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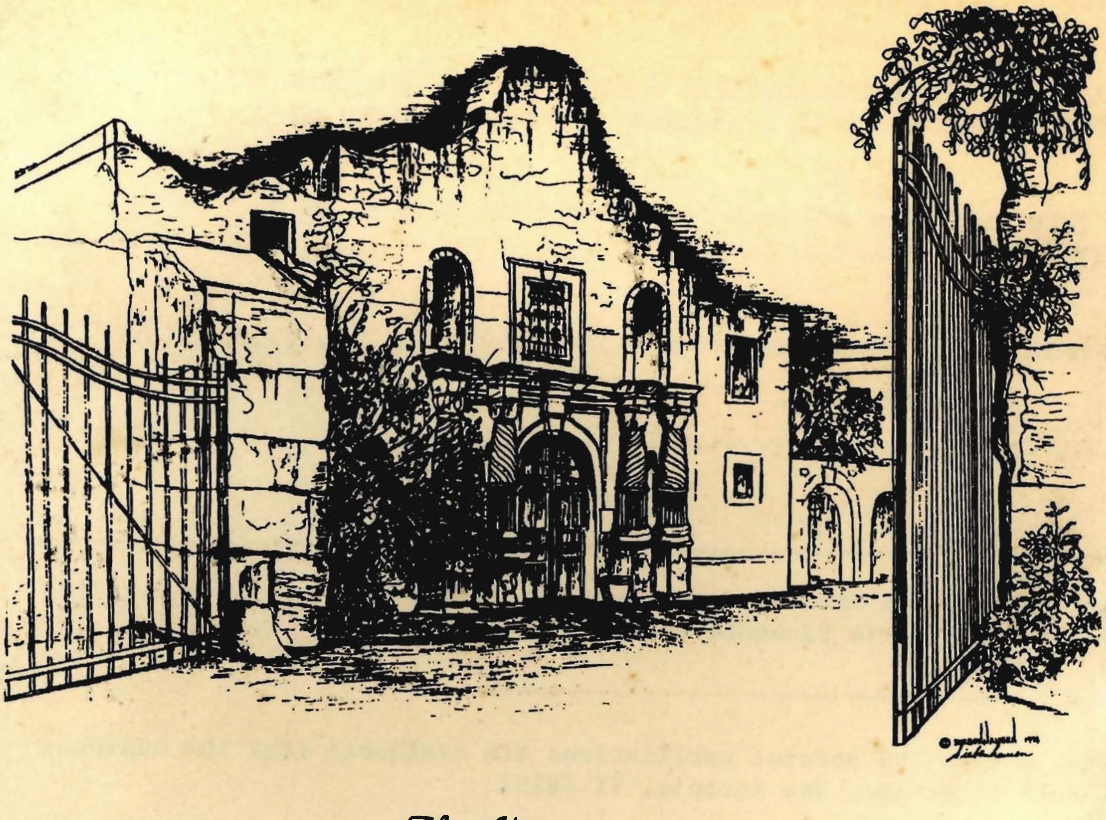

The Alamo

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Cover Illustration: Mission San Antonio de Valero (The Alamo) ------ See Page 13
By Rose Marie Siebenhausen (Pen and Ink)

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THE ROBERT F. HEIZER MEMORIAL AWARD

for 1980

The Robert F. Heizer Memorial Award was established by the Southern Texas Archaeological Association in 1979 to honor those individuals who had made an outstanding contribution to the archaeology of this area. For 1980, the award was presented to:

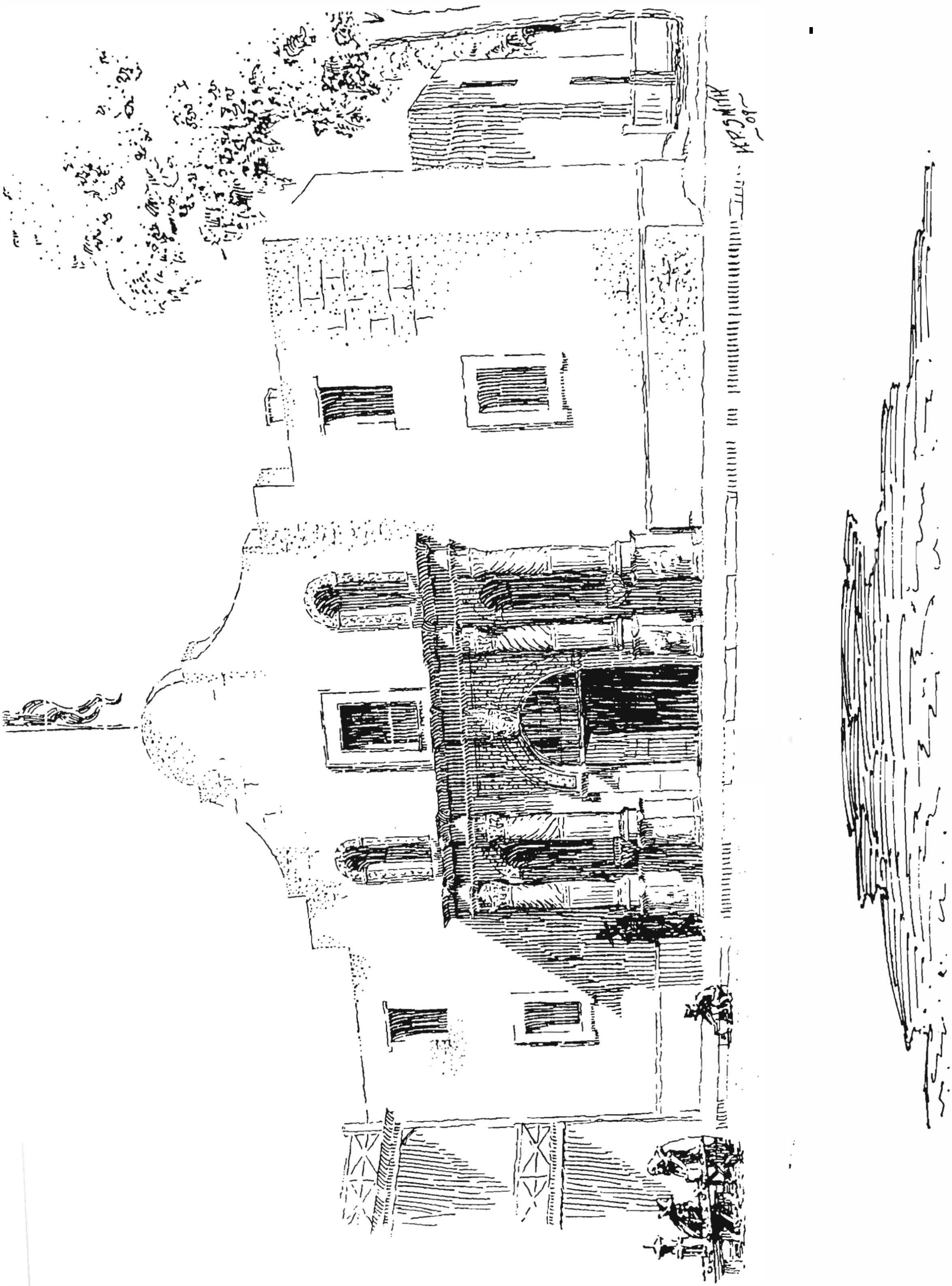
DR. THOMAS ROY HESTER
Director
Center for Archaeological Research
The University of Texas at San Antonio

Dr. Hester was cited for this honor for the publication of his book *Digging Into South Texas Prehistory: A Guide for Amateur Archaeologists*, which was published by Corona Publishing Company of San Antonio in midyear. This book has been applauded by many as a much-needed synthesis of the archaeology of the region as well as an excellent introduction for new avocational archaeologists. It very quickly has become a "must" in the libraries of any serious avocational or vocational archaeologist in the state.

Dr. Hester was also cited for the support which he and the Center for Archaeological Research at UTSA have given to individuals and to groups interested in the study of the prehistory of this region. Hester and his staff have been responsible for many of the programs presented at STAA quarterly meetings, for hosting numerous tours through the Center, and providing guided tours of a variety of archaeological sites where the CAR was responsible for excavations.

Although pressed for time because of his many commitments and projects, Tom Hester always finds the time to deal personally with amateurs. He does not "talk down" to those who are new to the science but rather is encouraging and helpful to everybody. This special consideration which he gives to avocationalist marks him as an exceptional individual, and makes him particularly dear to the hearts of most Southern Texas archaeologists.

The plaque for the 1980 Robert F. Heizer Memorial Award was presented to Dr. Hester at the January 1981 quarterly meeting of the STAA at Incarnate Word College.



HISTORY AND ARCHAEOLOGY OF MISSION SAN ANTONIO DE VALERO (THE ALAMO)

Jack D. Eaton

INTRODUCTION

San Antonio de Valero was the first mission to be established on the San Antonio river, and it was an intricate part of that early settlement begun in 1718 which would eventually become the City of San Antonio, Texas. Although the old mission, now called the Alamo, has been at its present location since 1727, it is the end product of a long series of events. Suffering numerous relocations and changes in name, its history began 27 years earlier as a small mission situated a short distance south of the Río Grande near the present town of Guerrero, Coahuila, México. At the time of the battle of the Alamo in 1836, the fortified complex had long ceased to be a mission. Probably few, if any, of the men who died at the Alamo knew or cared that the old buildings in which they gave their last breath of life had been built for the glory of God and the salvation of men. However, fate would introduce an irony, and in those early morning hours of March 6, 1836, the place would become a virtual hell for all of those involved in that tragic battle. All that remains standing today from mission San Antonio de Valero is the unfinished mission church, now called the Alamo Shrine to Texas Liberty. This was the final bastion of defense to fall to the victors. Now owned by the State of Texas, the Alamo is a National Historic Landmark (41 BX 6), and it is under the guardianship of the Daughters of the Republic of Texas.

The old mission church, although under construction for many years, never reached its full beauty in design. Only the lower portion of the 18th century Early Baroque retable-facade was completed before secularization occurred in 1793 when construction terminated. However, in its original design, the church facade was to rise several feet higher than at present and to have an upper portion of the retable with a niche centered above the choir window. Each of the five niches was meant to hold a statue of a saint and to be flanked by columns similar to those beside the front doorway. Also there were supposed to be two bell towers and a large cupola crowning the transept (Eaton 1980b; Leutenegger 1977). The curvilinear gable presently centered on top of the facade was designed by architect John Fries in 1850 and installed at that time by the U. S. Army when the building was being repaired and converted to a Quartermaster warehouse. Previously there had been no roof or upper portions of the walls. Although now generally regarded as a martyry to those who died at the Alamo, the remains of the old church can also be appreciated as a beautiful example of Spanish Colonial monumental architecture.

As fascinating as the event of the Battle of the Alamo was in Texas history, it only occupied a few days in the long overall history of the Alamo. To the archaeologist, probably the most interesting era was the Spanish Colonial mission period. This is in large part due to the interest in that function of the mission which dealt with the transition of native Americans from a simple, mobile hunting and gathering tradition, a continuation of some 11,000 years of subsistence methods, into a settled farming and craft-oriented life bound within a rigid framework of cultural, economic, and religious doctrine. For many of the neophytes who were able to survive the transition, the result of the experience was generally a better life and assimilation into Spanish society; but for some individuals it was a morally devastating experience when the old ways and traditions were lost and the new ways and traditions were never fully adopted or understood.

Fronticepiece: Mission San Antonio de Valero (41 BX 6). This drawing of the Alamo was done in 1909 by Harvey Smith, Sr.. It is published here for the first time through the courtesy of Harvey Smith, Jr.

Each archaeological project at the Alamo has provided a small amount of additional information relating to historical events there; and the artifacts collected, when viewed in perspective, have given us a better understanding of the many people who were involved and something of their varied cultural affinities.

HISTORY

The history of the Alamo began some 280 years ago on the raw frontier of northeastern México. Franciscan missionaries from the Apostalic College at Santa Cruz de Querêtaro, in their northward advance to Christianize and civilize the native Americans of a wild and unsettled region, established the mission San Juan Bautista a short distance from the Río Grande where the small town of Guerrero, Coahuila, now stands (Almaráz 1979; Eaton 1980a; Weddle 1968). This event took place on a cold New Year's Day in 1700. Friars Antonio de San Buenaventura y Olivares, Marcos de Guereña, and Francisco Hidalgo, with the aid of mission Indians brought with them from the Río Sabinas, built a simple complex of structures to protect them from the weather and began instructing the native inhabitants of the region. The purpose of the mission on the northern frontier was to Christianize and educate the simple native inhabitants in an effort to produce useful citizens under the Spanish Crown (Bolton 1907). Essentially the mission was a Christian seminary and industrial trade school, and the architectural plan was designed to house the facilities relating to those tasks.

The missionizing program at San Juan Bautista soon became a formidable task, and a second mission was established nearby to share in the responsibilities. On March 1, 1700, Mission San Francisco Solano was founded under the authority of the local military commandant, Major Diego Ramón, and Fray Antonio Olivares took charge. It was this mission that would eventually, through a series of moves and changes in name, become the Alamo. In 1702, the Mission San Bernardo and Presidio San Juan Bautista del Río Grande del Norte, were also established in the vicinity of the earlier missions. The missions and presidio, and the Spanish civil settlement which grew up around the presidio, formed what has been referred to as the Gateway to Spanish Texas (Weddle 1968).

Mission San Francisco Solano lasted only a brief time at its original location. Subject to repeated attacks by hostile Indians, crop failures, scarcity of water, and finally abandoned by the neophytes late in 1703, the mission suffered the first of a long series of failures.

In October of the same year, Fray Antonio, joined by Fray Hidalgo, moved the mission 16 leagues (48 miles) to the west, near the present town of Zaragoza, México, and renamed it San Ildefonso.

Mission San Ildefonso was moderately successful for several years, while the missionaries instructed the native inhabitants of the area. However, in 1708, the wild Toboso Indians of the region finally provoked the mission neophytes to flee, abandoning the mission. The friars made every effort to induce the frightened Indians to return to the mission, but without success. In 1712, by permission of the Franciscan College, the mission was moved to a more suitable location near the Río Grande about 3 leagues from the original mission site. When this move was made, the mission was renamed San José.

Mission San José remained at the Río Grande del Norte until 1718, when Fray Antonio, with permission of the College, moved his mission north into Texas and established it on the bank of the Río San Antonio de Padua near San Pedro Springs. The official reason for the move, as directed by Martín de Alarcon, Governor of Coahuila and Texas, was to place a mission and to establish a Spanish settlement at a convenient place on the Camino Real between the Río Grande and the East Texas missions. This was a move designed to facilitate better communication between those widely separated settlements.

The move from the Río Grande began in April, 1718, and the expedition led by Governor Alarcón arrived at the San Antonio river on May 1.* They camped on the west bank of the river near San Pedro Springs; and on the same day, Fray Antonio Olivares, by permission of the Governor, established mission San Antonio de Valero, naming it after St. Antony of Padua and the viceroy of New Spain, the Marqués de Valero (Weddle 1968). Just four days later, and a short distance downstream from the mission, Governor Alarcón founded the Presidio and Villa de Béjar, a small Spanish settlement which one day would become the City of San Antonio (Barker 1929:36-38).

Shortly after establishing the mission on the west bank of the San Antonio river, it was moved to a more suitable location on the east bank. The mission buildings at this time are described as consisting of a small fortified tower for the friars and crude huts for the Indians (Barker 1929:36-38; Fox, Bass, and Hester 1976:2). In September of 1720, Fray Antonio Olivares retired from the mission to return to the college at Querétaro. He was succeeded by Father Francisco Hidalgo, an old friend and colleague.

In 1724, following a terrible hurricane which demolished the houses of the Indians and did the mission great damage, the mission was again moved. This time the move was farther downstream to opposite the Presidio and Villa de Béjar. However, before permanent construction began, the mission was moved slightly to the north. At this final location of San Antonio de Valero, where the mission church (the Alamo) still stands, the architectural complex developed to its ultimate degree.

By 1727, the construction of a permanent mission complex was well underway and included a convento (friary), granary, Indian housing, workshops, and other structures of stone and adobe. The Indian population at the mission totaled 70 families including Aranamas, Payaya, and Ervipiame groups (Fox, et al 1976:3). Some of these groups were local Indians (i.e., Payaya) while others (particularly the Ervipiame and Hume) entered Valero from the short-lived Mission San Xavier de Náxera (1722-1726) for Ranchería Grande groups. With such growth in population, a large stone church was planned, but because of shortages of materials and qualified masons, the construction was delayed until May 8, 1744, when the cornerstone was finally laid. In the meantime, a small adobe structure served as a church. The mission population had further increased in 1740 with the conversion of the Tamique Indians and by 1744 totaled 311 individuals (ibid.).

By the early 1750s, the stone-built church was nearly completed. However, because of poor workmanship the structure collapsed. Finally, a competent master builder was found to undertake the reconstruction of the church. This time good building practices and materials were used and the result was the building (Alamo Shrine) which is standing today.

In 1772, the control of mission San Antonio de Valero was transferred from the college at Querétaro to the College of Nuestra Señora de Guadalupe de Zacatecas (Leutenegger 1977). By this time the mission architectural complex had stabilized to its ultimate development (Figure 1). However, the large stone church that was under construction was never finished. Then, in 1793, in compliance with a royal decree issued the previous year, mission San Antonio de Valero, along with the other missions that had been established downstream on the San Antonio river, were secularized. The mission records were transferred to the Villa de San Fernando church archives, and the mission lands distributed to the resident mission Indians. This ended the role of the Alamo as a mission. Later the building complex would serve other needs.

After secularization, the San Antonio de Valero mission buildings were abandoned and lay essentially unoccupied until 1802 when the Flying Company of San Carlos de Parras del Alamo, a Spanish cavalry unit, occupied the old ruins (Smith 1967:8).

■ Editor's Note: Some Indian groups (such as some Papanac, Pataguo, Patzau, Xarame, etc.) accompanied the transfer of San Francisco Solano to San Antonio. Campbell (1979) reports a number of other groups which were present both at the Guerrero missions and at mission San Antonio de Valero (including Payaya, Siaguan, Yorica, etc.).

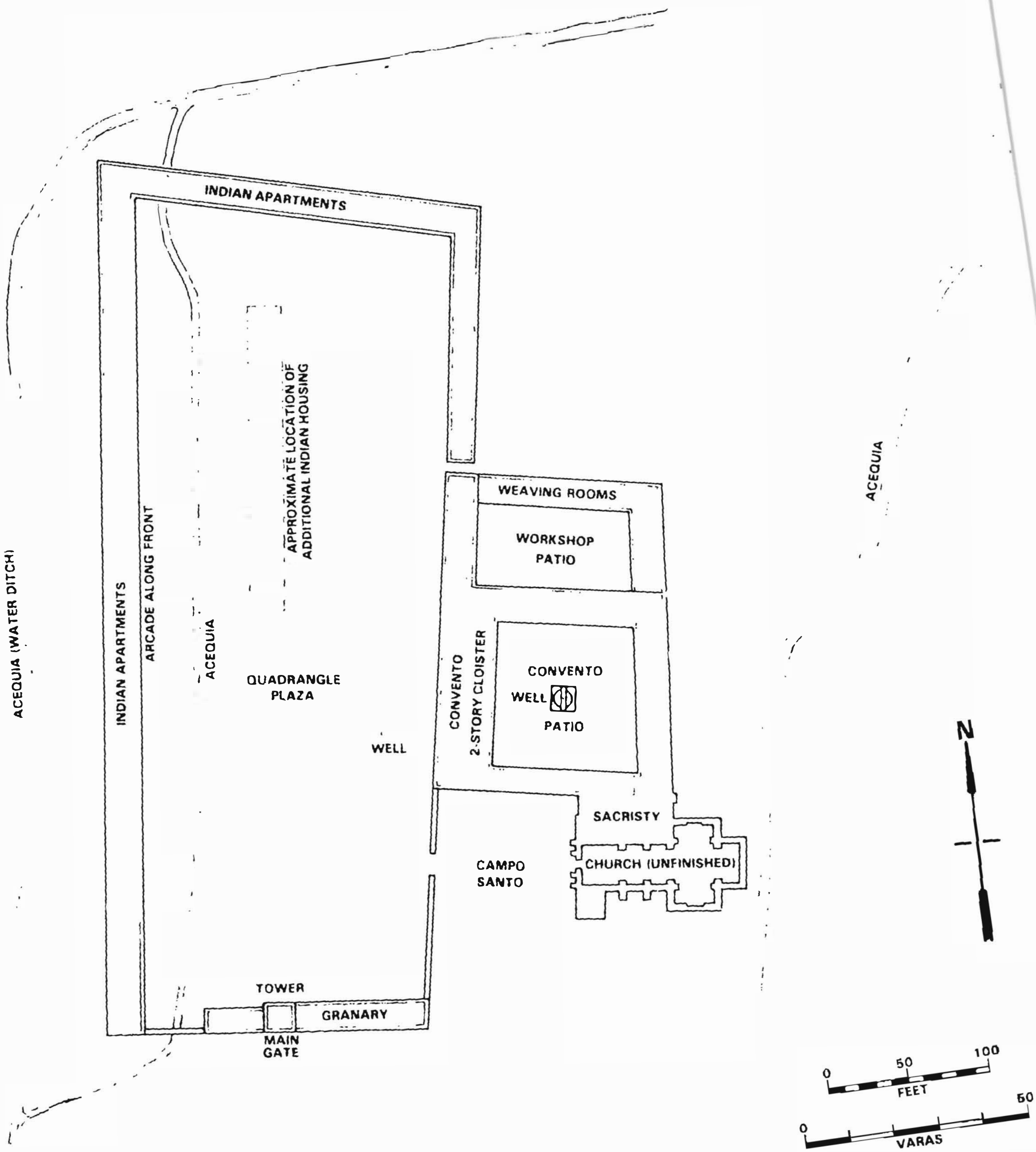


Figure 1. Mission San Antonio de Valero. Plan of the mission complex as it appeared in the 1760s.

Evidently the old mission complex became known as the "Alamo" during this occupation. In 1805, a hospital, the first in Texas, was established at the Alamo; and by 1810, considerable repairs and additions to structures vastly improved the living and defense conditions of the complex.

The Mexican Independence movement was underway at this time south of the Río Grande and was soon to be felt in Texas. On January 21, 1811, a group of rebels led by Juan Bautista Casas took over the Alamo. In April of 1818, a larger rebel force under José Gutiérrez and William Magee, after a series of victorious encounters with Spanish troops, entered San Antonio and occupied the Alamo buildings (Garrett 1939: 39-40, 178). Then, subsequent to Mexican Independence in 1821, Mexican troops under Colonel Domingo de Ugartechea were assigned to occupy the Alamo Complex (Yoakum 1955, I:55).

Meanwhile, Texas colonists, reacting to Mexican provincial policies backed by military persuasion, began a rebellion early in 1835. When the colonists fired upon Mexican Dragoons on the Guadalupe River just south of Gonzales on October 2, 1835, the Texas Revolution had begun (Nevin 1975:71).

Late in 1835, General Martín Perfecto de Cós, with two divisions of infantry, arrived from México and took over the Alamo. During his occupation he had the place repaired and put in fort fashion. This included repairing walls, erecting palisades, digging ditches, and mounting cannons at strategic positions along the walls. It was probably at this time that the palisade and ditch that extended between the old church southwest corner and the quadrangle wall was installed. A section of this palisade ditch was uncovered during archaeological excavations conducted in 1977 (Eaton 1980b).

On December 5, 1835, a ragtag army of about 300 Texans commanded by Edward Burleson, and divided into two columns, one led by Ben Milam and the other by Francis Johnson, entered San Antonio and engaged Cós' troops. Milam was killed in the fight and Johnson took charge of both columns. Against artillery and small arms fire from the Alamo, the Texans advanced through the town toward Cós' defenses. The Texans then brought up their own cannon and blasted away at the Alamo, doing some damage and shattering the nerves of the defenders causing many to desert. After 5 days of siege, General Cós surrendered his remaining 1,100 officers and men to Burleson (Nevin 1975:75). This ended the first battle of the Alamo and the Texans took charge of the fortified complex.

General Cós and his remaining troops returned to México, but when President-General Antonio López de Santa Anna learned of the defeat his response was swift. By the end of January, 1836, an army of nearly 6,000 men and 20 cannons, under the command of General Santa Anna began advancing north toward San Antonio. By mid-February they were at Presidio del Río Grande (Guerrero, Coahuila) where they rested and regrouped. Ironically, they camped just a short distance from the site of the old mission San Francisco Solano, the birthplace of the Alamo to which they were soon to lay siege (Perry 1975:32; Weddle 1968:386).

In the meantime, the Texans began to realize the seriousness of the situation and started repairing and arming the Alamo as best as time and available materials would allow. William Travis and James Bowie would be joint commanders, and Green B. Jameson was appointed garrison engineer. The fortifications and weapons at the Alamo were not ideal to withstand a formidable siege, and the 182 men who would be the final defenders of the old walls were far too few to adequately man such a large area (more than one-third mile of perimeter). But the decision was made to stand with little regard to the odds.

Near the end of February, 1836, the Mexican forces arrived at San Antonio, and on February 29, the siege of the Alamo began. Then on March 5, the general orders for the assault were issued by General Santa Anna. The attack formation was assembled and the advance on the Alamo began at one o'clock in the morning of March 6. At dawn's first light, the bugle call ordering death, the dreadful *degüello*, urged the attack to move more rapidly and to close for the final assault. The raging, bloody battle that followed was over by 8 o'clock in the morning, and all of the defenders perished, but at a staggering loss to the assault forces. The last to resist were those who held out in the old mission church, now the Alamo Shrine.

After the battle, Santa Anna ordered the fortifications to be destroyed and to spike all cannons. But some of the buildings, notably the church, were too well built to easily tear down, so they were left standing.

Following the departure of the Mexican troops, the Alamo lay vacant and unclaimed for several years. Then on June 13, 1841, by an act of the Congress of the Republic of Texas, it was declared that the Alamo property belonged to the Catholic Church.

The U. S. Army took an interest in the Alamo ruins when Texas was annexed to the United States in 1845, and involvement in the Mexican War in 1846 created a need for more military installations in the borderlands. In January, 1849, the U. S. Army Quartermaster leased the Alamo from the Catholic Church and developed it into a Quartermaster Depot. It was during the repairs to the old church structure that the curvilinear gable was constructed on top of the building, along with installing upper flooring, windows, and a new gable roof (Smith 1967:25).

Shortly after the Civil War began in 1861, the Alamo was seized by secessionists and it became a Confederate Army depot. It remained in Confederate hands until the end of the war in 1865 when it was returned to the Federal forces. The U. S. Army continued to occupy the Alamo until 1879 when it moved the depot to the new Fort Sam Houston Quadrangle.

In 1877, Honoré Grenet bought the old Long Barracks from the church and converted it into a store and warehouse. In 1883, the State of Texas bought the Alamo Shrine, and in the same year the Grenet building was sold to the Hugo and Schmeltzer company, and it was further developed as a department store.

In 1905, the State of Texas purchased the Hugo and Schmeltzer property and, along with the Alamo Shrine bought previously, designated the Daughters of the Republic of Texas as guardians of the property. Through the 1920s and 1930s, the remaining buildings on the Alamo grounds were restored to their present condition. In 1940, the Alamo Cenotaph located in the plaza was dedicated. (For photos at the Alamo from the 1850s to the present, see Fox, et al. 1976:Figures 8-10).

ARCHAEOLOGY

During the 1930s, the Work Projects Administration (WPA) excavated extensively on Alamo grounds, mostly in the area to the east of Alamo Shrine where there had been commercial buildings. However, it was not until the 1960s that controlled archaeological excavations were conducted at the Alamo.

In the summer of 1966, John Greer (1967) directed excavations for the Witte Museum on the north side of Alamo Shrine in what had been the mission convento patios. His excavations verified that the present wall dividing the two courtyards, which was built in 1913, rests upon the original mission period wall. Greer also uncovered remains of what appear to have been structural footings of probable mission workshops (weaving rooms and storerooms) in the north patio. In addition, excavations in the Well Court uncovered remains of an adobe structure which may have been the temporary church which predated the large stone-built church.

In 1970, William M. Sorrow (1972) of the Texas Archeological Survey carried out excavations north of the Daughters of the Republic of Texas (DRT) Library where he uncovered 19th century structural footings and part of the old mission period *acequia*, a branch of the *Acequia Madre* (called the Alamo Ditch) which ran on the east side of the old mission church.

Mardith Schuetz (1973), then with the Witte Museum, did some extensive excavations in the north court (second patio) in 1973 providing additional structural information relating to the mission period workshops and the patio north and east walls.

In 1973, Thomas R. Hester of the University of Texas at San Antonio carried out excavations east of the museum and souvenir building (Adams and Hester 1973). This testing verified the location of the Alamo Ditch in that area, as well as uncovering considerable debris from late 19th and early 20th century commercial structures which once stood on that part of Alamo grounds. (Ed. Note: Students in the first UTSA archaeology course participated in this excavation project; many of these students were subsequently also involved in the founding of STAA in December 1973.)

During the summer of 1975, Anne A. Fox and Feris A. Bass, Jr., of the Center for Archaeological Research (CAR), The University of Texas at San Antonio (UTSA), directed excavations in Alamo Plaza, within the small park in front of Alamo Shrine (Fox, Bass, and Hester 1976). An attempt was made to locate the old mission quadrangle south wall. Although the wall had been completely destroyed, the excavations did uncover wall footings and also remnants of a fortification ditch of the battle period that was just on the outside of the quadrangle.

In January, 1977, Anne Fox (UTSA, CAR) monitored backhoe trenching in front of the Long Barracks Museum (the old mission convento) which was done by the City of San Antonio during the Alamo Plaza repaving project. Trenching near the wall and subsequent hand excavations at the building revealed that the present restored wall of the Long Barracks rests upon the original mission convento wall footing (Fox 1977).

Excavations were conducted in front of Alamo Shrine in March, 1977, under the direction of Jack Eaton for the Center for Archaeological Research (Eaton 1980b). The excavations were confined to the area on the south side of the Alamo Shrine front entrance where flagstone paving was being replaced by the City. Uncovered here was the old street curb built in 1889. The curb was located 3 meters out from the building and curved around the southwest corner following the entrance to an old street which once ran along the south side of the old church. In addition, a section of the palisade trench which was dug between the old church and the Quadrangle prior to the 1836 battle was uncovered. The trench fill contained many military artifacts from that battle.

In 1979 and again in 1980, excavations were conducted by the UTSA, CAR under the direction of Anne Fox on the north side of Alamo grounds where remnants of the north patio wall were found (Fox, manuscript in preparation). During these excavations, a large part of a human skull, evidently a grim reminder of the 1836 battle, was found. This was the first documented human remains uncovered by archaeologists from that famous battle.* Other human remains are reported to have been found by various workmen in the past, but these were never documented and the whereabouts are currently unknown.

Also during 1980, extensive excavations were conducted by the UTSA, CAR, under the direction of Anne Fox and James Ivey, on the west side of Alamo Plaza where the River Linkage Project is located. These excavations have uncovered a basal section of the old mission quadrangle west wall, including remnants of rooms and front arcade originally built to be mission Indian apartments. The basal sections of the walls are built of adobe bricks. Just to the west of the wall, the excavations uncovered a large "bone bed" containing thousands of animal bones from many species of animals, but mostly cow and goat, which were butchered at the mission for subsistence. In addition, remains of 19th century house walls which overlay the mission period materials outside of the quadrangle were identified. The results of these excavations are currently being written.

DISCUSSION

The history of San Antonio de Valero has been long and involved, and it has shaped the lives (and deaths) of many peoples of differing ethnic and cultural backgrounds for more than two and a half centuries.

Excavations on Alamo grounds, in addition to uncovering structural remains and other features, have recovered a significant amount of cultural materials dating from all periods of occupation beginning with the earliest mission settlement at the site. Although Indian artifacts were found in the lowest cultural levels of the soil

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* Editor's Note: This discovery was reported by Anne Fox to the January 1980 quarterly STAA meeting where the skull and other artifacts were on display.

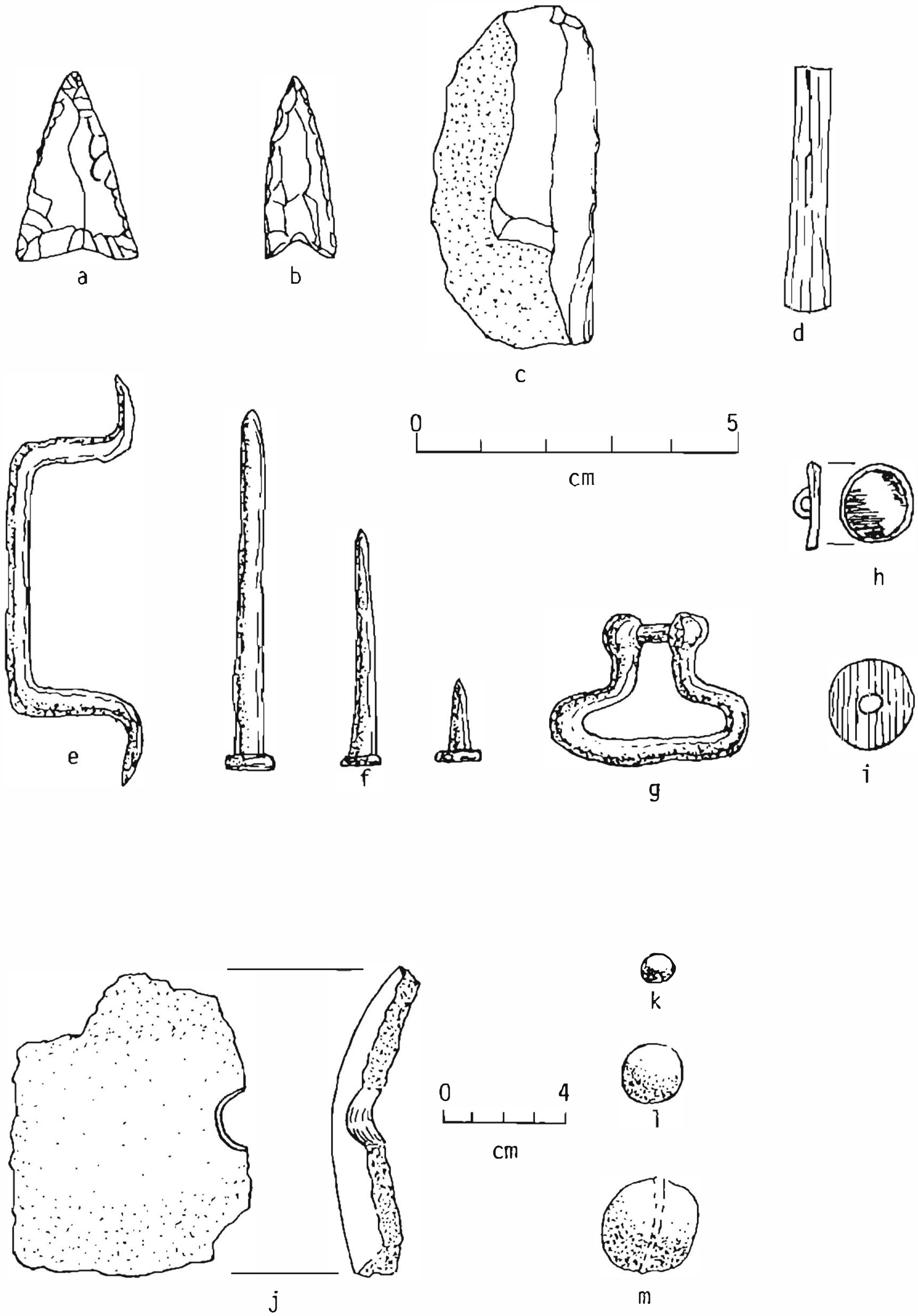

Figure 2. Selected Artifacts from Excavations at Mission San Antonio de Valero (The Alamo). a-b, mission points; c, side scraper; d, bone bead; e, iron wagon part; f, square iron nails; g, musket sling swivel; h, brass button; i, bone button; j, fragment of 8-in. howitzer spherical shell with fuse hole; k, 36-caliber lead musket or pistol ball; l, 69-caliber lead musket ball; m, bronze cannister shot.

stratigraphy, none seems to pre-date the mission period. Indian materials found, which were in association with Spanish materials, include a variety of chipped stone tools, mostly core and flake tools, thick and thin bifaces, and also objects of worked animal bone. Notable in the collections are thin bifaces forming small triangular arrow points with slightly concaved to deeply indented bases (Figure 2). Similar points have been found at other missions in Texas (Fox 1979) and at San Juan Bautista and San Bernardo at Guerrero, Coahuila. These are characteristic mission Indian arrow points that have been termed *Guerrero* points by Hester (1977).*

Spanish Colonial artifacts, as well as later period materials, have included a variety of metal, glass, pottery, and other objects. Some materials are clearly dateable to specific periods, such as the differing types of majolica pottery. The Mexican periods of occupation are recognized by such ceramics as certain majolicas and lead-glaze wares. The Anglo-Texan period is noted largely by such pottery as English-made pearlwares. Although pottery is a very handy tool for the archaeologist in estimating dates and cultural affiliations, many other recognized cultural materials are also useful in the reconstruction of history.

The battle of 1836 is well represented by collections of military artifacts that include such things as buttons, musket balls, cannon ball or shell fragments, and many other objects (Figure 2).

Faunal materials have been identified from the excavations and represent many species, both wild and domestic, most of which relate to the diet of the human occupants.

Archaeology at the Alamo has consisted largely of limited test excavations in various places on the Alamo grounds which were directed more by salvage needs preliminary to (or during) developments rather than planned, problem oriented research. In many ways this is unfortunate since the excavations had to be conducted on short notice and only in the areas to be affected by the developments. However, an Alamo Master Plan (1979) has recently been developed which includes the archaeology in the long range preservation plans for the Alamo. Although a comprehensive, long-term archaeological plan is not yet formed in any detail, the need for the archaeology of known critical areas on the Alamo grounds has been recognized by the authors of the Master Plan and will be considered in any future development projects.

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* Editor's Note: Such points have also been called "Mission Triangular" arrow points by Hester and others. However, since Mission San Antonio de Valero was colonized initially by Indians from the Guerrero enclave, the author's use of the name here is probably very realistic.

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COVER ARTIST Rose Marie Siebenhausen

The view of the Alamo on the cover of this issue is the work of Rose Marie Siebenhausen, a well-known San Antonio artist. She holds membership in the Fine Arts Association, Metropolitan Art League (Victoria), River Art Group, and the Helotes Art Guild.

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AN ARCHAEOLOGICAL SAMPLE FROM AN UNDOCUMENTED *EDWARDS* SITE IN NORTHERN BEXAR COUNTY, SOUTHERN TEXAS

Richard McReynolds and Keith Grunewald

INTRODUCTION

In recent years, a good deal of interest has been focused on the *Edwards* arrow point as being a probable transitional link between Archaic dart point types and Late Prehistoric arrow point types (Sollberger 1967; Hester 1970, 1971). Some have speculated that the *Edwards* arrow point distribution represented a very distinct cultural group (Sollberger 1967; Mitchell 1978). A possible trait of this culture seems to be their use or reuse of earlier Archaic burnt rock middens (Skinner 1974; Beasley 1978; Mitchell 1978). Radiocarbon dates from the La Jita site in Uvalde County (Hester 1971) and from sites on Camp Bullis in Northern Bexar County (Kelly 1978) date the *Edwards* point as A.D. 930 to 1100; some authors suggest that the first appearance of the *Edwards* may have dated as early as A.D. 860 (Mitchell 1978).

SITE

In the fall of 1980, we heard rumors of relic collectors being active on a good *Edwards* site in Northern Bexar County. Since relic collectors are fairly close-mouthed about their sites to anyone outside of their immediate group, it was not until late December 1980 that the junior author was able to locate and visit the site.

We contacted the landowner and found that he was not aware of the existence of the site on his property. Nonetheless, he agreed to meet us at the location. After examining the very disturbed site, he granted permission for us to salvage a sample of the artifacts found in the midden as long as we restricted our work to the area which had already been disturbed.

The site is located on the Cross Mountain Ranch in Northern Bexar County. The property has been in the family of Fred Adams since the middle of the last century. A portion of the ranch has now been subdivided for development. The subsequent roadwork is responsible for making the area of the site visible to the public and making it accessible to collectors.

The area is within the confines of the Edwards Plateau, more commonly known in this part of Texas as the Hill Country. Generally, it is an area of low hills and valleys eroded from limestone formations. Wet weather springs are abundant in the area and permanent springs are not too uncommon.

The site itself is a fairly large burnt rock midden approximately twenty-five yards wide and thirty-one yards long. The midden is on a terrace midway between an east-west ridge and a dry creek which is parallel to the ridge. (This creek eventually empties into Leon Creek which meanders south through Western Bexar County until it empties into the Medina River south of San Antonio.) The terrace slopes gradually to the south and terminates twelve feet above the creekbed. Sixty-five yards south of the midden and on the opposite creekbank is a spring which has been modified by a dug cistern lined with unmortered rock (A possible historic site which is worthy of investigation in its own right).

The central portion of the midden appears to have been potholed repeatedly over a long period of time. However, more recent activity was readily apparent; part of the more recent disturbance appears to have been made with mechanical equipment.

We started our sample pit in a very unscientific fashion, since by our agreement with the landowner we were restricted to the disturbed area. No attempt was made to stake out a grid, take systematic measurements, nor to plot artifacts which were recovered. Most of the previous potholing was more or less centralized in the middle of the burnt rock midden; where there was not a pothole, the midden in this area was covered by the remains or debris left from sifting operations. We attempted to pick a spot within the area which showed the least signs of disturbance. Our test area took on the appearance of an east-west trench as we followed the path of least resistance (and what seemed to be the least disturbance). Artifacts were numerous, but we also found boards, bottles, broken glass, modern nails, rags, and even a cinch buckle with part of a rope attached. Obviously, even though we had chosen what appeared to be a relatively undisturbed area, the whole vicinity had been "worked" and none of the original stratigraphic relationships remained. Some of the earth was removed from the midden for closer screening.

While we were working the site, others continued to also visit the site. Our time expended at the site was limited to a few hours on weekends; it was rare that we returned to find any resemblance of what we had left. Apparently our weekly compatriots found the center of our pit-trench handier as a starting place so that our work area was usually greatly expanded. Thus, we cannot claim that our sample of artifacts is completely representative of the materials found in this midden.

We took depth measurements at several places on the midden. The deepest measurement was twenty-three inches; at that depth we encountered an apparently sterile level of fine limestone and caliche gravel.

ARTIFACT SAMPLE

Some of the materials recovered from this site are illustrated in the accompanying photographs (See Figures 1 - 4). These are the more identifiable or complete specimens, not all of which were found by the authors. Our specimen counts (See Table 1 below) also include those found by the landowner and his friends.

TABLE 1

Types of Artifacts Recovered from the Cross Mountain Ranch Site

Dart Points			Arrow Points		
Bulverde	-	2	*Perdiz*	-	1
Castroville	-	3	*Scallorn*	-	17
Darl	-	1	*Edwards*	-	66
Ensor	-	4	Other	-	8
Frio	-	2			
Langtry	-	1	**Bifacial Knives**		
Marcos	-	2			
Marshall	-	5	Triangular	-	4
Montell	-	8	Ovate	-	3
Nolan	-	3			
Pedernales	-	14	**Worked Bone**		
Uvalde	-	6			
Williams	-	2	Awl (?)	-	1

DISCUSSION

The dominant type of artifact found at this site is the *Edwards* arrow point which seems to justify our calling this an *Edwards* site. The *Edwards* arrow points recovered included several subvarieties, thus giving some credence to Sollberger's (1967) original contention that this type may represent miniature copies of earlier Archaic dart point styles. Even though our sample of the artifacts from this site was not systematically collected, we feel that the very high proportion of *Edwards* points recovered suggests that the major occupation of the site can be credited to the *Edwards* point people, which Sollberger (1967) and Mitchell (1978) have titled the Turtle Creek Phase. Thus the most intensive occupation of the site appears to have been during the transition between the Late Archaic and the Late Prehistoric periods.

Figure 1. Early and Middle Archaic Dart Points from the Cross Mountain Ranch site, Northern Bexar County, Texas.

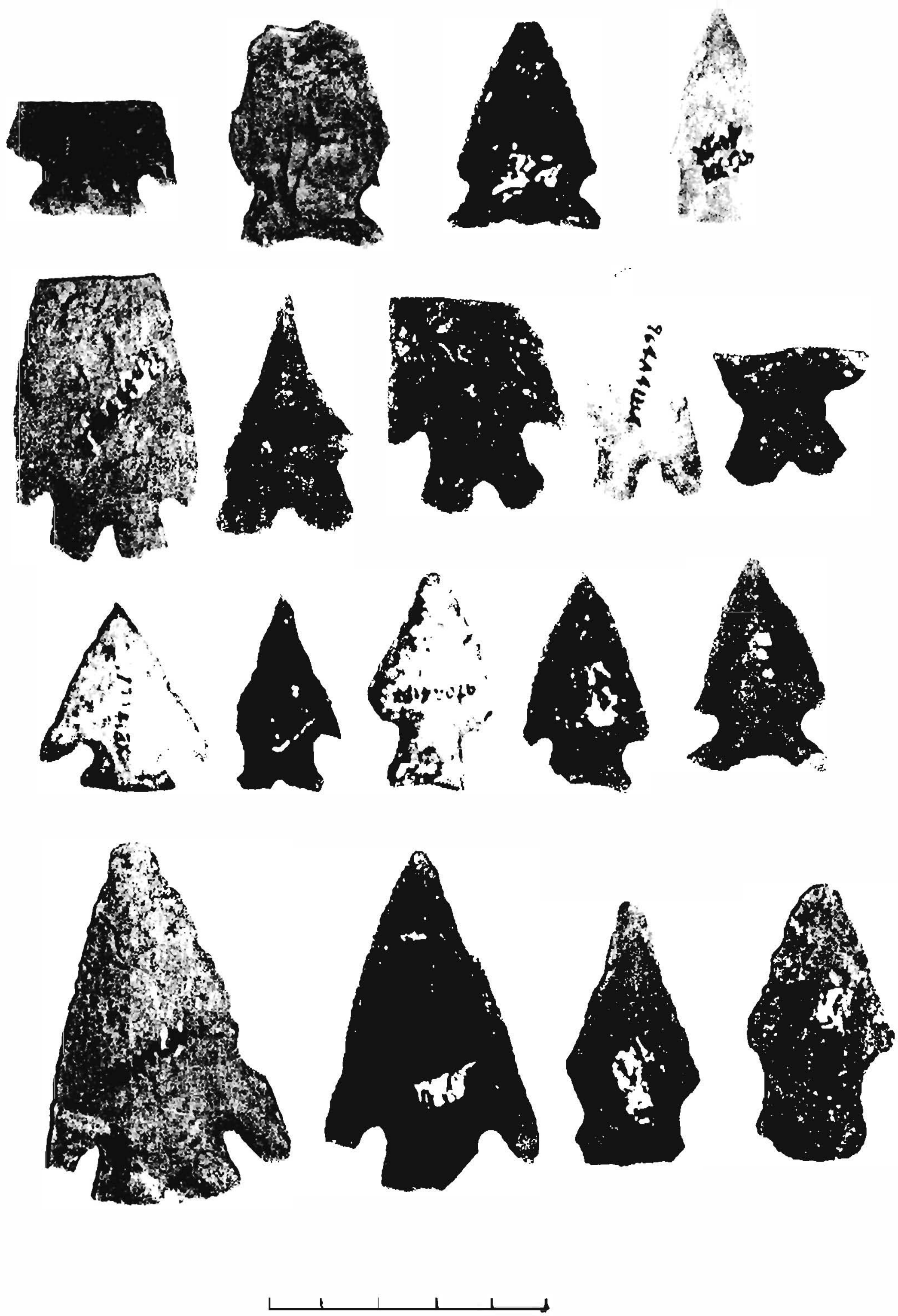

Figure 2. Middle and Late Archaic Dart Points from Cross Mountain Ranch; note the row of smaller dart points (3rd row) presumably from the very Late Archaic.

Figure 3. *Edwards* and *Scallorn* Arrow Points from the Cross Mountain Ranch site.

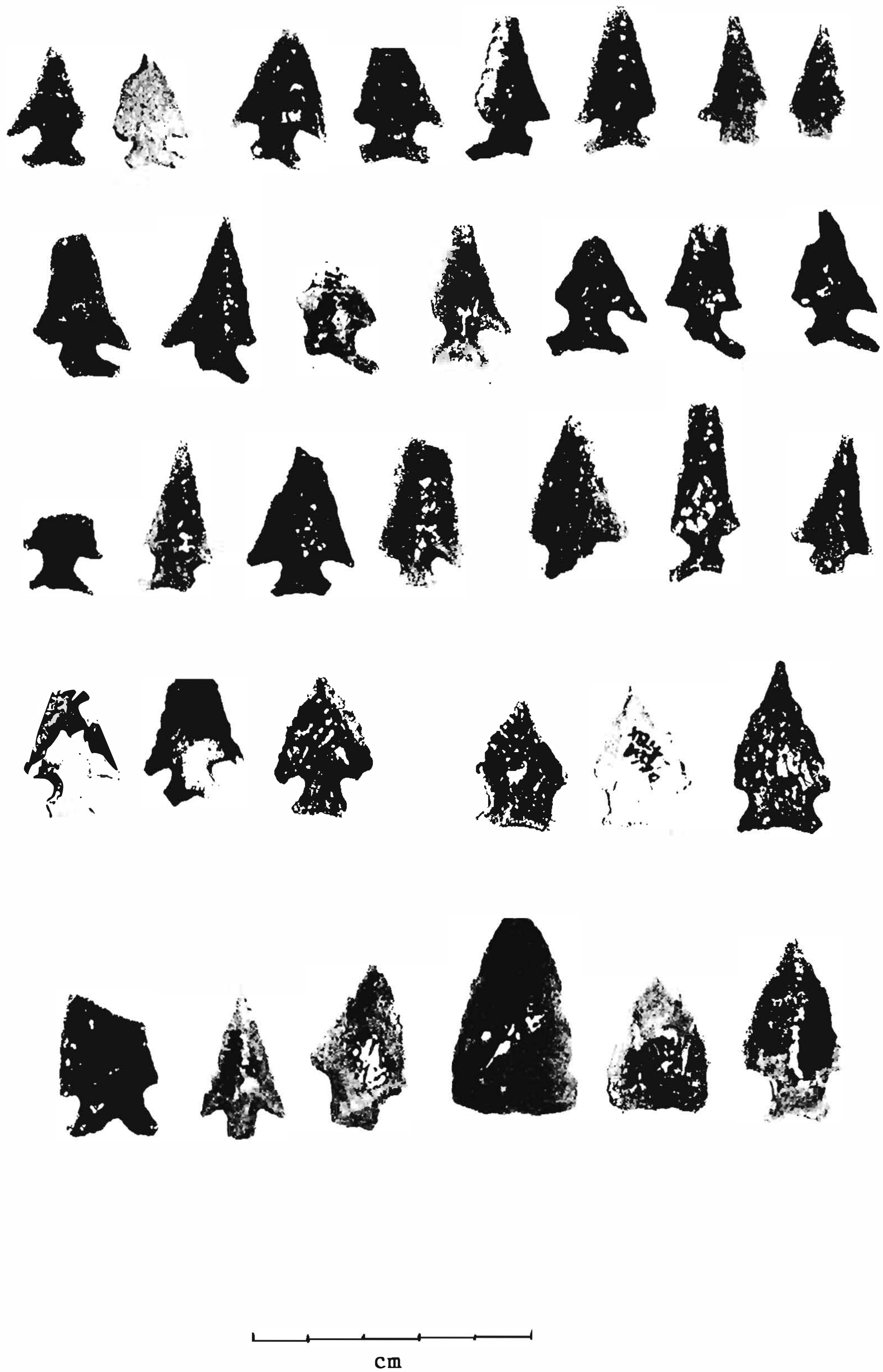

Figure 4. Additional *Edwards*, *Perdiz*, *Triangular* and other Arrow Points from the Cross Mountain Ranch Site.

Scallorn points, though not profuse, are present in some quantity. *Scallorn* arrow points are the second-most frequently encountered point type on the site. The lack of stratigraphic control makes it impossible to conclude anything about any possible temporal separation of *Scallorn* and *Edwards* arrow points at this site. The two point types appear to be somewhat mixed at many sites (La Jita, Bammel, Oblate Shelter, Scorpion Cave, Beasley's Bandera County *Edwards* Point Site, etc.) although they appear in distinctly separate stratigraphic layers with *Edwards* predating *Scallorn* at a Sinkhole site in Bandera County (Henderson 1981).

The almost complete lack of *Perdiz* points at this site (only one broken specimen recovered) suggests only minimal (if at all) occupation after the Initial Late Prehistoric. Two triangular points were also recovered but one of these appears to be an unfinished "blank"; the other may well be a complete *Triangular* (*Fresno*?) arrow point.

Dart point forms of the Archaic Period apparently represent most of the Central Texas Phases outlined by Weir (1976, 1979). Among the dart point forms, the *Pedernales* is the dominant form, suggestive of occupation during the Middle Archaic or Weir's Round Rock Phase (2250 to 650 B.C.).

CONCLUSIONS

We feel that this site is an important one because of its location and the various types of artifacts which have been recovered. Uncontrolled as our salvage operations may have been, they were sufficient to demonstrate that the site was occupied during most of the Archaic Period, with the exception of the very earliest phase (San Geronimo Phase or Pre-Archaic; Weir 1979). Apparently the burnt rock midden began to accumulate during the Early Archaic or Clear Fork Phase which dates around 3000 B.C. (*Bulverde, Nolan*) and the Archaic occupation reached a peak during the Middle Archaic or Round Rock Phase (2250-650 B.C.: Weir 1979) based on the presence of *Pedernales, Langtry,* and *Bulverde* dart points. The occupation continued into the Late Archaic or San Marcos Phase (850 B.C. - A.D. 150) as indicated by the presence of *Ensor, Marshall, Marcos, Montell* and *Castroville* dart points (ibid.). Finally, the occupation of the site continued into the transitional period between the Late Archaic and the Late Prehistoric; this period was the most intense occupation at the site, as evidenced by the dominance of *Edwards* and *Scallorn* points recovered. This occupation represents the Turtle Creek Phase, and marks the initial stages of the Late Prehistoric in South Texas (A.D. 860 - 1130: Sollberger 1967: Mitchell 1978). Occupation of this site may be related to the complex of similar sites on Camp Bullis, which is located in the next drainage (Salado Creek) to the east of Leon Creek (Gerstle, Kelly and Assad 1978).

While much of this site has been destroyed by indiscriminate relic collecting, enough of the site remains to be of considerable scientific value. If stratification exists in the undisturbed areas of the midden, a considerable amount of information might be recovered concerning the *Edwards* arrow point type and the cultural group responsible for this type. We need to have a better understanding of this phase, which appears to be unique to Southern Texas and distinct from the Central Texas sequence postulated by Weir (Toyah and Austin Phases). Did the groups in Northern Bexar County (and other counties along the Balcones Escarpment in South Texas) diverge from the continuity of the Central Texas Archaic during this transitional period, as has been speculated by Sollberger (1967) and Mitchell (1978)? Was pottery introduced into the Turtle Creek Phase during this era (Mitchell 1978)? At present, no pottery has been recovered from this *Edwards* site, but this may be a function of the unsystematic excavation and potholing of the site.

At present, the bulk of the midden is relatively intact. We feel that it should be properly recorded as a site and should be investigated by professional archaeologists. We have advised the landowner to install Posted and No Trespassing signs. We have also approached him several times on the possibility of having qualified people from UTSA make a controlled excavation. He is at present reluctant to do so, probably because he wants to retain the artifacts found at the site. [Ed. Note: If an STAA or CAR excavation is done at this site, the artifacts would be returned to the owner if he so desires, after they have been properly studied and evaluated.] Such scientific study of the site could only add to the value of his present and future collections from this important Archaic and Initial Late Prehistoric site.

ACKNOWLEDGEMENTS

The authors wish to thank the landowner, Mr. Fred Adams, for allowing this salvage operation. Thanks also to Mr. Vernon Vaughn for the excellent photographs of the artifacts.

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PALEOINDIAN LITHIC TECHNOLOGY AND NEW ASSOCIATED DATES FOR SITE 41 ME 3, MEDINA COUNTY, TEXAS*

Leland W. Patterson

ABSTRACT

Site 41 ME 3 in Medina County, Texas was previously identified as a Paleoindian site by analysis of overall lithic technology, rather than by projectile point typology, before confirming dates were obtained. This demonstrates the basic continuity of Paleoindian lithic technology, compared to the diversity of projectile point types, and the value of complete lithic analysis in Paleoindian studies. Two Paleoindian period dates have now been obtained for site 41 ME 3 by the thermoluminescence (TL) method. A discussion is given on the value and limitations of the TL dating method for thermally altered flint.

INTRODUCTION

One of the great pleasures in Archeology is obtaining new data that answers old questions. This paper describes such an event.

An earlier report on archeological site 41 ME 3 in Medina County, south central Texas (Patterson 1977) noted the similarities of the lithic technology of this site to general Paleoindian lithic technology and to the lithic technology of the Upper Paleolithic of northeast Asia. Site 41 ME 3 was described as a hilltop quarry and campsite that seems to fit the general occupation pattern of the Paleoindian. Others have noted the tendency of Paleoindian sites to be on high ground as "lookout" sites (Hester 1980:138).

The lithic materials from site 41 ME 3 are a surface collection from a thin soil layer above a Cretaceous surface. This collection is of a statistically significant size, and detailed data were published (Patterson 1977) on this material. Flint sources are present at the site. The lithic technology of this site appears to be homogeneous, without indications of mixing of several cultural time periods. Many investigators tend to ignore surface collections as too difficult to interpret. Much valuable data is overlooked by this attitude.

Surface collections are not usually considered datable, but dates have been obtained for site 41 ME 3 by direct dating of two thermally altered flint artifacts by the thermoluminescence (TL) method. The date range obtained is consistent with the previous hypothesis (Patterson 1977) given as to the Paleoindian nature of this site.

DATES FOR SITE 41 ME 3

The University of Missouri at Columbia has obtained dates for two thermally altered flint artifacts (thick man-made flakes) from site 41 ME 3. These dates are 9551 ± 765 B.P. (Sample 79-8-2) and 7098 ± 760 B.P. (Sample 79-8-3). These are minimum dates as the specimens have been exposed to sunlight, because this is a surface collection. Both dates are within the Paleoindian period time range of 7,000 to 12,000 B.P. given by Jennings (1974:Figure 3.27). Both dates are also within the 7,000 to 10,000 B.P. time range for the Paleoindian *Plainview-Golondrina* projectile point series in Texas (Johnson and Holliday 1980:Table 3).

Given the minimum nature of these dates for site 41 ME 3 and the error range for TL dating, the earliest date of 9551 ± 765 B.P. could easily overlap with the 10,000 to 12,000 B.P. range of the Llano fluted point complex. For example, the

* A somewhat longer version of this paper was presented at the annual meeting of the Texas Archeological Society, Austin, Texas, November 1, 1980.

earliest date for site 41 ME 3 statistically overlaps the *Folsom* complex date of 10,080 ± 330 B.P. (RL-558) at the Hanson Site in Wyoming (Frison and Bradley 1980: 10). As a parallel example, Dibble and Lorrain (1968:Figure 14) have found a *Folsom* fluted point and *Plainview* unfluted points in close proximity at the Bonfire Shelter, Val Verde County, Texas.

The author had originally hoped for pre-*Clovis* dates at site 41 ME 3 to demonstrate Asiatic type lithic technology as the Paleoindian tradition precursor. The actual TL dates obtained are early enough to place the lithic technology of site 41 ME 3 firmly in the Paleoindian tradition time period, but not early enough to demonstrate technological origins.

COMMENTS ON THE TL DATING METHOD

Even though the thermoluminescence method has been in use for several years for dating ceramics, the use of this technique for dating thermally altered flint is relatively new. The author was informed by several organizations with TL dating facilities that they could handle only ceramics. The University of Missouri at Columbia, which did the TL dating work reported here, is a pioneer in dating of thermally altered flint.

The TL dating method depends on a specimen being heated to a high enough temperature to remove all trapped electrons from the mineral crystal structure. After heating, the specimen again begins to accumulate trapped electrons because of formation by ambient background radiation. The TL method measures the amount of trapped electrons by measurement of light evolved upon reheating of the specimen. The amount of trapped radiation and its formation rate are used to calculate the date of a specimen from the time of initial thermal alteration. Ralph Rowlett (personal communication) of the University of Missouri at Columbia states that a minimum temperature of 400 degrees C (752 degrees F) is required on flint to reset the TL "clock." A soil sample is required to determine the background radiation level.

The TL method can be used in two ways on flint. One is to obtain the date of an object since the time of thermal alteration. The other is to determine if any thermal alteration has occurred, often from purposeful heat treating of siliceous minerals to obtain improved knapping properties (Melcher and Zimmerman 1977).

A major problem with TL dating is that a thermally altered specimen may not have reached a high enough temperature to completely reset the TL "clock." The two specimens successfully dated for site 41 ME 3 both had signs of exposure to intense heat, in the form of potlid fractures on surfaces and coarse internal appearances with irregular internal fractures. A third specimen from site 41 ME 3 was processed for TL dating because it displayed the typical properties of thermal alteration found by experimental heat treating to improve knapping characteristics. These changes typically due to heat treating observed on this specimen were reddish discoloration and waxy luster of new fracture scars. This third specimen was not successfully dated, and gave an impossibly old date of well over 90,000 years (sample 79-8-1).

In many cases, siliceous minerals can be heat treated to improve knapping properties at a temperature level too low to reset the TL "clock." The author (Patterson 1978) successfully uses a temperature of 260 degrees C (500 degrees F) for experimentally heat treating many types of Texas and Ohio flints. The third specimen for site 41 ME 3 had a divergence in shape of the TL glow curve at approximately 235 degrees C, compared to the other two successfully dated specimens. This indicates that the third specimen had not been heated to a high enough temperature level to completely reset the TL "clock," even though some thermal alteration was indicated. The TL glow curve for a sample (79-8-4) of raw flint of the same type as the third specimen had a higher magnitude TL glow curve than the specimen being dated. This also indicated some thermal alteration on the third specimen that was not successfully dated.

It can be concluded from the TL dating results reported here, and from information on experimental heat treating of flint, that much of the heat treated siliceous minerals found on archeological sites cannot be dated by the TL method. In choosing specimens of flint for TL dating, selection should be made from materials showing signs of exposure to intense heat. Even this selection procedure will not always be successful. The author and J. B. Sollberger (personal communication) have obtained severe thermal damage on some grades of smooth, dark Texas flints at a temperature level as low as 232 degrees C (450 degrees F), which is not high enough to reset the TL "clock."

An important advantage of the TL dating method is that it dates lithic artifacts directly, and is not subject to the problems of stratigraphic interpretation as required for C-14 radiocarbon dating. In the case of sites such as 41 ME 3, which are not stratified and have no carbon samples, the TL method is the only dating technique that is presently available.

PALEOINDIAN LITHIC TECHNOLOGY

A detailed review of the lithic technology of site 41 ME 3 has been published (Patterson 1977), and will not be repeated here. As previously noted, there are a number of similarities between the lithic technologies of site 41 ME 3 and known Paleoindian sites. The industry for manufacturing large size prismatic blades at site 41 ME 3 corresponds to blade industries at several Paleoindian sites (Green 1963, Hester 1972:92, Converse 1973, Hammatt 1969, Kraft 1973). At site 41 ME 3, most prismatic blades are over 20 mm wide.

Specimens of semi-conical blade cores are also available to demonstrate the complete prismatic blade industry at this site. Other examples of this blade core type connected with the Paleoindian in North America have been published (Dragoo 1973:Figure 27, Chapman 1975:Figure 4-13, West 1973:Plate III, and Patterson 1977: Figure 2A).

CONCLUSIONS

The following key points can be made from the previous analysis of lithic technology from site 41 ME 3 (Patterson 1977) and the two Paleoindian period dates now obtained for this site:

1. The Paleoindian nature of site 41 ME 3 was successfully identified by analysis of overall lithic technology, rather than by projectile point typology, <u>before</u> dates were obtained. This demonstrates the value of analysis of overall lithic technology for Paleoindian studies.

2. The previous hypothesis (Patterson, 1977) that the lithic technology of site 41 ME 3, and Paleoindian technology in general, represents a continuation of an origin from the Upper Paleolithic of northeast Asia remains a viable possibility, although a pre-*Clovis* date would have been more conclusive.

3. The projectile point technology of site 41 ME 3 may represent a separate tradition parallel to recognized Paleoindian point forms, or an early divergency from recognized Paleoindian point forms. More research is required on this subject.

4. The successful dating of thermally altered flint artifacts from site 41 ME 3 furnishes an additional demonstration of the value of the TL dating method, although care must be given to proper sample selection.

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DISTINGUISHING MAN-MADE FROM NATURAL FRACTURES

Lee Spencer

ABSTRACT

This theoretical paper attempts to establish primary quantifiable criteria inherent in man-made versus naturally occurring fractures on conchoidally fracturing isotropic solids (i.e., silicates). The physical principles of fracturing are identical for both types of fractures, but it is a species-wide conceptual system producing a systematic series of decisions which allow differentiating criteria to be defined. Discussion of this area must, necessarily, be somewhat technical. It is hoped that the paper may be of some use to the avocational archaeologist and that it may generate discussion among those with a more intense interest in lithics.

INTRODUCTION

For years it has been assumed that man-made artifacts can be differentiated from pseudo-artifacts produced by natural causes. Oakley (1949) asserted that certain recognizable features are exhibited by man-made flakes. The natural assumption is that man-made fractures and the principles involved are somehow different from those operational for natural fractures. However, this fundamental assumption is wrong. Both man-made (artificial) and natural fractures follow the same physical principles when produced on the same materials.

The apparent differences are because artificial fracturing follows an internally consistent system of force application, while natural fracturing may result from a relatively random application of force. The consistent system produces a consistent series of fracture features on artifacts. Therefore, when these features or criteria are recognized on a lithic specimen, given a minimally significant context, then the specimen must be classified as an artifact. To do otherwise would be to forego objectivity which can produce quantification difficulties. This paper is an attempt to clarify this point of view.

Another clarification which may be necessary at this point is the arbitrary distinction which I will make between the differentiation problems of pseudo-artifacts and pseudo-wear. I feel this to be useful because while physically and typologically the distincti loes not hold up, any archaeologist will recognise that the identification of a possible flake, core, or tool, presents a range of different problems from those presented by the segregation of minimally used or modified flakes (tools) from a collection of lithic debitage. This paper deals primarily with the artifact/pseudo-artifact dichotomy. Much further work and probably more significant work remains to be done on the tool/non-tool dichotomy.

THE NATURE OF FRACTURE IN CRYPTO-CRYSTALLINE SILICATES

When force is introduced into a piece of crypto-crystalline silicate (hereafter CCS) or glass, it generally disperses through this medium in a cone-like fashion. This cone has been referred to as a hertzian cone or cone of force by Crabtree (1972:54) and others. In most artificial fractures only an arc of this cone is sent through the objective piece close to its surface. Compression rings, or ripples, are generally formed because these materials are semi-viscous and compressible. In a situation where force is introduced from two roughly opposite directions directed towards the center of the piece something Crabtree calles cone shear at times occurs (ibid.:54). This is a flat fracture with little emphasis of the bulb of percussion.

Certain conditions are responsible for the nature of fracture in isotropic materials. It is the interaction of these conditions which is responsible for the variation in the features observed on a fracture face. These conditions are listed below. They do not include the factors involved in thermal fractures except in an indirect way.

Interdependent factors responsible for generalized CCS fracture:

1) the proportion of introduced force to the mass of the objective piece. Combined here are the factors of compressor mass and the velocity of force introduction.
2) the area of surface over which contact is made.
3) the nature of the material's crystalline matrix.
4) whether other forces are acting at the same time and the constituent vectors.
5) whether there are pre-existing stress lines in the material.
6) the relative hardness of the compressor and the objective piece (hereafter O.P.).
7) whether the force is introduced by pressure or percussion, or a combination of the two.
8) the direction of the force relative to the edges, surface features, and interior of the piece.
9) the medium containing the materials when fracturing occurs; i.e., water, air, soil, ice, the human hand.

Indeed, whether the outcome of all these factors is a fracture at all rather than the incorporation of stress lines, and/or miniscule surface shattering is dependent on all these conditions.

Considering the number of dependent factors in the fracturing of CCS material and adding to these the different mechanisms responsible for fractures, it becomes apparent that there is an extremely wide range of fractures possible in nature. Operationally the variations are endless. Discounting man for the moment, some of the processes involved in mechanical weathering or fracturing include river, stream, or glacial transport; talus slippage; tectonics; soil creep; land slide; trampling; wave action; solifluction; sand blasting; wild fire; solar radiation; and frost action. This listing glosses over many specific processes, such as natural material movement of an alluvial fan. The listing is also redundant, but generally indicates the range of variability present in the natural world. There are even certain processes of chemical weathering which can produce provacative end products. When the human agent is added to these mechanisms we have listed the causal factors in the universe of fractures on conchoidally fracturing materials.

The passage of the cone of force through the siliceous material leaves characteristic features apparent on the positive and the negative fracture faces of the material. These features vary greatly according to the relationships of the dependent factors listed above to each other. Hypothetically, if we knew how to calculate the relationships of all the factors to each other we could not only predict and produce, but explain the characteristics of any given fracture. What leads Oakley, Crabtree, and others to call certain features diagnostic of man-caused fractures is not that there is a difference in "kind" between artificial and natural fractures, but that humans have developed a system for working stone which incorporates certain operational consistencies. The conditions responsible for fracturing are purposefully varied by the people flaking in a finite number of ways to produce a functional stylistic end product. Probably partially functionally, partially culturally, and partially unconsciously developed over millenia by early hominids, it is likely that all humans have a similar gross "template" for how to produce fractures in conchoidally fracturing materials.

THE SYSTEM

Each of the considerations (decisions/actions) which will be discussed below will produce a physical attribute or set of attributes on the objective Piece. Each can, as well, be produced in an operationally unlimited number of ways. I'd like to make it clear, however, that while I believe in the occurrence of each of these actions/decisions, it is how they are produced that is the problem. This latter is the province of lithic replicators, analysts, and theorists. What follows then is what I believe to be the considerations incorporated in the species wide, cross cultural system of lithic reduction.

1) the preparation of a platform surface on the O.P., or the use of a natural platform.
2) the preparation of or use of an angled surface (face) contiguous to the platform. Sollberger (1980:33) has used the term "outer face" for this surface. Please bear in mind that O.P. refers to "cores," and bifaces, unifaces, and modified flakes (tools).
3) the delivery of force to a point near the edge formed by the intersection of the platform and the outer face.
4) control of the direction of the force delivered to the platform so that it uses only a small range of the possible angles to the outer face of the O.P.: i.e., ca. 0° to 180°. Remember that the ridges are being produced on the outer face. In the determination of the direction of force delivery the angle formed by the platform and the "core's" outer face prior to removal, the dorsal flake face, is more important than the platform ventral flake face angle. The quantification of the latter measure will produce information about bulbar characteristics, not preferred "hammerstone":platform angle characteristics.
5) the delivery of this force with a variety of tools, some fortuitously and some purposefully chosen, each of which produces a different flake with its concomitant configuration of flake features.
6) variation of the introduction of force according to the mass of the objective piece and the nature of the flake removal desired. This variation is accomplished by control over the mass of the compressor, the length of contact time between the compressor and the objective piece, and/or the speed or muscular force behind the introduction of force.
7) attention is normally given to the preparation of ridges (which sometimes occur naturally) or interflake crests roughly perpendicular to the platform edge and connected to it (this consideration is different from #2 above which is only a reference to platform:outer face angle; undeniably these two considerations are closely related). These ridges are incorporated into the dorsal side of the flake removed. The difference in surface mass these ridges incorporate into the "core" are used to guide the flake removal (the dispersion of force through the O.P.). I have observed where the prehistoric fabricator has purposefully prepared ridges parallel to the platform edge; this produces a thick cylindrical flake suitable for manufacture into drills. This site assemblage was from northern San Francisco Bay. Figure 1, h-m, illustrates the affects of dorsal ridges on gross flake morphology.
8) the area of contact between the compressor and the O.P. is quite small relative to the complete surface area (see discussion of node in the following section).

In most cases divergencies from the above-stated considerations would be either accidental or for a specific purpose. Classic examples of purposeful divergencies would be the purposeful bisection of spherical nodules to prepare a striking platform and the snapping of flakes to produce a working edge.

The systematic actions outlined above are admittedly reductionist. Not implied is that this was a conceptual system thought out consciously by its users. It may have only been considered as "the way it is done," a functional/stylistic means to an end; I believe the emphasis should be on the functional end of the above ratio. The functional significance of the system presented above is that it produces variably sharp edges, usually at least 10° to 90°. I have observed apparently purposefully steeper edges but they have been extremely rare.

Because force is introduced into the mass of the objective piece in a systematic fashion with a "template" in the mind of the fabricator, a consistent configuration of flake features is produced and observable on the end product. Therefore, it is these features which define a man-made removal. One or two of the features to be discussed below will be found on a natural removal. Under very rare circumstances most or all the man-caused features will be reproduced naturally, since, after all, all fractures of isotropic solids form a continuity. In the case of ambiguous natural fractures, these occur when the norms incorporated into the human conceptual system are rarely and randomly reproduced under natural circumstances. It is interesting in this regard that pseudo-wear or pseudo-retouch on artifacts will cause the arhcaeologist much more in the way of headaches than pseudo-flakes, cores, or "choppers" will. This is because the generally acute edge of a flake closely and naturally imitates the preconditions for removals under the human conceptual system.

FLAKE FEATURES DIAGNOSTIC OF MAN-CAUSED REMOVALS

These are the features produced on flakes and negative scars as a product of the passage of an arc of the hertzian cone through the O.P.. The consistency in the way that this arc is passed through the materials is responsible for the consistent co-occurance of these features on man-caused fractures. Note that these are "ideal" descriptions of the features and that differences in the crystalline matrix of the materials as well as pre-existing lines of stress will make these features more or less observable.

BULB OF FORCE This phrase refers to the pronounced convex swelling at the proximal end and on the ventral side of any flake (Figure 1, a-d:5). This feature is negatively represented on the O.P. (Crabtree 1972:48). The bulb is the dominant remnant of the hertzian cone produced before differences in the surface mass of the core become the dominant influence in the flake removal.

CROSS-SECTIONS The longitudinal cross-sections are recurved both negatively and positively (Figure 1, c,e,f). The end-on-cross-section is smoothly convex positively and smoothly concave negatively (Figure 1, e). This means that on an interior flake or secondary cortex flake the dorsal scars will be concave. The term, meniscus, has been used to describe any convexo-concavity.

DORSAL RIDGES This phrase refers in a general sense to any ridge on the outer surface of an O.P. which either fortuitously or purposefully guided a flake removal and is present dorsally on an artifact (Figure 1, a-d:4). More specifically this phrase refers to the intersection of two negative flake scars on the dorsal face of a flake; synonymous with arris, and interflake crests. In the latter usage the concept more commonly applies to dorsal ridges on tools.

ERAILLURE FLAKE This phrase refers to flake removals solely from the positive bulb of force which have the ventral parent flake's face as their dorsal surface. While no negative scar of the eraillure flake is retained on the negative bulb of force commonly the eraillure flake itself is retained against the negative bulb of force. The negative eraillure scar on the positive bulb of force has ripples and minute fissures oriented concentrically to some point of applied force or to some area on the platform of the parent flake (Figure 1 d:3, g,h-z). Commonly these flakes are oval but they may be of any shape though generally with a smooth outline. This flake is not always produced and has no bulb of force itself (ibid.:60). At times there may be more than one eraillure scar on a bulb. The term is synonymous with secondary flake scar.

FISSURES This term refers to "lines of radii usually originating at the margins of flakes" and negative scars "and directed towards the point of force" (ibid.:64). These fissures are also found directly associated with the point of force and with eraillure scars (Figure 1, a-d:2,g). More traumatic introductions of force may produce more pronounced fissures.

LIP This term refers to an overhanging platform projection found on the ventral side of many flakes (Figure 1,f). Usually associated with a soft hammer technique though not necessarily so (ibid.:74).

NODE This term is defined here for the first time and will hopefully prove to be useful. It refers to the area of the point of force on the platform surface which is contacted by the compressor (Figure 1 n-z). The use of the term in this paper is slightly different from what is called the point of contact by Crabtree (ibid.:84), or I may be only elaborating on Crabtree's term. Commonly the node forms a small, hemispherical ventral projection to the platform. Biface thinning flakes, for instance, have an elliptical node. At times the platform of the eraillure flake removes a portion of the node's ventral edge. There is usually a variable amount of extra-node platform surface. The amount of this extra-node surface seems to be dependent on the amount of platform preparation, the hardness of the compressor, and the shock or suddenness of the introduction of force. Though very fine and brittle there should be a negative representation of the node on the O.P.. The area of the node is probably related to the nature of the compressing tool and the amount of force initiating the removal. I do not think that this is a consistently proportional relationship.
PLATFORM This term refers to the table or surface area of the O.P. into which force is initially introduced (Figure 1 a-d,f,g:6, n-z). Part of this O.P. platform is removed with each flake as its extreme proximal surface, or flake platform. The platform is sometimes shattered or crushed during flake removal.
RIPPLE This term refers to compression rings radiating from the point of applied force (Figure 1 a-d:1). A compression ring is a homogeneous series of waves propagated through an elastic medium and concentric around the propagation point.

If the above features are present on a lithic specimen and if its context is minimally good, then this specimen is an artifact. By good context is meant, conservatively, late pleistocene or more recent deposits where there is some reason to expect prehistoric human activities, even if only after the fact. Presence in river gravels is a reasonable context since these deposits were commonly mined for lithic material as is evident from the stream-rolled cortex evident on the artifacts from many site collections. This case may not hold true for central Texas streams.

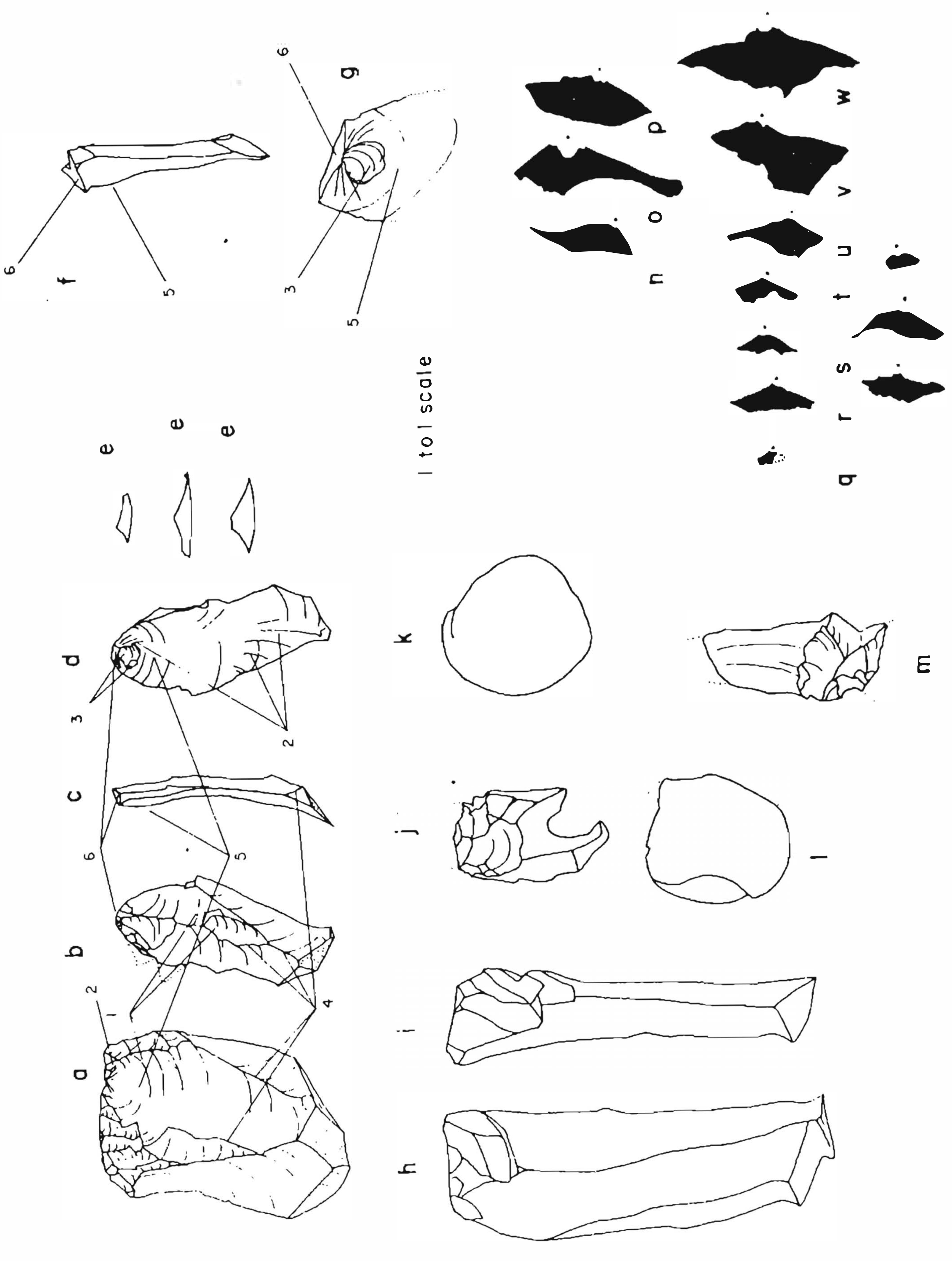
Another helpful indicator in the designation of a "core" artifact is the patterning of the apparent scars. While one scar may designate an artifact, obviously, the more complex the better.

Yet another useful indicator of human intervention is the size of the scar on the "core" artifact. This last statement is related to the pseudo-wear or pseudo-retouch which are very common in any archaeological site collection. As the complexity of the patterning and the size of the scars increases above a certain minimum size so does the likelihood of the involvement of the human agent.

I have been purposefully vague with the last three indicators since it is felt that these data fall outside the main thrust of this paper. They were introduced because they could not be ignored.

The following is then the definition of a lithic artifact according to the discussion presented in this paper. A lithic artifact is any lithic specimen which exhibits the following features of a conchoidally fracturing semi-fluid solid either positively or negatively: a bulb of force; ripples; fissures; eraillure scar(s); a platform, in particular with a lip or a node evident; and a sinuous or recurved longitudinal cross-section, and an end-on cross-section which is smoothly convex positively (ventrally) and smoothly concave negatively (dorsally). Context, scar patterning, and scar size must also be taken into account. Note that some of these features may be absent, such as the eraillure scar, fissures, or a platform lip without affecting the determination. Features may also be obscured by the surface texture of the material. Post removal breakage may cause the loss of certain features.

Natural fractures may exhibit a few of these features, but will more likely exhibit others some of which will appear to be radical mutations of the above-discussed man-caused features. Actually, there are probably overall generic features produced by all fracturing of isotropic materials. The man-caused features are probably those generic features modified by a consistent system to form a consistent multi-variant class of features.


1 to1 scale

a. Core, platform toward top of page; illustrates NEGATIVE SCAR on objective piece for flake drawn in b-e.

b. Flake, platform toward top of page; DORSAL VIEW. Note dorsal left lateral damage which occurred during flake removal. Also note dorsal ridges and ripples, fissures not drawn.

c. Flake, platform toward top, LONGITUDINAL CROSS-SECTION. Note sinuous, recurved ventral profile, dorsal profile obscured by dorsal ridges. Also note lateral damage in this view.

d. Flake, platform toward the top, VENTRAL VIEW. Note two eraillure scars, platform, lateral damage, ripples and fissures.

e. Flake, dorsal side toward top, END-ON CROSS-SECTIONS at various points along the flake. Note smooth ventral convexity and smooth negative concavities dorsally.

f. Flake, platform toward top, longitudinal cross-section. Note small LIP and recurved, sinuous profile.

g. Proximal end of flake, ventral view. Note ERAILLURE SCARS; two miniscule scars to the ventral left of main scar. In this case main scar ripples are not oriented explicitly to the point of impact.

1. ripples
2. fissures
3. eraillure scar
4. dorsal ridges or interflake crests
5. bulb of force
6. platform

h-m. Six flakes, platforms toward top, dorsal views. Note CONTROL OF RIDGES OVER FLAKE MORPHOLOGY IN PLAN VIEW. Figures k-l illustrate the oval shape of flakes without dorsal ridges. This sort of uniformity would be expected from the passage of a cone of force arc through an isotropic solid without the interference of dorsal ridges. Figure m is the medial section of a flake the dorsal scars of which are perpendicular to the long axis of the flake. This is an example of the fact that two pronounced ripples can have the same guiding influence over flake morphology that actual dorsal ridges can.

n-p Flake platforms, chert, ventral right edges toward the top. Note vaguely hemispherical NODE projections on ventral side with eraillure scar divots removed ventrally. a dot has been placed opposite node center impact point. Also note extra-node platform surface. These are mirror image impressions using a stamp pad so that left and right are reversed.

q-z Flake platforms, obsidian, same orientation as n-p. Figure q is platform of flake illustrated in b-e, this figure; note damage. NODE is more pronounced on these glass flakes.

← Figure 1. Flaked Stone Artifact Features. All examples illustrated except for n-p made by the author from east Oregon obsidian; n-p are chert.

SUMMARY AND CONCLUDING STATEMENTS

The mechanics of fracturing isotropic materials is the same for artificial and natural fracturing. The finite set of variables responsible for the nature of any fracture in siliceous materials are varied virtually infinitely in nature; operationally natural fractures are random. Man-caused fractures are non-random; the finite set of variables are varied to conform to a generalized, internally consistent conceptual system. I believe this conceptual system is a species wide "template" relating to conchoidal fracture. All human flake removals show a consistent series of features. Some of these features are functionally selected for, such as acute edges for cutting, and the creation of negative scars; others are accidental by-products of the physical principles of fracturing. The latter include eraillure scars and flakes, ripples, and fissures.

There will be an occasional natural fracture which will exhibit the flake features by a man-caused removal will be recognized. This will be because the natural processes responsible will have randomly approximated the human conceptual system. Conversely, there will also be man-caused removals which will lack the man-caused features. This will be accidental and/or due to childish playing, or poor material.

The set of criteria by which artifacts can be recognized is real insofar as it is the physical representation of the mechanics of conchoidal fracturing. All of the variability obvious worldwide and through time in those artifact assemblages produced from the fracturing of isotropic materials are variations on this same basic theme.

I hope that this paper has produced some useful information, and I welcome any feedback or criticism that may be generated.

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INFORMATION FOR AUTHORS

Articles dealing with the archaeology or ethnology of Southern Texas and adjacent areas are invited. Short articles dealing with specific sites, with types of artifacts, or with archaeological ideas (phases, periods, relationships with historic Indian groups, etc.) are preferred; see the articles in this issue for examples. Priority for publication will be given to original works; however, some reprints of previous work will be used, particularly when they were originally published in journals not readily available in South Texas.

Manuscripts can be submitted in any form (handwritten, printed, typed, etc.) although double spaced typed drafts are preferred. We understand, however, that typewritten material is not possible for everyone and will gladly work with whatever you choose to submit. To protect your work and to protect *La Tierra*, you are encouraged to make a copy (Xeroxing is available almost everywhere) of your work. That way, if your manuscript is misplaced or lost in the mail, it can still be used without having to rework the material.

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Illustrations are key to most articles. Good illustrations can do much to communicate the significance and beauty of your materials, and will permit other researchers in the future to have a good idea of your material. Always include a scale (preferably metric) in your illustrations since the size of the reproduced copy may not be exactly life size. Please do not write or type on illustrations; note your captions and lettering on a separate sheet. This will permit the lettering and captions to be added in a type style consistent with the other material in the issue. Ed Mokry uses a system of doing his drawings, making a xerox, and then typing in captions and specimen designations (lettering) on the xerox copy; this leaves the original clean for use in final preparation of the journal.

Black and white photos will be used as funding permits. However, each photo plate costs an extra thirteen dollars so that the number of photos which can be used is limited. Authors who submit more than one photo should be prepared to help defray the extra cost of publication. Please do not cut up your photos or paste them on sheets with anything except rubber cement; this complicates our preparation of final publication copy.

Authors will receive two extra copies of the issue in which their article is published. These will be mailed after the regular mailing to STAA members has been completed.

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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 amateur 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.

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