upper Panhandle region. One such question emerging from an examination of published reports concerns the diagnostic value of large expanding base dart points which previously had been thought to be horizon markers within the Archaic period (Tunnell and Hughes 1955) based on stratigraphic work in other areas of the state or general type descriptions. Work in the Texas Panhandle and in western Oklahoma in recent years indicates that such forms are found at sites assumed to be Archaic (Twilla, Finch, Sitter Ranch, etc.), in Woodland sites (Lake Creek, 41MO5, 41PT29), at Custer Focus sites, and in Panhandle Aspect sites (Roy-Smith). Beginning with the Woodland sites, these large ex-

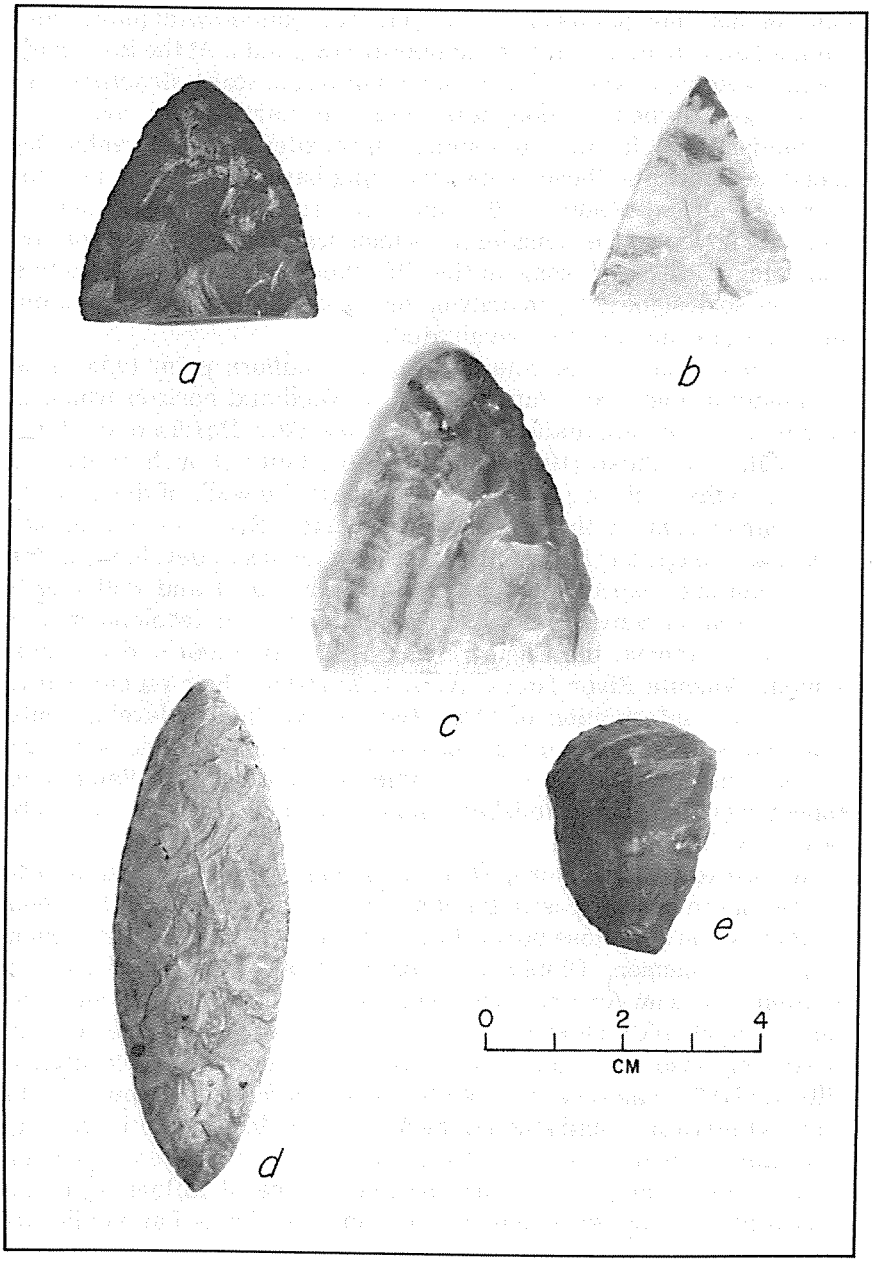

FIGURE 4. Miscellaneous pieces: a-c, bifaces; d, plains knife; e, scraper.

panding base dart points are increasingly associated with plain, side-notched, and basal notched triangular arrow points. At the Roy-Smith site in Oklahoma, where there was a multiroom stone structure, the arrow point types predominate and the dart points are rare (Schneider 1969). In later Panhandle Aspect sites and post-Panhandle Aspect components, these large expanding base projectile points appear to be absent (Keller 1975). Thus, this size and style of projectile point can no longer be considered as temporally diagnostic of the Archaic stage. Presently, some of the sites thought to be Archaic in this area are so designated primarily on the basis of these kinds of points; such sites may need to be re-evaluated.

A second issue is the potential for the *Scallorn* point type to be diagnostic in the Texas Panhandle of a Woodland horizon which is earlier than the Panhandle Aspect (Hughes 1962; Harrison and Griffin 1975). Moorehead (1931) noted the possibility of such an earlier horizon on the basis of ash lenses underneath the walls of the massive stone structures at the Handley Ranch site. Such an earlier occupation strengthens Hughes' hypothesis of an *in situ* development for the Panhandle Aspect (Hughes 1968). Lintz (1974) and Bell (1973) have presented convincing cases for similar *in situ* developments in western Oklahoma, the Custer Focus (A. D. 800-1100) and the subsequent Washita River Focus (A. D. 1100-1400). Their recent works synthesizing information of these two Plains Village developments represent substantial contributions to the archeology of the Southern Plains. Unfortunately no comparable analysis of the Panhandle Aspect has yet been published, though such a synthesis is sorely needed (Keller 1975).

The presence of *Scallorn, Toyah* and small corner notched arrow points also raises the possibilty of some type of relationship between the Panhandle and those parts of Central and West Texas where such forms are common. Dibble and Lorrain (1968) postulated such a relationship on an Archaic time level between the Bonfire Shelter and the Twilla site of the lower Panhandle based on the presence of large expanding base dart points and fossil bison bone in both locations. Dillehay (1974) has recently restated this hypothesis, attributing it to Hughes and Dibble, and studied the presence of bison in both areas as a possible causal factor. Certainly this hypothesis deserves further study since it implies another possible source of influence in the presently unclear developmental sequence of Texas Panhandle archeological complexes.

The artifacts reported here do establish that the Woodland and Panhandle Aspect horizons, which have been demonstrated in other parts of the Texas and Oklahoma Panhandles, are also present in the

Palo Duro Creek area of Hansford County, an area previously unreported in the archeological literature. Archaic occupation may be indicated but cannot be demonstrated conclusively since the large dart points are also found in Woodland and Panhandle Aspect horizons.

In this northernmost tier of Texas counties, a great deal of work is yet to be done, even in the basic documentation of sites. Hopefully, such work will be done in this area of Palo Duro Creek before it is inundated by the lake presently planned for the area.

While archeological work in this remote area of the northeastern Texas Panhandle is not as glamorous or as immediately rewarding as in some other parts of the state, this brief report has demonstrated that there are archeological materials and problems in this area which need study. Very little has been published about this specific area in the past 30 years and it is possibly one of the least known areas of the state. At this stage when so little professional work has been done in this region, the examination of amateur collections is a particularly fruitful method of research.

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REFERENCES CITED

Baerreis, David A. and Reid A. Bryson
1966 Dating the Panhandle Aspect Cultures. *Bulletin of the Oklahoma Anthropological Society*, Vol. 14, pp. 105-116.

Bell, Robert E.
1958 Guide to the Identification of Certain American Indian Projectile Points. *Special Bulletin* No. 1, Oklahoma Anthropological Society.
1960 Guide to the Identification of Certain American Indian Projectile Points. *Special Bulletin* No. 2, Oklahoma Anthropological Society.
1973 The Washita River Focus of the Southern Plains. In: *Variation in Anthropology*. (Lathrap and Douglas ed.), Illinois Archaeological Survey.

Binford, Lewis R.
1963 A Proposed Attribute List for the Description and Classification of Projectile Points. Miscellaneous Studies in Typology and Classification, *Anthropological Papers*, Museum of Anthropology, University of Michigan, No. 19, pp. 193-221.

Bousman, C. Britt
n.d. Archeological Assessment of Alibates National Monument. *Archeological Research Program*, Southern Methodist University.

Campbell, T. N.
1960 Texas Archeology: A Guide to the Literature. *Bulletin of the Texas Archeological Society*, Vol. 29, pp. 177-254.

Collins, Michael B.
1968a A Note on Broad Corner-Notched Projectile Points Used in Bison Hunting in Western Texas. *The Bull-Roarer*, Vol. 3 (2), pp. 13-14.
1968b The Andrews Lake Locality: New Archeological Data From the Southern Llano Estacado, Texas. Unpublished M. A. Thesis, University of Texas at Austin.
1971 A Review of Llano Estacado Archaeology and Ethnohistory. *Plains Anthropologist*, Vol. 16 (52), pp. 85-104.

Dibble, David S. and Dessamae Lorrain
1968 Bonfire Shelter, A Stratified Bison Kill Site, Val Verde County, Texas. *Miscellaneous Papers* No. 1, Texas Memorial Museum, The University of Texas at Austin.

Dillehay, Tom D.
1974 Late Quaternary Bison Population Changes on the Southern Plains. *Plains Anthropologist*, Vol. 19 (65), pp. 180-196.

Duffield, Lathel F.
1964 Three Panhandle Aspect Sites at Sanford Reservoir, Hutchinson County, Texas. *Bulletin of the Texas Archeological Society*, Vol. 35, pp. 19-82.

Ellzey, Tom S.
1966 A Panhandle Aspect Site (Preliminary Report). *Midland Archeological Society Special Bulletin* No. 1, pp. 59-65.

Glasscock, Keith, and Alma Glasscock
1955 A Preliminary Report on CR-1, an Indian Campsite in Moore County, Texas. *Panhandle-Plains Historical Review*, Vol. 28, pp. 96-105.

Green, F. E.
1967 Archeological Salvage in the Sanford Reservoir Area. Manuscript on

file at the Southwestern Regional Center, National Park Service, Santa Fe, New Mexico.

Harrison, Billy R. and Bob T. Griffin
1975 An Infant Burial in the Texas Panhandle. *Bulletin of the Texas Archeological Society*, Vol. 44 (for 1973), pp. 61-68.

Heizer, Robert F.
1974 Some Thoughts on Hoaxes and Fakes. *Bulletin of the Texas Archeological Society*, Vol. 45, pp. 191-196.

Holden, W. E.
1929 Some Recent Explorations and Excavations in Northwest Texas. *Bulletin of the Texas Archaeological and Paleontological Society*, Vol. 1, pp. 23-25.

Hughes, Jack T.
1962 Lake Creek: A Woodland Site in the Texas Panhandle. *Bulletin of the Texas Archeological Society*, Vol. 32, pp. 65-84.
1968 Prehistory of the Caddoan-Speaking Tribes. Ph.D. Dissertation, Columbia University. University Microfilms, Ann Arbor.

Jelks, E. B., E. Mott Davis, and H. F. Sturgis (eds.)
1960 A Review of Texas Archeology, Part One. *Bulletin of the Texas Archological Society*, Vol. 29, pp. 1-176.

Keller, John E.
1975 The Black Dog Village Site. *Texas Highway Department Publications in Archaeology*, Highway Design Division, Report No. 5.

Kelley, Jane H.
1964 Comments on the Archeology of the Llano Estacado. *Bulletin of the Texas Archeological Society*, Vol. 35, pp. 1-18.

Lehmer, Donald J.
1971 Introduction to Middle Missouri Archeology. *Anthropological Papers* No. 1. U. S. Department of Interior, National Park Service.

Lintz, Christopher
1972 The 1972 O. U. Field School. *Oklahoma Anthropological Society Newsletter*, No. 20 (6), pp. 8-9.
1974 An Analysis of the Custer Focus and Its Relationship to the Plains Village Horizon in Oklahoma. *Papers in Anthropology*, Vol. 15 (2), Department of Anthropology, University of Oklahoma.

Luchterhand, Kubet
1970 Early Archaic Projectile Points and Hunting Patterns in the Lower Illinois Valley. *Illinois Archaeological Survey, Monograph* No. 2.

Moorehead, Warren K.
1931 *Archaeology of the Arkansas River Valley*. Phillips Academy; Andover.
1933 The Importance of Texas as an Archeological Field. *Bulletin of the Texas Archeological and Paleontological Society*, Vol. 5, pp. 9-13.

Randall, Mark E.
1970 The Archaeology of the Lamb County, Texas Area. *Lower Plains Archeological Society Bulletin* Number 1, pp. 43-53.

Schneider, Frederick
1969 The Roy-Smith Site (Bv-14) Beaver County, Oklahoma. *Bulletin of the Oklahoma Anthropological Society*, Vol. 18, pp. 119-179.

Shaller, Rolla
1973 The Wolf Creek Expedition, A Review. Paper presented at the 1973

Texas Archeological Society Annual Meeting, Lubbock, October 30, 1973.

Sollberger, J. B.
1971 A Technological Study of Beveled Knives. *Plains Anthropologist*, Vol. 16 (53), pp. 209-218.

Studer, F. V.
1931 Some Field Notes and Observations Concerning Texas Panhandle Ruins. In: Moorehead, *Archaelogy of the Arkansas River Valley*, pp. 131.143.

Suhm, D. A., and E. B. Jelks.
1962 Handbook of Texas Archeology: Type Descriptions. *The Texas Archaeological Society Special Publication* No. 1 and the *Texas Memorial Museum Bulletin*, No. 4.

Tunnell, C. D. and J. T. Hughes
1955 An Archaic Bison Kill in the Texas Panhandle. *Panhandle-Plains Historical Review*, Vol. 28, pp. 63-70.

Wedel, W. R.
1961 *Prehistoric Man on the Great Plains*.. University of Oklahoma Press.

Wormington, H. M.
1957 *Ancient Man in North America*. Denver Museum of Natural History. Popular Series No. 4 (4th Edition).

Lafayette, Indiana

POROSITY AND REFIRING TESTS ON CERAMICS FROM THE GEORGE C. DAVIS SITE, TEXAS

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ABSTRACT

Refiring experiments involving porosity and color change were performed on a sample of the pottery from the George C. Davis Site. The technology of ceramic production at this site was elucidated through these experiments the results of which are described in this paper.

INTRODUCTION

The George C. Davis Site (41 CE 19) is located on a Pleistocene terrace of the Neches River in Cherokee County, Texas, and is bisected by Texas State Highway 21 approximately midway between the towns of Crockett and Rusk. The site had been occupied by prehistoric Caddo Indians from about A. D. 700 to A. D. 1250 (Story 1972: i). Major features of the site include two earthen temple mounds (Mounds A and B), an earthen burial mound (Mound C), and an extensive village area. The W.P.A. sponsored excavations at the site from 1939-1941 reported by Newell and Krieger (1949). From 1968 to 1970 excavations were carried out under the supervision of Dee Ann Story, Director of the Texas Archeological Research Laboratory, The University of Texas at Austin. The ceramic collection from this site forms the body of data from which samples were taken for this porosity and refiring study. A more extensive ceramic analysis of the 1968-1970 collection is available in Arnold (1973).

POROSITY AND REFIRING TESTS

The main coloring agents in clay are the naturally occurring impurities such as iron compounds and carbonaceous matter. The firing atmosphere, temperature, and duration operate upon these impurities to produce the color the vessel will possess after firing (Shepard 1968: 103). The firing atmosphere may be oxidizing, containing free oxygen, or reducing, containing gasses that take oxygen from constituents of the clay. Oxidation produces clear colors, and reduction produces gray (Shepard 1968: 103).

Grays and blacks can also be obtained if the firing temperature is too low to drive out carbonaceous matter and to change iron compounds to iron oxide (*Ibid.*) Smudging is another means of intentionally producing grays and blacks by causing carbon to be deposited on the vessel during firing. Smudging can be accomplished

when smoldering fuel comes in contact with the pottery at the end of the firing process. Sooty smoke from such substances as wood chips and saw dust or powdered dung can also produce smudging (Shepard 1968: 88).

The colors produced by the iron compounds depend upon a number of variables. Colton (1939: 266) says the main variable is the percentage or iron content (Table 1). Shepard (1968: 103) points out that there are other variables in operation such as iron compound particle size and distribution. These factors reduce the level of confidence which can be placed in Colton's statements on color. Also it must be remembered that grays and blacks can be produced due to the simple lack of oxidation of carbonaceous matter. Reduction is not the only cause of blacks and grays.

Table 1

The Effect of Iron on Color (From Colton 1939: 266)

Iron Content	Oxidized	Reduced
1%	Almost White	White
1% - 3%	Buff	Gray
3%	Red or Brown	Dark Gray to Black

Duration of firing can also affect the final color of the pottery. If a high enough temperature is not reached and maintained for a sufficient period of time colors may not be clear, or if the surface is fully oxidized there may be a dark core indicating residual carbonaceous matter the carbon having been burned from the surface only (Shepard 1968: 104). An oxidized surface and a dark core are a frequent occurrence in this collection (Table 2).

Refiring tests can be helpful in determining original firing conditions. By refiring at a relatively high temperature in a controlled atmosphere and observing color change some aspects of the original firing atmosphere may be inferred. A short refiring at relatively low temperatures should clear the colors of sherds that have been smudged (Shepard 1968: 105, 217-220).

Porosity is indicative of the relative quality or suitability of the paste or clay body (Nelson 1971: 143). Relative firing temperature may also be inferred if significantly different porosities are found to exist for different shapes or types of pottery. This can be done since a change in firing temperature causes a change in porosity in a given paste. The specific changes encountered in refiring sherds from this

Table 2

Exterior Surface Color Vrs. Core Color

COLRCORE	COUNT / COL PCT	COLOREXT DARK (1)	LIGHT (2)	MIXED (3)	ROW TOTAL
BLACK OR DARK GR	1	99	267	74	440
		63.5	51.8	59.7	55.3
LIGHT GRAY	2	52	161	40	253
		33.3	31.3	32.3	31.8
CLEAR	3	5	87	10	102
		3.2	16.9	8.1	12.8
	COLUMN TOTAL	156	515	124	795
		19.6	64.8	15.6	100.0

RAW CHI SQUARE = 23.67306 WITH 4 DEGREES OF FREEDOM.
SIGNIFICANCE = .0001

collection will be discussed below. Furthermore, comparing porosity before and after refiring at a relatively high temperature may give some idea of the potential of the paste under consideration. It is possible to combine refiring for porosity and color in a single test.

All refiring tests were performed in an American Art Clay Company Standard Economy Electric Kiln, Type EC15. The kiln is equipped with a thermocouple-pyrometer system made by the same company. The centigrade scale is marked in 25° increments.

Experiment No. 1 — Color and Porosity Test

The combined color and porosity change refiring experiment was carried out for a small sample of each of ten main pottery types (Table 3) from the George C. Davis Site. In this way any variation between types as well as an average for all the types, can be observed. Fifteen sherds were drawn at random from each type. The porosity of the sample of 150 sherds was determined before and after refiring by means of the formula suggested by Shepard (Shepard 1968: 127).

Shepard's formula, "recommended by the Committee on Standards of the American Ceramic Society," (*ibid.*) was chosen over the alternate formula suggested by Nelson (1971: 143) because it was felt that

its allowance for the volume of the sherd added a dimension of accuracy not afforded by Nelson's simple percentage weight increase. Shepard's formula derives the apparent percentage of porosity by dividing the weight difference of the sherd before and after soaking in water by the volume of the sherd and multiplying by 100.

The color of 100 sherds, ten randomly selected from each set of fifteen, was recorded using the Munsell Soil Color Chart (1954) both before and after refiring. Since for the color change test no statistical procedures were to be applied, it was felt that the whole original 150 sherd sample need not be used. All the sherds were refired in an electric kiln. The kiln was heated slowly and continuously over a period of three hours to a maximum temperature of 1100° C, a temperature well above the high of 700° - 800° C that could be expected from an aboriginal open air firing (J.A. Neely, personal communication). The temperature of 1100° C was maintained for thirty minutes, and then the kiln was turned off and allowed to cool overnight while remaining closed.

The change in the color of the sherds refired was dramatic. From a relatively broad range of rather dark brown, gray, reddish brown, and reddish gray colors the refiring under the oxidizing conditions of the electric kiln produced a remarkably narrow range of light red and red colors. This applies to surface color and core color. In many cases a light surface color had been present with a dark core. Note the tight clustering of value, 4 - 5, and chroma, 7 - 8, in the "after" columns of Table 4.

The porosity tests on the sherds before refiring yielded fairly uniform results (Table 3). An analysis of variance inherent in these porosity figures will help in their interpretation. Since the sample sizes are equal, a F-maximum test — a simple yet robust test for homogeneity of variances — is applicable (Bruning and Kintz 1968: 110-111). The F_{MAX} of 4.51 with fourteen degrees of freedom is not significant at the .05 level, and therefore it is concluded that the variances are homogeneous before firing. The same is true of the porosity measurements taken after refiring which yielded an F_{MAX} of 4.08 with fourteen degrees of freedom. There is no significant difference between types reflected in the porosity results.

The porosity percentages measured after refiring consistently showed an increase for all types (Table 3). Interestingly enough, the weight of the individual sherds decreased and their volume increased. Many of the sherds developed a network of shallow surface cracks after refiring. Therefore, the clay involved, whether it was in a natural state or modified before use, was suited only for a limited firing range. If temperatures above that range were reached, ex-

pansion would cause surface cracks. There was also a notable change in the ringing sound given by the sherds when dropped on a table top. The sound this produced became distinctly higher and clearer after refiring.

Table 3

Average Apparent Porosity Before and After Refiring

Ceramic Types	Before	After
Davis	25%	31%
Duren	22%	31%
Dunkin	20%	28%
Kiam	24%	37%
Weches	22%	27%
Crockett	22%	30%
Pennington	19%	20%
Hickory	26%	28%
Holly	23%	28%
Bowles Creek Plain	25%	29%
Mean	23%	30%
Standard Deviation	2.25%	2.78%

Experiment No. 2 — Smudging Test

A separate sample of twenty-five black or dark gray sherds was selected from Holly Fine Engraved, a type possibly intentionally smudged. Test chips were broken off of these sherds for this refiring experiment. According to Shepard (1968: 217-220) a short firing in air (oxidizing atmosphere) at 500° C should be sufficient to clear a sherd that has been smudged. If no significant change in color is observed then the dark color must be attributed to reduction during firing or lack of oxidation or carbonaceous material in the clay.

The test chips were fired in the electric kiln used in the previous experiment at a temperature of 500° C for fifteen minutes.

In every case the refired test chip when compared to the sherd from which it was removed proved to be a lighter color (Fig. 1). Further evidence of smudging can be seen in the presence of a few sherds in the sample analyzed from the recent collection. These sherds have a dark surface color and a light core color (Table 2); two of the five sherds with this characteristic are classified as Holly Fine Engraved.

TABLE 4.
Surface Color Designations Before and After Refiring

before		after	
Holly Fine Engraved			
7.5YR4/2	dark brown	2.5YR5/8	red
7.5YR4.5/2	dark brown	2.5YR5.5/8	red
7.5YR3.5/2	dark brown	2.5YR5/8	red
5YR5/4	reddish brown	2.5YR5/8	red
5YR5.5/3	reddish brown	10R6/8	light red
5YR4.5/2	very dark gray	10R5.5/7	red
5YR4/2	very dark gray	2.5YR5/7	red
5YR4.5/1	dark gray	2.5YR6/8	light red
5YR4.5/2	dark reddish gray	10R4.5/7	red
2.5YR5/6.5	red	10R5/7	red
Hickory Fine Engraved			
5YR4.5/3	reddish brown	10R5/8	red
5YR5/3	reddish brown	10R5/7	red
7.5YR4.5/2	brown	10R6/8	light red
5YR4.5/2.5	dark reddish gray	10R5.5/8	red
5YR3.5/1	very dark gray	10R5/8	red
5YR3.5/1	very dark gray	10R5.5/6	red
5YR3.5/1	very dark gray	10R5/8	red
5YR5.5/6	yellowish red	2.5YR5.5/8	red
7.5YR3/2	dark brown	10R5.5/8	red
5YR5/2	reddish gray	10R5/6	red
Pennington Punctated-Incised			
7.5YR3.5/2	dark brown	10R5.5/8	red
5YR4.5/6	yellowish red	10R5/6	red
5YR4.5/6	yellowish red	2.5YR5/8	red
5YR5/6	yellowish red	2.5YR5.5/8	red
5YR5/6	yellowish red	10R5.5/6	red
5YR4.5/2	dark reddish gray	10R5.5/6	red
7.5YR4.5/2	brown	10R5.5/7	red
7.5YR4.5/4	brown	10R5.5/7	red
5YR5.5/4	reddish brown	2.5YR5/8	red
5YR5/3	reddish brown	10R4.5/7	red
Crocket Curvilinear Incised			
5YR4/1.5	dark gray	2.5YR5/8	red
7.5YR4/2	dark brown	2.5YR5/8	red
7.5YR4/2	dark brown	10R5/7	red
7.5YR4/4	dark brown	10R5.5/6	red
5YR3.5/1	very dark gray	10R5.5/7	red
5YR5.5/2	reddish gray	10R5/6	red
5YR4.5/4	reddish brown	2.5YR5/8	red
5YR5.5/4	reddish brown	2.5YR5/8	red
7.5YR5/3	brown	10R5/6	red
5YR5.5/6	yellowish red	10R5.5/8	red

TABLE 4 (continued)

before		after	
	Weches Fingernail Impressed		
5YR5/3	reddish brown	10R5.5/8	red
2.5YR5/4	reddish brown	2.5YR5.5/8	red
2.5YR5/4	reddish brown	2.5YR5/8	red
5YR4.5/3	reddish brown	2.5YR5/8	red
5YR5/4	reddish brown	10R5/7	red
5YR4/3	reddish brown	10R4.5/8	red
5YR3.5/1	very dark gray	10R4.5/7	red
5YR3.5/1.5	very dark gray	10R5/6	red
2.5YR5/6	red	10R4.5/7	red
5YR3/2	dark reddish brown	10R5/7	red
	Davis Incised		
5YR4.5/3	reddish brown	2.5YR4.5/8	red
5YR5/3	reddish brown	2.5YR6/8	light red
5YR5/3	reddish brown	10R5.5/7	red
5YR6/4.5	light reddish brown	10R4.5/8	red
5YR5/2.5	dark reddish brown	10R4.5/8	red
7.5YR4.5/4	brown	10R4/7	red
5YR5/6	yellowish red	10R5/8	red
5YR3.5/1.5	yellowish red	10R4.5/8	red
5YR5/6	yellowish red	10R5/8	red
2.5YR5/6	red	10R5/6	red
	Dunkin Incised		
5YR4/3	reddish brown	10R4.5/8	red
5YR5/3	reddish brown	10R4/8	red
5YR5.5/4.5	reddish brown	2.5YR5.5/8	red
2.5YR4.5/2.5	weak red	10R4.5/6	red
2.5YR4.5/2	weak red	10R4/8	red
5YR5.5/6	yellowish red	10R5.5/8	red
5YR5/6	yellowish red	10R5/6	red
7.5YR5/4	brown	10R5/8	red
5YR4/1	dark gray	10R4.5/8	red
2.5YR5/6	red	10R5/8	red
	Kiam Incised		
5YR4/3	reddish brown	10R4/6	red
5YR5/3.5	reddish brown	2.5YR5/8	red
5YR4/1	dark gray	10R4/8	red
5YR4.5/1	dark gray	2.5YR8/8	light red
2.5YR5.5/6	red	2.5YR6/8	light red
2.5YR5/3	weak red	2.5YR5/8	red
2.5YR4.5/2	weak red	2.5YR5.5/8	red
7.5YR4.5/2	brown	2.5YR5.5/8	red
7.5YR3/2	dark brown	10R5.5/8	red
5YR4/2	dark reddish gray	10R5/6	red

TABLE 4 (continued)

before		after	
Duren Neck Banded			
5YR5.5/4	reddish brown	2.5YR5.5/8	red
5YR4.5/3	reddish brown	10R5/7	red
5YR5/3.5	reddish brown	2.5YR5/8	red
5YR5.5/3	reddish brown	2.5YR6/8	light red
5YR5.5/4	reddish brown	10R5.5/6	red
2.5YR4.5/2.5	weak red	10R5/8	red
7.5YR4.5/2	brown	10R5/7	red
5YR4.5/1	dark gray	10R5.5/7	red
5YR5/1.5	gray	2.5YR5.5/8	red
5YR4.5/2	dark reddish gray	10R5/7	red
Bowles Creek Plain			
5YR4/6	yellowish red	10R4/7	red
5YR5/2.5	reddish gray	10R5/7	red
2.5YR4.5/2	weak red	10R5.5/6	red
2.5YR4/2	weak red	10R5.5/8	red
2.5YR4/2.5	weak red	10R5/6	red
2.5YR5/6.5	red	2.5YR5.5/8	red
2.5YR5.5/6	red	10R5/7	red
5YR6/7	reddish yellow	2.5YR5.5/8	red
5YR4.5/3	reddish brown	2.5YR5.5/8	red
5YR3.5/1	very dark gray	10R4.5/8	red

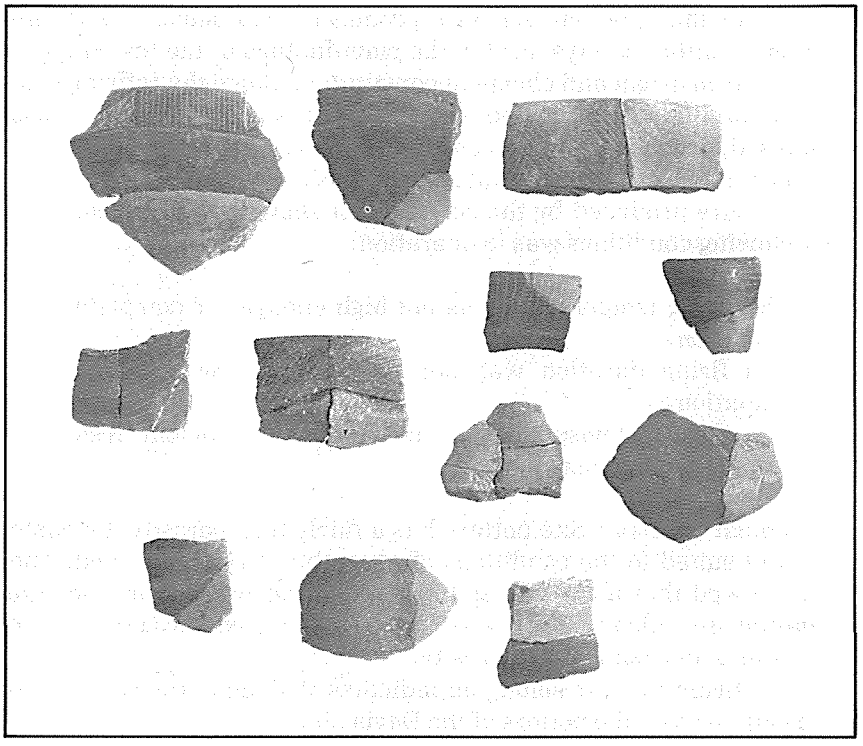

FIGURE 1. Holly Fine Engraved sherds from which chips were removed for the smudging test and then reattached. The dark section of each sherd is the original shade and the light section is the refired test chip.

CONCLUSIONS

The remarkable uniformity of the results of the porosity tests indicates that vessels of any or all of the various Davis Site pottery types could have been made from similar batches of prepared clay body or paste, and firing conditions of time and temperature were not greatly different for individual types. This indicates a striking homogeneity of technology and clay sources. By way of comparison of the seventeen types of pottery from Pecos whose average apparent porosity was tested by Shepard (1968: 128) the range of values was about 1 - 24% after refiring and about 21 - 40% before. The range of average apparent porosity of Davis Site pottery was 27 - 37% after refiring and 19 - 26% before.

The fact that the refiring tests produced such similar colors indicates constituent clays used in the manufacture of the tested types are similar in origin and chemical constitution. Since the refiring conditions definitely oxidized the test sherds, it is probably safe to use Colton's figures and to conclude that the iron content of the clay is greater than three percent (Colton 1939: 226).

The colors produced by the refiring test show that one or more of the following conditions was in operation:

1. The firing temperature was not high enough for complete oxidation.
2. The firing duration was not long enough for complete oxidation.
3. The firing atmosphere did not possess sufficient free oxygen for complete oxidation.

Although the Davis Site pottery has a fairly high porosity the paste was well suited to the conditions of aboriginal firing employed. The tests showed that if the higher temperature necessary for complete oxidation and clear colors was reached the paste would develop cracks and an even higher porosity.

The refiring test for smudging indicates that this process was indeed employed by the potters of the Davis Site.

REFERENCES CITED

Arnold, J. Barto III
1973 George C. Davis Site Ceramic Analysis — Excavations of 1968-1970. Unpublished Report in Lieu of Thesis. Department of Anthropology, The University of Texas at Austin.

Bruning, James L. and B. L. Kintz
1968 *Computational Handbook of Statistics*. Scott, Foreman and Company. Dallas.

Colton, Harold S.
1939 The Reducing Atmosphere and Oxidizing Atmosphere in Prehistoric Southwestern Ceramics. *American Antiquity*, Vol. 4, pp. 224-231.

Munsell Color Company, Inc.
1954 *Munsell Soil Color Charts*. Baltimore.

Nelson, Glenn C.
1971 *Ceramics: A Potter's Handbook*. Third Edition. Holt, Rinehart and Winston, Inc., Dallas.

Newell, H. Perry and Alex D. Krieger
1949 The George C. Davis Site, Cherokee County, Texas. *Memoirs of the Society for American Archaeology*, No. 5.

Shepard, Anna S.
1968 *Ceramics for the Archaeologist*. Publication 609 (6th printing). Carnegie Institution of Washington. Washington, D.C.

Story, Dee Ann
1972 A Preliminary Report of the 1968, 1969, and 1970 Excavations at the George C. Davis Site, Cherokee County, Texas. Report of Field Research conducted under National Science Foundation (GS-2573 and 3200) and Interagency Contract between the University of Texas at Austin and the Texas Building Commission and the Texas Historical Survey Committee, Austin.

Texas Historical Survey Committee

NOTES

PALEOECOLOGICAL CONSIDERATIONS AND EAST TEXAS ARCHEOLOGY

JOHN E. KELLER

ABSTRACT

Archeologists have frequently tended to generalize ecological considerations when applied to archeological problems. An example is presented which explains procedures and reveals some possible avenues of interpretation. Investigations into subsistence resources, strategies, and scheduling models are suggested and examples are presented. The value of local as well as generalized material is stressed and the possible consequences of such studies are indicated.

While paleoecology is, at present, in vogue in archeological thought, there are indications that the subject is not completely understood by all members of the archeological "fraternity" (Butzer 1975). There is often a tendency to pay only lip service to the concept and a disinclination to utilize the information collected to its fullest extent. The complexity of the situation is frequently blurred when generalized works like those of Blair (1950) are utilized to the exclusion of other sources. While the general utility of such sources is undeniable, they often have less than adequate information to contribute to the interpretation of localized conditions and the examination of the interrelations existing between the site and its environment.

The Davis site (41CE19) and the middle Neches River region provides an example of the type of local information valuable in the implementation of proper ecological studies. Previous information indicated little other than the site lies within the broadly defined Austroriparian biotic province (Blair 1950). Basically this is a source of index species information but it supplies very little about local conditions. For example, there is little information on the different biotic communities making up the separate components of the ecological system in operation, or the individual species comprising consumable subsistence resources.

The collection of this sort of information requires investigation of various sources. Actual on-the-ground survey can supply a great deal of information and may be valuable for the delineation of discrete biotic communities. However, simply tabulating the present species and their occurrence does not provide the whole solution. Past conditions may be examined in the light of present information but to

really evaluate the situation requires the input provided by modern ecological theory. In this respect the concepts of vegetative succession and climax stability (Odum 1963: 87) are particularly important. Vegetation typically follows an identifiable progression from initial colonization to establishment of a climax state (Odom 1963: 87-88). This progression can be predicted and as a result some extrapolation of the past from the present is possible. There are, of course, limits to the extent of this extrapolation. However, the stability of the climax state and the buffering effect of the dominant vegetation type, a mixed evergreen deciduous forest, would seem to indicate that the same conditions have persisted for some thousands of years (Odum 1963: 87-88). This interpretation, which receives confirmatory evidence from historic accounts (Keller 1974) indicated that conditions are to be expected in which various subtypes of a mixed deciduous/evergreen forest predominate. While definition of the biotic communities existing within this generally homogenous climax configuration is purely arbitrary, it is possible to distinguish some separation. On this basis four major zones, aquatic, bottomlands, terrace, and uplands, can be defined.

All of these zones are capable of supplying some subsistence material although some are definitely more important than others on this basis. Of perhaps equal importance are the ecotonal areas separating the major zones. Here, in keeping with the concept of edge effect (Odum 1959: 278) a high degree of species diversity and individual numbers have resulted in increased productivity. In light of these developments it seems obvious that strong ecological considerations were in operation in the selection of the Davis site location. However, the importance of the ready availability of such a broad range of natural subsistence materials from so diverse but adjacent communities can not be doubted. This would be especially true if wild subsistence materials were as important as investigation indicates. Hardwood nuts, as evidenced by archeological recovery, were indicative of this importance. Such an occurrence, especially in the light of the dietary value of such resources (Woods 1899: 74-75) is hardly surprising (Richard Ford, personal communication). A tremendous amount of humanly consumable energy was thus available to the inhabitants of the Davis site. Exactly how much of these potential resources were actually used is, of course, impossible to state. Some idea of the magnitude of caloric energy available can, however, be gained from the fact that only 5% of the total could supply approximately 15,000 persons on an annual basis. Large populations could be, thus, a distinct possibility, even without agriculture.

Despite the tremendous amount of energy available for exploitation, some scheduling is implied by the seasonal availability of subsistence resources. When dealing with floral materials, particularly those with high caloric values, scheduling is of primary importance. The problem seems particularly acute when dealing with foods that are high in carbohydrates and fats. Since the main sources of these materials, nuts and corn, are only seasonally collectable in the middle Neches region, a subsistence schedule may be hypothesized based on the availability of these foods.

Thus, if scheduling is conceived of in terms of carbohydrates and fat collection, the historic Caddoan practice (Swanton 1942: 131) of cultivating two distinct corn crops offers a considerable advantage in subsistence. The first or "little corn" crop might be expected to mature in early to mid-June, depending on when it was planted and local weather conditions (Newcomb 1961: 292). This crop would provide an excellent source of high energy at the time when calories were generally lacking in the natural system. A high amount of concentrated energy would also be valuable in meeting the demands of planting and maintaining the second or "flour corn" crop. By late August or mid-September this second crop would mature and would offer a high quality and easily stored source of caloric energy valuable in meeting the subsistence demands of the winter season. Crop failure cannot be completely discounted, but there was little chance of whole-scale failure.

It is in relation to reduced agricultural crop harvest that the basic value of the fall nut crop can be discerned. Probably this was normally a subsistence supplement, but the nut crop would, in times of crop failure, actually supplant agricultural products as a dietary resource. The differential maturation and reproductive rates of the various nut producing species (Goodrum, Reid, and Boyd 1971: 525) are particularly important in that total mast failure is precluded. Failures in one or even a number of species are not likely to seriously alter this essentially stable resource configuration (Goodrum, Reid and Boyd 1971: 525).

The concentration of naturally available carbohydrates during the fall also has important consequences for the exploitation of faunal resources. High population densities of such species as deer are expected to be concentrated in the areas of mast production (Smith 1974: 34). Deer population are, by virtue of their density and the onset of breeding season, especially susceptible to human predation at this time.

Nut collecting and hunting may then be viewed as two subsistence

activities that could be carried on nearly simultaneously in the same geographically restricted areas. A subsistence scheduling strategy utilizing this combination of resources would be highly successful for a relatively sedentary population which also relied on agricultural products.

While the models mainly incorporate what are believed to be primary activities, it should be clear that other resources were also utilized. Subsistence activities, particularly those involving resource collection could have been carried on throughout the year. Some activities such as mussel collection or exploitation of spring fish runs are incompletely understood and could well have had more importance than indicated by the models.

The projected scheduling strategy is highly viable since wholescale subsistence failure seems virtually precluded. Individual resource failure may occur, but the effects of this situation would be mitigated or completely nullified by recourse to other materials. An additional advantage is the predictable nature of the resource involved. People familiar with their environment, such as the inhabitants of the Davis site surely were, would be aware sometime in advance of probable yields and plan accordingly. A considerable amount of potential flexibility is provided to the cultural system in operation. A knowledgeable group would be able to alter its subsistence strategy quite easily in order to take advantage of an abundance of one resource, or to recover from another's failure. This allows for a maximization of resource potentials and the allocation of labor to non-subsistence activities.

As an example, the Davis site and indeed the whole middle Neches region is somewhat less than ideal in that the environmental reconstruction is more hypothetical than desirable. This is due to a variety of uncontrollable factors. Nevertheless, this example does illustrate the uses of ecological studies in archeology and serves to indicate some of the sources of information that should be utilized for proper evaluation. It certainly indicates the value of thorough as opposed to generalized investigation.

REFERENCES CITED

Blair, W. Frank
1950 The Biotic Provinces of Texas. *Texas Journal of Science*, Vol. 2, pp. 93-117.

Butzer, Karl
1975 The Ecological Approach to Archaeology: Are We Really Trying? *American Antiquity*, Vol. 40, pp. 106-111.

Goodrum, P. D., V. H. Reid, and C. E. Boyd
1971 Acorn Yields, Characteristics, and Management Criteria of Oaks for Wildlife. Wildlife Society of America, *Journal of Wildlife Management*, Vol. 35, pp. 522-527.

Keller, John E.
1974 Subsistence Paleoecology of the Middle Neches Region of Eastern Texas. Ph.D. Dissertation, The University of Texas at Austin.

Newcomb, W. W., Jr.
1961 *The Indians of Texas*. The University of Texas Press, Austin.

Odum, Eugene P.
1959 *Fundamentals of Ecology*. 2nd ed. W. B. Saunders Co., Philadelphia.
1963 *Ecology*. Holt, Reinhart and Winston, New York.

Smith, Bruce D.
1974 Middle Mississippi Exploitation of Animal Population: A Predictive Model. *American Antiquity*, Vol. 39, pp. 274-292.

Swanton, J. R.
1942 History and Ethnology of the Caddo Indians. *Bureau of American Ethnology Bulletin*, 132.

Woods, Charles P., and L. H. Merrill
1899 Nuts as Food. *Maine Agricultural Experiment Station Bulletin* No. 54. Orano, Maine.

Austin, Texas

COMMENTS ON WOODLAND CULTURES OF EAST TEXAS*

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ABSTRACT

The subject of this paper is the late Archaic adaptations of eastern Texas and western Louisiana. The material assemblage of the late Archaic cultures is discussed and compared to the Woodland tradition in the Eastern United States. The temporal and spatial occurrence of a Hopewell manifestation in east and southeast Texas is also discussed.

The Woodland tradition of the Eastern United States is characterized by cord-marked and fabric-marked ceramics, burial mounds, and other earthworks, and at least the beginning of agriculture (Willey 1966: 267). At the onset, if we are going to call the material in the following discussion "Woodland", we must broaden this definition by being less particular about surface finish on ceramics, less particular about the presence of mounds, and to impose a prerequisite of hunting-gathering efficiency which may have provided the basis for the incorporation of incipient horticulture.

The late Archaic in central and southern east Texas is characterized by a lithic assemblage consisting of contracting and parallel stem dart points (*Gary* and *Kent*) plus an assortment of non-diagnostic biface forms, many of which are apparently the failures in projectile point manufacture. No diagnostic uniface forms are recognized and one is struck by the virtual absence of unifaces in this assemblage. It should be pointed out that this is not so in the northern part of east Texas, especially in the post-oak savannah region, where numerous uniface tools — those we call gouges and adzes — occur.

For the convenience of this discussion I will refer to the lithic assemblage described for the central and southern part of east Texas (Figure 1) as the Gary assemblage. This assemblage has been found underlying ceramics, but it is also associated with ceramics. Sites are numerous and are usually located on small sandy knolls or ridges situated either in or at the edge of stream valleys. Surveys at Livingston Reservoir and Lake Conroe clearly show that sandy locations were preferred.

The widespread popularity of the Gary assemblage in both time and space serves as a good indication that the introduction of ceramics was not made by populations with different technology invading the

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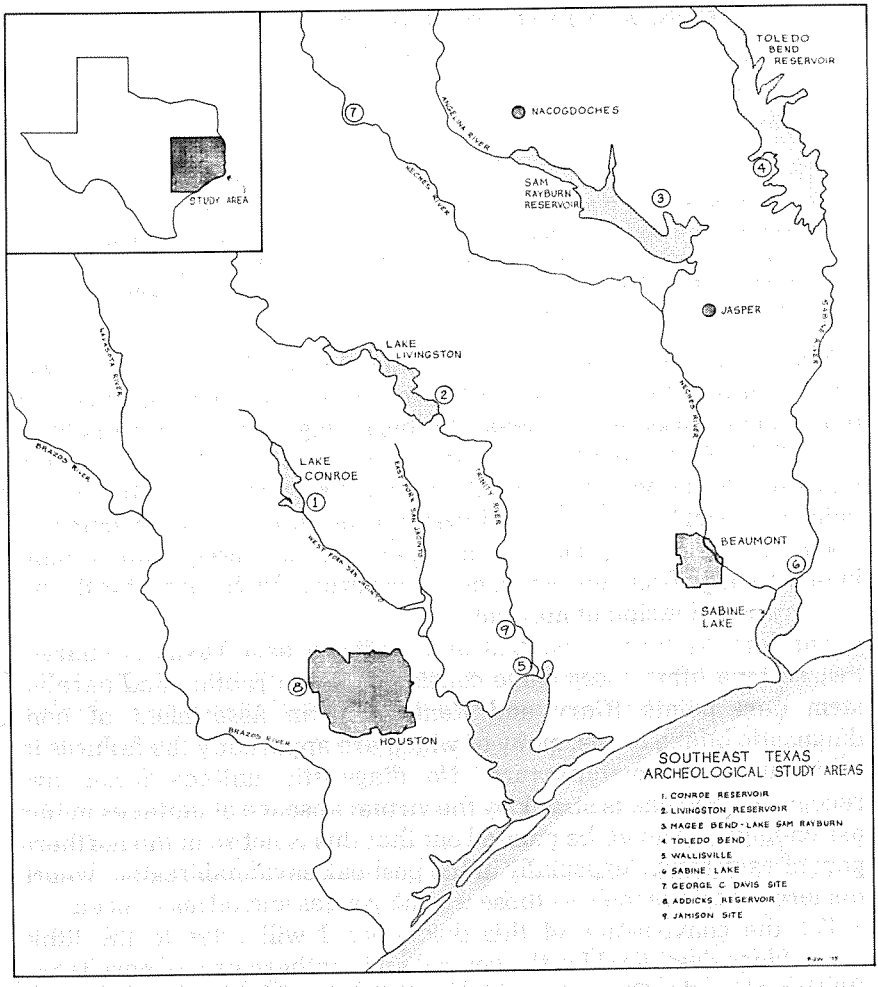

FIGURE 1. Southeast Texas showing location of archeological study areas.

area. The adoption of ceramic technology was made by indigenous populations and had no apparent affect on either the settlement pattern or stone technology. The same sandy knolls and ridges were occupied. Again, sites were usually small, but sites of several acres are known in both the Livingston and Conroe Reservoir districts.

Subsistence data on the Gary assemblage (both preceramic and ceramic) are virtually non-existent north of the coastal plain. Charred walnut shells and deer bones were recovered at Conroe

(Shafer 1968); deer was found at Livingston (McClurkan 1968); Webb *et al.* (1969) report hickory, walnut and pignut hulls from the Resch site in Harrison County; Story (1965) reports deer, raccoon, bison, tortoise, and fish at the Gossett Bottoms site in Kaufman County. The remains at the Gossett Bottoms site suggest rather extensive use of prairie-grassland and riverine environments which were located nearby.

Despite the paucity of ecological data in archeological sites the overall situation is not unlike other areas of the Eastern United States; a successfully adapted hunting-gathering subsistence with some degree of permanency (probably on a seasonal basis although the seasonal patterns cannot as yet be defined) which readily adopts ceramic technology at the utilitarian level.

There is regional variation in the early ceramics of east Texas, to be sure. In the northern part, the early ceramics are grog tempered vessels and *Williams Plain* seems to be the predominant type. In central and southern east Texas, sandy paste ceramics are the earliest. This sandy paste ware is evidently contemporaneous with the Tchefuncte Period on the coast and near Marshall in central east Texas. In both localities, *Tchefuncte* and *Tchefuncte*-like ceramics occur with indigenous sandy paste pottery.

The sandy paste ceramics are predominantely plain with both rounded and flat bases. Hemispherical bowls and cylindrical jars predominate. Shapes indicate vessels were utilitarian in nature (i.e., cooking and serving vessels) and traces of charred organic matter on sherds are frequent and support this supposition.

Incised, incised-punctated, and punctated decorations occur rarely; lip notching occurs occasionally, but seems to be more common along the coast. Previously defined types *Bear Creek Plain* described by Jelks (1965) at McGee Bend Reservoir, *Goose Creek Plain* (Suhm and Jelks 1962: 55, 57) and its many variations, and McClurkan's "Fat Orange" from Livingston Reservoir are all part of the sandy paste tradition.

In some areas of east Texas, particularly in the central portion, the sandy paste tradition is succeeded by grog-tempered and bone tempered Coles Creek and Caddoan ceramic assemblages. This change took place about A. D. 700-800. In the coastal region, grog tempered pottery becomes dominant about A. D. 950 (Aten 1971) although sandy paste pottery continues; it(sandy paste) remains the dominant ware in the lower Trinity and San Jacinto river basins.

The full distribution of sandy paste pottery in east Texas is not known at the early time level nor is this introductory period dated. It is apparently spread over much of the central and southern portions

by the time of the Marksville period in the Lower Mississippi Valley which begins about the time of Christ. *Marksville Stamped* pottery is found at Jonas Short (Jelks 1965), and Coral Snake (McClurkan *et al* 1966; Jensen 1968) mounds (Coral Snake was in Toledo Bend Reservoir on the Louisiana side and Jonas Short was in McGee Bend — Lake Sam Rayburn). This type (*Marksville Stamped*) has also been reported at the Resch site near Marshall (Webb, *et al* 1969), in the lower Sabine (Aten and Bollich 1969) and as far west as the Trinity at Livingston Reservoir (McClurkan 1968). It is also found in collections from Orange and Jefferson counties housed at the Texas Archeological Research Laboratory. In all sites mentioned above, sandy paste pottery is dominant.

Jonas Short and Coral Snake mounds are part of a vaguely defined Hopewellian expression in western Louisiana and eastern Texas. We do not know the full extent of it as yet; perhaps it encompasses the area included in the distribution of the sites mentioned where *Marksville Stamped* has been found. The Bellevue Focus defined by Fulton and Webb (1953) may be a part of a local variation of the same expression. The ceramics in the Bellevue Focus sites are predominantly grog-tempered and the mounds lack the exotic goods recovered from Jonas Short and Coral Snake.

The latter two sites (Jonas Short and Coral Snake) had cremations in central depressions as well as cremations and probably flexed burials at the base of the mounds (or perhaps on surfaces within the mounds). The accompanying artifacts together constitute an impressive array of exotic objects mixed with an indigenous lithic assemblage consisting of *Gary* and *Kent* projectile points and percussion chipped bifaces, mostly of local cherts and silicified wood. There are also sites in both reservoir areas which yielded sandy paste pottery and the Gary lithic assemblage.

Mounds similar in form are known as far west as the Neches, and the sandy paste pottery and local lithic assemblages virtually inseparable from that recovered from the above mentioned sites extends westward to the Brazos River. Let me emphasize again, however, that we do not know if this entire area was involved in the Hopewell interaction.

The Adena and Hopewell similarities exhibited at Jonas Short were noted by Jelks (1965); McClurkan (1966) and Jensen (1968) were also cognizant of the Hopewell-like nature of the Coral Snake assemblage.

This Hopewell expression shares basic underlying similarities with other Hopewell manifestations. The Hopewell as recognized by Struever (1964) and Caldwell (1964) represents a conglomeration of regional cultural traditions each adapted to their respective en-

vironments but which were interacting on a social level reflected in certain burial practices and material goods. The exotic materials in association with the burials reflects participation in an exchange network which transported objects over considerable distances; some degree of social stratification is also indicated. The main point to emphasize here is that like other regional cultures reflecting participation in the Hopewell interaction, the Hopewell of east Texas and western Louisiana represents a regionally adapted forest economy which adopted a position in the interaction.

In short, I am stating that the sandy paste ceramics and the Gary lithic tradition represents a local Woodland manifestation which was involved for a time in the Hopewell interaction. This sandy paste-Gary lithic assemblage continued after the demise of the Hopewell although the geographic extent diminished somewhat.

It is appropriate to point out that judging from radiocarbon dates from Coral Snake mound reported by Jensen (1968) and the Resch site by Webb *et al* (1969), this Hopewell complex had absolutely nothing to do with the Caddoan culture which appeared in these areas at least 400 and possibly as much as 1400 years later. One archeologist has stated that the Caddoan settlements are unmistakably the elements that supported the mounds (Gibson 1970). I am saying that, in view of the chronological data, it is impossible for the Caddoan Indians to build mounds and bury their dead in them hundreds of years before the people appear on the scene.

Findings in Livingston (McClurkan 1968) and Conroe (Shafer 1968) reservoirs indicate that in these areas, the sandy paste ceramics continue to be the dominant ware despite the introduction of grog-tempered and bone tempered pottery; this is probably equivalent to the time of the Caddoan development in the adjacent region to the north. In the southeast portion of the state, the Woodland expression survives probably until Historic times. This is inferred on the basis of a continuum of the sandy paste pottery. The indigenous Indian groups in this area were the Bidai, Deadose, Patiri, and Akokisa, all Atakapan speakers (Newcomb 1961: 315-329). It is suggested that these groups represent the historic survival of Woodland culture in east Texas.

REFERENCES CITED

Aten, Lawrence, E.
1971 Coastal Southeast Texas Archeology. Paper presented at the Caddoan Conference, Magnolia, Arkansas.

Aten, Lawrence E. and Charles Bollich
1969 A Preliminary Report on the Development of a Ceramic Chronology for the Sabine Lake Area of Texas and Louisiana. *Bulletin of the Texas Archeological Society*, Vol. 40, pp. 241-258.

Caldwell, Joseph R.
1964 Interaction Spheres in Prehistory. *Hopewellian Studies, Illinois State Museum Scientific Papers*, Vol. XII, No. 6, pp. 133-143.

Fulton, Robert L. and Clarence H. Webb
1953 The Bellevue Mound: A Pre-Caddoan Site in Bossier Parish, Louisiana. *Bulletin of the Texas Archeological Society*, Vol. 24, pp. 18-42.

Gibson, Jon
1970 The Hopewellian Phenomenon in the Lower Mississippi Valley. *Louisiana Studies*, Vol. IX, No. 3.

Jelks, Edward B.
1965 Archeology of McGee Bend Reservoir. Doctoral Dissertation, University of Texas, Austin.

Jensen, Harold P.
1968 Coral Snake Mound, X16 SA 48. *Bulletin of the Texas Archeological Society*, Vol. 39, pp. 9-44.

McClurkan, Burney B.
1968 Livingston Reservoir, 1965-66. *Papers of the Texas Archeological Salvage Project*, No. 12, The University of Texas at Austin.

McClurkan, Burney B., William T. Field, and J. Ned Woodall
1966 Excavations in Toledo Bend Reservoir, 1964-65. *Papers of the Texas Archeological Salvage Project*, No. 8, The University of Texas at Austin.

Newcomb, W. W. Jr.
1961 *The Indians of Texas from Prehistoric to Modern Times*. The University of Texas Press.

Shafer, Harry J.
1968 Archeological Investigations in the San Jacinto River Basin, Montgomery County, Texas. *Papers of the Texas Archeological Salvage Project*, No. 13, The University of Texas at Austin.

Story, Dee Ann
1965 The Archeology of Cedar Creek Reservoir, Henderson and Kaufman Counties, Texas. *Bulletin of the Texas Archeological Society*, Vol. 36, pp. 163-258.

Struever, Stuart
1964 The Hopewell Interaction Sphere in Riverine — Western Great Lakes Culture History. In: *Hopewellian Studies, Illinois State Museum Scientific Papers*, Vol. XII, No. 6.

Webb, Clarence H., Forrest E. Murphey, Wasley G. Ellis, and H. Roland Green
1969 The Resch Site, 41 HS 16, Harrison County, Texas. *Bulletin of the Texas Archeological Society*, Vol. 40, pp. 3-106.

Willey, Gordon
1966 *An Introduction to American Archaeology*, Vol. 1: North and Middle America. Prentice-Hall.

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IN MEMORIUM
Miles P. Locke

Miles P. Locke, a long time resident of Waco, died January 4, 1975 after suffering a stroke. His death represents a real loss to archeology in Texas and particularly in central Texas. He is, and will continue to be, missed.

Miles was born in Hillsboro and received his High School Diploma from Stamford High in 1939. He graduated wtih a Degree in Civil Engineering from Texas A&M and later was awarded a M.S. Degree in Economics from Baylor University in 1957. He served in the infantry during WW II and was recalled for one year during the Korean Affair. He was a First Lieutenant.

He was a registered professional engineer of Texas and served as Vice President, President and Director of the Central Texas Chapter of the Society of Professional Engineers. He served as a committeeman for the Texas Society of Professional Engineers and was a member of both the State and National Society of Professional Engineers.

In spite of his busy professional career Miles was able to find time for his favorite activity, archeology. He was president of Central Texas Archeological Society for the 1967-1968 year and again for the 1972-1973 year. He was a director during the 1974-1975 year. From 1967 until the time of his death he was publisher of the monthly newsletter of the Central Texas Archeological Society. He was program chairman from 1967 until his death. In addition to his active participation in the affairs of the local society, he served as Regional Vice President of the Texas Archeological Society for the years 1969-1970 and 1970-1971.

One of his favorite summer activities was the annual TAS Field School and he attended them regularly. In 1971 he was "Camp Boss" when the Field School was near Kerrville. He was Chairman of the TAS Field School Committee in 1972 and again in 1973.

Although Miles was an amateur archeologist, he took a professional attitude towards its study. His death is a loss to professional and amateur alike because he knew and worked with both.

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BOOK REVIEWS

The Museum Journal XV, 1974: History and Prehistory of the Lubbock Lake Site. edited by Craig C. Black. West Texas Museum Association Lubbock, 1974. 160 pages, ill.

Today the topic of Early Man and his culture in the Americas is still a much studied and debated subject among both the layman and professional anthropologists. Recent work in the Andes of Peru by R. S. MacNeish has yielded radiocarbon dates in association with man-made artifacts from periods of the past over 19,000 years old and recent racemization dates from human skeletal material in California have been announced by G. F. Carter which are more than twice as old as the Andean material. Not all archeologists are ready to accept either or both of these studies as the earliest evidence of man in the New World yet one thing is becoming certain: the long established and traditionally accepted maximum dates of 10,000-15,000 years for man's presence in the New World is in serious jeopardy. Along with the controversy as to when man first entered the North American continent is the controversy as to what kind of a culture these early people possessed. The Lubbock Lake report offers some new ideas and raises new questions about the culture of early man in North America.

The Lubbock Lake report presents a collaborative effort by eight separate authors. The first three articles provide a general summary of previous work conducted at the site prior to the 1970's and is essential background information since it helps to explain the importance of the site and the reasons for the renewed studies currently in progress. Represented in these articles is one on the historical background of the Lubbock Lake site by W. C. Holden, one on the early WPA excavations conducted in the late 1930's and early 40's by J. B. Wheat and finally a brief summary by J. H. Holden on the artifacts recovered from the Lubbock Lake site prior to the 1970's. The remaining articles of this volume cover a variety of aspects mostly related to the results of the current renewed excavation efforts during the 1970's. There are two articles, one by C. Johnson and the other by C. V. Haynes, Jr., on the geologic interpretation of the paleoenvironment and depositional sequence of the area during the past 15,000 years; another of the articles, by E. Johnson, is an interpretation of the zooarcheology and listings of the specific types of faunal remains thus far recovered at the Lubbock Lake site; and finally there are two general articles on the Paleo-Indian period, one by W. J. Judge on projectile point form and function and the other on faunal changes during the last 15,000 years in North America by E. L. Lundelius, Jr.

The Lubbock Lake report is well suited for use as a reference source since its chapters are easy to read and are arranged in a chronological sequence. The subject matter is well illustrated (except on page 70 where the photograph is too dark, and pages 84 and 109 where the site map is over-

reduced and thus is illegible in areas) and contains sufficient bibliographies. However, there are a few discrepancies in the text which tend to confuse the reader. For example, on page 94 Johnson states that no diagnostic artifacts have yet been recovered from Stratum 3 of the Lubbock Lake site yet on page 137 Haynes states that Portales type artifacts were found in Stratum 3. Again on page 90 Johnson says that a radiocarbon date of 12,650 ± 250 years was obtained from clam shells in Stratum 1, whereas on page 137 Haynes states that a radiocarbon date of 12,650 ± 250 years was obtained from mollusc shells in the middle of Stratum 2. In another instance, on page 136, Haynes describes the Lubbock Lake Stratum 1 as consisting of three units (sand, gravel, and an overlying layer of gray sand), while on page 90 Johnson discusses the presence of only the gravel and sand deposits of subunits 1a and 1b of Stratum 1 even though his schematic diagram on page 88 shows three subunits (1a, 1b, 1c) of Stratum 1. I realize that these examples of inconsistencies probably represent misprints or minor oversights yet for the layman or researcher who is trying to use the data in this book it becomes a confusing problem of deciding which statements are correct and which are not. My only other criticism is that two of the articles (by Judge and Lundelius) do not specifically deal with the Lubbock Lake site yet are included in this book entitled, "History and Prehistory of the Lubbock Lake Site." Although both articles are of interest and add new information to the subject of the Paleo-Indian Period, they seem out of place in this volume.

No book, especially one containing the ideas of a number of different authors, is ever perfect and minor errors will almost always exist. Furthermore, as any reviewer knows, it is far easier to criticize the work of someone else than it is to actually write an article for a book. Thus, on all accounts the merits of this book far outweigh its minor faults and I would recommend it to anyone wanting a useful reference dealing with Lubbock Lake and the more general topic of the Paleo-Indian Period.

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Archeological Investigations Along Armand Bayou, Harris County, Texas. Edited by Frank Hole. Technical Report Number Two, Department of Anthropology, Rice University, Houston, Texas. Report Number Two, Houston Archeological Society, September, 1974. ix + 97 pp. No price given.

Archeological Investigations Along Armand Bayou is an eighteen site report publication based on joint field work by Frank Hole, Michael J. O'Brien, and Bonnie Laird Hole of Rice University and members of the

Houston Archeological Society. Although the title implies a broad study along the bayou, the major portion of the monograph is a basic archeological treatment of excavated artifactual and shell debris from a second season of work at 41 HR 82, the Fullen site.

The report is edited by Frank Hole and is divided into three sections. The introductory section by Hole is a rather simplistic review of the appropriate problems of Upper Gulf Coast archeology. Emphasis is placed on the need and rewards of (1) employing an ecological approach to archeological problems, (2) utilizing historical documentation on the area, and, (3) developing a data recovery technique that would distinguish "thin layers across a horizontal surface" (p. 7) which might reveal "separate events in the accumulation of the site" (p. 7).

The reader may be disappointed to find tenuous connection with Hole's introductory statements and the results of research as reported by Michael O'Brien and Bonnie Hole.

The section on sites surveyed and excavated, by O'Brien, is a traditional approach beginning with generalized statements on the geological and environmental characteristics of the area. Survey data on the 18 sites are reported only briefly and are not analyzed in great depth; the bulk of the section is devoted to excavations at the Fullen site. The treatment of data from this site is primarily descriptive in nature and contains brief statements about the ecological setting, history of previous work at the site (O'Brien 1971), reasons for choosing the locale for additional research, and an assessment of the function of the site and its place in the cultural history of the region.

O'Brien's section is by far the most lengthy and most informative in the monograph. One of the more creative and potentially useful aspects of O'Brien's work is a much needed attribute analysis of systematically recovered ceramic materials from coastal sites. This is particularly relevant since ceramics are currently the most diagnostic artifacts from sites in the region. Additionally, O'Brien analyzes the various artifact and shell "layers" or "zones" arriving at three distinct occupational phases and reflects "that the basic ways that the Indians used the site did not change throughout its history" (p. 70). This analysis and interpretation of occupational layers or zones is interesting, though not entirely convincing.

The reviewer is disappointed in that O'Brien made no attempt whatever to postulate a more precise chronological period of occupation for the site. With the relatively well-established ceramic chronology for the area, coupled with his sherd attribute analysis and previous reserach, it seems fairly certain that a more precise temporal placement of the site in regional chronology could have been advanced. An additional major weakness is that O'Brien does not adequately combine his previous research at the Fullen site with what he has reported in this monograph. One would think that the relationship between two different seasons of work at the same site would have been explored more fully. Despite some problems, this section does provide substantial documentation for future investigations along Armand Bayou.

Probably the most interesting aspect of the study, although seemingly tangential to the principal focus of the monograph since it assumes roughly 20% of the total text, is the final section by Bonnie Hole, entitled "Analysis of the Molluscs." Much of the section is devoted to examination of the recovered *Rangia cuneata* refuse (i.e., shellfish valves) from 41 HR 82 for purposes of delineating separate depositional and/or occupational layers and what this might mean with respect to "prehistoric utilization of the area" and "past environments" (p. 81). The primary focus is on (1) individual valve condition (whole or crushed), age, and size for a specified sample of shellfish debris from each excavated layers at 41 HR 82, and, (2) suggestive field techniques for improving shell midden analysis, all of which have significant implications for future research. That temporal and spatial changes do occur in the numbers, condition, age, and size of molluscs within "shell middens," as remarked upon by B. Hole, there can be little argument.

Also, she raises some very interesting questions regarding the interplay of the "over-collecting" of molluscs by prehistoric groups, environmental conditions, and presumably demographic factors within individual clam populations that were being exploited (p. 93). It is, however, important to remember that not all changes in an estuary subsistence system, such as that of the Armand Bayou area, need to have environmental causes (which B. Hole is aware of (p. 91-96). The study of the interaction of human groups and a basic marine environment in a cultural system is significant, but it is just as significant to understand that there may be other aspects of that system that have an indirect and as yet archeologically unrecognized impact on these particular interactions and thus the observed data. "Variability" may also be accounted for by product redistribution networks among discrete groups occupying different biotic zones along or near the bayou, or even differential exploitation of these zones by one group and so on. Granted that there was no direct evidence reported to indicate such phenomena, the problem warrants consideration just as much as the questions raised by B. Hole in this section.

The treatment of the shell material is definitely one of the main assets of this monograph, but this reviewer wonders if it might not have been just as useful to deal with the relevance of these marine items as a dietary source and as an indicator of seasonality of subsistence exploitation along the bayou by prehistoric groups. Methodological procedures for such approached are available in a number of recent publications pertaining to various coastal regions in North America and Europe.

In format, the monograph as a whole is well designed for its purpose and the paper quality and illustrations are good. I found a few typographical errors.

In summary, the strength of this volume is in its descriptive analysis and concern for distinguishing discrete depositional shell and artifact layers in a "shell midden," especially in the sections by O'Brien and B. Hole. In spite of the richness of new material it brings together on one area of the coast, one finishes this work with the feeling that it might have done more. The fault lies less with the individual sections, which on the whole are quite interesting,

than with the lack of substance to convey a sense of the volume's conclusions or overall results.

Thus, the impact of this work will vary according to the background of the reader. For those unfamiliar with Upper Gulf Coast archeology, the work provides some insight into current research problems and the nature of prehistoric sites and artifacts in the study area. For the areal specialist, it has greater potential as a sampler of future research possibilities in the region. Finally, even with its faults, it has aided in setting new methodological standards for excavating coastal sites and reveals how much our expectations of archeological reports by professionals have changed over the past few years.

References Cited

O'Brien, Michael J.
1971 The Fullen Site, 41 HR 82. *Bulletin of the Texas Archeological Society*, Vol. 42, pp. 335-366.

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Field Methods in Archaeology. Thomas R. Hester, Robert F. Heizer and John A. Graham. Mayfield Publishing Co., Palo Alto. 1975, 6th edition, 408 pp.

A new edition of *Field Methods in Archaeology* is to many archeologists of my generation equivalent to a remake of a James Dean flick: what needed to be said was said; so why try to revive the old thoroughbred for another trot around the track? After all, most archeologists trained in the last decade or so used the fourth and then the fifth editions with great effect. The basics were all there, the special skills had to be acquired elsewhere anyway, and the unique field situation — being unique — could be met only in the field, not in a textbook. Then of course there was that rather intemperate review of the fifth edition by Binford (1968: 806-808), which seemed to suggest that "cookbook approaches" to field techniques were all wrong, that we couldn't get "all the data" as such standard methods implied, and more than that we had to let our problems condition — nay, determine — our methods. So out cookbook, out bathwater, out, it would seem, baby too. But with all this, why still another edition of *Field Methods*?

One can very easily supply himself with the answer by examining this latest version. "Version" is perhaps the word to use, rather than merely "edition," for the authors have extensively edited, rewritten and expanded the original chapters or replaced them altogether with essentially new essays

by other scholars. To cite a few examples, gone is the rather makeshift approach to mapping and site layout of the earlier editions and in its place is a very professional treatment of the topic by Lewis Napton. My only real quibble with Napton is that in his discussion of preparing maps for publication, he uses a handlettered example (Figure 4-14, page 62), which is only a moderate improvement over the sketch of the same map (Figure 4-5, page 48) shown earlier. Surely, use of a Leroy lettering device or press-on letters is called for in a figure meant to represent a type specimen of a publishable map.

A more adequate treatment of faunal analysis is also provided in the new edition. Alan Ziegler enlarges the discussion to include, not merely the care and feeding of faunal remains in the field, but an outline of their treatment and analysis in the laboratory as well. His summary of some techniques for rendering raw data into comparable form (pp. 186-191) is especially useful and may also be germane in other classes of artifactual material. Collins follows a somewhat similar track in his reworking of the chapter on human skeletal material, stressing that in addition to their uses in archeology such remains are important for studies of human micro-evolution in general. Perhaps unique in essays on burials, Collins includes a caveat alerting excavators to observe "local statutes regarding human remains" (p. 163): a sign of the times certainly, and of the burgeoning legalism which threatens to engulf us all.

Adams' essay on stratigraphy combines an excellent review of the basics of observation and recording with some sallies into problem areas such as the use and applicability of sampling strategies. Adams also suggests an intriguing linguistic analogy in which he makes a kind of emic-etic distinction between stratigraphic units and interpretative units in archeology (p. 155). Finally, a list of solid references on stratigraphic problems is presented, although personally I would like to have seen works germane to the problems of areal and regional cross-correlations of stratigraphy included as one of the categories. A minor point: we must credit Nicolaus Steno in 1669 with the earliest modern formulation of the concept of stratigraphy (Haber 1959: 21; Steno 1916) rather than William Smith in the 1790's as Adams (p. 148) suggests.

Most of the other chapters in the book have been similarly improved or updated with the curious exception of Sonia Ragnir's now classic "Review of Techniques for Archaeological Sampling" (Chapter 15). Although this remains a useful treatment of the subject, it would seem to me that the widespread, almost knee-jerk, application of sampling in contract archeology and in the preparation of environmental impact statements would justify an expanded evaluation of the strengths and weaknesses of the approach. Finally, three new appendices have been added, including one with tables of equivalents and conversion factors (which is an invaluable aid to those like myself who have difficulty recalling that a meter equals 3.28 feet and such like).

Why a new edition of *Field Methods*? Why, indeed. This last decade of

massive numbers of archeological field projects, both problem-oriented and "public," combined with an almost surrealistic theoretical foment have demonstrated to this archeologist at least that some kind of agreement over fundamentals is essential to the discipline. Moreover, it seems apparent that the most fundamental kinds of questions that can be asked about any individual's research is *not* whether his "paradigm" has been derived from the old archaeology or the new one, from Marxism, from settlement archeology or even, God forbid, from structuralism a la Levi-Strauss. Rather, they are: does he maintain adequate provenience, does he record standard kinds of data in a form intelligible to others, does he make decent maps and know how to draw stratigraphic profiles, and so on and on. A gulf separates those archeologists who have mastered such fundamentals from those who have not, and this gulf is far greater, far more unbridgeable than those real and imagined theoretical differences which also divide us.

A science is, after all, a kind of language and in it, as in any form of communication, mutual intelligibility is of the essence. The words used must have connotations which are shared, the categories of meaning must be mutually comparable. The "words" of the archeological language are the field and laboratory data we collect; the spatial, temporal and distributional relationship into which we organize these words are our sentences. The "grammar" by which we generate and order these sentences is made up of our theory and our methodology. By updating and refining a methodological classic, Hester, Heizer and Graham will have enhanced the clarity and coherence of archeological "speech" for years to come.

References Cited

Binford, Lewis R.

1968 Review of "A Guide to Field Methods in Archaeology: Approaches to the Anthropology of the Dead" by Robert F. Heizer and John A. Graham. *American Anthropologist*, Vol. 70, pp. 806-808.

Haber, Francis C.

1969 Fossils and Early Cosmology. In Bentley Glass, Owsei Temkin, William L. Straus, editors *Forerunners of Darwin: 1745-1859*. The John Hopkins Press, Baltimore, pp. 3-29.

Steno, Nicolaus

1916 The Prodromus of Nicolaus Steno's Dissertation Concerning a Solid Body Enclosed by Process of Nature within a Solid. Translated by J. Winter. *University of Michigan Studies, Humanistic Series.*

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