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Evelyn Lewis
Editor

About the Cover: The attractive cover design was drawn by Richard McReynolds, the *La Tierra* staff artist. He and Richard Dobie, a flintknapper from Three Rivers, Texas, discussed their ideas as to how a Native American might have approached the technique for striking blades from a core. Richard also drew the illustrations on pages 18, 21, 23, and 24.

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IN MEMORIAM

MARY FRANCES CHADDERDON

1916-1992

Mary Frances Chadderdon, known to all her friends as M.F., passed away in Kerrville, Texas on November 5, 1992. A memorial service was held in that city on November 15, attended by several members of the Southern Texas Archaeological Association (STAA).

M.F. was born in Delaware, Oklahoma on August 4, 1916, the daughter of Clarence C. Reid and Laura Jonas Reid. She graduated from Seminole (OK) High School and in 1937 received a BS degree in Education from the University of Oklahoma. She later married Jack Chadderdon and they had two children, a son, Jim, and daughter, Marty. M.F. lived in Houston for a number of years, and trained as a potter at the Museum of Fine Arts. She moved to Kerrville in 1971 and operated the Potter's Wheel, a studio and shop until 1973.

In 1973, M.F. moved to San Antonio and entered The University of Texas at San Antonio (UTSA) in September, to pursue the study of archaeology. In December of that year, she was a founding member of the STAA, and served as its Treasurer from 1974-1977. She was involved in a number of field projects, including the first UTSA summer field school at Chaparrosa Ranch (1974), as a staff member at Baker Cave (1976), the UTSA St. Mary's Hall field school (1977), and in 1979 and 1980, at the Maya site of Colha, Belize.

At UTSA, M.F. became the first, in 1981, to receive an MA degree in the archaeology program. Her thesis was a synthesis of the 1976 Baker Cave excavations; published in 1983, it remains a key reference in lower Pecos archaeology. M.F. helped set up the Archaeology Laboratory at the UTSA Center for Archaeological Resarch, putting together its filing system for site records and collections. She had many friends among her fellow archaeologists at the Center, entertaining us on New Year's Day with bowl-game extravaganzas—especially if OU was playing.

M.F. moved back to Kerrville in 1986. She had recently served as president of the Unitarian Universalist Fellowship in Kerrville.

The announcement of M.F.'s death was accompanied by a photograph (shown here) of her which T. C. Hill, Jr. described best: "...an excellent color photo of my old buddy wearing that blue jacket...short haircut with the wind blowing it around, and a 'mean grin' like she was saying 'let's go raise some hell.'" Her friends in archaeology will greatly miss M.F. and her enthusiastic embrace of life.

Thomas R. Hester

RADIOCARBON DATE? READ THE FINE PRINT

Archaeologists generally consider radiocarbon dates the most useful and accurate indicators of antiquity for objects of organic origin. This date is based on the amount of radioactive carbon-14 remaining in a sample as a measure of the time which has passed since the death of the living organism. The carbon-14 measurement itself can be made with good precision.

The problem is to convert the radioactive carbon content in the sample to the length of time since death in terms of a date before present. The half-life of the radiocarbon is the length of time required for one-half of the carbon-14 to disintegrate. Willard Libby, the father of carbon-14 dating, initially determined this value to be 5,568 years. For several years, and several thousand samples, this value has been used for dating. In 1967 a more accurate determination found the half-life was 5,730 years. However, so many samples had been documented with the original "Libby" half-life that it was decided, for reasons of consistency, to stay with the incorrect date.

During the late 1960s atmospheric nuclear weapons tests doubled the concentration of carbon-14 in the air so that all organisms living since that time have more radioactivity than before the nuclear testing. To adjust for this, the modern reference materials are from 1950, which is now zero on the Before Present (BP) time scale.

Originally it was assumed that all living organisms had the same level of carbon-14 during their lifetime. However, studies on plant and animal physiology showed that there were definite variations in the amount of carbon-14 taken up from the environment by different organisms. To monitor this, samples now have the amount of non-radioactive carbon-13 measured to determine the amount of carbon-14 initially present. This isotopic variation is great enough that different organisms of the same age can have carbon-14 values equivalent to several hundred years difference in age. The use of carbon-13 to adjust the calculated age is referred to as *correcting* the date.

Even as these refinements were emerging, studies of the carbon-14 in the tree rings used for dendrochronology disclosed that there were major and minor variations in the amount of carbon-14 in the environment during the past 10,000 years. Detailed graphs now exist to relate the *corrected* age as calculated to the *calibrated* age from dendrochronology. This range is now in the process of being extended to 20,000 years using coral growth and other absolute dating techniques for cross-dating.

This layer upon layer of adjustments to reach a calendric date has led some archaeologists to revert to the earlier, more basic (but less accurate?) reporting for carbon-14 dates. Clearly, to understand the applicability of any carbon-14 date to a particular archaeological situation, or to compare radiocarbon dates, it is necessary to know which of these adjustments have been applied to the raw carbon-14 data. It is essential to read the fine print!

An excellent condensed discussion of current carbon-14 dating practices is *Radiocarbon Dating* by Sheridan Bowman, University of California Press/British Museum, 1990. A comprehensive presentation of dating methods is in *Radiocarbon After Four Decades*, edited by R. E. Taylor, A. Long, and R. S. Kra, Springer-Verlag, 1992.

Don Lewis
Associate Editor

NOTES ON SOUTH TEXAS ARCHAEOLOGY: 1992-4

Paleo-Indian Engraved Stones from the Gault Site

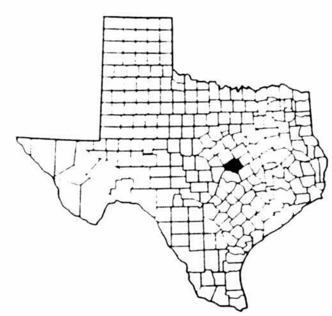
Thomas R. Hester, Michael B. Collins and Pamela J. Headrick

The Gault site (41BL323) is located along Buttermilk Creek in Bell County, central Texas. First excavated by the University of Texas in 1929 (collections at the Texas Archeological Research Laboratory), it has suffered greatly in recent years from extensive digging by relic collectors. Most such activity has focussed on Early Archaic through Late Prehistoric deposits; of special interest to the collectors have been the Early Archaic deposits that have yielded large numbers of Andice points. In other parts of the site numerous Paleo-Indian projectile points have been found, including Clovis, Folsom, Midland, Plainview and Angostura, along with specimens resembling Hell Gap and Golondrina. In one of these areas, David Olmstead (Temple, Texas) reported to us that he had found (or knew of others having found) four Clovis points (Figure 1, a, b; b is made of Alibates agatized dolomite; Collins et al. 1991), along with a wide array of cores, flakes, blades, preforms, a burin spall, biface fragments, and a unifacial Clear Fork tool. In addition to this chipped stone assemblage, he found several engraved limestone pebbles and cobbles. When Hester and Collins first visited this part of the site, four additional engraved specimens were found in the collectors' backdirt.

The possibility that these engraved cobbles were associated with an *in situ* buried Clovis component led Hester and Collins to carry out controlled excavations at this locality in May and June, 1991. Supported by a grant from a private donor, and with funding from the University Research Institute, The University of Texas at Austin, the excavations were able to document the stratigraphy and examine cultural materials identified in four zones. Zone 1, at the base, is a culturally sterile silty clay. Zone 2 can be divided into two distinct subzones, and of particular interest in Zone 2a, a silty clay in which a complete Clovis point, a fragment of a Clear Fork tool, three Clovis blade fragments, and a Plainview-like specimen [the latter requires further typological study given the antiquity Paleo-Indian specialist George Frison has suggested for similar forms, which he terms "Goshen"]. These data are reported in Collins et al. (1992). Though our work was hampered by a high water table, requiring the constant use of water pumps, Zone 2a appears to be the stratigraphic unit from which Mr. Olmstead and others had previously found Clovis points and engraved cobbles. Indeed, we were able to find two such engraved stones in this zone during our excavations. Zone 3, overlying Zone 2, was mixed, through erosion and secondary deposition, and contained a wide array of Paleo-Indian and Early Archaic point types, including a large blade core very likely of Clovis age, and four more engraved stones. Zone 4, at the top of the deposits, contained snails, burned rock, and Middle and Late Archaic dart points.

Including the specimens shown us by Mr. Olmstead, and those we found in excavation and in backdirt piles in this part of the site, at least 15 engraved cobbles have now been recovered. There are likely others, as we retained all pebbles and cobbles from the excavations that resembled, in any fashion, the engraved artifacts! These were heavily encrusted with carbonates and will have to be carefully cleaned to see if there are further engraved stones in the collection.

We have illustrated three of the engraved stones in Figure 1 (c-e). Specimens *c* and *e* were found by Mr. Olmstead; *d* is a specimen collected by us. Additional illustrations appear in Collins et al. (1992). The specimens vary widely in shape and in size (including fragments,



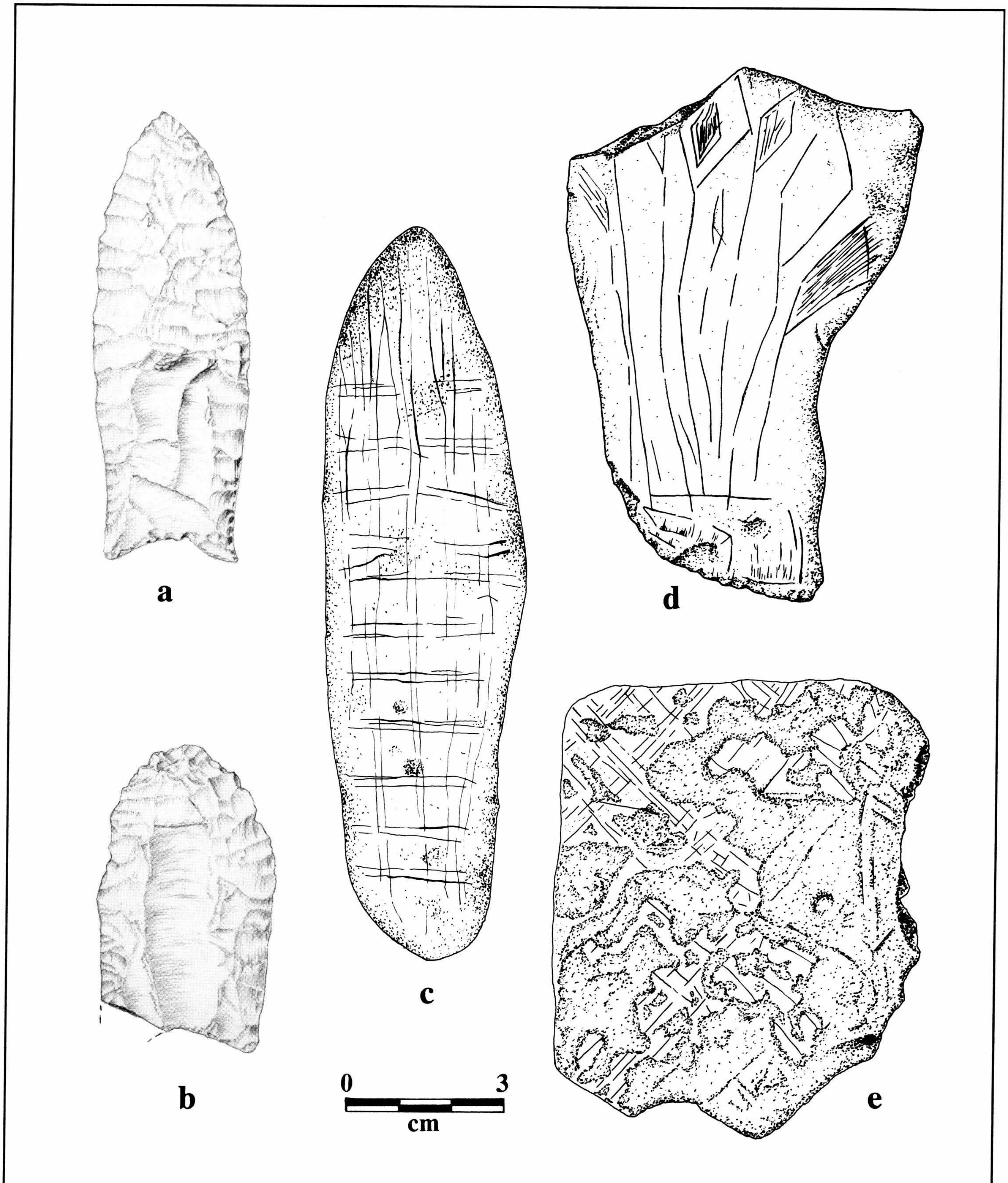


Figure 1. Projectile Points (a, b) and Engraved Stones (c, d, e) from the Gault Site (41BL323). Illustrations drawn by Pamela Headrick.

and complete specimens ranging from 4.5 - 16 cm in length). They have complex engraved designs, usually on one smooth surface. In a number of cases, there are sharply-incised lines that are parallel or sometimes intersect; some have curving lines, and at least one has circles connected by lines..One specimen found by Mr. Olmstead (Figure 1, c) has a grid of carefully engraved lines; one specimen we collected, Figure 1, e, also has a grid pattern, obscured by carbonate incrustation. Another of Mr. Olmstead's specimens (Figure 1, d) has been referred to as the "wheatstone," since the motifs look like plants. However, we note that they might also be spear or dart shafts. A third specimen, not illustrated here, appears to depict an animal in profile.

Our excavations appear to have confirmed Mr. Olmstead's observations that engraved stones are associated with Clovis occupations in this area of the Gault site. We cannot rule out, at this point, that they might continue somewhat later into the Paleo-Indian period. For example, at the Wilson-Leonard site (41WM235), 40 km (25 miles) southwest of the Gault site, a large chert flake with rectilinear lines engraved on the cortex side, seems to date to Folsom times. The only other Clovis site that has apparently yielded an engraved stone is Blackwater Draw (specimen illustrated in Figure 93g; J. Hester et al. 1972).

There are, of course, a variety of engraved stones in the central, lower Pecos, and south Texas archaeological record, many of which have been documented in the pages of *La Tierra* (e.g., Chandler 1991). Where these can be dated, they are Archaic and Late Prehistoric in age. Thus far, the engraved stones from the Gault site are the only ones that can be convincingly linked to Paleo-Indian times—and now with some certainty, dated as early as Clovis.

ACKNOWLEDGEMENTS

We are grateful to Peter Bostrom and David Olmstead for bringing this fascinating situation to our attention and to Mr. Olmstead for permitting casts to be made of his specimens (on file, TARL; copies of the casts are available through Bostrom's Lithic Casting Laboratory, Troy, IL). Shelton Properties (especially Emmett Shelton and Jeffery Dochen) is to be thanked for its financial support, as is the University Research Institute, which funded the casting of the Olmstead specimens and later provided significant support for the excavations). We were greatly aided by R. C. Harmon, Robert J. Mallouf and staff from the Office of the State Archeologist, C. Vance Haynes, Jr., and our hardworking crew of students and volunteers.

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Evelyn Lewis, Editor

CURRENT DATA ON EARLY USE OF THE BOW AND ARROW IN SOUTHERN NORTH AMERICA

Leland W. Patterson

ABSTRACT

Data are summarized on the present state of knowledge regarding the initial use of the bow and arrow in southern North America. Although not widely accepted, there is increasing evidence for introduction of the bow and arrow in the Archaic time period, at least as early as 2000 B.C.

INTRODUCTION

In a previous study (Patterson 1982), it was noted that the introduction of the bow and arrow to southern North America is commonly stated to begin at approximately A.D. 500, with the start of the general use of small standardized types of bifacial projectile points. Evidence for much earlier use of the bow and arrow in southern North America was then presented in that study. Additional data on early use of the bow and arrow has been obtained since the previous study (ibid.), and it is now appropriate to give a current summary of information on this subject.

Introduction of the bow and arrow to southern North America at a much earlier date than is generally assumed would negate some of the cultural impacts that have been attributed to introduction of this technology. For example, Ford (1974:402) states for sometime around A.D. 400 that "One new technological change that could have been used to disrupt trade arteries was the replacemant of the atlatl by the bow and arrow, introduced from Asian and Arctic sources into the Midwest at this time." Fiedel (1987:243) concludes that the Hopewell decline in the Midwest at about A.D. 400-600 coincides with the replacement of the spear thrower by the bow and arrow. Cultural impacts from early use of the bow and arrow are discussed in this paper in terms of demographic evidence. If there was a gradual replacement of the atlatl by the bow and arrow, as discussed by Cressman (1977:106) for the Great Basin, many popular interpretations for the initial use of the bow and arrow are doubtful. In some geographic regions, such as the Southeast Woodlands (Hudson 1976:76,116) and Southeast Texas (Patterson 1980; Aten 1983:306), the bow and arrow never completely replaced the atlatl.

There is an increasing body of evidence for use of the bow and arrow in southern North America at a much earlier date than is accepted by the common archaeological dogma. Many investigators reject early dates for the bow and arrow without giving any consideration to the time that might be required for diffusion and adaptation of a new technology by local cultures. It apparently seems to some archaologists that bow and arrow technology suddenly appeared and was immediately adopted by all cultural groups that were exposed to this new technology. As previously noted (Patterson 1982:19), the literature gives the impression that there is a "magic line" at about the 50th parallel which impeded southward diffusion of the bow and arrow for a considerable time period of several thousand years.

The possibility of diffusion of the bow and arrow from Asia into the North American Arctic and then southward is widely recognized (Ford 1974; Fiedel 1987:146; Patterson 1982:19). There is considerable controversy, however, on the timing of this diffusion pattern. As discussed here, there are basic problems in recognizing the earliest forms of bow and arrow technology. The early use of unifacial arrow points, with later standardization of bifacial arrow point types, is supported by currently available data.

IDENTIFICATION OF BOW AND ARROW TECHNOLOGY

Unfortunately, wood components of bow and arrow systems are seldom preserved in the prehistoric record. There are only a few examples of arrow shafts at prehistoric sites in southern North America, with preservation of wood artifacts being more common in dry caves in the west. Some examples of preserved arrow shafts are dated much earlier than A.D. 500. Aikens (1970:Figure 113) recovered arrow shafts at Hogup Cave in Utah with earliest dates of 650 B.C. for Stratum 10 and 2660-1250 B.C. for Stratum 8 (ibid.,Table 2). Lewis and Kneberg (1957:32,48) recovered a cane arrow shaft at an Early Woodland site in Tennessee dated to 100 B.C.

At most prehistoric sites, use of the bow and arrow must be determined by the morphologies of projectile points. There are two general problems associated with this type of analysis. These problems are: (1) distinguishing between arrow points and small dart points, and (2) identifying all forms of arrow points, including unifacial forms.

Distinguishing between arrow points and small dart points seems best done on a regional basis (Patterson 1985:88), due to possible local variations in technology. In general, however, arrow points are smaller than dart points, because good balance is needed for arrows. A study for Southeast Texas (Patterson 1985) shows that most arrow points in this region have thicknesses less than 5 mm, stem widths under 9 mm, and weights under 2.3 grams. Thomas (1978) has shown that a distinction between arrow points and small dart points can be made using some ethnographic data. Thomas (1978:469) gives a mean weight of 2.07 grams for arrow points with a standard deviation of 0.28 grams. Most regions of southern North America have not had this type of study, so that in most regions there are not good analytical criteria established for distinguishing between arrow points and small dart points. There is astudy of this type available for the Northwestern Plains (Knight and Keyser 1983). Without good analytical criteria it is possible to overlook early arrow point specimens. Although there are ethnographic examples of use of heavy arrow points (some over 4 grams), these seem to be specialized cases where long-range arrow trajectory is not important. Dennis Stanford (personal communication) notes from his experience in Alaska that Eskimos used heavy arrow points when firing on caribou herds at very short range.

Projectile point weight is a good attribute to consider on a regional basis. Studies by Patterson (1985) and Thomas (1978) indicate that most projectile points with weights under 2.3 grams are good candidates for use as arrow points. Many archaologists seem to use time rather than technical attributes of projectile points in judging whether a specimen is an arrow or a dart point. For example, there is little justification in classifying a projectile point that weighs under 2 grams as a dart point, rather than an arrow point, simply because the specimen dates earlier than A.D. 500.

A major problem in identifying early use of the bow and arrow is in the identification of all forms of arrow points, including unifacial forms which are often simply pointed marginally retouched flakes. Data from excavations and surface collections in Southeast Texas show that unifacial arrow points are fairly common in this region (Patterson 1989). Some examples of unifacial arrow points from site 41HR315 (Patterson 1980) are shown in Figure 1. One

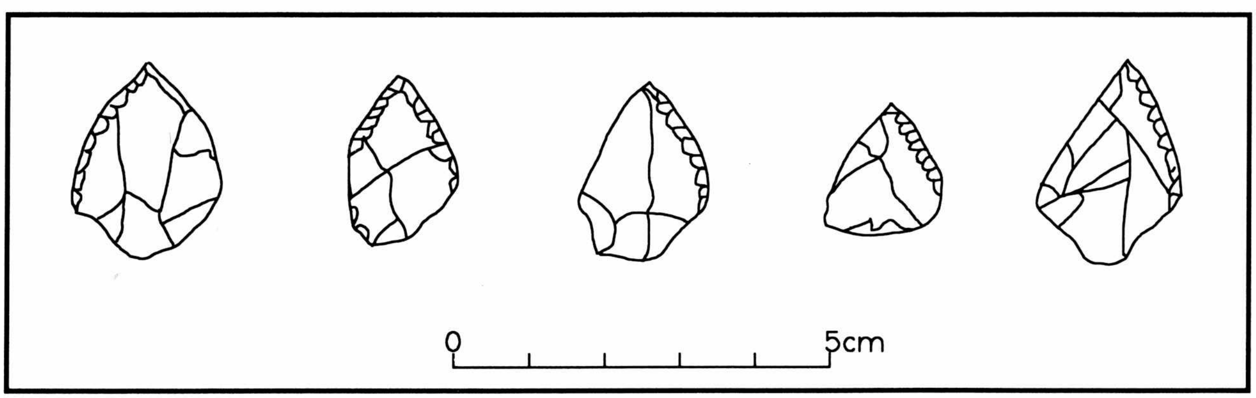

Figure 1. Unifacial arrow points from site 41HR315.

small pointed flake from site 41HR210 (Patterson 1975:Figure 1) had asphalt on the basal end, which could be evidence of hafting on an arrow shaft. Unifacial arrow points in Southeast Texas are made from flakes and small prismatic blades, using fairly steep marginal retouch. This type of point can be quickly replicated using a chert flake as a pressure flaking tool (Patterson and Sollberger 1980). All of the examples of unifacial arrow points in Southeast Texas fall within the upper dimensional limits established for bifacial arrow points (Patterson 1985) of 5mm thickness and 2.3 grams weight.

Wenke (1990:568) has noted that a study by Odell (1988) indicates that archaologists have often looked at the wrong stone tools in trying to reconstruct ancient hunting. Odell's study identifies a class of arrow points as being small retouched flakes that exhibit impact fractures of the same types as obtained in experimental use of the bow and arrow (Odell and Cowan 1986). The use of unifacial arrow points (retouched flakes) is thus supported by use damage patterns as well as artifact form. Odell's (ibid.) study of a large number of retouched flakes from the Lower Illinois Valley seems to agree with Patterson's (1982) study of unifacial arrow points from Southeast Texas.

It would seem that most archaologists overlook unifacial arrow points simply because they are not looking for this type of artifact. It is easy to overlook unifacial arrow points in a lithic flake collection. Often, close examination with a magnifier is required to determine if a pointed flake is fortuitous or the product of purposeful retouch. More often, however, the analytical problem is psychological. Many investigators are not prepared to recognize retouched flakes as arrow points. It is not clear why this psychological barrier exists in southern North America, since unifacial arrow points have been used throughout the world, with especially well-known examples in the Eurasian Mesolithic period. There are even ethnographic examples of unifacial arrow points in the New World, such as the Lacandon Maya (Gibson 1976; Patterson and Sollberger 1980).

CHRONOLOGIES OF BIFACIAL ARROW POINTS

There is increasing evidence that bifacial arrow points in some regions of southern North America did not start as late as the common assumption of A.D. 500-700. In the Great Basin several sites have indications of early use of the bow and arrow. There are small points weighing under 2 grams at least as early as Stratum 8 (2200-1250 B.C.) at Hogup Cave in Utah (Aikens 1970). Dalley (1976:71) shows the use of the bow and arrow as early as 650 B.C. at Swallow Shelter in Utah. Webster (1980:65) has reported dates for the bow and arrow as early as 3300 B.P. in western Idaho at the northern end of the Great Basin. Grosscup (1960:32) has given a date of 500 B.C. for the first use of the bow and arrow at Lovelock Cave in Nevada. Hester and Heizer (1973:8) see the introduction of the bow and arrow in the Great Basin at about A.D. 500. Their conclusion seems to be based on not being willing to accept that the bow and arrow and atlatl were in concurrent use in the Great Basin for a long time period, as discussed by Cressman (1977:106). As noted above, concurrent use of the bow and arrow and the atlatl is known from some regions of the United States, such as Southeast Texas (Patterson 1980; Aten 1983:306) and the Southeast Woodlands (Hudson 1976:76,116).

Aikens (1970:35-41) shows several bifacial projectile point types at Hogup Cave that have wide ranges in weight, such as Elko Corner-Notched (1.9-6.1 grams), Elko Side-notched (1.9-5.6 grams), Pinto Barbed (1.1-4.1 grams), and Residual Side-Notched (1.2-4.2 grams). There is a possibility that some of the lighter specimens were being used as arrow points at the same time that heavier specimens were being used as dart points. Another possibility would be that the range of weights represents a developmental sequence from heavier dart points to lighter arrow points.

Hughes and Willey (1978:185) give a radiocarbon date of A.D. 120 for bifacial arrow points in the Texas Panhandle, about 500 years earlier than other dates given in Texas for the beginning use of the bow and arrow. In Central

Oklahoma, an even earlier radiocarbon date of 840 B.C. has been given by Taylor (1987:9) for a bifacial arrow point.

There are a number of locations in the midwestern and eastern United States where diminutive projectile points occur in the Late Archaic period, well before A.D. 0. Examples include the Riverton culture in Illinois and Indiana (Winters 1969:41), New York (Ritchie 1969:Plate 29-10-11), and Wisconsin (Wittry 1959). Further investigations should be conducted to determine if these diminutive point types are related to the bow and arrow. Diminutive projectile points are also known from the Archaic period in southern Ontario, Canada (Wright 1978:Table 1). Swanson (1972:210) proposed that start of a new distinctive small projectile point series may indicate possible use of the bow and arrow as early as 6000 B.C. in Idaho.

Data from the Riverton culture in Illinois and Indiana give a good example of possible early use of the bow and arrow. The Terminal Archaic Riverton culture dates from about 1600 to 1000 B.C. (Winters 1969). Merom and Trimble Side-Notched projectile point types from the Riverton culture (Justice 1987:130) are diminutive types that could easily be classified as arrow points. Many specimens of these point types from a site in Bartholomew County, Indiana have thicknesses under 5 mm and neck widths under 9 mm (Bergman, Rue and Doershuk 1991). Merom and Trimble Side-Notched points from this site have a weight range of 1.5 to 3.8 grams, with 70 percent of 30 specimens weighing less than 2.3 grams (C.A. Bergman, personal communication). Many Merom and Trimble Side-Notched points would be classified as Scallorn-like arrow points if found in Texas. This site also has somewhat larger Lamoka-like points with characteristics similar to Merom and Trimble Side-Notched points. This is a situation similar to some sites in the Great Basin, with the possibility that different size points of similar shapes were being used as arrow and dart points.

Two untyped, stemless bifacial arrow points were found in the Archaic period strata at site 41HR315 in Southeast Texas (Patterson 1980:Figure 7G, Figure 10I). These specimens may be early examples of development of bifacial arrow points from initial unifacial point technology.

Even farther south in Mesoamerica, Tolstoy (1971:Table 2) shows Bassett, Fresno and Perdiz arrow point types in the Middle Preclassic at 850 to 400 B.C. If diffusion of the bow and arrow was from the north, the bow and arrow should start even earlier than this time period in southern North America.

DIFFUSION OF THE BOW AND ARROW

I have previously proposed that the bow and arrow diffused from the Arctic southward through North America with an industry to produce small prismatic blades (Patterson 1973,1982). Earliest use of the bow and arrow in the New World seems to derive from Asiatic technology. Chard (1969:129) feels that the bow and arrow may represent a single invention with subsequent rapid worldwide diffusion. Unifacial arrow points and inset blades have been found in Siberia at about 9000 B.C. (Aksenov 1969:Figure 1). Even earlier examples of stemmed arrow points have been found in Kamchatka dating to 12,000 B.C. (Chard 1974:37). Earliest use of the bow and arrow in the New World appears to be with the use of bone points with inset segments of microblades. Barbed arrow points dating to approximately 8000 B.C. have been found at the Trail Creek site in Alaska (Larsen 1968:54). Inset blades of the early Akmak phase of the Onion Portage site in Alaska may have had use for barbed arrow points (Anderson 1970:58) similar to Trail Creek in time.

Southern diffusion of the bow and arrow was relatively rapid. Small bifacial points associated with the bow and arrow are found in the Maritime Archaic of Labrador as early as 5000 B.C. (Fitzhugh 1972, 1978). This probably represents an already standardized technology, compared to initial diffusion of the bow and arrow with use of unifacial points. One of the earliest examples of use of the bow and arrow in southern North America is in Colorado at the Magic Mountain site. Irwin-Williams and Irwin (1966:Figure 42) show small unifacial points made from small prismatic blades that could easily have functioned as arrow points, dated at approximately 3500 B.C. After about 2000 B.C., examples of prismatic blade industries with possible unifacial arrow points are found throughout the Southeast United States.

CHRONOLOGIES OF UNIFACIAL ARROW POINTS

Industries for the manufacture of small prismatic blades occur throughout the Southeast United States in the Late Archaic period, with unifacial points that seem to be associated with the bow and arrow. For the Poverty Point culture (1500-500 B.C.), Gibson (1976) has made a functional comparison of "Jaketown perforators" and ethnographic examples of unifacial arrow points of the Lacandon Maya Indians. A number of microtools associated with the Poverty Point microblade industry (Webb and Gibson 1981:Figure 3) could easily have functioned as arrow points. Some of the unifacial artifacts referred to as "perforators" in the Archaic period at other locations in the Southeast states could have been used as arrow points, such as those illustrated by Watson (1974:Figure 4) for Florida. In California, Singer (1979) reports microblades in use over a long time span that could have been used as inset blades for arrow points. David T. Hughes (personal communication) has noted examples of small unifacial and bifacial points from site 34JN28 in Johnston County, Oklahoma, with many specimens coming from the Early Ceramic level and some possibly coming from as early as the Middle Archaic at several thousand years B.C.

It is now known that unifacial arrow points are fairly common in Southeast Texas, as shown in Table 1 for published sites in the regional data base (Patterson 1989). Many specimens are from multi-component surface collections with undetermined time periods for the unifacial points. Several time periods could be represented for unifacial points, since many of these sites start in the Late Paleo-Indian or Early Archaic and continue through the Late Prehistoric. Specimens of unifacial arrow points from single component surface collections represent the Late Prehistoric (A.D. 600-1500), Early Ceramic (A.D. 100-600), and Late Archaic (1500 B.C.-A.D. 100) time periods. The Late Prehistoric time period is represented by excavated specimens of unifacial points from 41HR273 (Ensor and Carlson 1991:Figure 42), 41PK88 (McClurken 1968:Figure 48), 41WH19 (Patterson et al. 1987:Figure 4), and 41WH12 (Patterson and Hudgins 1989). At site 41HR315 in Harris County (Patterson 1980:Table 6), there are excavated specimens of unifacial arrow points from the Late Prehistoric, Early Ceramic, Late Archaic and Middle Archaic time periods. A good example of a unifacial arrow point (Figure 2) was excavated from the Early Ceramic level at site 41WH73, deeper than Late Prehistoric strata that contained conventional bifacial arrow points (to be published in Houston Archeological Society site report). This specimen has a small area of bifacial retouch

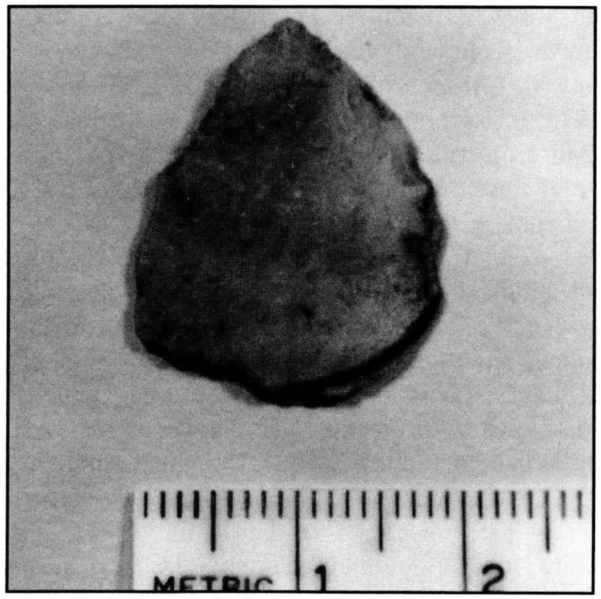

Figure 2. Unifacial arrow point from site 41WH73.

at the tip and marginal retouch on both lateral edges. Unifacial arrow points continue to be overlooked by many investigators in Southeast Texas. Based on excavations at 41HR315, the bow and arrow started sometime in the Middle Archaic (3000-1500 B.C.), with prismatic blades and unifacial arrow points both starting in this time period.

Similar conclusions on the use of unifacial arrow points (marginally retouched pointed flakes) have been made by Odell (1988) for the Lower Illinois Valley, compared to data from Southeast Texas. Odell (ibid.:350) notes that unifacial points begin to increase about 4,000 years ago, and rose dramatically in Middle Woodland and Mississippian times. Odell's conclusions are based on a study of several thousand specimens.

Table 1. Unifacial Arrow Points from Southeast Texas.

Site	Work (A)	Time Period(s) (B)	No. of Points
41AU7	S	Mixed LA, EC, LP	1
41HR182	S	Mixed LA, EC, LP	2
41HR183	S	Mixed EC, LP	4
41HR185	S	Mixed LA, EC, LP	7
41HR206	S	Mixed LA, EC, LP	24
41HR208	S	LP	1
41HR209	S	Mixed LA, EC, LP	8
41HR210	S	Mixed LA, EC, LP	14
41HR215	S	Mixed EC, LP	1
41HR223	S	Mixed LA, EC	8
41HR244	S	Mixed LA, EC, LP	13
41HR245	S	Mixed EC, LP	2
41HR248	S	LP	3
41HR250	S	LA	2
41HR255	S	LP	7
41HR267	S	EC	1
41HR273	E	LP	2
41HR293	S	LP	3
41HR315	E	MA, LA, EC, LP	54
41HR525	S	Mixed LA, EC, LP	1
41PK88	E	LP	7
41WH12	E	LP	1
41WH19	E	LP	2
41WH37	S	Mixed LA, EC, LP	1
41WH73	E	EC	1
TOTAL			170

(A) S = surface collection
E = excavated

(B) LP = Late Prehistoric (A.D. 600-1500)
EC = Early Ceramic (A.D. 100-600)
LA = Late Archaic (1500 B.C.-A.D. 100)
MA = Middle Archaic (3000-1500 B.C.)

Another candidate for early use of the bow and arrow is the Hopewell culture of Illinois and Ohio. As previously noted (Patterson 1987), the Ohio Hopewell culture had a significant prismatic blade industry, but investigators have not determined the functional uses of prismatic blades here. Small prismatic blades could have been used as elements for arrow points by the Hopewell (100 B.C.-A.D. 400), especially since the bow and arrow appears to have been in use during the same time period farther south in Tennessee (Lewis and Kneberg 1957).

CULTURAL IMPACTS OF EARLY USE OF THE BOW AND ARROW

As noted above, if the bow and arrow started in southern North America much earlier than generally recognized, then proposed cultural impacts of the start of the bow and arrow at about A.D. 500 are not valid. Wenke (1990:565) has noted a sharp increase in population in eastern North America from about 800 B.C. to A.D. 800. This covers the Early and Middle Woodland periods in the East and the Late Archaic and Early Ceramic periods in Southeast Texas. Wenke (ibid.:568) then notes, based on Odell's (1988) study for unifacial arrow points, that "The use of such projectile points seems to have increased dramatically after about four thousand years ago, and by the first few centuries A.D. the bow and arrow may have been adding enough extra production to some economies that significantly higher population densities were possible." This concept fits well with the Late Archaic Poverty Point culture and the Early Woodland Hopewell culture. These cultures were able to develop complex societies, with extensive trade and monumental earthworks, without much subsistence support from agriculture. More efficient hunting by use of the bow and arrow would have given significant subsistence support. Hunter-gatherer bands in Southeast Texas also increased dramatically in population during the Late Archaic (1500 B.C.-A.D. 100) and Early Ceramic (A.D. 100-600) periods (Patterson 1991:Figure 1).

SUMMARY

The following is a summary of conclusions that can be made on initial use of the bow and arrow in southern North America:

1. The bow and arrow diffused southward in North America from the Arctic, arriving in southern North America about 4,000-5,000 years ago.

2. Initial diffusion of the bow and arrow was with unifacial points, with later standardization of bifacial arrow points.

3. Initial diffusion of the bow and arrow was related to technology for small prismatic blades.

4. The bow and arrow did not diffuse through southern North America at an even rate.

5. In many areas of southern North America, the bow and arrow did not immediately replace the spearthrower weapon system.

6. The bow and arrow made important economic contributions to cultures of the Late Archaic and Early Ceramic/Early Woodland time periods.

7. Initial use of the bow and arrow is not recognized in many regions of southern North America simply because appropriate research has not been done.

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TWO POSSIBLE GUADALUPE TOOLS FROM HAMILTON COUNTY

Ellen Sue Turner and Ollie Schrank

ABSTRACT

Guadalupe Tools are unique gouge-like artifacts that occur in the Early Archaic and are found most frequently along the San Antonio and Guadalupe Rivers with the heaviest concentrations in two areas, the lower and middle Guadalupe River and the upper drainage system of the San Antonio River. Reported finds have been restricted to South Texas and the tool was previously assumed to have a limited temporal and spatial distribution. This report is provided to document a possible new locality of the tool.

INTRODUCTION

Two tools, surface collected on Oleta Seilheimer's farm, were loaned to me for study by her brother, STAA member Ollie Schrank. Repeated rejuvenation has removed many diagnostic attributes of the tools but the overall morphology is that of the Guadalupe Tool (Hester and Kohnitz 1975). Seilheimer and Schrank found the tools on two visits to the site, which is located two miles southwest of Pottsville in Hamilton County (see Figure 1 for reported county locations of this tool with relation to Hamilton County). The soil is very thin at this hillside location and caliche is only two or three inches from the surface (Ollie Schrank, personal communication). Heavy rains of the past two years probably exposed the artifacts.

In the same general area a few additional artifacts have been surface collected, in the needle grass and in the gulley at the foot of the hill. Among these are broken points, tools and a possible Carrollton, Godley and Early Triangular of gray/brown chert—all so heavily patinated that the flake scars are obscured and identification is nearly impossible.

DESCRIPTION

Guadalupe Tools are thick and percussion-flaked and have abruptly truncated distal ends or bits that angle from the dorsal edge toward the proximal end (Campbell 1962; Hester 1980; Black and McGraw 1985; Turner and Hester 1985). The bit is usually unifacially worked, often by the removal of narrow, blade-like flakes around the curved distal bit, and the working edge angles are generally steep, ranging roughly from 55° to 85°. Obvious damage, scarring and frequent evidence of resharpening are visible on this working edge. The tool may be biconvex, keel-shaped or nearly triangular in cross section. Black and McGraw (1985) have done an extensive study of the Guadalupe Tool and have provided a formal definition of this form.

Definitive studies by Brown (1985) describe and compare metrically and microscopically three caches of these tools from Medina, Bexar and Atascosa Counties. Brown provides us with a manufacturing sequence and landmarks, as well as measurements on the Guadalupe Tool. Using his terminology (ibid.:82), measurements were taken on the Seilheimer tools (Figure 2) and follow below:

	Spec. 1	Spec. 2
Dorsal length (mm)	101.56	102.14
Ventral length (mm)	93.80	92.38
Maximum Bit Width (mm)	35.87	26.10
Maximum tool width (mm)	37.98	38.04
Maximum thickness (mm)	21.20	26.92
Bit thickness (mm)	21.52	18.38
Maximum depth of bit facet cavity (mm)	(almost none)	1.93
Facet/ventral angle (degrees)	105	112
Bit spine-plane angle (degrees)	78	72
Weight (grams)	80	90

Specimen 1 has a small, chisel-like proximal end and Specimen 2 has what appears to be a burin on the proximal end. Both specimens are elongate-oval bifaces of light gray homogeneous, patinated chert with incomplete but well-defined bits formed on their ventral sides that angle from the dorsal edge toward the proximal end.

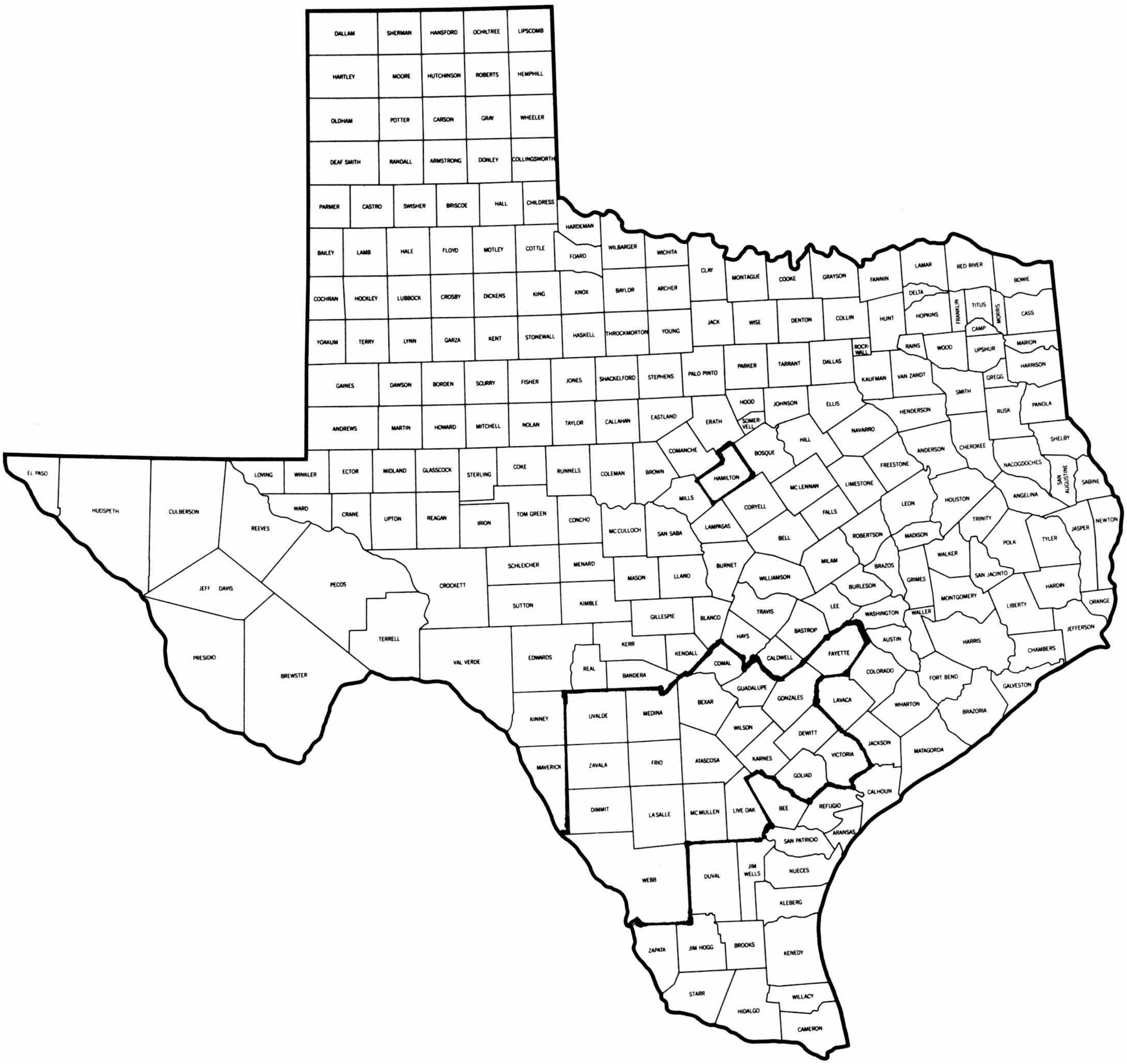

Figure 1. Outlined counties show distribution of South Texas sites containing Guadalupe Tools (Turner and Hester 1985:216). Isolated county above is Hamilton County.

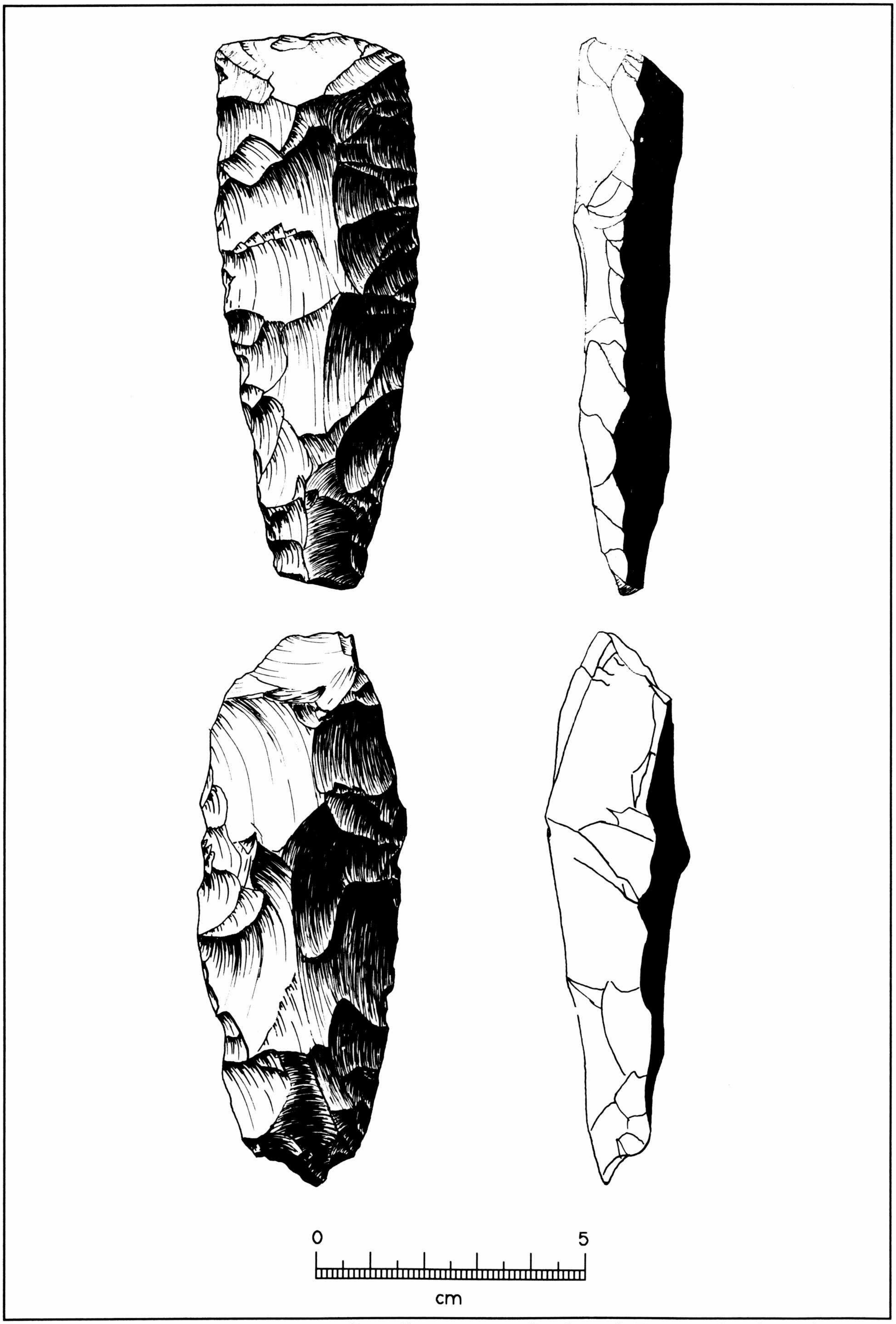

Figure 2. Guadalupe Tools from Hamilton County. Top, Specimen l; Bottom, Specimen 2. Both shown side view also.

COMMENTS

Typing these two tools is a difficult call because they have been extensively rejuvenated (Ken Brown, personal communication). Neither specimen has an intact or smooth bit and the cutting edge of both specimens has been altered with restoration. Prismatic trimming is absent or difficult to identify, and the diagnostic smoothing of the lateral edges is not present. However, while Specimen 1 (Figure 2) looks more like a Clear Fork than Guadalupe Tool, one can argue that the overall morphology of both heavily patinated artifacts indicates that the two specimens are probably extensively rejuvenated Guadalupe Tools.

The function of this tool form has not been determined. They are generally thought to have been some sort of adz-like woodworking tool—which seems to be the best explanation advanced yet, but Sollberger and Carroll suggest another use:

> Regardless of hide thickness or size, the Guadalupe tool would make a fine membrane cutter-slitter...it may have been used primarily as a membrane-lifting tool....After the membrane had been slit at necessary intervals, the nose of the Guadalupe tool was inserted in a slit and pushed under the membrane .... While this report is largely speculative, it is based on careful observation of shapes and wear patterns on a sizeable number of Guadalupe tools and other lithic artifacts. [Sollberger and Carroll 1985:21-22].

Brown's detailed studies involving microwear analysis on the three caches of Guadalupe Tools from south Texas arrived at the following conclusions:

> ...trying to recognize use wear on such roughly made artifacts as the Guadalupe Tools...is a difficult task...microwear examination for this kind of tool class—*percussive cutting tools*—is weighted with uncertainty... while all the Guadalupe tools reviewed here can be considered equivalent in *manufacture*, each cache seems to have its own microwear signature that distinguishes it from the others, suggesting these are *tool sets*, not simply random collections of tools [Brown 1985:116, 117].

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A POLYHEDRAL BLADE CORE FROM NORTHEAST SAN ANTONIO, BEXAR COUNTY, TEXAS

C. K. Chandler

ABSTRACT

This paper describes and illustrates a polyhedral blade core from northeast San Antonio, Bexar County, Texas. Cores of this type are generally considered to be of Paleo-Indian cultural association.

ARTIFACT DESCRIPTION

This core (see Figure 1) is roughly cone-shaped with a sub-round polygonal striking plat - form. It is made of light grayish tan, grainy Edwards chert of good, but not excellent, quality. It is perhaps tougher than the finer grained cherts, and might be better suited to indirect percussion technique in the production of blades. This material is locally available and there are several lithic quarry sites recorded in this northeastern area of San Antonio. There is no patina and no remaining cortex. Standing the core on its platform end it is 122 mm tall. The platform angles around the circumference vary from 77° to 82° when measured with a goniometer. The platform diameter varies from 50 to 61 mm and its circumference is 190 mm. Maximum diameter below the platform is 64.6 mm. It weighs 516 grams. There are presently five full length blade facets around two-thirds of the artifact circumference. Two of these are from blades struck from the distal end. All of these facets were produced by the removal of true blades. These blade facets are from 110 to 122 mm in length and average 116.4 mm long. They are 17 to 29 mm wide with an average width of 24.6 mm. There are no negative bulbs of percussion on these facets. The striking platform has been totally rejuvenated by knocking off the original platform below the negative bulbs of percussion of the original blades. This is evidenced by a single, large flake scar across the face of the platform that forms a shallow depression with slightly protruding edges. After this operation, several short maintenance flakes were struck from the periphery of the platform by direct percussion. This produced a series of small negative flake scars around the circumference of the platform face. These slightly concave striking surfaces are more suitable for the punch and hammer technique of indirect percussion in the removal of blades (Collins 1990; Goode and Mallouf 1991). Attempts at removal of additional blades were not successful. There are several scars all around the core at the platform end where these blade removal efforts terminated in the blades snapping off from 8 to 45 mm below the platform. None of these attempts resulted in the removal of a blade full length of the core. This has produced a greater core diameter below these failed attempts, that further interfered with successful blade removal. There are several other short flakes that originate from the distal end. These appear to be an effort to reduce this prominent material mass protruding well beyond the edge of the striking platform where the failed blade removals terminated. The final outcome was probably the conversion of the core to other use. It appears to have seen additional use as an obtuse angle scraper. Two of the adjoining ridges have small flake scars in their central area that prompted further investigation.

This blade core has four nearly full-length adjoining ridges that have angles varying from 116° to 146°. All of these ridges have been microscopically examined and exhibit varying degrees of modification. The one ridge with 116° of angle is lightly rounded and polished, and has short striations in one area at right angles to the ridge. The adjoining ridge has an angle of 146° and is without noticeable modification. The third ridge has an angle of 123° and has a slight crown in its

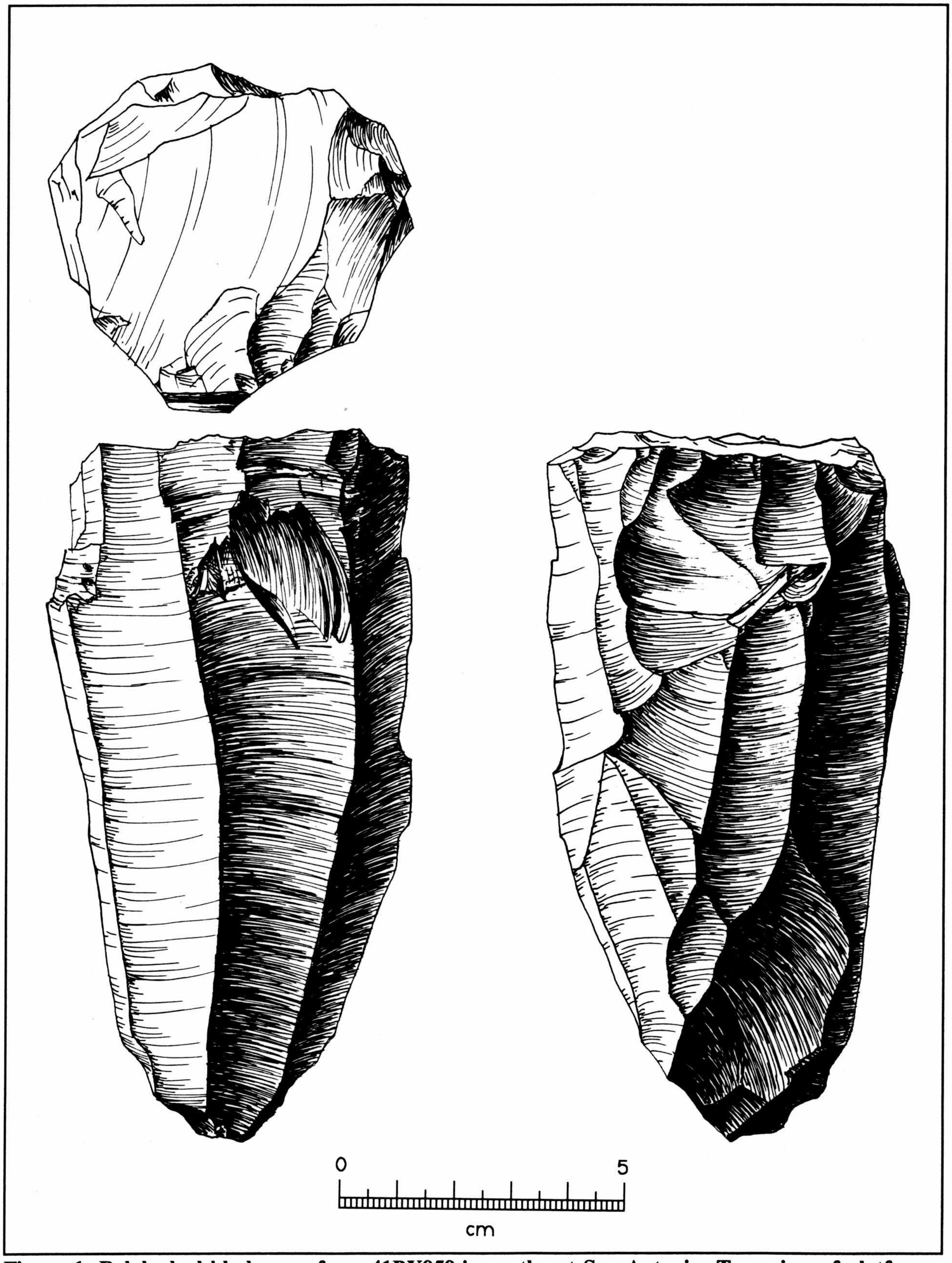

Figure 1. Polyhedral blade core from 41BX959 in northeast San Antonio. Top, view of platform; Bottom, two views of sides.

central area. There are several small to tiny flakes over much of its length that are visible without magnification. This edge is crushed, rounded and polished, and shows the greatest use modification. The fourth ridge has an angle of 124° and has a prominent longitudinal crown. There are two flakes in the central crowned area that are visible without magnification. The ridge is rounded, reduced and polished.

Obtuse angle ridges used as working edges have generally been overlooked, but were recognized and investigated by Crabtree in the early 1970s. His replicative experiments and wear pattern studies established the obtuse angle as the more functional and preferred tool for modification of resistant materials such as dry bone, antler, ivory and hard woods. Angles between 90° and 130° were necessary as angles greater than 130° were too flat to function properly as scrapers (Crabtree 1973).

DISCUSSION

This core is a surface find by Marvin Eisenhauer from Site 41BX959 in northeast San Antonio. The illustration by Richard McReynolds (Figure 1) shows one view of the platform and two views of the sides. Note that the facets from the platform end are straight with nearly parallel edges. The two blades struck from the distal end leave facets that are narrow at the struck end and expand at the platform end. These two blades would have been slightly curved. All of these facets are virtually without ripple marks.

Two very similar cores from northeast San Antonio (Autry Collection) are reported by Kelly (1992). The blade facets on these two cores are narrower than those on the specimen reported here. The width of blades is a factor in whether they can be used to manufacture projectile points. But regardless of their width they are very functional as knives just as they come off the core, and many of them serve in this capacity (Collins 1990). They are also retouched into end scrapers and other tools (ibid.). There is considerable research presently ongoing with these blade cores and the blades produced from them, and the present thinking is that they are part of the Early Paleo-Indian lithic technology (personal conversation with M. Collins and R. Mallouf 1992).

Site 41BX959 is situated on a relatively flat rise along the bank of Mud Creek in northeast San Antonio. The site area has been recently cleared of brush, but the larger trees remain. The blade core from this site is part of a larger collection of 129 specimens surface collected from this site. Fifty-five percent of these are biface preforms and preform fragments; eighteen percent are dart points and dart point fragments from Early, Middle and Late Archaic time periods, and two Perdiz points are from the more recent Late Prehistoric period (Suhm and Jelks 1962). There are six triangular Clear fork tools, generally called gouges by Turner and Hester (1985). Two are unifacial and four are bifacial. One of the unifacial specimens is unusually large with maximum dimensions of 100 mm long and 71 mm wide. Large Clear Fork unifaces often occur in the Early Archaic (ibid.).

Seven flake-blades with roughly parallel sides, generally with longitudinal arrises and measurements approximately twice as long as wide, are in the collections from this site. All specimens have one or both edges retouched. One of these, Specimen 1, Figure 2, is quite large with maximum dimensions of length 125 mm, width 65 mm, thickness 29 mm and weight 254 grams. It has a large single facet striking platform (16.8 x 37.5 mm) and a prominent force bulb. It is rectangular in form and triangular in cross section with very little curvature. It is of light grayish tan, good to excellent quality Edwards chert that is locally available. It is without patina and has no cortex. One lateral edge has been unifacially retouched.

Specimen 2, Figure 3, is a large flake-blade with roughly parallel sides and a longitudinal arris. The central area of one lateral edge is retouched toward the ventral face. Maximum dimensions are length 130 mm, width 63 mm, thickness 26 mm and weight 170 grams. The striking platform is missing and there is no force bulb. It is rectangular in form, triangular in cross section, and has no curvature over eighty percent of its length. It is a light grayish tan chert of good quality with a darker inclusion. This specimen is

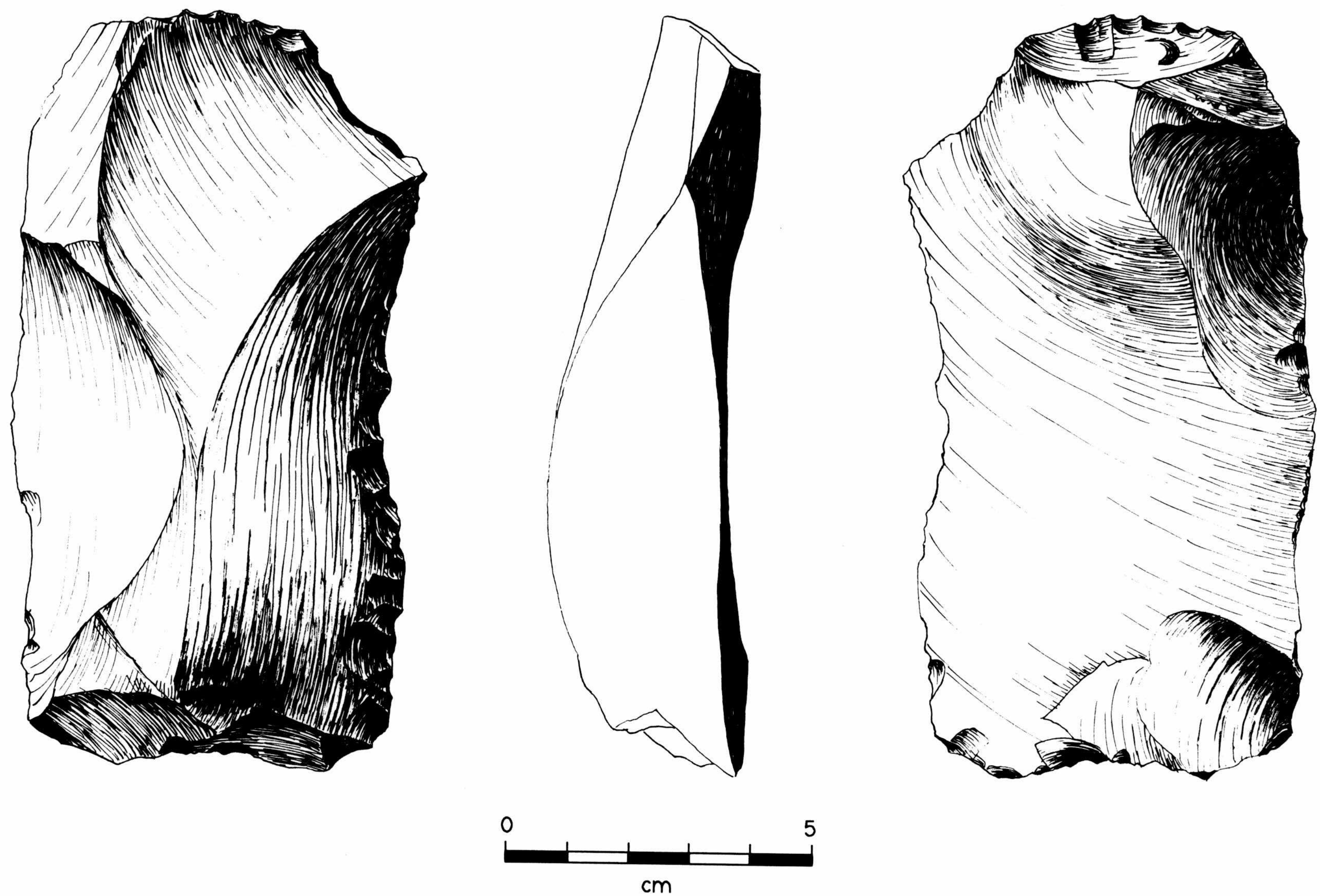

Figure 2. Three views of a large flake-blade from 41BX959. Left and right, sides; Center, cross section view. Note unifacial retouching on left view.

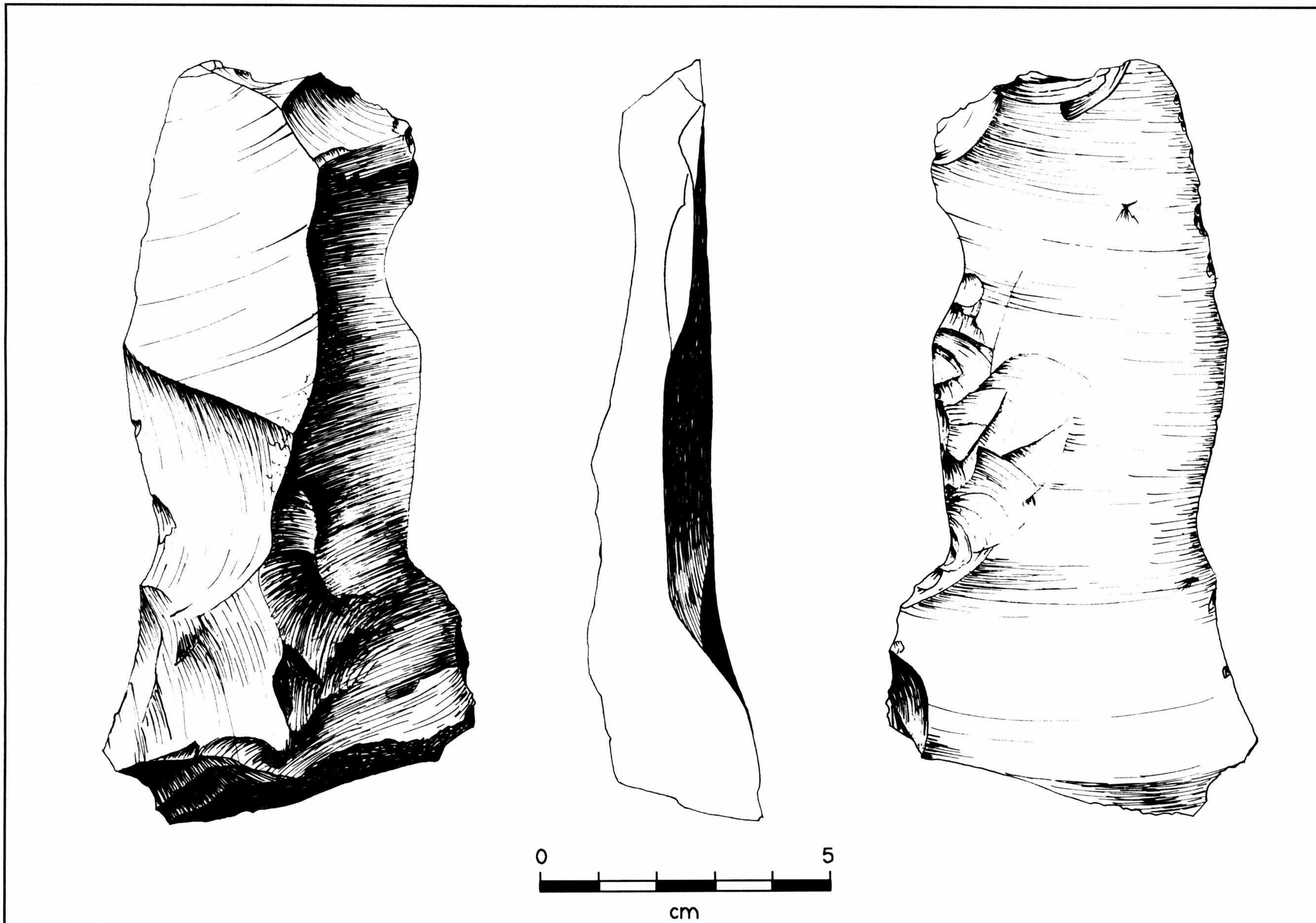

Figure 3. Three views of a large flake-blade from 41BX959. Note retouching on left lateral edge of right view.

a near duplicate of the flake-blade from the Yellow Hawk Site (a Clovis site in Taylor County) illustrated by Mallouf in his Figure 8 (Mallouf 1989:34-124). These two specimens were produced by hard hammer percussion and are virtually without ripples. They appear to be well suited for further reduction into Clovis-size projectile points or tools.

ACKNOWLEDGEMENTS

I extend my sincere appreciation to Marvin Eisenhauer for bringing this site to my attention, and for the loan of his collection for study and documentation. Sincere thanks are extended to Michael Collins for his review of the initial draft of this article and his helpful comments and location of obscure reference material that was pertinent to the final report. And my special thanks to Richard McReynolds for his accurate drawings of the artifacts.

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EDITOR'S NOTE

It is regrettable that the cores in the cover illustration for *La Tierra* Vol. 19, No. 2 as well as those on pages 30 and 31 in the report on cores, were incorrectly mounted. The cores should have been shown with the flat end up, the manner in which they are held for striking off blades.

COMMENTS ON KELLY'S INTERPRETATIONS OF THE "VAN AUTRY" CORES

Michael B. Collins and Pamela J. Headrick

ABSTRACT

Two polyhedral cores from Comanche Hill in San Antonio recently reported by T. C. Kelly in this journal possess technological affinities to early Paleo-Indian (Clovis) rather than to Late Prehistoric (Toyah) blade cores and there are errors in Kelly's technological inferences regarding these cores.

INTRODUCTION

Thomas C. Kelly, in his recent attempt in the pages of this journal to interpret two large polyhedral cores from Bexar County (Kelly 1992: 29-33), was faced with the problem that almost no contextual evidence was available to indicate the age or affiliation of these remarkable specimens. He described the cores, made selected comparisons with other blade and blade-core data, discussed some technological aspects of them, and suggested that the cores are of Late Prehistoric derivation. Lest weaknesses in his argument for a Late Prehistoric affiliation and errors in his technological inferences go unnoticed, the following comments are offered.

Form and Origin of the Van Autry Cores

Basically, in our general archaeological region, prismatic blade technology is documented for the Toyah archaeological culture of the Late Prehistoric (Tunnell 1989; Johnson n.d.; Hester and Shafer 1975; Headrick 1991; Mallouf 1981; Ricklis n.d.) and for the Clovis manifestation of the early Paleo-Indian (Green 1963; Warnica 1966; Irwin and Wormington 1970; Young and Collins 1989; Collins 1990; Sanders 1990; Frison 1991). Therefore, the greatest probability is that the "Van Autry Cores" are either very late or very early in the regional archaeological chronology.

Three kinds of evidence bear on deciding whether these two cores are more probably one or the other of these two possible ages. First is context. Second is form, primarily those aspects of form that reflect technology. Third is condition related to weathering.

Kelly relied on context to the extent that he felt the numerous Late Prehistoric artifacts reported for the "Comanche Hill Site" were a good indication that these two cores might also be of that age (Kelly 1992:32). That the site has yielded primarily artifacts of Late Prehistoric and Late Archaic affiliations is an important fact to keep in mind as we assess the probable age of these two cores, however, this is not a sufficient basis for interpreting the cores. If the early point (Angostura) mentioned by Kelly (1992:29) is best explained as having been brought to the locality by later people, the same could be said for the cores. And, of course, the site could have early components that are less well represented than are the later components. Context, though important, is simply too imprecise in this case.

Turning to the morphology of the Van Autry Cores (or "Autry" cores—Kelly uses both appellations), evidence is growing that aspects of Clovis blade technology are as diagnostic of Clovis Culture as are Clovis points themselves (Collins 1990; Sanders 1990; Goode and Mallouf 1991; Green 1963; Young and Collins 1989; Henderson and Goode 1991). Of considerable interest in the present instance are strong technological affinities between the Van Autry Cores and cores of known Clovis, or at least early Paleo-Indian, affiliation.

Sanders (1990) describes and illustrates Clovis cores from the Adams site in Kentucky with basically the same form as the Van Autry Cores. Although Sanders' monograph is concerned mainly with Clovis biface-production technology and treats blade-and-blade-core technology only in passing, illustrated polyhedral cores (Sanders 1990: Frontispiece, and Figure 6) and blades (ibid.: Figures 41 c and d, 42 d, 44 b, 47 d, and 54 a and b) clearly manifest close technological similarities to the Van Autry pieces. It has long been established that blades were part of the Enterline Chert Industry (Witthoft 1952), which includes fluted points and a variety of other implements, distributed from eastern Pennsylvania to North Carolina.

Several examples of blades found at early sites (Hammatt 1969) and in an isolated cache (Hammatt 1970) on the South Central Plains are considered to be of Paleo-Indian, probably Clovis, affiliation. The Anadarko Cache included one blade core with multiple platforms that, overall, is less regular than are the Van Autry cores, but that in technological detail of each set of platform and core face resembles the Comanche Hill specimens (Hammatt 1970:142 and Figure 2a).

Closer to home, there is a core tablet flake from the sealed Clovis component at the Aubry Site in north central Texas (Ferring 1990:11); the platform on the Aubry Site core tablet flake is technologically similar to those on the Van Autry Cores. Prismatic blade segments and a large prismatic blade core (Figure 1) were recovered from Paleo-Indian levels at the Gault Site (41BL323) during excavations in 1991 (Collins et al. n.d.); the prismatic blades were recovered in association with a Clovis point and the core was from an overlying zone in association with a Plainview point fragment. Again, technologically, the Gault Site core strongly resembles the Van Autry Cores.

R. K. Saunders has recovered a prismatic blade core (Figure 2) from deep in an Archaic site (41GL175) in Gillespie County, Texas, below artifacts diagnostic of the early Archaic (Saunders 1988, and personal communication). Collins (1990:73-74; Collins et al. 1989) has reported similar blade cores, one from Zone 4 (Clovis) at Kincaid Rockshelter in Uvalde County and two from uncertain provenience in Llano County (Site 41LL3), one of which is illustrated here (Figure 3). Importantly, these latter two cores have identical technological attributes, especially platform treatment, to the ones from sealed Clovis components at Aubry and Kincaid, are deeply patinated, and closely resemble the Van Autry specimens.

Also similar to the Van Autry Cores are the Evant Cores recently reported from Hamilton County, Texas (Goode and Mallouf 1991:67-70). These are surface finds, but they are far too deeply patinated to be of Late Prehistoric age. Technologically, as Goode and Mallouf note, these three cores have Clovis affinities. Chandler (1992, this issue) describes a large, polyhedral core out of the Eisenhauer collection from 41BX959 in northeastern San Antonio that is very similar to the Van Autry Cores; Chandler considers this to be a Paleo-Indian core on technological grounds.

Green (1963:161) illustrated and discussed a prismatic blade core from Comanche County, Texas, seemingly to be from Archaic context and suggested that production of blades continued from Clovis times into the early Archaic of Texas, but the evidence for this is not convincing. At present, we prefer the interpretation that Clovis-age cores are occasionally intrusive into later contexts. We base this on a virtual lack of true blades, artifacts made on blades, and blade-core debitage (such as core tablet flakes) in the Early Archaic. The large conical cores may have been attractive to later peoples who collected them but overlooked the less noteworthy blades and tools made on blades. Other claims for Archaic blade technology are either based on inadequate data or include other than true blades. For example, it is difficult to evaluate the context of blades and blade cores discussed by Patterson (1977), and his proposed technological patterns must await verification from assemblages in good context. As another example, Johnson (1991:124-126, Table 23,147-163) claims to have evidence of true blades, "*lames*," in the early Archaic of the central and Lower Pecos regions of Texas. Those that he illustrates (ibid.:Figure 54) are arguably blade-like flakes produced incidentally in any flint-knapping industry; even if they were intentionally produced, they are of such small size as to have no relevance to the blades and blade cores discussed here.

There is a constellation of attributes which constitutes the technological hallmark of the early, true polyhedral blade cores (Collins 1990). The most distinctive attributes are the nature of the platform and its orientation in relation to the core

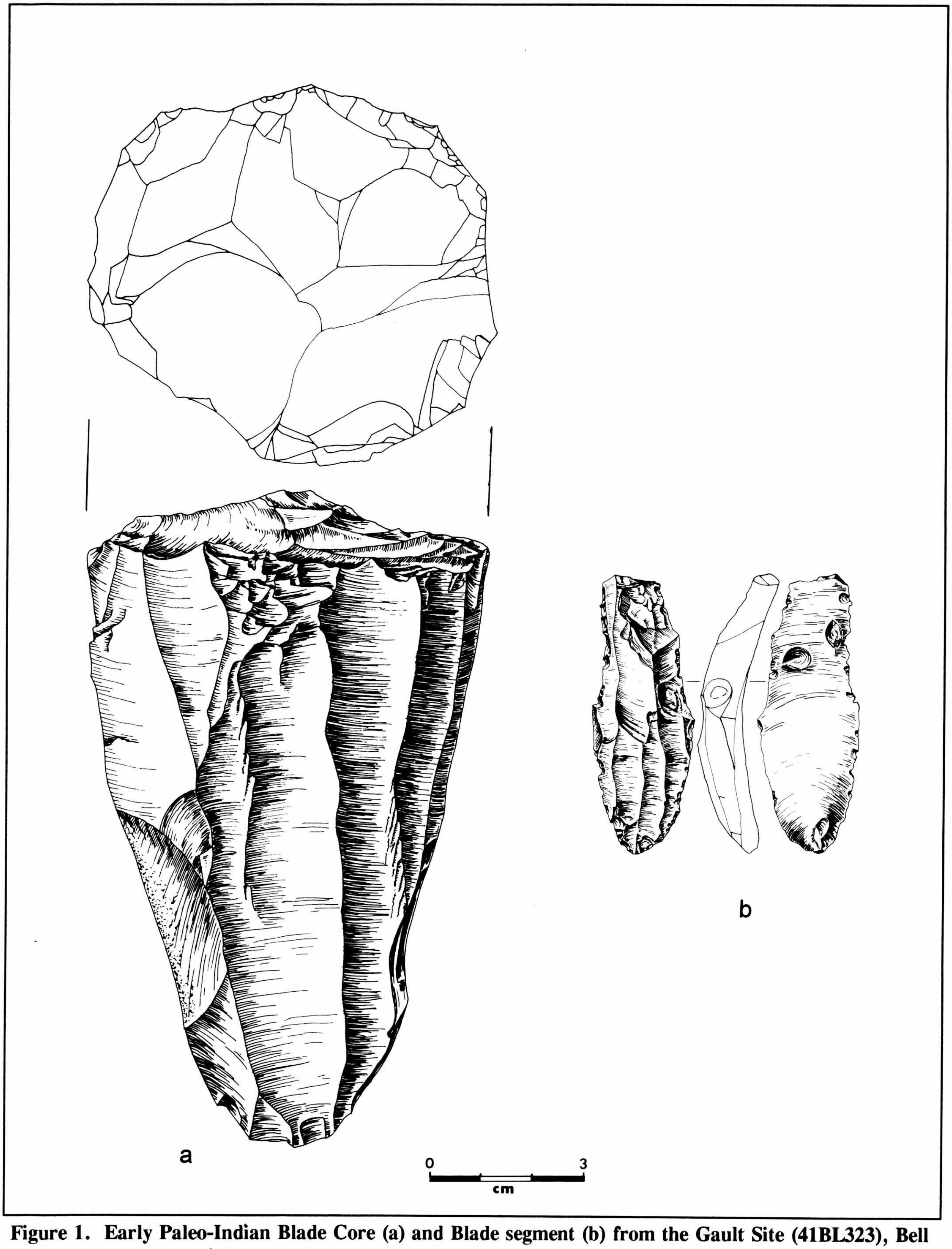

Figure 1. Early Paleo-Indian Blade Core (a) and Blade segment (b) from the Gault Site (41BL323), Bell County, Texas. Drawings by Pamela Headrick.

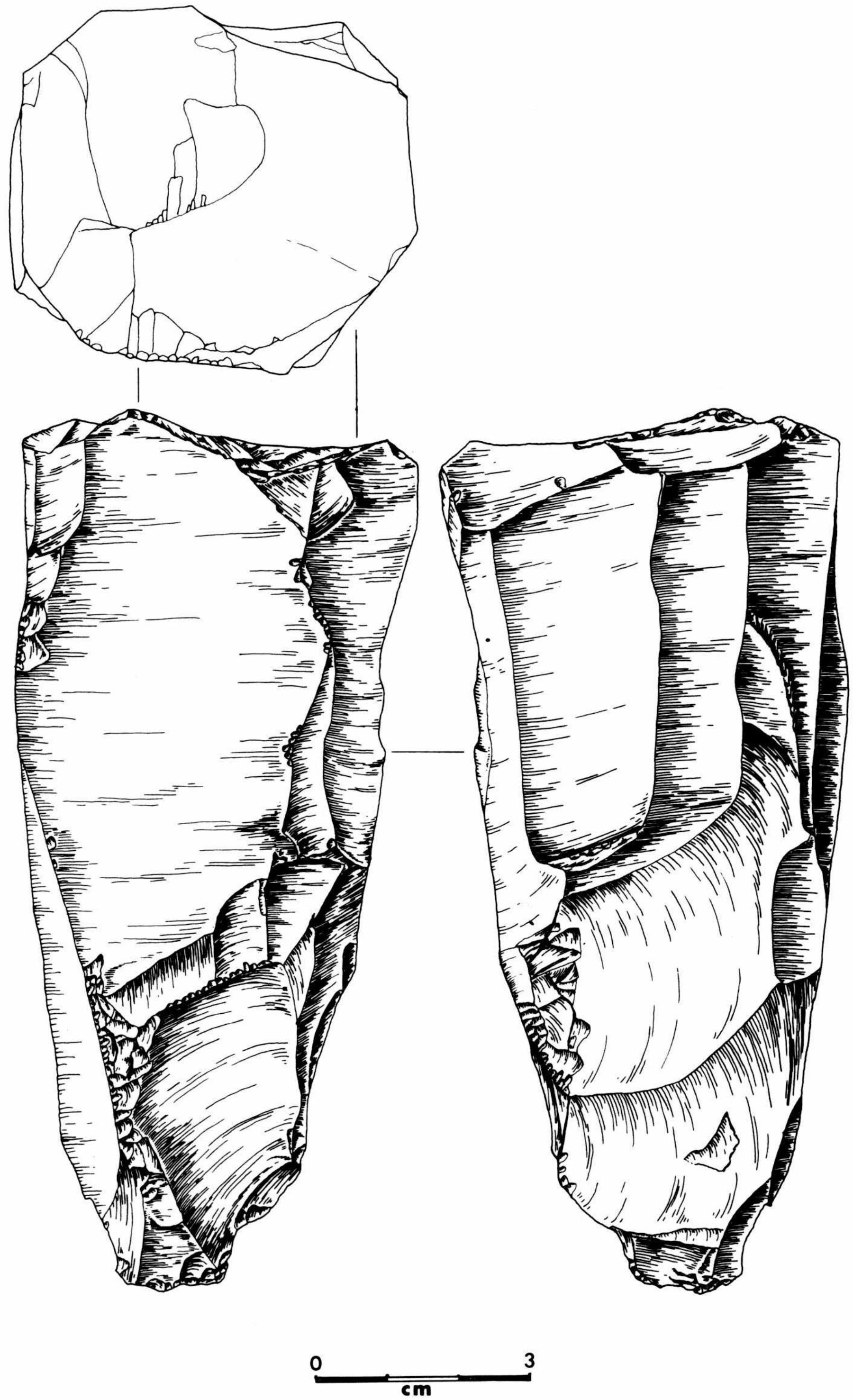

Figure 2. Deeply patinated Blade Core with early Paleo-Indian attributes from 41GL175 in Gillespie County, Texas. Drawings by Pamela Headrick.

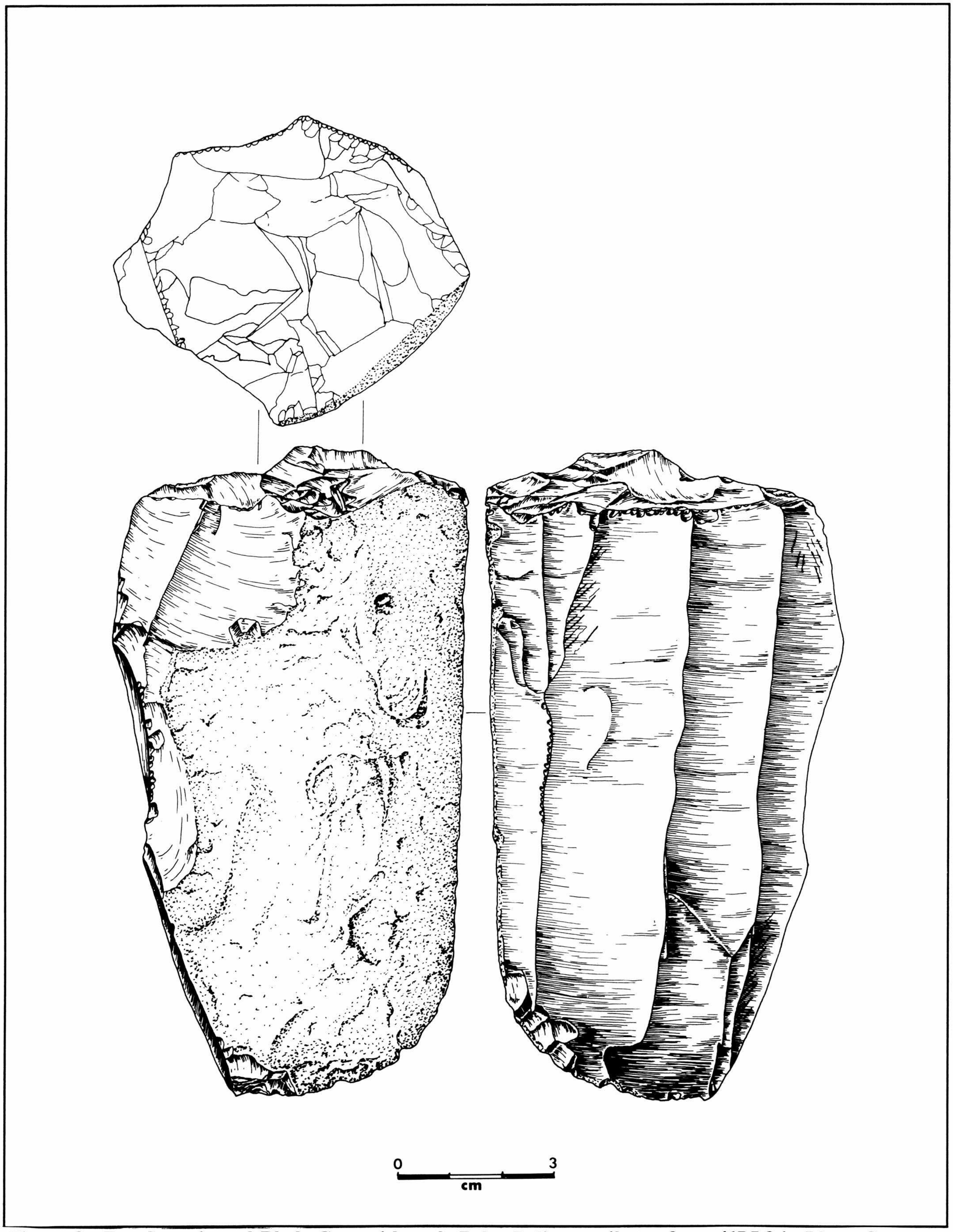

Figure 3. Deeply patinated Blade Core with early Paleo-Indian attributes from 41LL3 in Llano County, Texas. Drawings by Pamela Headrick.

face. The general plane of the platform is basically perpendicular to the long axis of Clovis blade cores. Yet on Clovis blades the generally very small platform of each blade is at an acute angle in relation to the long axis of the blade (Green 1963; Young and Collins 1989; Collins 1990; Sanders 1990). This seeming contradiction is accounted for by the platform maintenance techniques used by these knappers. Small flake removals around the perimeter of the platform leave fairly deep negative scars on the platform. The acute angle formed between the core face and the negative bulb scars on the platform is the point of purchase for the tool used in blade detachment and the acute angle seen on the blades results from this configuration. (It should be mentioned that indirect percussion was probably the detachment technique in most cases, so the tool in question would be a punch—which is consistent with the small platforms characteristic of most of these blades.) As this removal of small flakes is repeated in sequential platform preparations, hinge terminations are common with the cumulative effect of isolating a protruding area of the platform with a stair-step series of deeper and shorter hinge terminations. The platform quickly becomes nonfunctional and a core tablet removal is required to rejuvenate it. (A core tablet [cf. Barnes 1931] is a flake struck from one face of the core to completely remove the platform; it is a distinctive hockey-puck-like flake with the dysfunctional platform as its dorsal surface and the proximal blade facets as its polygonal perimeter.)

Size is another attribute. Prismatic blades and blade cores from early contexts show that the initial blade lengths were somewhere around 150 mm or greater and that core reduction continued until blades near 75 mm were being removed. In the maintenance of Clovis blade core platforms, each tablet removal shortened the core 10 mm or more, resulting in shorter blades after each core tablet removal.

The interior surface of Clovis blades (Figure 4) and the blade removal scars on Clovis blade cores are almost smooth with extremely low amplitude ripple marks. This is thought to be the result of indirect percussion blade removals, but a great deal more experimental evidence is needed to confirm this impression.

Finally, Clovis blade technology relied on high quality chert and the cores are often found near outcrops of excellent chert, as at Kincaid (Collins 1990), Evant (Goode and Mallouf 1991), and Gault (TARL files, 41BL323). It is not uncommon for cortex to remain on one side of Clovis blade cores (Figure 3) (Sanders 1990; Collins 1990).

The Van Autry Cores as described by Kelly fall entirely within the attribute cluster of early blade cores as these are presently understood.

In North America, widely scattered Late Prehistoric blade technologies occur. Among the better known are those of Mesoamerica, Hopewell, and, in our region, Toyah. None of these produced cores like the Van Autry cores. Hopewellian blade cores are actually for the production of microblades and usually have acute angles between the core platform and the core face (Morse 1974; Mason and Perino 1961). Mesoamerican polyhedral blade technologies, commonly in obsidian, are highly specialized and bear attributes of sophisticated pressure detachment techniques (Crabtree 1968; Clark 1981). Mesoamerican knappers began with large cores roughly shaped by percussion which superficially resemble the Van Autry Cores, but show important differences (primarily, the Mesoamerican cores have large percussion flake scars remaining from arris preparation, often have broad percussion scars from preliminary blade removals setting up ridges for subsequent pressure blade detachments, and lack scars from systematic blade removals).

In strong contrast, Toyah blades and Toyah blade cores (Figures 5 and 6), are less regular, smaller (usually less than 70 mm in length), have larger platforms, and the blade scars show stronger amplitude ripple marks (Johnson n.d.; Mallouf 1981; Tunnell 1989; Ricklis n.d.; it should be noted that it is our interpretation that the Brookeen Cache is of Late Prehistoric derivation, not Mallouf's; also, we have not included in this discussion the Late Prehistoric and possibly late Archaic blade and micro-blade evidence presented by Patterson [1975] because of insecure contextual evidence for most of his specimens). None of the characteristics seen in late blade technologies match the Van Autry specimens as described by Kelly. The few Toyah blade cores of

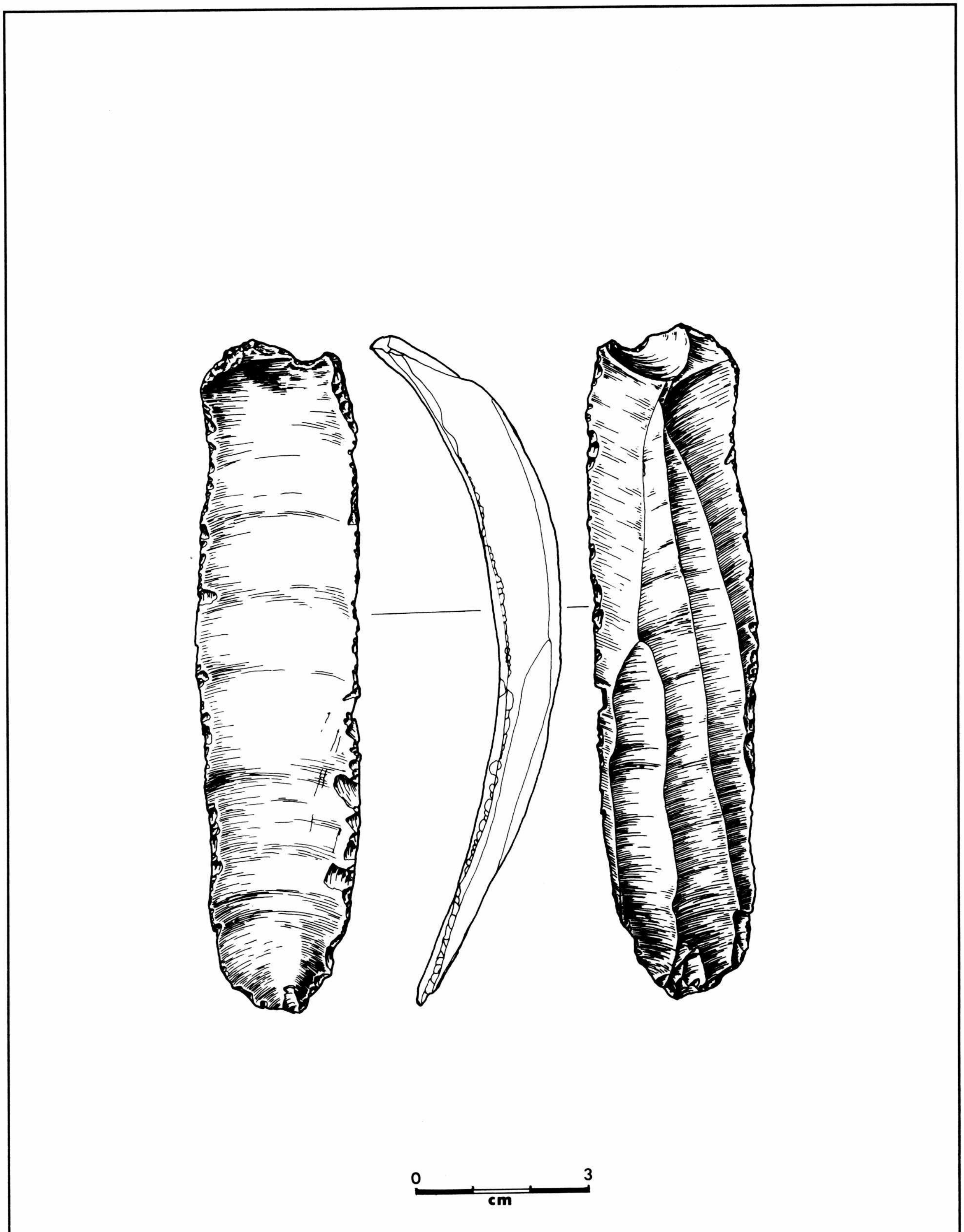

Figure 4. Blade from Keven Davis Clovis Blade Cache 41NV656, Navarro County, Texas. Drawings by Pamela Headrick.

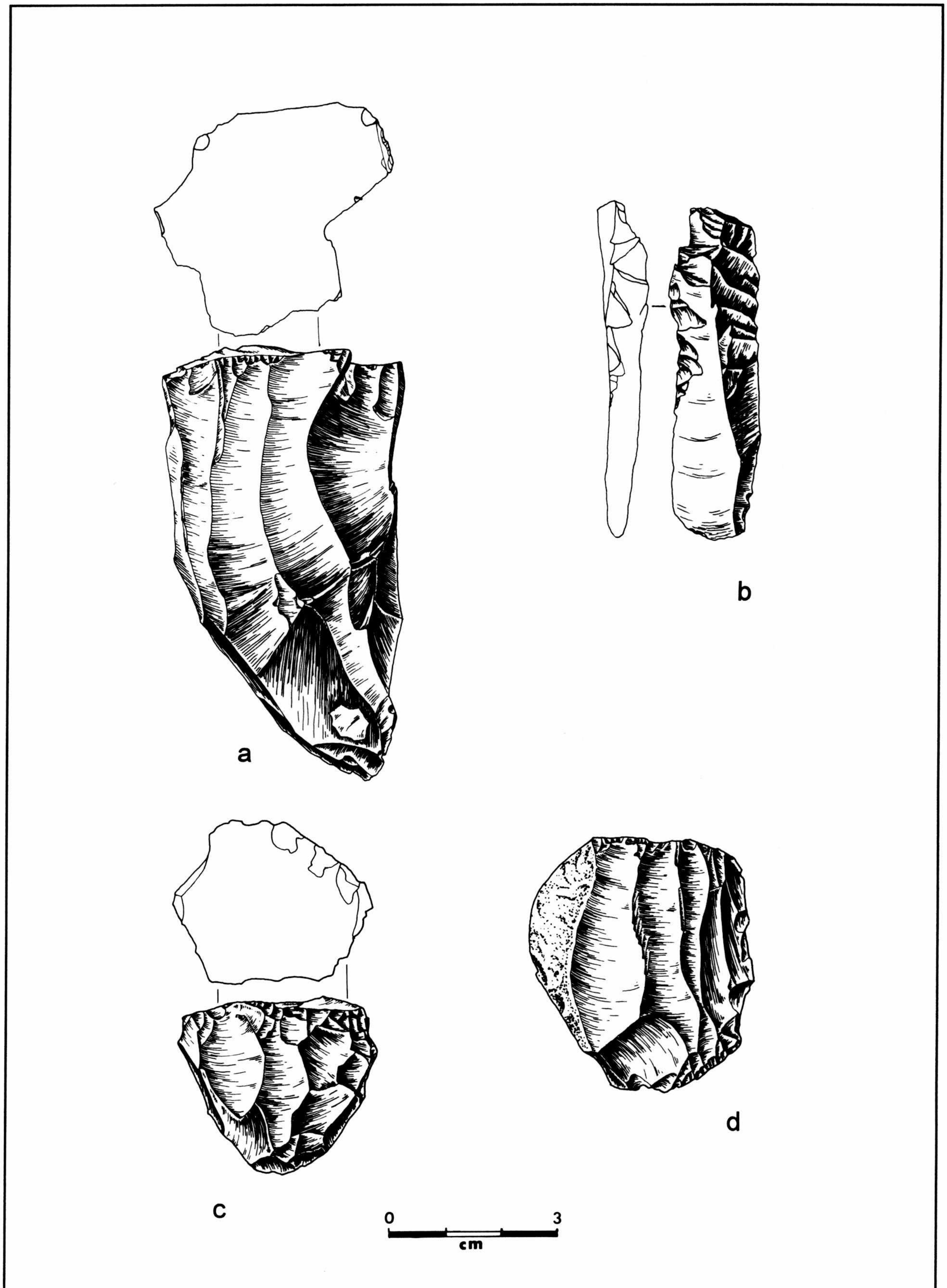

Figure 5. Late Prehistoric (Toyah) Blade Cores and Blades. a, Blade Core from 41HY209, the Mustang Bluff Site, Hays County, Texas; b, Blade from the Mustang Bluff Site; c, d, Blade Cores from the Kirchmeyer Site, 41NU11, Nueces County, Texas. Drawings by Pamela Headrick.

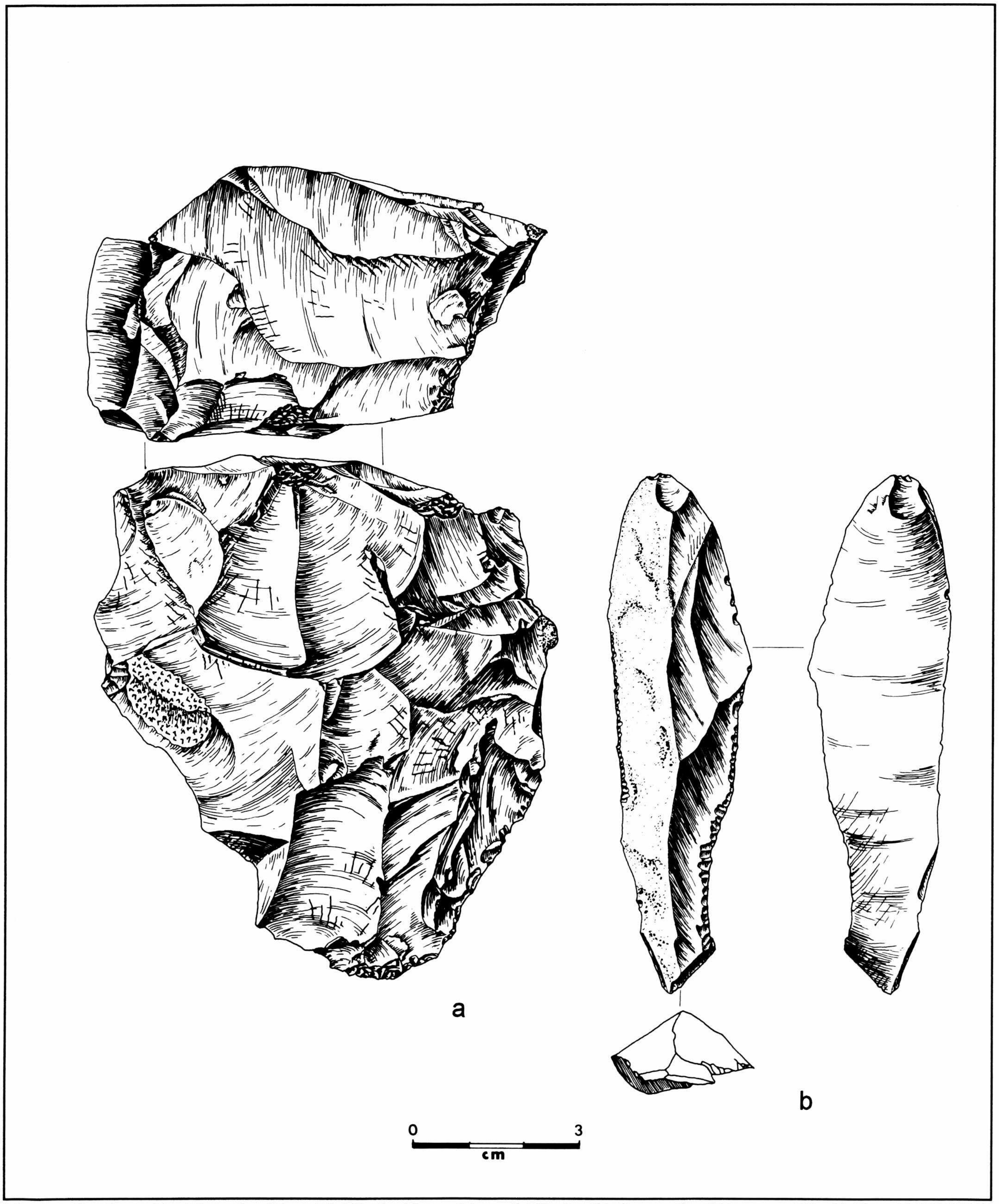

Figure 6. Late Prehistoric (Toyah) Blade Core (a) and Blade (b) from the Mustang Bluff Site (41HY209) Hays County, Texas. Drawings by Pamela Headrick.

which we are aware are small, rather irregular, and indicate a much more expedient approach to blade production. Illustrated here are one such core and a blade from the Toyah component of the Mustang Bluff Site (41HY209) in Hays County, Texas (Figure 6).

Finally, the nature of the patination on the Van Autry cores should be taken into consideration. Kelly clearly indicates that he considers these cores to derive from the Toyah interval of Late Prehistory. This allows a maximum of only about 750 years for these artifacts to have weathered. Unfortunately, Kelly does not report the extent of patination manifest by these two cores. One of us (MBC) had the opportunity to inspect these cores about two years ago. From that opportunity comes the recollection that these pieces have a moderately advanced, hard, shiny patina greatly more developed than could occur under normal circumstances in the short interval since Toyah times. This aspect of the specimens is critical to interpretation and needs to be fully reported. Patination is a process that advances at highly variable rates, but it does provide important information in many cases and should always be reported as part of artifact descriptions.

In sum, the technological attributes of the Van Autry Cores more closely match those of prismatic blade cores from early Paleo-Indian than from Late Prehistoric contexts; an early Paleo-Indian origin is not precluded by the available contextual information; more evidence is needed on the nature of the patination on these cores, but it is our impression that the patina is more consistent with a Paleo-Indian than with a Late Prehistoric age. Therefore, a Paleo-Indian affiliation for the Van Autry Cores must remain open for consideration, and in our view, is by far the more likely interpretation.

Correction of some Misconceptions

We also must clarify some of Kelly's technological interpretations and items of comparison with other data. First we would like to laud the excellent line work of Richard McReynolds (and lament the fact that they were published upside down). McReynolds' illustrations allow close comparisons to be made between these and other specimens and clearly show technological details not adequately discussed in the verbal descriptions.

Kelly (1992:29,32) interprets those removals from the conical (distal) end of the core as having the purpose of making subsequent blades struck from the platform more pointed. In fact, the occasional removal of blades in the reverse direction is necessary to straighten the core face and reduce curvature of the blades removed subsequently. This procedure is characteristic of most blade-core technologies the world over (e.g. Anderson 1970; Barnes 1931; Bordaz 1970; Futato 1990; Kobayashi 1970; Morlan 1970; Sanger 1968; Wyatt 1970; Bordes and Crabtree 1969; Ferring 1988).

Lengths and widths of scars on blade cores indicate only *minimum* dimensions of the corresponding blade in all cases but the final removal. As the McReynolds drawings of the Van Autry Cores show, most of the blades were longer than the scar remnants present on the cores since no negative bulb area remains. This is the result of frequent platform renewals and is typical of the early Paleo-Indian blade core technology across North America. The 121 and 122 mm maximum scar lengths on the Van Autry Cores are compatible with blades in the 130 to 150 mm length range commonly seen on Clovis blades (Green 1963; Young and Collins 1989). Kelly's own comparative observations on Late Prehistoric blade lengths from the Kirchmeyer and Indian Island sites illustrate the significantly shorter blade lengths typical in Late Prehistory (Kelly 1992:32).

Similarly, scar widths are less than blade widths in most cases because as each blade in an overlapping series is removed, a linear segment of (usually) two previous scars goes with the newer blade. In this way, only the final scar retains its full width (see Hay and Rodgers 1978, and Clarke 1935, for related discussions). So when Kelly (1992:32) argues that the Van Autry cores are dissimilar to the cores which produced Clovis blades because Clovis blades are typically wider than the scars on these cores, he demonstrates a complete misunderstanding of this fundamental aspect of blade technology. The mean scar width of 17 mm only means that blades *wider* than 17 mm were being struck. The widest blade scars on the Van Autry cores are 26 and 27 mm, a width that compares favorably with the widths of Clovis blades from the Keven Davis Cache (13 to 33 mm, average 25 mm; Young and Collins 1989) and to blades from the Clovis Site (23 to 35 mm, average 31 mm, based on data in Green 1963).

Our view is that prismatic blade technology in the early Paleo-Indian cultures of the Americas derives ultimately from pre-Aurignacian or Aurignacian origins in the Mediterranean Basin or western Europe whence it spread eastward across Eurasia, northeastern Siberia, and Beringa. It is clearly widespread in North America by ca. 11,000 years ago. Clovis knappers were evidently seeking out premier raw material for blade production, caching blades and cores, and, most likely, transporting cores between episodes of blade removal. It appears that both direct and indirect percussion techniques were used in detaching blades, which seems to be in accord with Clovis biface-production technology. Sanders (1990) presents evidence that Clovis knappers were fluting some Clovis points using direct percussion and others using indirect percussion. In Clovis lithic technology, contrary to assumptions implied in Kelly's article (1992:32), prismatic blades were *not* used as blanks for points (Collins 1990). Instead, they were used intact, segments of them were used, and scrapers or other implements were fashioned from them.

We do not see true prismatic blade technology surviving into Folsom times. Instead, Folsom knappers were transporting very large, thin bifaces (Hofman, Amick, and Rose 1990; Stanford and Broilo 1981; Boldurian 1991) and detaching large bifacial thinning-type flakes as blanks for points or scrapers. These large flakes detached from bifaces, such as the ones up to 140 mm long documented for the Shifting Sands Site (41WK21, a Folsom-Midland site in Winkler County; Hofman, Amick, and Rose 1990; note also scar-lengths on the Broilo specimen [Stanford and Broilo 1981; Boldurian 1991]), have central ridges which remain in the center of scrapers and resemble arrises on blades, but true blades seem not to be in use. The blade technology at the Pavo Real Site (41BX52, Henderson and Goode 1991) may eventually prove to be of Folsom affiliation (seven points and six aborted preforms), but we suspect that it belongs either with the Clovis material (three points) from the site or fits into a transitional technological development between Clovis and Folsom.

Of note in regard to the Pavo Real blade technology is apparent direct percussion blade detachment and concomitantly larger blades and larger platforms on the blades.

CONCLUSIONS

There is much to be learned before we fully understand the early history of blade technology in the Americas. Until a case much stronger than the one presented by Kelly is made for Late Prehistoric affiliation of the Van Autry Cores, a question we must all keep open is whether these cores may contribute to that understanding.

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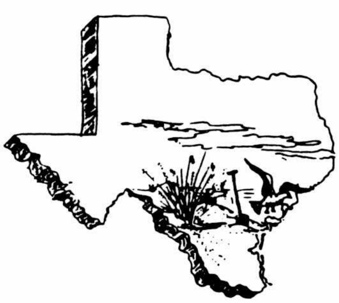

COASTAL BEND ARCHEOLOGICAL SOCIETY

Another local archaeological society our readers may find interesting to participate in is the Coastal Bend Archeological Society, recently risen from a short functioning hiatus, and now a very active group.

A recent business meeting vote has returned their monthly meeting to the first Wednesday of each month. The meetings will be in the Hilltop Community Center, Corpus Christi, at 7:00 o'clock p.m.

Contact Larry Beaman, 303 Rolling Acres Dr., Corpus Christi, Texas 78410 for further information.

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C. K. CHANDLER, Documentation Chairman of STAA, is a retired railroad management official and engineering consultant with an insatiable interest in Texas archaeology. He is Past President of the Texas Archeological Society and a member of the Coastal Bend Archeological Society. C. K. was the 1985 Robert F. Heizer Award winner for his extensive work in south Texas archaeology (see Vol. 13, No. 1). Also, in 1985, he recorded more archaeological sites with the Texas Archeological Research Laboratory than any other individual. C. K. is a valued contributor of manuscripts to *La Tierra* and the *Bulletin of the Texas Archeological Society*, covering such varied subjects as metal points, rock art, and hearthfield sites in Terrell County. He has been honored by being named a TAS Fellow, and was also appointed as a steward for the Office of the State Archeologist. The Chandlers reside in northern San Antonio.

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LELAND W. PATTERSON is a retired chemical engineer whose last professional position was Manager of Environmental Affairs, Engineering for Tenneco, Inc. His work included cultural resource studies for environmental impact studies and the general overview of any archaeological work required. He has published 280 archaeological reports in local, state, regional and national journals, such as *American Antiquity, Plains Anthropologist, Journal of Field Archaeology and Bulletin of the Texas Archeological Society*.. He is a member of several archaeological societies and has served as a member of the American Institute of Archaeology Committee for American Archaeology.

Lee now plans to write an integrated synthesis of southeast Texas that covers all time periods and geographic subregions. Because of his untiring efforts to conduct survey, record over 150 prehistoric sites in Texas, Louisiana and Ohio, and publish his findings, Patterson has received the Golden Pen Award from the Texas Archeological Society.

OLLIE SCHRANK is a retired Amoco Production Company employee residing one-half mile northwest of historic Gruene, Texas. In 1987 he noticed that stone artifacts were being uncovered during foundation preparation for new homes adjacent to his residence. Curiosity, and the purchase of *A Field Guide to Stone Artifacts of Texas Indians* by Ellen Sue Turner and Thomas R. Hester, laid the groundwork for a thoroughly enjoyable avocation. Subsequent membership in STAA and TAS have stimulated his interest.

ELLEN SUE TURNER has spent the last year working on the second edition of *A Field Guide to Stone Artifacts of Texas Indians*. Sue and Tom Hester have undertaken the extensive revision in order to accommodate the changes in Texas archaeology and to incorporate the substantial volume of literature that has appeared in Texas archaeological publications over the past seven years. Gulf Publishing Company has scheduled February, 1993 as publication month.

THE SOUTHERN TEXAS ARCHAEOLOGICAL ASSOCIATION

The Southern Texas Archaeological Association brings together persons interested in the prehistory of south-central and southern Texas. The organization has several major objectives: To further communication among avocational and professional archaeologists working in the region; To develop a coordinated program of site survey and site documentation; To preserve the archaeological record of the region through a concerted effort to reach all persons interested in the prehistory of the region; To initiate problem-oriented research activities which will help us to better understand the prehistoric inhabitants of this area; To conduct emergency surveys or salvage archaeology where it is necessary because of imminent site destruction; To publish a quarterly journal, newsletters, and special publications to meet the needs of the membership; To assist those desiring to learn proper archaeological field and laboratory techniques; and To develop a library for members' use of all the published material dealing with southern Texas.