REGIONAL SUMMARIES OF PREHISTORIC AND EARLY HISTORIC CERAMICS IN TEXAS FOR THE COUNCIL OF TEXAS ARCHEOLOGISTS

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INTRODUCTION

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This document presents regional summaries of the prehistoric and early historic ceramics made and used by Native groups in Texas, an essay on an overview of ceramic methods and attributes, along with a topical discussion of archeological considerations of spatial and temporal issues and their effect on the study of prehistoric and historic ceramic assemblages. These regional summaries have been prepared by members of the Council of Texas Archeologists' (CTA) Ceramics Protocol Committee. Not all the regional summaries are fully developed or complete, and thus some of them are more like working documents than fully developed summaries/syntheses, but it is our goal—with the assistance of CTA—to have each of the fully developed regional summaries eventually prepared and made available on the CTA Website.

The purpose of these regional summaries is to introduce and discuss for CTA members that analyze Native ceramics in Texas the current state of knowledge about the manufacture and use of ceramics by native groups in the different regions of the state where ceramics have been documented in the archeological record. That knowledge includes summaries of the ceramic traditions in those regions, focusing on their technological and functional character, as well as changes over time in ceramic styles, types, and vessel forms. Additionally, the regional summaries discuss the preferred analytical methods and research perspectives that are being employed in the analysis of native ceramics, along with the posing of a range of research questions and issues (but by no means all research questions and issues) that would be relevant and applicable to address in current and future study of Native ceramics across different parts of Texas.

General Ceramic Methods and Attributes

Linda W. Ellis

To address a broader range of ceramic research objectives, any given analysis must be comprehensive enough to capture the array of stylistic and technological diversity found on any one group of ceramics. This means including a wide array of ceramic variables that more effectively address these broader objectives, as well as determining the specific attributes best suited to addressing those objectives.

Every study of prehistoric ceramics centers on three basic questions: (1) How were pots made? (2) How were they used? (3) Where and when were they used? Answering the first two questions requires a basic understanding of ceramic technology and its place within a larger technological system that incorporates the use of pottery. Answering the third question requires knowledge of the distributions of specific ceramic traditions and, by implication, the technological attributes specific to those traditions. Thus, any comprehensive technological analysis of ceramics should provide an understanding of the ways in which pottery use influenced pottery manufacture, and vice versa, as well as how pots are distributed across space and through time.

Given this perspective, understanding the universe of prehistoric ceramic traditions occurring in Texas requires an integrated approach that begins with an understanding of the basic nature of ceramic technology and its general parameters. Technology, in general, is both a human activity and a means to an end (Dewey 1985). Thus, pottery technology involves both the human activities that made the pot, as well as the technological activities involved in the use of the pot. Because ceramic technology encompasses a number of multi-faceted components that are both abstract (e.g., the need and the conceptual notion of how to fulfill that need) and physical (e.g., the production of the finished product, its properties, and its actual use), the study of ceramic technology is best understood if we have some means of organizing its basic components.

If we think of the pottery cycle as a continuous flow from dust (clay) to dust (grog), then the technology of prehistoric ceramics can be illustrated by the following model (Ellis 1992; Van der Leeuw 1984) (Figure 1). The need for some type of ceramic product arises. Based on the potter's experiences, both as an individual and as a member of a particular group, he/she devises a strategy for meeting that need. In the pottery production stage, the potter acquires the raw materials and tools (apparatus/hardware). Then, using his/her idiosyncratic and/or cultural technological knowledge (technique/software), the potter constructs a pot by making a set of choices in a process sequence executed within a particular organization of production, either alone or in cooperation with others. Once the pot is finished, it becomes a tool in the end-state technology of pottery use. When the pot breaks, its sherds may become the apparatus/hardware in yet another technological system (i.e., spindle whorls, grog tempering for new pots, ceramic knives) or they may drop out of the system entirely to become part of refuse.

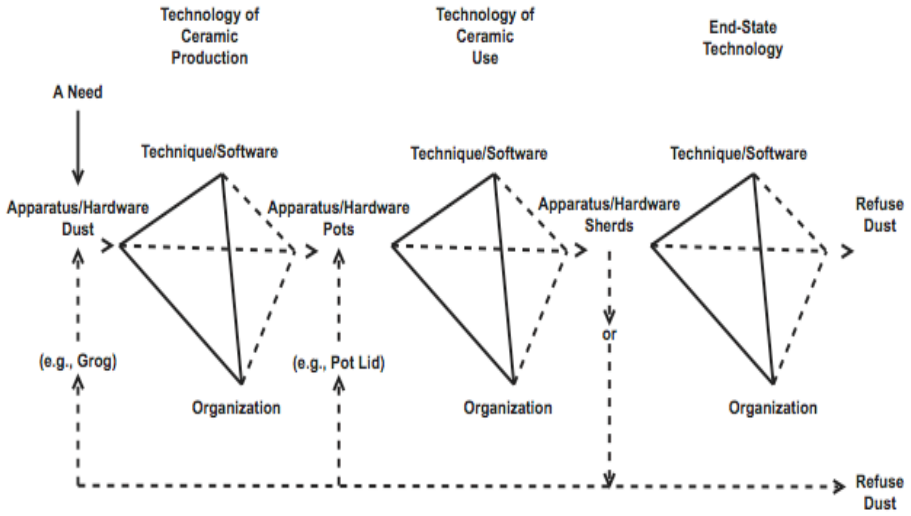

Figure 1. The technology of prehistoric ceramics (after Winter 1977 and van der Leeuw 1984a).

To have a thorough knowledge of ceramic technology requires an understanding of the mutually influencing *dynamic* structures of ceramic production and use that either are or are not stable over time (Ellis and Ellis 1999). Hence, to have any particularly thorough knowledge of ceramic technology at any given point in time requires the analyst to have an understanding of what came before, and whether what came before was different or not. This follows because stability in ceramic production is at least as informative about ceramic technology as is change in production if we regard ceramic technology as a goal-directed system thoroughly integrated into human activities. This approach carries with it certain theoretical expectations:

(1) Pottery making is a skill passed from teacher to student and potter to potter;
(2) Knowledge of pottery making includes knowledge of tricks of the trade, and no potter can transmit such knowledge if she/he does not have it;

(3) Potters, like chert knappers, are familiar with the properties of materials and tend to select raw materials meeting their preferences;
(4) Different potters may work within different spacio-temporal networks for transmitting knowledge of pottery making;
(5) Potters, like chert knappers, know their environments and go where they can get preferred materials *if they know of any nearby*; and
(6) Knowing where to find good sources of clay or, if needed, temper is an important trick of the trade.

Given these parameters, pottery can be seen as the product of structured human behavior, and its qualities are determined by its raw materials and method of manufacture (Rice 1987; Shepard 1976). Presumably, the technological decisions made during pottery production bear some relationship to the desired qualities of the finished pot. Therefore, understanding how a pot was made helps us understand how one pot varies from another, and, by implication, it helps us to recognize the range of technological variability we might expect to see even on relatively similar pots. It also provides a means of describing, and thus comparing, ceramic assemblages in terms of their shared technological aspects.

By implication, this requires classificatory criteria that enable us to recognize and describe those mutually exclusive attributes (i.e., independent, unordered, and unweighted) associated with ceramic manufacturing behavior (see Dunnell 1971:7086; Rice 1987:249; Shepard 1976:306322). To do this we need classification schemes that enable us to effectively distinguish the full range of attributes associated with each stage in the pottery making process and a set of rigorous and useful definitions that will assure a common foundation on which to build such classification schemes. Such classification schemes serve as a basis for distinguishing repetitive, patterned behavior from idiosyncratic behavior. Thus, any ceramic classification scheme is simply a construct useful for organizing our data into categories based on some perceived similarity that reflects relevant aspects of particular research topics (e.g., Dunnell 1971).

Because pottery making is a step-by-step procedure, one way to organize our inquiry is to focus on the attributes that are diagnostic of the various events embodied in the various steps of the process sequences involved in pottery manufacturing. This enables us to build a paradigmatic classification scheme that is adequate for describing ceramics in terms of the way they were made. Each dimension, therefore, will consist of those attributes that can be acquired only at a given stage in the process and, hence, are mutually exclusive relative to every other attribute that could be acquired in the same stage. Because some attributes are interrelated, there may always be some overlap; however, the major steps in the process are still relatively exclusive. To better understand the nature of these dimensions and the decision-making processes involved in the manufacture of prehistoric pots, the best place to begin is with a basic understanding of the pottery manufacturing process.

The Pottery Manufacturing Process

The starting point for any vessel is the raw clay. Once the raw material has been acquired and processed, there are three basic stages in the construction of a vessel: primary forming, secondary forming, and surface modification. At each stage, techniques that often leave detectable attributes on the clay surface are used in a particular sequence. By necessity, some procedures must have occurred before others, thus enabling us to reconstruct the process (Rye 1981:62). Reconstructing the process or processes used by potters constitutes an analysis of the technological style(s) or "recipes for action" that inform pottery making (see Lechtman 1997; Livingood 2007; Rice 1987), providing a basis for discovering the ways in which culturally structured knowledge and performances influenced ceramic production.

During the procurement and processing of the raw material, the potter makes a series of decisions. He/she must decide: (1) which clay is the most appropriate and where to gather it, (2) how to prepare it, and (3) how to process it. Once the potter decides what clay source is to be used, he/she manipulates the clay into a workable state.

The study of forming techniques is "the study of the manner in which pressure was applied to the clay" (Rye 1981:58). During primary forming, the clay is manipulated into a workable state, then gradually converted into a rough form resembling the vessel. During this process, certain decisions are made regarding its basic form. It is in this stage of manufacture that the potter produces the overall size and shape of the vessel and decisions are made regarding the basic technique used to form the clay body. While there are a number of techniques used to construct pots, common ones are pinching and/or drawing, molding, joining, and coiling (Rice 1987:124; Rye 1981:66-83).

Secondary forming techniques and surface modifications supplement the basic manufacture of the vessel. During secondary forming, the rough vessel is defined and shaped. During, between, and/or after the primary and secondary forming stages, the vessel may be partially dried, rewet, and subjected to a variety of surface modifications. Secondary forming techniques (such as beating, scraping, or trimming) may alter both the dimensions of the vessel and the surface characteristics, while surface modifications are performed after the vessel has attained its final shape and affect only the surface (Rice 1987:136138).

There are two general categories of surface modification: surface finishing and surface enhancement. Surface finishing produces a more regular surface and includes such techniques as smoothing, burnishing, and polishing. It can be the final treatment before the vessel is fired, or it can be a prelude to additional enhancement. The surface enhancement of a vessel is embellishment beyond forming and surface finishing. It can include one or more techniques that either displace or penetrate the surface (such as incising, stamping, or punctating) or are added to the surface (such as slips, glazes, or appliques). Although differentiated analytically, this in no way implies an unambiguous distinction between surface finishing techniques and surface enhancement, as both may

be part of the decorative quality of the vessel and both are often interrelated (Rice 1987:144-152).

Once the vessel has been formed and its surfaces finished and enhanced, it must be carefully dried and fired in order to irreversibly transform the plastic clay into a rigid vessel (see Arnold 1985; Rice 1987; Shepard 1976). Drying time and firing success are affected by a number of factors. Climatic conditions, the size and shape of the vessel, and the amount and size of non-plastic inclusions in the paste are some of the more important (Arnold 1985). For example, although low temperatures and high relative humidity increase drying time, these factors would be offset somewhat by large amounts of non-plastic inclusions in the paste. However, firing success will be reduced in an overly humid climate or during rainy weather.

Color is an indicator of the variability in firing temperature; however, color attributes can be questionable sorting criteria given the fact that color variations can result from a number of variables other than firing (e.g., sediment source, impurities in the clay) (see Rice 1987:333; Shepard 1976:103-106). Variability in surface color also results from post-depositional factors and from pottery use (Rye 1981:119-120). These problems notwithstanding, general coloration of the vessel's surfaces and paste core can be useful in assessing overall firing environment.

Thus, the pottery making process involves a set of intentionally structured choices or decisions that occur in some non-random order that follows from the nature of the pottery making process itself. These decisions or choices are based on the potter's technological knowledge. The potters technological knowledge, in turn, is very likely to be influenced by the community's culturally accepted modes or standards of manufacturing vessels and, by implication, on functional considerations, environmental considerations, and/or aesthetic considerations that may be either idiosyncratic or cultural.

If the ultimate aim is to address specific problems by asking specific questions, what kinds of relevant information would we need to obtain from the study of pottery manufacturing? Beyond that, how would this information enable us to effectively address the given problem? To answer these questions, a comprehensive ceramic analysis should begin with an analysis of six primary ceramic attributes. As always, clearly defined attributes and consistency in recording those attributes is critical:

> (1) Paste morphology— This should include aspects of: (a) *Paste constituency*—the type of non-plastic inclusions (e.g., sand, bone, grog) and the predominant size range of non-plastic inclusions (e.g., medium sand, crushed bone fragments, small hematite nodules), and (b) *Paste texture*—the general morphology and configuration of the crystalline components, amorphous material, and voids as observed in cross-section (e.g., smooth, laminated, contorted). To facilitate these observations, it is suggested that a fresh break along the edge of each sherd be microscopically examined.

(2) Exterior and interior surface treatment—these are techniques that affect the surface characteristics of a vessel and can be carried out during all stages of pottery manufacture. However, for analytical purposes, these techniques can be "divided into those which are auxiliary to the basic construction, carried out on wet pliable clay, and those which figure in the finishing of dry vessels" (Reina and Hill 1978:22). Auxiliary construction techniques, because they are performed on wet pliable clay (i.e., floating), can be considered an additional stage in the manufacture of the vessel and, therefore, part of the secondary forming stage. Supplementary techniques used in the finishing of dry or leatherhard vessels (i.e., dry-smoothing and burnishing) can be considered part of the surface modification stage.

(3) Exterior and interior decorative treatment—This is embellishment beyond surface finishing that adds to the detail of the overall surface and can involve additions to (or over) the existing surface finish (e.g., slips, glazes, washes, appliqués), displacement of the existing surface (e.g., incising, stamping, punctating, engraving), or some combination of both. As with surface finishing, the presence of one decorative technique does not necessarily preclude the presence of another technique and may be closely intertwined with surface finishing techniques (see Rice 1987).

(4) Vessel form – For whole vessels, this would include data such as orifice and base diameter and estimated volume. In the absence of whole vessels, the general aspects of vessel form can be assessed through attributes such as thickness, diameter, and gross morphological category (i.e., body, base, and rim). Five additional attributes should be recorded for each rim in the assemblage: rim profile, rim form, rim diameter, lip profile, and lip decoration.

(5) Firing environment (i.e., oxidizing or non-oxidizing)—Upon completion of the vessel, the potter must transform it into a sturdy, useable product. Information about how well the potter was able to control the firing atmosphere can be assessed by categorizing vessels/sherds as either oxidized (lighter colors such as those in the tan, orange, light brown, to red range) or non-oxidized (dark colors such as dark browns, grays, or blacks) (see Shepard 1976:103-106).

(6) Post-Firing Attributes - Sherds often exhibit some type of post-firing modification. This modification may be deliberate (i.e., drill holes or asphaltum coatings), may result from use (i.e., residues), or may result from post-depositional factors (i.e., eroded surfaces). Recognizing post-firing modifications enables the analyst to more clearly differentiate subtle use-related attributes from those attributes acquired during the production process.

Each of these attributes provides specific information about the technological choices made at each stage in the pottery manufacturing process, which in turn allows the analyst to more fully characterize the assemblage even in the absence of identifiable types. This in turn provides a basis for comparing the technological variability of the ceramics recovered at any given site with the technological variability of other ceramic assemblages in the region.

Although this information provides valuable information about how pots were manufactured and what pastes were preferred, it tells us nothing about where raw materials were procured. Therefore, special physicochemical and petrographic studies of paste composition would complement the technological data by indicating where the preferred sources for raw materials were and, by extension, something about how pottery making was organized in space. Instrumental neutron activation analysis (INAA) would contribute valuable information on the intra- and inter-site spatial patterning of pottery. Recording technological and decorative attributes and coupling that data with ceramic petrography and INAA studies provides a consistent means of classifying ceramic assemblages and teasing apart different production techniques. This, in turn, provides a basis for comparing different communities of production. Quantifying the existence of this variability has the potential for making finer-grained distinctions between the spatial and temporal boundaries of ceramic temper types and stylistic elements and their relationship to recognized types.

With respect to pottery use, the technological attributes acquired during pottery manufacturing may have a direct bearing on the intended use of the pot. For example, from a functional perspective, research suggests that a dense paste can reduce porosity (Rice 1987:230-232). This may be useful for long-term dry storage containers or short-term water storage; however, in cooking vessels, some degree of porosity helps to reduce thermal stress. Charred or incompletely oxidized organics and/or the amount, size, and shape of the inclusions embedded in the paste fabric serves to reduce porosity in order to accommodate a variety of uses. Other variables related to vessel function are vessel shape, surface treatment, and thickness. Further, special studies such as residue analyses provide direct lines of evidence for vessel function.

Ultimately, a thorough ceramic analysis requires an integrated approach that includes a suite of studies that used together provide an effective means of addressing process-oriented research problems, as well as questions addressing spatial/temporal distributions. Only by expanding our theoretical and methodological research designs can we begin to discuss the role that ceramics may have played among native groups living in Texas.

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Woodland and Caddo Ceramic Traditions in East Texas

Timothy K. Perttula

Introduction

Following an initial meeting of the CTA Ceramics Group, the consensus was reached that detailed ceramic studies geared to regional/cultural problems/questions should be the goal of ceramic analysis on prehistoric and early historic aboriginal ceramic vessels and sherd assemblages in Texas. What would comprise these suggested detailed ceramic analyses would be specific to that particular region, in this case the Woodland and Caddo Ceramic Traditions in East Texas (Figure 1).

The CTA Ceramics Group also agreed that "the study of ceramic technology is complex and there are about as many methods of analyzing pottery manufacture, use, and regional distribution as there are attributes to be studied and archeologists to study them. If the goal is to gain a better understanding of the ceramic universe in Texas then we need to implement standards/guidelines that will enable all archeologists working in Texas to address the broadest range of research problems, without making those standards/guidelines so detailed that we limit our ability to pursue new lines of research as they arise. This requires taking into account the multi-dimensional aspects of ceramics (i.e., production, use, and distribution) and the full array of research questions associated with Texas ceramics" (Linda Ellis, May 2010 e-mail to CTA Ceramics Group members). This document represents a first iteration of a recommended approach to the study of prehistoric and early historic ceramics from Woodland and Caddo sites in East Texas; there likely are other worthwhile approaches to the analysis of Woodland and Caddo ceramic vessels and ceramic sherds (cf. Dowd 2008; Ellis 2007; Gadus et al. 2006; Kelley 1997; Schambach et al. n.d.; these represent a few of the ways aboriginal ceramics from sites in East Texas and surrounding regions have been approached analytically).

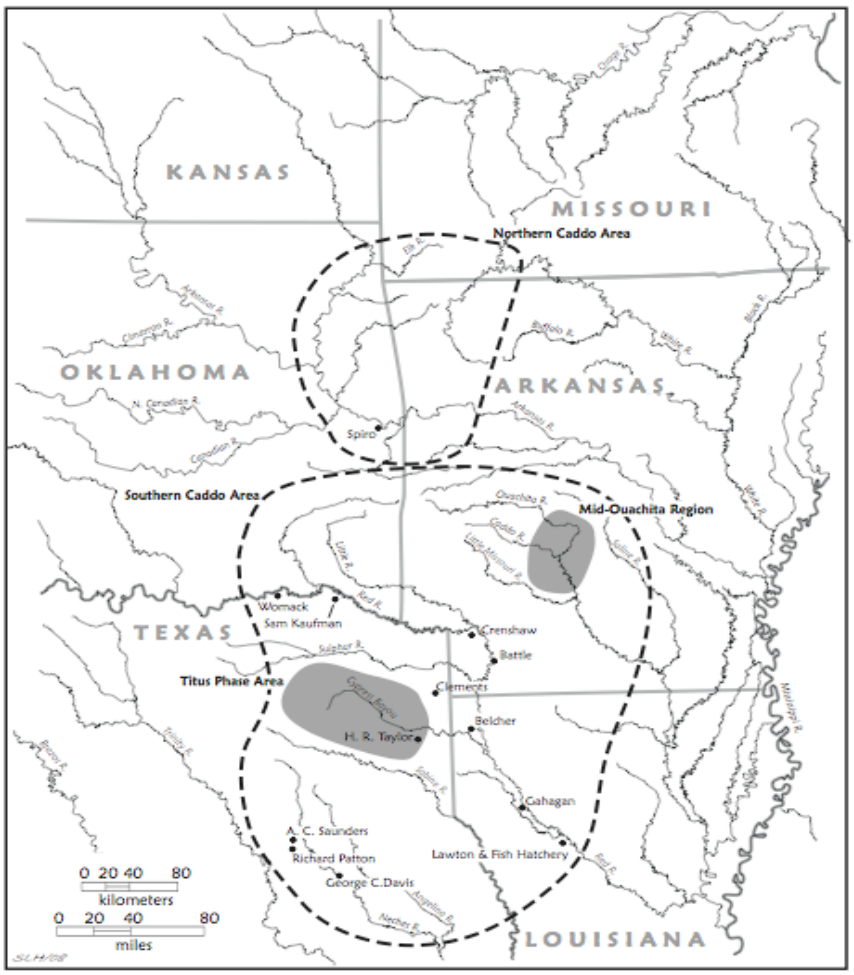

Figure 1. The Caddo archaeological area, including East Texas, and various sites and phases.

Woodland Ceramics in East Texas

Woodland period ceramics in East Texas are diverse, although not especially abundant in sites across the region. The earliest Woodland period ceramics in the region

date to perhaps as early as ca. 500 B.C. (calibrated), and are found on sites that date as late as the 9th century A.D..

In the Red, Sulphur, and parts of the Sabine River basin (cf. Dockall et al. 2008), the ceramics are primarily plain grog and bone-tempered Fourche Maline wares (i.e., Williams Plain) with flat bases and very thick vessel walls. Woodland period ceramics in other parts of the Sabine River basin as well as in the Big Cypress Creek basin are also primarily plain grog-tempered wares (Rogers et al. 2001:124-130 and Table 21), but there are also plain sherds with laminated and contorted pastes, similar to Tchefuncte-like or Marksville wares that may have been made between ca. 100 B.C and A.D. 200. There are also relatively thick bone-tempered sherds as well that may be related to Cooper Boneware (see Schambach 1998), another Woodland period ceramic type, as well as sherds with grog temper and a sandy paste, bone temper with a sandy paste, and non-tempered sandy paste sherds. Decorated ceramics with lower Mississippi Valley similarities are notable in these assemblages (including Tchefuncte, Marksville, Troyville, and early Coles Creek types), recently labeled as belonging to the Mill Creek Culture. Woodland period ceramics in the Neches-Angelina River basins of East Texas are sandy paste wares (Ellis 2002), primarily undecorated Goose Creek Plain, *var. unspecified* (Aten and Bollich 2002), a common upper Texas Coast ceramic type. Lip notched sandy paste ceramics is characteristic of Mossy Grove ceramics in East Texas sites, and this distinctive lip decorated type appears to have been most commonly used prior to ca. A.D. 300 in East Texas (Perttula 2008). Other kinds of decorated sandy paste pottery (incised, punctated, and incised-punctated) have been documented in a late 7th-8th century ceramic assemblage in the Attoyac Bayou basin.

Caddo Ceramics in East Texas

The ubiquity and abundance of ceramic vessel sherds from Caddo sites in East Texas that date from ca. A.D. 800 to the early 19th century, as well as their diversity in decorative styles, methods of manufacture, surface treatment, firing, and chemical composition have proved useful in the acquisition of information on the stylistic and technological character of geographically distinctive prehistoric and early historic Caddo ceramic assemblages and how they have changed through time. The study of Caddo ceramics has also provided crucial insights into chronological and temporal issues, social relationships, culinary traditions, the context of ceramic manufacture and production, mortuary practices, and exchange/interaction between Caddo groups.

The analysis of recovered ceramic sherds and vessels in this discussion emphasizes the acquisition of information on the stylistic and technological character of prehistoric Caddo ceramic assemblage; the same analytical approach could also apply to the prehistoric Woodland period (ca. 500 B.C-A.D. 800) ceramic assemblages in East Texas, along with the consideration of the origins and adoption of ceramic vessels by Woodland peoples. Chronology, social relationships, culinary traditions, the context of

ceramic manufacture and production, and exchange/interaction between Caddo groups (and between Caddo groups and non-Caddo groups in the Southeast, Midwest, and Southern Plains) could each be addressed, with the goal of assessing the place of the Woodland and Caddo pottery made and used at specific Woodland and/or Caddo sites within the context of intra-region ceramic traditions and practices, and how the understanding of those may provide insights into the prehistoric peoples that lived in East Texas.

Research Approaches

Over the years, archeological interests in the study of ceramic artifacts have centered around such a few major and venerable themes: (a) classification and typology of ceramic artifacts for cultural historical purposes; (b) the measurement of time with changes in ceramic styles and functions; (c) the compositional characterization of ceramic materials; and (d) the performance of pots as tools, in conjunction with a study of the social factors that relate to the specific ways that pottery function as tools (Neff 2005:1-3; McClure 2007). Thematically, these represent pertinent and viable ceramic research approaches today,

Certainly a principal research issue of any ceramic analysis to be done in East Texas, or elsewhere in the state, includes first refining or bracketing the age and intra-site chronological relationships of the ceramics at a particular site, starting from any available radiocarbon and luminescence/TL dates (Feathers 2003, 2009) from features or archeological deposits, and investigating differences and similarities in ceramic decoration and manufacture. Attributes of the ceramics can then be employed to establish the occupational history of a particular site as reconstructed from ceramic stylistic analyses (particularly variation in decorative elements and motifs in both the utility ware and fine ware), and then determining structure and feature relationships through time at a site by defining temporally distinct ceramic assemblages, if such assemblages can be identified. Utility ware vessels were used for cooking, storage, and probably other culinary activities; they tend to have a coarse paste, thick body walls, have smoothed interior surfaces, and are decorated with wet-paste designs (i.e., decorations were made with tools and fingers prior to the vessel being fired, when the vessel had a wet exterior surface). Fine wares are engraved and red-slipped vessels that were used for food service and to hold liquids, as well as for other purposes (effigy vessels). They tend to have fine pastes, with finely crushed tempers, are frequently burnished on interior and/or exterior vessel surfaces (except the bottles, which were burnished on exterior surfaces only), and have relatively thin body walls compared to the utility wares.

There is a general consensus among archeologists that stylistic expressions, and variations in that expression, in material culture, dress, body ornamentation, food practices, etc. can be a measure of social identity. However, the recognition of style in archeological materials is more than "the *material correlate*" [emphasis in the original]

of social affiliation" (Wobst 1999:120). Patterns of style reflect variability in both individual choices as well as social group membership, and therefore the existence and pervasiveness of styles in material culture—our concern here being the existence of local styles of ceramic decoration—reflect the strength of interaction between individuals (individual potters), the form of cultural transmission (i.e., from parent to child; from a teacher to a pupil; from older to younger members of a social group; or between unrelated individuals, see McClure 2007:Table 1), and the ability of styles to be inherited from one generation to the next (O'Brien and Lyman 2003:19). Styles "share a common developmental history and are from the same tradition" (O'Brien and Lyman 2003:19). Style in ceramics as used here simply mean the characteristic patterns of pottery decoration that when applied to the rim and/or body of vessel in certain combinations and elements result in a unique set of visually represented design motifs and attributes. The combinations may be innumerable, as the choice "between certain kinds of design elements on ceramics is not a functional consideration but rather is historically determined and selectively "neutral," because there is no inherent advantage between one element and the next" (Meltzer 2003:140). In actual fact, ceramic practice among Caddo potters would have dictated the range of acceptable variation (a rather impressive variation at that, particularly among the fine wares) in stylistic choice that were maintained for generations.

Styles are expected to change rapidly, more rapidly than functional forms of tools and pottery vessels (see Rogers and Ehrlich 2008:3418). This interpretation follows from the idea that stylistic traits have a relatively rapid turn-over because of their use in generating and reinforcing cultural identity, their selectively neutral character (i.e., stylistic elements have no differential effect on survival), and the potential high variation between individuals and groups in learning and replicating specific shared styles, particularly (in the case of ceramics) if Caddo potters were producing vessels largely independent of one another, that together comprise a ceramic tradition at any one moment in time.

These same stylistic analyses can be employed to answer broader questions of the social and cultural affiliation of Caddo groups, and the place of a particular site within a specific community of Caddo people, through stylistic and vessel morphological comparisons with collections from other broadly contemporaneous Caddo sites in the local area. One should also be concerned with determining the character and frequency of the utility ware vessel forms in any prehistoric Caddo households and components at a particular site, and how their composition at the assemblage level may be related to (and influenced by) the postulated intensification of maize consumption by Caddo groups in East Texas after ca. A.D. 1300/1400 (see Kenmotsu and Perttula 1993:140), as well as differences in culinary and plant food storage traditions.

The stylistic analysis of Caddo ceramics from sites in East Texas should focus on the definition of recognizable decorative elements in the fine wares (i.e., the engraved

and red-slipped vessels, including carinated bowls and bottles) and utility wares, usually cooking or storage jars and simple bowls. These wares are known to have been made and used differently, based on functional, technological, and stylistic analyses on numerous Caddo sherd assemblages in the broader East Texas region, with uses ranging from food service, cooking of food stuffs, as containers for liquids, and for plant food/seed crop storage. The ceramic analysis should be completed in conjunction with formal and technological analyses of any vessels and vessel sections (from macroscopic analyses of sherd cross-sections), and from the detailed analysis of a robust sample of plain and decorated rim and body sherds (larger than 1.5 cm in length and width), emphasizing paste characteristics, non-plastic inclusions, surface treatments, and firing environments of the decorated and plain sherd assemblages as well as whole vessels, if such are recovered.

Another productive approach to the analysis of Caddo ceramic vessels and sherds from East Texas sites is ceramic practice. By ceramic practice, I mean the decorative, technological, and formal attributes of sherds and whole vessels that were chosen and practiced by a potter or group of potters when they made pottery vessels within a distinctive social community or network of socially related individuals (see Eckert 2008:2-3, 10-13). These practices as a whole form the "technical choices [that are] selected in a rich context of tradition, value, alternatives, and compromises" (Rice 1996a: 140). As Stark (2006:22) puts it, "people reproduce their cultural and social positions through daily practice, that daily practice is structured by basic organizational principles," and that daily practice is expressed through tendencies and trends (*habitus*) "that develop as a practical solution to a particular demand within the framework of certain environmental and cultural conditions" (Eckert 2008:10).

These choices and tendencies exhibited in the manufacture and decoration of ceramics by potters indicate that the consideration of ceramic practice is an ideal medium for the study of technical systems (the tools and technical capabilities), social interaction, style, and social identity, as well as the dissemination of relevant behaviors between individuals (Chilton 1999:2; van der Leeuw 2002:241; Rogers and Ehrlich 2008). Thus, the particulars of ceramic practice and technical choice that can be identified in a temporally (and socially) related group of aboriginal Caddo sites are a means to recognize socially defined groups that closely interacted, transmitted "knowledge among individuals creating pottery" (McClure 2007:486) as a means of social learning, and this knowledge of manufacture and decoration choices was inherited by other descendant potters in that group. In this context, then, ceramic practices shared or not shared by potters (women in the community) reflect the learning of their craft from other women in the community, and that "patterns in local pottery styles, both technological and decorative, result from potters making different decisions throughout the production process but using a similar set of tools and techniques available to other potters within an area" (Eckert 2008:2).

Such an approach would identify the key choices and trends in the character of the production of domestic ceramics from a particular Caddo site, including: raw materials; temper; methods of manufacture; production areas; vessel forms and functions; vessel size; and firing. Next, a ceramic analyst might wish to examine issues of style and social identity and changes in culinary traditions as possible manifestations of changes in ceramic practice that occurred in a particular site, region, or sub-region. Mortuary ceramics from Caddo sites may illustrate broad continuities in ceramic practice, particularly in terms of vessel decoration and vessel form, but also they can demonstrate patterns in technical choices that are very different than what may be documented in domestic Caddo ceramic assemblages of the same age and made by the same social group of potters. Finally, the disparate and variable ceramic practice data (i.e., decorative, technological, and formal)—from both domestic and mortuary contexts, if possible—may be employed to posit the existence of distinctive prehistoric and early historic Caddo ceramic traditions within East Texas or within the larger Caddo archeological area.

A Sampling of Research Problems and Questions

Since research problems and questions concerning Woodland and Caddo ceramics found on East Texas sites derive from the research approaches and perspectives of the ceramic analyst, as well as the overall framework of the archeological investigations, there is a wide range of research problems and questions that can be posed with each particular ceramic analysis. It is not the purpose in this section to present an exhaustive accounting of potentially applicable or useful Woodland and Caddo ceramic research problems and questions, but simply to present and discuss a sampling of the common research problems and questions that may typically present themselves when studying a ceramic assemblage of sherds and/or vessels from a CRM project (or a long-term series of CRM projects in the same region) in East Texas. Typically, such questions—and the answers thereto—will need to be able to be examined and/or correlated with changes in aspects of past economic and social life documented in other archeological datasets from sites occupied by Woodland and Caddo groups.

The initial appearance of ceramics on Woodland period sites in East Texas, when absolutely dated to establish their temporal context, means that the archeological study of Woodland period ceramics can contribute new to information regarding one of the quintessential Eastern Woodlands research problems: the invention, adoption, and use of ceramics by hunter-gatherer Woodland societies (cf. Rice 1996b; Sassaman 2002). That this happened well before the development of agricultural traditions is important in examining the practical roles of ceramic vessels in these societies (see Jordan and Zvelebil 2009:54-68). When were ceramics adopted among East Texas Woodland period peoples—was the adoption contemporaneous across the region, and was it a technological tradition (i.e., a new form of container technology that has other technological and social practices, see Jordan and Zvelebil 2009:Figure 1.4) that was

shared by different Woodland groups? It has been noted that the prehistoric adoption and initial development of ceramic vessels in general was one best suited, for a variety of reasons, to hunter-gatherer societies that lived in lake and river-edge settings and exploited estuarine and riverine resources (Rice 1999:21; Jordan and Zvelebil 2009:58-59). Is such a technological relationship apparent in the economic and settlement choices of the earliest ceramic-using Woodland period groups in East Texas?

With respect to the study of Woodland period ceramics, was there was a long history of use of ceramic vessels among peoples living in the different river basins in the region, and, if so, were there changes through time in ceramic manufacture and vessel shapes that represented the evolution of ceramic use for different functional, technological, and social purposes by these groups? It is probably the case that the Woodland period groups in East Texas may have adopted and made use of different ceramic technologies from disparate groups that they interacted with socially.

Are there significant variations in the manufacture and use of ceramics (as detected in the simple measure of sherd density) by Woodland period groups, and if so, what does that variation represent? Are there regional differences in food processing and dietary habits between Fourche Maline, Mill Creek, and Mossy Grove Woodland groups that can be detected in the study of ceramic assemblages? It is likely that there were changes in the frequency of boiling food in vessels, along with changes from indirect heating to direct heating using cooking vessels (cf. Sassaman 2002; Nelson 2010), and there may also have been changes from stone to wood preparation tools. All these technological changes point to an increased consumption of carbohydrate-rich plant foods by some Woodland groups (see Schambach 1998, 2002), and these carbohydrate-rich foods may have included some amount of maize and starchy seeds. The Mossy Grove and Mill Creek Culture groups were primarily still hunter-gatherers, with a heavy emphasis on forest mast products and animal resources, with little evidence from either plant or animal remains or the pottery found on sites occupied by these people (cf. Hood 2007) for the consumption or processing of starchy foods or seeds. These plant and animal resources were frequently processed in large pits and earth ovens using ground stone tools and hot rock cooking (cf. Rogers et al. 2001).

Cooking in ceramic pots versus employing direct heating in open fires or indirect heating using hot rocks may have broadened the range of foods (including both plant foods and game animals) that could be readily or more efficiently cooked by Woodland period groups in East Texas. The familiarity of these Woodland period peoples with a ceramic cooking technology would have created conditions where such foods could be more efficiently cooked if and when such foods (i.e., cultigens) became known to them or their Caddo descendants. What significant plant food sources were used (as detected by residues, phytoliths, and stable isotope signatures) that were facilitated by processing via cooking in ceramic vessels? How did changes in cooking technology with the early use of ceramics affect Woodland period subsistence strategies? Are there changes through time

in ceramic manufacture and vessel shape, as well as any evidence for the evolution of ceramic use for different purposes by Woodland period groups?

Does the occurrence of ceramics—albeit not necessarily in large quantities at any Woodland period culture sites—point to the development of some occupational redundancy (i.e., a tethering to certain locations and a repeated and consistent use of those locations) in site use in Woodland period times? In a study of the use of ceramics among residentially mobile hunter-gatherers, Eerkens (2003:736) has suggested that "the degree of occupational redundancy in areas with resources suited to mass collecting and boiling [are]… correlated with pottery use." This occupational redundancy may actually promote long-term trends in decreasing mobility and increasing sedentism, and in such settings the use of pottery may be also "associated with incipient agricultural strategies" (Eerkens 2003:736). May pottery development and use in East Texas Woodland period sites be related to the mass processing of hickory nuts for their oil?

As with Woodland period ceramic assemblages, there are several common research questions and problems that concern the study of Caddo ceramic sherds and/or vessel assemblages in East Texas. First, perhaps, is how do we employ ceramic sherds and vessels to determine and measure social relationships/broad social affiliations between prehistoric and early historic Caddo groups from ceramic stylistic evidence? What do ceramic stylistic similarities between sites tell us about Caddo communities? Because these distinctive kinds of decorated pottery in Caddo contexts were circulated within or among specific cultural and historical milieus, they have a social significance, and thus pots have a "social life" (Habicht-Mauche 2006:7). That is to say, the ceramic material culture of Caddo peoples have a social significance and a social history, in that there are meanings inscribed in their form and style that have been derived by people (potters included) as a result of "material transactions and performances that make up the day-to-day, rough-and-tumble of human social life" (Habicht-Mauche 2006:7). Examining that social history through a consideration of the wide range of decorative styles that were employed on fine wares and utility ware pottery among prehistoric and early historic Caddo peoples ought to lead to the identification of other Caddo peoples that held similar symbolic, structural, and aesthetic beliefs about pottery and how the world works. The histories of how ceramic vessels were made, shaped, and decorated are reflective of technological, functional, and stylistic practices, beliefs, and ideas shared by different groups of people within households and communities of kin-affiliated Caddo peoples.

The iconography present on Caddo ceramic vessels also warrants detailed consideration in current Caddo ceramic analyses in East Texas. This iconography reflects belief systems of different Caddo groups, as well as the social relationships between different Caddo groups as well as more far-flung Mississippian groups (Gadus 2010; Hart and Perttula 2010); some iconographic symbols consistently cross spatial and temporal stylistic boundaries. Among others, there are several engraved motifs and decorative

elements in East Texas Caddo ceramics hat have iconographic symbolism characteristic of the post-A.D. 1300 Southeastern Ceremonial Complex. These include engraved rattlesnakes in all their stylistic diversity, swastika cross-in-circles, rayed circles, and looped squares, as well as vertical hatched and cross-hatched motifs on bottles and carinated bowls that resemble the striped pole, albeit in a more simplified form than described by Lankford (2007:30). Each of these iconographic symbols appears to have cosmological meanings (see Lankford 2007). Gadus (2010) identifies other distinctive iconographic motifs in post-A.D. 1430 Ripley Engraved vessels from Titus phase contexts. Can the analysis of Caddo iconography on ceramic vessels identify regional variations in symbolic expression?

Are there measurable stylistic variations within each region and significant differences between the regions? These similarities and differences lie at the heart of any conclusions about the cultural and ceramic affiliations of local Caddo groups, and should lead to a better understanding of the development of Caddo pottery styles on a regional and intra-regional basis. Will chronological refinements and the temporal bounding of specific material culture assemblages of ceramics from different Caddo groups in East Texas facilitate temporal and spatial comparisons of different local sequences that together can be interpreted to have social, social learning (Eerkens and Lipo 2007), and kin-affiliated meanings?

Can we directly track the rapidity or tempo with which maize production may have intensified in local Caddo economies? Is there evidence in the archeological record for associated or accompanying changes in food technologies and food processing using ceramic vessels? Other than stylistic changes in the decorations of utility ware and fine ware vessels, there may be indications in the material culture record for significant functional changes in ceramic manufacture and use (e.g., a measurement as simple as wall thickness changes over time, see Rice 1987; Hart et al. 2009) that would constitute evidence for changes in food technologies and food processing, such as larger volumes or different vessel forms, especially among the utility wares.

Ceramic sherds and other domestic artifacts in prehistoric Caddo sites are relevant to the consideration of the stylistic, technological, and functional character of artifact assemblage on residential settlements. These remains were the means by which plant and animal resources were procured, processed, cooked, and stored. How did the Caddo peoples process and cook wild and domesticated plant foods and an assortment of animal foods, and how were ceramic vessels used in these tasks?

The domestic artifacts found on prehistoric and early historic Caddo sites are a testament to their use in prehistoric times to cook and serve foods and liquids and process animal and plant foods. How do the ceramic artifacts recovered from domestic contexts on Caddo sites express the different factors that played into shaping the character of artifact assemblages over a long period of time? Considerable effort was expended by

these Caddo in the processing of plant foods of various sorts, including nut meats and corn kernels, as well as seeds, and their use was facilitated not only by the ability to boil these food stuffs in cooking pots (everted rim jars), but also by being able to store dry and parched plant food stuffs and liquids in ceramic containers rather than having to rely on baskets and hide containers. Comprehensive residue analysis of visible and absorbed organic residues (see Beehr and Ambrose 2007) on pottery vessels and sherds can be employed to more fully understand the functional uses of Caddo pottery vessels.

Can the recognition of local ceramic chemical groups and manufacturing locales as determined by INAA, petrography, and other special analyses (see below), shed light on the existence, size, intensity, and relative amount of goods traded in local Caddo economic networks? Such information about the nature of interaction with contemporaneous Caddo groups in East Texas—based on the identification of non-local Caddo ceramics preserved in archeological deposits—should be enlightening about social and trade relationships with other Caddo groups. Presumably, the Caddo peoples living in East Texas—comprising communities of kin-affiliated families—made ceramic vessels and other goods that were also traded and exchanged through social and economic relationships.

The available ceramic evidence from East Texas Caddo sites does suggest that there was a flourishing and long-term sustaining economic trade network in existence in Caddo times across the region. This network was primarily based on the exchange of materials destined for use in domestic contexts, rather than one where obtaining prestige goods served as a primary economic and social motivation for exchange and interaction by the social and political elite. Were these ceramic vessels (as well as their contents) obtained for use as funerary objects or for other special purposes, or with the intention of meeting domestic needs and probably fulfilling economic obligations with Caddo neighbors?

Methods of Vessel Analysis

To facilitate the documentation of Caddo vessels that may need to be studied as part of CRM and research projects in East Texas, and aid in comparisons with other Caddo vessel documentation projects, a documentation protocol is discussed below that may be of assistance in the analysis of the vessels from a particular site or sites (Woodland period vessels are very rarely encountered in East Texas sites, but this method of vessel analysis would be suitable for those vessels as well). Each of the ceramic vessels in a collection should be described and analyzed utilizing a consistent set of morphological, functional, and stylistic attributes. The purpose of the documentation is to thoroughly characterize the character of each of the ceramic vessels in different Caddo collections.

The following attributes may be employed in such a ceramic vessel study from a particular Caddo site or set of sites:

Non-plastics: Deliberate and indeterminate materials in the paste (Rice 1987:411), including a variety of tempers (grog or crushed sherds, bone, hematite, shell, quartz sands, etc.) and "particulate matter of some size." The grog, bone, and hematite non-plastics appear to have been deliberately added to the paste as tempers. The bone used for temper by Caddo potters has likely been burned and calcined, then crushed, before it was added to the paste, as is the case for mussel shell.

Paste: The paste represents the natural constituents of the clay used, once temper is added, by Caddo potters to manufacture vessels. The paste may be a homogeneous clay, or have a sandy or silty paste based on texture, along with minerals such as iron, hematite, plagioclase feldspar, chert, microline, micrite, biotite, and quartz sands, etc., of various sizes and angularity.

Clays used for vessel manufacture were probably gathered from nearby alluvial settings, but almost certainly within a short (1-7 km away, at most) distance from a Caddo settlement (e.g., Arnold 2000:343; Arthur 2006:52), so that an inordinate amount of time and energy was not expended by potters in hauling clay back to the site. Arthur (2006:52) points out that potters would be likely to select lower quality clays for vessel manufacture than high quality clays if the latter were farther away.

Vessel Form: The principal vessel form categories ought to include open containers (bowls, carinated bowls, and compound bowls) and restricted containers, including jars and bottles of several shapes and sizes. Woodland period vessels ten to be simple bowls and jars. As restricted containers, jars allow access by hand, but bottles do not (Brown 1996:335). Another important vessel form, at least in some Caddo burial contexts, is the effigy bowl with a modeled head (usually a bird or duck head) and a tab tail. Occasionally, an effigy vessel will have a broader tab tail that supported an anthropomorphic or zoomorphic tail rider (see Suhm and Jelks 1962:Plate 24k).

Additional form attributes that can be recorded on each of the vessels in a study (depending upon their completeness) include the rim profile (outflaring or everted, vertical or standing, and inverted), lip profile (rolled to the exterior, rounded, flat, or thinned), and base shape (flat or rounded).

There are differences in Caddo vessel forms through time and among contemporaneous Caddo groups, and these changes appear to be both stylistic, social, and functional. According to Sadie Bedoka, a Caddo-Delaware woman interviewed by historians employed by the Works Progress Administration in the 1930s, "each [Caddo] clan had its own shape to make its pottery. One clan never thought of making anything

the same pattern of another clan. You could tell who made the pottery by the shape" (La Vere 1998:92).

Core Colors: Observations on ceramic cross-section colors permit consideration of oxidation patterns (Teltser 1993:Figure 2A-H; Perttula 2005, ed.), and thus the conditions under which the vessel was fired and then cooled after firing. This information should be recorded when the opportunity permits on vessels that are to be reconstructed, or on virtually complete vessels whose core can be examined. Comments on the vessel recordation form may also include the presence and location of fire-clouding, sooting or smudging from cooking use (Skibo 1992), and the preservation and location of charred organic remains or residues.

Caddo vessels tend to fired in a variety of different ways, presumably reflecting personal preferences in firing, the desired vessel color, the kind of clays that were used, and the functional and technological requirements of the kinds of vessel forms that were being manufactured at a specific site. Vessels were likely fired in an open fire, with the vessels either set atop the fire or nestled in the coals and ash.

Wall Thickness: Thickness should be recorded in millimeters, using a vernier caliper, at the lip, along the rim, at several points along the body, and at the base when possible (only for the vessels that were not complete). Fine ware vessel sherds are consistently from vessels made thinner than decorated utility ware or plain ware sherds, particularly when measured along the rim. These variations in vessel wall thickness are likely related to functional and technological decisions made by Woodland and Caddo potters in how these different wares were intended to be used in local encampments or households. The less substantial vessel walls in some of the utility wares would be well suited to the cooking and heating of foods and liquids and, because heat would have been conducted efficiently while heating rapidly, would have contributed to their ability to withstand heat-related stresses; also, the much thicker utility ware vessels (with rim thicknesses greater than 9 mm and body wall thicknesses greater than 10-11 mm) would have created stronger and more stable vessels, and would have been well suited for use as long-term storage containers (Rice 1987:227). Fine wares were probably intended for use in the serving of foods and liquids, and thinner and less porous vessel walls would have helped to maintain the temperature of served food and liquids; thinner and lighter vessels would have also contributed to the ease with which serving vessels could be handled, used, and transported.

Another factor that would have influenced vessel body wall thickness would have been the sequence in which a vessel was constructed (Krause 2007:35), of which there are a wide variety of choices available to potters (cf. van der Leeuw 2002:243-256). Vessels constructed from the bottom up, as most Woodland and Caddo vessels likely were, would tend to have thinner walls moving up the vessel body towards the rim, with the lower portion of the vessel—especially the base, likely made separately, and thus

available to serve as a support during later vessel construction—usually significantly thicker than the upper portions of the vessel.

Interior and Exterior Surface Treatment: The primary methods of finishing the surface of Caddo ceramic vessel include smoothing, burnishing, and polishing (Rice 1987:138), although polishing is generally rarely seen on burial vessels. Brushing is a popular method of roughening the surface (particularly the body) of large and small Middle Caddo (ca. A.D. 1200-1400) and Late Caddo (ca. A.D. 1400-1680) period cooking jars and other utility wares, as well as Historic Caddo sites (post-A.D. 1680) in certain parts of East Texas. Here it is considered a decorative treatment rather than solely a functional surface treatment (cf. Rice 1987:138), although not all Caddo ceramic analysts treat brushing as a decorative treatment (cf. Gadus et al. 2006:31). In certain fine ware Caddo vessels, brushed bodies accompanied engraved rim panels. Smoothing creates "a finer and more regular surface…[and] has a matte rather than a lustrous finish" (Rice 1987:138). Burnishing, on the other hand, creates an irregular lustrous finish marked by parallel facets left by the burnishing tool (perhaps a pebble or bone). A polished surface treatment is marked by a uniform and highly lustrous surface finish, done when the vessel is dry, but without "the pronounced parallel facets produced by burnishing leather-hard clay" (Rice 1987:138).

The application of a hematite-rich clay slip (Ferring and Perttula 1987), either red or black after firing in an oxidizing or reducing (i.e., low-oxygen) environment, is another form of surface treatment that may be noted in Caddo vessel assemblages. The clay slip is more frequently applied on the vessel exterior than on the interior surface, and then was either burnished or polished after it was leather-hard or dry.

Height and Orifice Diameter: These attributes, measured in centimeters, may be recorded with a ruler. The orifice diameters of vessels, used for cooking, food service, and the storage of food stuffs and liquids, provide some indication of the scale of food preparation and food serving in a Caddo vessel assemblage, and whether vessels were intended for individual or communal use. That vessels from Caddo sites are all hollow wares (i.e., jars, bowls, and carinated bowls), which leads to likely conclusion that the Caddo diet was based almost entirely on liquid-based foods cooked in jars, including stews, corn and bean dishes, and gruels.

Vessel size (in conjunction with wall thickness) may also be useful in identifying likely storage vessels in use at a particular size.

Diameter at Bottom of Rim and Base Diameter: Also to be recorded in millimeters using a ruler, these attributes permit characterization of the overall contour and shape of the vessel. With bottles, it is recommended that the analyst obtain measurements of their maximum body diameter.

Volume: Vessel volume in liters may be determined by filling (to within 1 mm of the lip) the vessel with lentil seeds, then dumping the lentil seeds in containers of known volume. In estimating the volume of vessels with holes, the vessel can first be filled with a cloth that conforms to the vessel contours, then the lentil seeds can be poured into the depression in the cloth to within 1 mm of the top of the lip. Then they can be dumped into containers of known volume. In cases where the vessels cannot be reconstructed, but measurements of height and orifice diameter can be obtained, volumes can be estimated by comparison with known vessel volumes of specific forms (i.e., carinated bowl, jar, bottle, compound bowl, and bowl) in other documented Caddo vessel assemblages. Vessels used in domestic contexts at Caddo sites tend to be generally much larger than those placed in burials with the deceased.

Decoration: Decorative techniques present in vessel collections from Caddo sites in East Texas include engraving and excising, incising, punctating, pinching, lip notching, brushing, neck banding, grooving, and appliquéing. On certain vessels, primarily the utility wares, combinations of decorative techniques (i.e., brushed-punctated or incised-punctated) will create the decorative elements and motifs, with one motif on the rim and another on the vessel body (Schambach's Rule of Two). Engraving and lip notching were done with a sharp tool when the vessel was either leather-hard, or after it was fired, while the other decorative techniques were executed with tools (incising and punctation as well as grooving), by adding strips of clay to the wet body (appliqué), by crimping the coils (neck banding), using frayed sticks or grass stems (brushing) dragged across the body surface, or fingernails (certain forms of punctations and pinching), when the vessel was wet or still plastic. Excising is considered a form of engraved decoration, where the clay is deliberately and closely marked/scraped and carved away with a sharp tool, usually to create triangular elements (the pendant triangle motif or small tick marks), negative elements, or crescent-shaped elements or brackets that separate or serve to define scrolls (Suhm and Jelks 1962:Plate 64a–b, f). A red clay film or wash may be added to the surface (interior and/or exterior surfaces) of some vessels as a slip before they were fired.

Ceramic style elements defined and recognized on sherds and vessels from a Caddo site simply represent one classification, among several developed and used in Caddo archaeology (cf. Dowd 2008; Suhm and Jelks 1962; Schambach et al. n.d.), of different ways of decorating a vessel by the prehistoric Caddo peoples (cf. Dowd 2008), and there is general consensus that shared styles are "the result of direct cultural transmission once chance similarity in a context of limited possibilities is excluded" (Dunnell 1978:199). If the decorative elements are truly stylistic in character, they allow the measurement of time as well as interaction between different but contemporaneous groups of people (Lyman et al. 1997:10), along with an assessment of a potter's place within a larger tradition of ceramic practice. Because the lion's share of the ceramics from Caddo sites are sherds rather than vessels or sherd vessel groupings, the most accessible stylistic information from a specific site is the rim and body decorations (often different on the same vessel).

If there is an interest in determining not only broad trends in changing ceramic styles, but also in exploring more-fine-tuned synchronic and diachronic differences in stylistic composition and diversity at specific sites or groups of sites in a specific sub-region of East Texas, a more detailed consideration of ceramic stylistic variability and diversity should be developed on particular projects, focusing on decorative elements. These represent distinct designs or design combinations (i.e., the breakdown of individual decorations within an overall design, as in a hatched triangle, circle, or tick marks) that can be identified on sherds and vessel sections (even if it is only a portion of the element), as a recurrent feature of decoration within each of the major decorative methods (e.g., incising, punctating, engraving, etc.) present in a Caddo ceramic assemblage. The design elements can be defined at different levels of association, depending upon variations in the designs (e.g., the number and spacing of engraved lines on a rim), the location of the decoration (e.g., on the rim, body, on the vessel interior, etc.), and the method of decoration (e.g., horizontal vs. vertical brushing).

Pigments: Another form of vessel decoration is the use of red (hematite or ochre-enriched clay) or white (kaolin clay) clay pigments that have been smeared, impressed, or rubbed into the engraved lines of certain vessels. It is important to identify the locations on the vessel (i.e., rim versus body, or rim and body) where the different pigments have been applied to the vessel design.

Type: The kinds of named ceramic types may follow primarily the work of Suhm and Jelks (1962), or the modified type-variety system favored by many Caddo ceramic analysts (cf. Early 1993; Kelley 1997; Schambach et al. n.d.), for lack of anything more current, but it is urged that the ceramic analyst becomes familiar with Caddo ceramic analysis work done since that time. There are a number of new types (ca. 30) introduced in East Texas since the mid-1960s, and new defined varieties of several existing fine ware types (including Hume Engraved, Patton Engraved, Poynor Engraved, and Ripley Engraved), that one needs to become familiar with because of the geographical and chronological implications of these varieties. Furthermore, the age ranges provided by Suhm and Jelks (1962) for ceramic types are 40 years out of date; only a thorough review of more recent East Texas Caddo reports and publications should be relied upon when assigning age ranges to specific ceramic types found on sites in the region.

Vessel Recordation Form

SITE NAME OR SITE NUMBER:

VESSEL NO.:

NON-PLASTICS:

PASTE:

VESSEL FORM:

RIM AND LIP FORM:

CORE COLOR:

INTERIOR SURFACE COLOR:

EXTERIOR SURFACE COLOR:

WALL THICKNESS (RIM, BODY, AND BASE IN MM):

INTERIOR SURFACE TREATMENT:

EXTERIOR SURFACE TREATMENT:

HEIGHT (IN CM):

ORIFICE DIAMETER (IN CM):

DIAMETER AT BOTTOM OF RIM OR NECK (IN CM):

BASE DIAMETER (IN CM):

ESTIMATED VOLUME (IN LITERS):

DECORATION (INCLUDING MOTIF AND ELEMENTS WHEN APPARENT):

PIGMENT USE AND LOCATION ON VESSEL:

TYPE [IF KNOWN]:

Methods of Sherd Analysis

Detailed analysis of Woodland and Caddo ceramic sherds may be based on differences in temper, type of sherd (i.e., rim, body, or base), rim and lip form (cf. Brown 1996: Figure 2-12), decoration (if present, including the identification of motifs and elements, see above), surface treatment (smoothing, burnishing, or polishing; see Rice 1987), and firing conditions (cf. Teltser 1993). Sherd cross-sections should be inspected macroscopically and with a 10X hand lens to determine the character of the paste and its inclusions. Determining the firing conditions may be based on the identification of the firing core in the sherd cross-sections and the identification of oxidation patterns as defined in Teltser (1993:535-536 and Figure 2a-h; see also Perttula 2005).

Attributes employed in the analysis of Woodland period and Caddo ceramic sherds are the same as those outlined for whole vessels: (a) temper, the deliberate and indeterminate materials found in the paste (Rice 1987:411), including a variety of tempers (grog or crushed sherds, burned bone, etc.); (b) although most of the sherds may be small and thus from indeterminate vessel forms, where sherds are large enough, vessel form categories that may be identified would include carinated bowls, bowls, jars, and bottles; (c) other form attributes should include rim profile (i.e., outflaring or everted, direct or vertical, and inverted) and lip profile (i.e., rounded, flat, or folded to the exterior, among others); (d) Observations on ceramic sherd cross-sections permit consideration of oxidation patterns (Teltser 1993:Figure 2), namely the conditions under which a vessel was fired and then cooled after firing[1]; and (e) finally, wall thickness was recorded in millimeters (mm), using a vernier caliper, along the mid-section of the sherd.

With respect to interior and exterior surface treatment on Caddo sherds, the primary methods of finishing the sherds are smoothing, and burnishing. Smoothing creates "a finer and more regular surface…[and] has a matte rather than a lustrous surface" (Rice 1987:138). Burnishing creates an irregular lustrous finish marked by parallel facets left by the burnishing tool (perhaps a smoothed pebble or bone).

Decorative techniques present in a Caddo ceramic sherd collection include incising, punctation (with a tool), and on certain sherds, combinations of decorative techniques (i.e., incised-punctated sherds) created the decorative elements and motifs. These decorative techniques were executed with tools (wood or bone sticks or dowels). Within these general decorative methods, a few specific ceramic decorative elements are defined that represent distinct kinds of decorations or decorative combinations.

When there are less than 200 sherds (both plain and decorated) in an assemblage, all sherds in the assemblage should be categorized by sherd type, as well as the kinds of decorative methods and decorative elements identified on them. In larger assemblages (>200 sherds), it is recommended that a sliding scale of sampling be employed when conducting detailed sherd analysis. For example, in a sherd assemblage of 200-1000

sherds, 40-50% of the sherds might be selected for detailed analysis, thus obtaining sufficient information from that assemblage to characterize its stylistic and technological diversity and insure that a representative sample was subjected to analysis. In assemblages with 1001-5000 sherds, a 20-30% sample seems reasonable for detailed analysis; for assemblages with >5000 sherds, a 10% sample would obtain a sufficiently large (+500 sherds) large and analytically detailed sherd assemblage.

Another source of analytical information that can be derived from sherds from Caddo sites in East Texas is ceramic accumulation research (Varien 1999; Sullivan 2008). This research derives from ethnoarcheological research to establish artifact use-lives for cooking pots, along with estimates for total numbers of discarded artifacts that were derive from controlled statistical excavated samples in the Mesa Verde area, and estimates of the average numbers of artifacts of a given type in use. These are employed to model the length of time it takes for given numbers of artifacts (cooking jar sherds) to accumulate. Varien's (1999:Table 4.2) ethnographic and archeological information on the accumulation of utility ware sherds (i.e., what he calls cooking-pot sherds) in domestic contexts suggest that 4000-8000 grams (g) of cooking pot sherds would be accumulated through breakage and use per year on a residential site occupied by Native American farmers.

This accumulation information can be used as one inferential means to assess the possible length of different Caddo occupations. If we consider that Caddo wood pole and thatch structures would probably only last at most 20 or so years before they began to deteriorate (see Good 1982:69), then the utility ware accumulation data can be used to suggest with some confidence in generational terms. Calculating the total number of utility ware sherds depends on (1) estimates of sherd weights in grams (weighing on average 5 g each), (2) the total number of utility ware sherds in the different ceramic assemblages, and (3) the relative proportion of excavations (in m^2) at a site or set of sites compared to the known total extent of the Caddo ceramic-bearing deposits at the sites.

Guidelines for Final Report of Ceramic Analysis

In a final report on the analysis of ceramic sherds from a Caddo site, or set of sites in East Texas, at a minimum it should contain detailed analyses of temper, firing condition, surface treatment, rim and lip form, and vessel wall thickness of the sherds should first be provided in text and table formats. This report should also include a discussion of the decorative methods and elements present in all the sherds in the assemblage, along with at least one figure (photograph or drawing) that clearly shows the nature of the decoration on individual selected sherds. The findings from the analysis of any ceramic or clay special samples. Lastly, the report should also be expected to contain a discussion of the ceramic research and analytical approach and methods employed in the study, as well as a summary presentation of the ceramic findings.

Recommendations

Establishment of Databases for Sherd and Vessel Special Samples

I recommend that CTA establish and maintain computer databases from Woodland and Caddo sites in East Texas that contain data already obtained, or to be obtained on future projects, from special samples/analyses completed on Woodland and Caddo sherds and vessels, as well as any clay samples that have been chemically or petrographically analyzed . Such analyses may have consisted of, or will consist of in the future: (a) analysis of residues, including the direct AMS dating of those residues; (b) instrumental neutron activation analysis; (c) petrographic analysis; (d) luminescence dating of sherds; and (e) pigment analysis (Chris Caran, May 2010 personal communication). Creating and maintaining such databases by the CTA, which in some cases (i.e., instrumental neutron activation and petrographic analysis) are extensive for the region, would allow open access to these data by ceramic analysts and archaeologists working in the region, or other parts of Texas and surrounding states. It also would permit the synthesis of these data for various research purposes and problems for the East Texas region, and allow those with a research interest to fully utilize the full interpretive potential of these ceramic databases.

Analysis of residues on sherds and vessels

The analysis of residues on sherds and vessels is not an analytical technique applied with any frequency on Woodland and Caddo sherds and vessels. Charred, organic residue (i.e., visible residue analysis, see Reber 2006) recovered from ceramic sherds should represent residue of foods cooked in the vessel, which constitutes useful information about the use of a vessel, as well as contributes empirical evidence of what range of foods may have been used at a particular site. Absorbed residue analysis of sherds also provides direct information on the use of these vessels by determining through lipid analysis what was processed in a particular ceramic vessel (Reber 2006:238).

These visible and absorbed residues can also be radiocarbon-dated (Hart and Lovis 2007), analyzed through stable carbon/nitrogen isotope analysis (Reber et al. 2004), and examined for the presence of food-related phytoliths such as maize (see Hart et al. 2007; Thompson 2006). In the future, it is recommended that both residues can be examined from particular Woodland and Caddo ceramic assemblages for visible evidence of plant food residues, lipids, phytoliths, and/or starch evidence of foods that might have

been cooked in particular vessel or sets of sherds from particular vessels. Reber (2006) also suggests that the most useful and analytically comparable approach is to conduct both visible and absorbed residue analysis on the same set of sherds from a particular set of sites.

Instrumental neutron activation analysis and petrography

The regional analysis of the chemical compositional make-up of Woodland and Caddo pottery has the potential to help with the reconstruction of "how people created, modified, or moved items within a particular landscape" (Kantner 2008:54). At the present time over 970 sherds and clay samples from more than 130 Woodland and Caddo sites have been submitted for instrumental neutron activation analysis (INAA) (Perttula 2010). The Woodland INAA database only consists of 10 sherds from a few sites.

It is likely that the vast majority of the Caddo pottery made in East Texas was produced at the household or community level, and then distributed and used locally, with an unknown quantity of that pottery being made for trade or exchange with neighbors, both near and far-flung. However, the INAA database available at present is not sufficiently robust to be as analytically useful as it could be, because of the apparent chemical homogeneity in locally abundant clays and the still limited number of sites across the region with INAA sherd or clay samples, to establish with certainty the source of clays used by Caddo potters or to link those clays with tempered Caddo pottery vessels and vessel sherds of known styles and temporal ranges. Continued INAA analyses from a range of sites—and on both utility wares and fine wares—may be important in establishing production locales and their spatial scope, as well as delimiting both the kinds of pottery made in each production locale and the extent to which they made have been traded and exchanged amongst neighboring Caddo groups. The most useful INAA has been conducted on individual Caddo sites that have more than 20 sherds from both fine ware and utility ware sherds, as that sample size provides an opportunity to investigate with a more representative sample the chemical variation in Caddo ceramics at specific sites, and then make broader comparisons with Caddo INAA results at other specific sites.

Given that quartz sands are a primary constituent of the paste of Caddo pottery over much of East Texas, but that there are other mineral constituents that may have distinctive proveniences in alluvial and upland clays, analytical methods need to be developed and implemented here (following the lead of the important studies that have defined sand composition zones in Hohokam sites in Arizona, cf. Abbott 2003; Harry 2004) through sampling of sands in local clays to identify particular sand composition zones and source-specific pottery types (Abbott 2009). These analytical methods would

include INAA, petrographic analysis of sherd pastes (Stoltman 2001), laser ablation-inductively coupled plasma-mass spectrometry (see Speakman et al. 2007), and electron microprobe analysis (Dowd et al. 2009) of both natural clay and temper types in samples of sherds from well-dated Caddo sites in the region. INAA and petrographic analysis (more than 300 sherds have been analyzed by petrographic methods in East Texas sites, but no database has been compiled to my knowledge of these analyses) may be particularly effective methods when done in conjunction on the same set of sherds.

Luminescence dating

The luminescence dating of ceramics (see Feathers 2003) has been applied with some considerable success in a variety of settings—and on different ceramic wares—in North America (Lipo et al. 2005; Dykeman et al. 2002; Feathers 2009). However, since the days of Alpha Analytic (a subsidiary of Beta Analytic) in the early to mid-1980s, there have been almost no luminescence dating of Woodland or Caddo ceramic wares in East Texas until 2008, and even then, less than 60 luminescence dates are believed to have been obtained at the present time from less than six Woodland or Caddo sites of various ages (cf. Perttula and Feathers 2010).

Given the abundance of ceramics of several different kinds and styles at all Caddo sites and many Woodland period sites, the luminescence dating of both plain and decorated sherds recovered in situ from these many sites should be routinely explored on both testing and data recovery projects in the region since it is a method "that dates the manufacture and use of…ceramic objects [that] provide a closer relationship between the target event [when a site is occupied] and the dated event [the age determined by the luminescence on a sherd]. Luminescence is particularly well suited for the dating of ceramics since the method measures the time elapsed since vessels were last heated, usually corresponding to manufacture or use" (Lipo et al. 2005:535).

Rehydroxylation dating

This is a new method of dating ceramics, up to at least 2000 years of age, rather precisely that has been recently developed by Wilson et al. (2009). Since only 3-5 grams of ceramic material is needed for dating purposes, this method would seem to be well-suited to any Woodland or Caddo site with a modicum of sherds, and future analyses of Woodland and Caddo ceramic assemblages should consider the method when attempting to establish the absolute age of ceramic sherds, just as an analyst would with luminescence dating.

End Notes

1. Oxidation analysis of sherds and fired clay samples may also be a useful technique to employ in attempting to source ceramic sherds to specific clay source areas (Roper et al. 2010:140).

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Prehistoric Ceramics of the Gulf Coast

Linda W. Ellis

Ceramics along the Gulf Coast are associated with two fairly well-defined archeological regions, the Southeast Texas Archeological Region and the Coastal Bend and Central Coastal Plains Archeological Region, and a less well defined Lower Texas Coastal zone. Both archeological and ethnohistoric information indicate that during the Late Prehistoric period there were a number of relatively distinct cultural groups present in these regions/zone (including the barrier islands), with one of the primary means of differentiation being ceramics (see Aten 1983; Ellis 1992, 1996; Ellis and Ellis 1999; Hamilton 1988:80-82; Newcomb 1961:59-62; Ricklis 1996; Suhm and Jelks 1962). The Lower Texas Coastal zone extends from the Rio Grande delta northward to the southern edge of Baffin Bay and its prehistoric and ethnohistoric populations are poorly known (Ricklis 2004a). The Central Coastal Bend region extends from the northern edge of Baffin Bay northeast to the Colorado River and was populated by several "bands" collectively known as the Karankawa (Aten 1983:28-34; Newcomb 1961:315-316; Ricklis 1996:1-10). The Southeast Texas Archeological Region extends from the Brazos River Delta northeast to the Sabine River, and was populated by a number of linguistically different groups, primarily the Akokisa, the Bidai, and the Atakapa (Aten 1983:34-42). Ethnohistoric research indicates that the Brazos Delta-West Bay area may have been an ethnic boundary zone that was intermittently occupied by a Karankawan group called the Cocos (Ricklis 1996:6-7; Aten 1983:28-30; Kress and Hatcher 1931) and an Akokisa group known as the Han (Aten 1983:35). Archeological evidence indicates that ceramic assemblages found at sites in this transitional zone reflect a blend of technological attributes found in the major ceramic traditions of both the Galveston Bay area and the Coastal Bend area (Ellis 2003; Ellis and Ellis 1999; Ricklis 2004a, 2004b; Weinstein 2002).

Southeast Texas Archeological Region

The Southeast Texas Archeological Region includes what is commonly referred to as the Mossy Grove Tradition (Story 1990). Within the Mossy Grove Tradition, regional variations in settlement and subsistence patterns, technology, and ethnic affiliations indicate the presence of two sub-regions: the Inland Coastal Plain and the Coastal margins. Research indicates that both temporal and spatial differences existed between the two sub-regions (Aten 1983, Ellis and Ellis 1995; Perttula 1993; Ricklis 2004b; Story 1990).

Between 500-400 B.C., pottery first appears in archeological assemblages in Southeast Texas. During the Transitional Archaic/Early Ceramic period, cultural groups adapted to an environment of more sharply differentiated annual cycles. In response, settlement patterns and subsistence regimes took on increasingly seasonal emphases as

groups moved from the occupation of fall/winter shoreline fishing camps to spring/ summer hunting camps (Aten 1983; Perttula 1993; Ricklis 2004b). Chronological divisions for the Late Prehistoric have been defined for both the Inland Coastal Plain and the Coastal margins (Aten 1983; Ensor 1998, Story 1990, Winchell and Ellis 1991; Weinstein 1991).

Although the evidence indicates a continuation of many of the same cultural and technological patterns from the preceding Late Archaic period, the introduction of ceramic technology marks a shift in adaptive strategies, signaling a different means of processing, cooking, and/or storing plant and animal resources (Perttula 1993; Ellis and Ensor 1998). Ceramic technology evolves rapidly, with noticeable interregional distinctions and there is evidence of increased ethnicity among the coastal groups as settlement patterns shift in response to the integration of these new subsistence regimes (Aten 1983; Ricklis 2004b).

Aten's (1983) publication of his dissertation research provided the first formal synthesis of the Late Prehistoric period and has become one of the standard references on the prehistory of the region. Following Phillips's (1970) taxonomic scheme for the Lower Mississippi Valley, Aten (1983) devised a ceramic taxonomy based on changes in paste technologies, with various decorative treatments being used to split gross paste types into finer types or to denote the specific varieties within each type. The sequence began with untempered sandy paste wares (such as Tchefuncte and Goose Creek) and was followed, first, by sandtempered wares (such as Alexander, O'Neal, and Conway), then grogtempered wares (such as Baytown and San Jacinto), and later bonetempered wares (Aten 1983:219220). His taxonomic designations were devised on the basis of changes in paste technologies, with various decorative treatments being used to split gross paste types into finer types (e.g., Goose Creek, *var. Red-Filmed*) or to denote the specific varieties within each type (e.g., San Jacinto, *var. San Jacinto Incised*).

Using these established types, graphic seriations for the three relatively distinct archeological areas in the region were then produced. The most developed was that for the Galveston Bay area, which was verified by individual chronological controls such as associated diagnostic artifacts, radiocarbon dates, and geomorphological data. Seriations for the Conroe-Livingston area and the Brazos Delta-West Bay area were then correlated against the Galveston Bay area sequence (Aten 1971, 1979, 1983; Ambler 1967, 1970, 1973). The stated goal was to "map" the time/space distribution of ceramic artifacts in the region.

Subsequent research has called into question just how fine-grained the Galveston Bay seriation actually is (Ellis and Ellis 1999; Ricklis 1994; Weinstein 1991), and data suggest that it may be useful only as a relative sequence and should not be relied upon as an accurate calendrical scale. Ricklis (1994; see also Weinstein 1991) notes at length that the calendrical calibration of the seriation is problematic because Aten calibrated his

seriation to calendar years on the basis of radiocarbon dates on shell. Aten's dates were obtained before fractionation corrections were well understood or routinely measured. The regression method he used (Aten 1983:Appendix A) compensated for age anomaly, variability of anomaly, fractionation effects, variability of fractionation effects, and variability of contemporaneity between the paired charcoal and shell dates used in the regression. As a result, despite the fact that the regression has a very high correlation coefficient and R2 value, it also has a very high standard error of 103 radiocarbon years. So, no matter how accurate the correction is, it is very imprecise. Using the regression to correct for age anomaly yields uncalibrated radiocarbon ages with 95% confidence intervals of 412 radiocarbon years, which is approximately equal to the length of the Round Lake period as it is characterized by Aten (1983:Figure 14.2). At this level of imprecision, the only secure serial relationships are between samples from the same stratigraphic columns or samples firmly associated with statistically different radiocarbon ages, which requires mean radiocarbon ages several hundred radiocarbon years apart (Ellis and Ellis 1999).

It is possible to use Aten's correction procedure to produce reasonably accurate (if imprecise) ordinal measures of radiocarbon age and to integrate new studies in terms of radiocarbon rather than calendrical age; however, a more important problem affecting the seriation is the fact that few of the steps in the seriation are actually dated. The grog peak is derived from samples at 41CH98, levels 1-5 (Aten 1983:Figure 14.1 and Table 12.1), but the only radiocarbon ages are from charcoal and shell in level 5 that yielded uncalibrated radiocarbon dates of A. D. 640 ± 103 and A. D. 890 ± 110, respectively (Aten 1983:Table 14.1). This is considerably older than the uncalibrated radiocarbon date of A. D. 1400 that coincides with the grog peak in Aten's (1983, Fig. 14.2) period structure. The same problem affects the four seriation steps involving Old River and Orocoquisac ceramics from 41CH32. The uncalibrated radiocarbon dates from this site are 427 ± 103 B. C. and A. D. 584 ± 103, which at best place the 41CH32 ceramics sometime after the very Early Ceramic period. Without tying the dates to their assemblages, the 41CH98 and 41CH32 components float chronologically and ordinally unanchored within the seriation (see Ellis and Ellis 1999).

Excavations at several stratified, well-dated ceramic bearing sites have refined the temporal placements of ceramics within Aten's chronology (Ellis and Ensor 1998; Ricklis 1994, 2004a; Moore 1995; Winchell and Ellis 1991). For example, extensive work at the Eagle's Ridge site (41CH252) in the Wallisville Reservoir area has added significantly to our knowledge of the Early Ceramic period and served to refine the temporal placement of ceramics within the Galveston Bay seriation (Ensor 1998; Ellis and Ensor 1998). At the Eagle's Ridge site, more than 14,000 sherds were recovered and analysis of the stratified and well-dated ceramic assemblage has yielded some of the earliest dated pottery in the region, effectively pushing the earliest occurrence of ceramics back to sometime between 400-500 B. C. (Ellis and Ensor 1998). The range and distinct variability of the ceramics recovered at this site suggest that pottery making, while

definitely in its early stages, was fairly well-established in the region by the beginning of the Clear Lake Period (A.D. 100-A.D. 425). If the assemblage at the Eagle's Ridge site is broadly representative, ceramics in the coastal zone started out as highly diverse and the frequency of types found at the Eagle's Ridge site varies significantly from Aten's (1983: Figure 14.1) seriation. In addition, a much broader range of decorative techniques and motifs were observed on these early ceramics than is commonly found on late ceramics, and it appears that an early potter's repertoire also included a broad range of technological approaches to paste choice, primary forming, and surface treatment. However, by the A.D. 700s, the range of technological styles had narrowed considerably in the sense that both manufacturing processes and decorative techniques changed to include a smaller suite of technical procedures. This narrower range of technical procedures stabilized into a predominant pattern in which decoration in general (and the range of decorative techniques specifically) was much less common. In general, it appears that the emphasis came to be on the primary and secondary forming stage of the pottery production process and less on the embellishment of the finished pot. In essence, Southeast Texas potters settled on a combination of technical attributes and deviated from that overall style relatively little over a very long period of time. This is also confirmed by several other studies that have explored the regional range of stylistic variability in ceramics (Black 1989; Ricklis 1994), as well as the variability in forming techniques and surface treatment (Howard 1989; Winchell and Ellis 1991). Interestingly, many of these technological attributes, such as the distribution of smoothed vs. floated surfaces noted at 41HR273 (Winchell and Ellis 1991), exhibit diachronic changes that would be obscured if simply using Aten's paste-based typology. Ultimately, if one of the purposes of ceramic analysis is to develop a seriation for chronological applications, an alternative seriation showing diachronic change less ambiguously than Aten's seriation would be an important tool.

It also appears that many individual technological attributes may have distinct spatial properties (Ellis and Ellis 1999). For example, one distinctive firing attribute, interior smudging, appears in a number of ceramic assemblages in the region. The use of this firing technique apparently has substantial time depth, but there appears to be a spatial disjunction between ceramic traditions in the north/northwest inland zone and those in the east/southeast coastal zone with regard to the use of this technique. Ceramics with smudged interior surfaces occur in high percentages along a west-southwest/east-northeast trending line that runs from northern Fort Bend County to Chambers County and seem to occur in much higher frequencies in coastal sites (Ellis 2003; Hamilton 1988; Ellis 1996), and occur in minimal frequencies at sites located to the north/northwest (Ellis 1992; Ellis and Ellis 1999).

The distribution of one interesting decorative attribute also speaks to distinct spatial properties. Saw toothed notched lip decoration is a decorative motif more typical of the Middle Coast (Corbin 1963; Headrick 1993:30-39; Potter 1930:43 and Plate 7; Ricklis 1994:210), and, to my knowledge, has not been reported in any Harris County

sites, nor does it occur in the Chambers County area where Aten constructed his Galveston Bay area seriation. However, rims with distinctive saw-toothed notched lips have been recovered at 41GV66 on west Galveston Island (Ricklis 1994), 41FB200 (Ellis and Ellis 1996a), 41FB255 (Ellis 2000), and 41BO217 (Ellis 2003), reinforcing the notion that this area appears to be an ethnic boundary zone between the Middle and Upper Texas coast (Aten 1983:28-34; Ellis and Ellis 1999; Ricklis 1996:1-10). Thus, it appears that a more-thorough reporting of ceramics with this distinctive lip decoration may prove useful in refining both typological and cultural or spatial boundaries.

The discussion above, and in Ricklis (1994) and Weinstein (1991), shows that widely accepted knowledge about the Galveston Bay area is highly underdeveloped. Moreover, to the extent that our knowledge depends on Aten's Galveston Bay Area seriation, such knowledge is undermined by a reliance on a cultural-historical construct that itself is conjectural because the data base on which it is founded is weak. What the Galveston Bay area seriation can say reliably is that Tchefuncte, Mandeville, and certain Goose Creek wares are restricted to the very early portions of the Early Ceramic period, and that ceramic types with grog and/or bone inclusions are a Late Ceramic phenomenon. These gross demarcations appear to be true about the temporal distribution of typologically relevant attributes; however, if we also look at the spatial distribution of certain other technological attributes, we find that they were not distributed uniformly. Moreover, the available technological data suggest that if we look at the late part of the sequence, there are hints of different ceramic traditions within a single typological "space." This poses the possibility, as Aten did (1983:286-287), that we have more to learn, including the possibility that other technological attributes may reinforce these boundaries or identify more subdivisions.

Thus, looking at technological and typological attributes in tandem would enable a broader characterization of coastal ceramics. Because ceramic types in the Southeast Texas Archeological region are defined on the basis of specific typologically relevant technological attributes (in particular, paste and decorative treatment), changes and/or variations in those technological attributes have a direct bearing on typological issues. Further, certain of these typologically relevant technological attributes have demonstrated diachronic and spatial trends (Ellis and Ensor 1998; Ricklis 1994; Winchell and Ellis 1991) that provide additional insight into the potential existence of different ceramic traditions within the single typological "space" of the Mossy Grove cultural area. A broader characterization of ceramics would also help us address a much more interesting research problem: if the Indians of the Southeast Texas Coast were, in fact, semi-nomadic hunters and gatherers, then "why is pottery relatively abundant among these groups when, generally speaking, pottery is not abundant in hunting and gathering groups?" (Hamilton 1988:104).

Coastal Bend and Central Coastal Plains Archeological Region

Geographically, the Coastal Bend and Central Coastal Plains Archeological Region include an area that extends from roughly the San Antonio River on the north to the northern margins of Baffin Bay on the south. From the barrier islands along the Gulf Coast (i.e., the shoreline zone), the region extends inland approximately 40-50 km. Its boundaries are defined on the basis of both cultural and environmental factors (Ricklis 2004a).

Ceramics may have been in use by the terminal Archaic (Ricklis and Cox 1991; Story 1968); however, it was not until the earlier portion of the Late Prehistoric period (A.D. 1000-1250) that ceramics began to appear in greater numbers in coastal assemblages, most notably in the northern part of the central coast at sites in Jackson, Calhoun, and Victoria counties (Corbin 1988; Weinstein 1992, 1994). For example, at the Anaqua site (41JK8) in Jackson County (Story 1968; Mallouf et al. 1973), sandy paste ceramics similar to the Goose Creek wares typical of the upper Texas coast were found alongside Scallorn points in a single component. At 41CL2 in the San Antonio Bay area, Weinstein (1992, 1994) also notes that sandy paste pottery similar to the Goose Creek wares was found in association with Scallorn points, suggesting that sandy paste wares predate the asphaltum-coated/decorated ceramics found in later assemblages.

Sometime around A.D. 1250/1300, a distinctive artifact assemblage developed between Matagorda Bay and Baffin Bay. This manifestation (referred to as the Rockport complex or phase) is well documented throughout the coastal bend and is typified by a variety of tools such as Scallorn, Fresno, and Perdiz arrow points and a suite of shell tools (Corbin 1963; Headrick 1993; Ricklis 2004a). There is also a shift from plain sandy paste ceramics to a distinctive pottery tradition characterized by the coating or decorating of sandy paste wares with asphaltum, as well as an increase in the range of vessel forms. Distribution of these ceramics types, collectively known as Rockport wares, can be geographically delineated with a fair degree of accuracy, as these wares are found at sites extending north from Baffin Bay as far as the Colorado River basin and up to approximately 40 km inland (Black 1986; Fritz 1975; Ricklis 2004a). For example, at 41RF21, approximately 40 km from the mainland shoreline, both Rockport and Toyah components were identified on the basis of discrete spatial concentrations of both Rockport wares and bone-tempered plain ware sherds (Ricklis 1988, 1996).

Unlike the Goose Creek wares, Rockport wares are defined on the basis of their relatively unique surface treatments which have aided in defining their spatial and temporal extent (Corbin 1963; Suhm and Jelks 1962). A comparison of the temper and decorative attributes found on both inland coastal Toyah ceramics and the coastal Rockport ceramics shows basic differences between the two wares and suggests the presence of a geographic boundary between the respective ceramic traditions (Ricklis 1995). There also appears to be a geographically patterned variation in the distribution of Rockport coastal assemblages. For example, Rockport ceramic assemblages found at major shoreline fishing campsites that were seasonally occupied by large aggregate

groups exhibit greater variability in decorative attributes than do Rockport assemblages found at smaller campsites oriented toward procurement of terrestrial and riverine resources (Ricklis 1995, 1996). Ricklis (2000) suggests that more rigorous quantification of attribute variability (i.e., differences in non-plastic inclusions, surface treatment, and vessel form) might provide a better understanding of ceramic production and use within the context of settlement patterns. There is considerable variation in Rockport ware and the type-variety classification scheme currently in use is relatively generalized, giving formal names to different attribute combinations (Suhm and Jelks 1962). Ultimately, it may be that an attribute analysis approach may prove more flexible in dealing with specific research questions (Ricklis 2000).

Lower Texas Coast

Geographically, the lower Texas coast can be divided into two major subareas (Ricklis 2004a:177-180). From the southern shore of Baffin Bay southward to the middle of Willacy County, the coastal zone is part of the South Texas sand sheet, an area that is relatively unknown archeologically. Just south of the sand sheet is the Rio Grande deltaic plain. Archeological research in the delta area has been spotty and there is a poor understanding of the area's chronology, as well as a general lack of data with regard to prehistoric resource use and settlement patterns. The relatively small numbers of excavations conducted in this area provide little data on which to base inferences regarding intraregional variations in ceramic assemblages.

Discrete occupation components are scarce, reflecting the generally sparse nature of cultural debris in most excavated sites (Bailey 1990; Mallouf et al. 1977). Based on the cumulative evidence, two closely related complexes, the Brownsville and Barril, have been defined for the lower Rio Grande delta region. Common to both complexes are shell disks, pierced shell disk beads, plugs made from a columella that are round in cross section, rectangular conch shell pendants, mollusc shell scrapers, and Starr, Fresno, and Matamoros projectile points. Ceramic production does not seem to have been indigenous to this zone, but Rockport wares have been recovered (S. L. Black 1986, 1989; Headrick 1993). Intrusive pottery of Huastecan origin from southern Tamaulipas is sometimes associated with Brownsville sites and sometimes appears in burials (Anderson 1932; Mason 1935; MacNeish 1947; Mallouf et al. 1977). In summary, ceramics in the lower coast are relatively sparse and not well-defined.

Ceramic Methodology

To address a broader range of research objectives, a ceramic analysis must be comprehensive enough to capture the array of stylistic and technological diversity found on any one group of ceramics. This means including a wider array of ceramic variables that more effectively address these broader objectives. Understanding the universe of prehistoric ceramic traditions occurring in Texas requires an integrated approach that

begins with an understanding of the basic nature of ceramic technology and its general parameters. Because ceramic technology encompasses a number of multi-faceted components which are both abstract (e.g., the need and the conceptual notion of how to fulfill that need) and physical (e.g., the production of the finished product, its properties, and its actual use), the study of ceramic technology is best understood if we have some means of organizing its basic components within a systemic context.

Like all human endeavors, pottery is the product of structured human behavior, and its qualities are determined by its raw materials and method of manufacture (Rice 1987; Shepard 1974). Given this theoretical perspective, the technological decisions made during pottery manufacture bear some relationship to the desired qualities of the finished pot. Therefore, understanding how a pot was made helps us understand how one pot varies from another, and, by implication, it helps us to recognize the range of technological variability we might expect to see even on relatively similar pots. It also provides a means of describing, and thus comparing, ceramic assemblages in terms of their shared technological aspects.

One way to distinguish subtle differences among gross similarities is by looking at technological variations (i.e., technological style, where technological style refers to the particular choices made at each stage in the pottery production process [see Ellis 1992, 1995 for details relative to ceramic assemblages on the Texas coast]). Because pottery making involves a series of steps that proceed in a customary way, evidence of some of the human actions that produced the pot will be preserved in the finished product. This approach is similar in many respects to the technological analyses of lithics. Ultimately, if we can identify the technological style(s) present at specific sites, it may be possible to distinguish distributions of technological styles from one area to another. This approach has been applied at a number of sites in the Southeast Texas Archeological Region where ceramic types are paste-based and only 5% to 10% of the ceramics are decorated. The subsequent data that has come from this approach have yielded some potentially useful, if also preliminary, results. The emerging database suggests that there are diachronic and/or spatial variations in pottery technological style that may relate to socio-cultural and/or adaptive variation at sites in this region (Ellis and Ellis 1999).

Applying this same approach in other regions would require a broader characterization of ceramics to include both technological and typological attributes. Thus, regardless of which region one is working in on the Texas coast, a comprehensive ceramic analysis should begin with a basic ceramic attribute analysis that includes six primary classification criteria:

(1) Two aspects of paste morphology: (a) Paste Constituency—the type of non-plastic inclusions (i.e., sand, bone, grog) and the predominant size range of non-plastic inclusions (i.e., medium sand, fine sand, very fine sand), and (b) Paste Texture—the general morphology and configuration of the crystalline components, amorphous

material, and voids as observed in cross-section (i.e., smooth, laminated, contorted). To facilitate these observations, a fresh break along the edge of each sherd should be microscopically examined. In the absence of ceramic petrography, recording these two paste attributes serves to more fully characterize the ceramic assemblage (Ellis and Ellis 1996b);

(2) Basic exterior and interior surface treatment;

(3) Exterior and interior decorative treatment;

(4) Vessel form: In the absence of whole vessels, the general aspects of vessel form can be assessed through attributes such as thickness, diameter, and gross morphological category (i.e., body, base, and rim). Four additional attributes should be recorded for each rim in the assemblage, including: rim profile, rim form, lip profile, and lip decoration;

(5) Firing environment (i.e., oxidizing or non-oxidizing and/or color; interior smudging);

(6) Post-Firing Attributes: Sherds often exhibit some type of post-firing modification. This modification may be deliberate (i.e., drill holes or asphaltum coatings), or it may result from post-depositional factors (i.e., eroded surfaces).

Each of these attributes provides specific information about the technological choices made at each stage in the pottery manufacturing process, which in turn allows the analyst to more fully characterize the assemblage even in the absence of identifiable types. This in turn provides a basis for comparing the technological variability of the ceramics recovered at any given site with the technological variability of other ceramic assemblages in the region.

Although this information provides valuable information about how pots were manufactured and what pastes were preferred, it tells us nothing about where raw materials were procured. Therefore, physicochemical (i.e., instrumental neutron activation analysis [INAA]) and petrographic studies of paste composition will complement the technological data by indicating where the preferred sources for raw materials were and, by extension, tell us something about how pottery making was organized in space. INAA would contribute valuable information on the intra- and inter-site spatial patterning of various pottery traditions. Techniques such as Thermoluminescence and Rehydroxylation have also proved valuable methods for dating the physical properties of sherds.

Ultimately, a thorough ceramic analysis requires an integrated approach that includes a suite of studies that, used together, provide an effective means of addressing

process oriented research problems, as well as spatial/temporal distributions. Only by expanding our theoretical and methodological research designs can we begin to discuss the role that ceramics may have played among native groups living in Texas.

Research Objectives

The Southeast Texas Archeological Region

- More detailed analyses of intra-regional variation in ceramics especially along the boundary between the Lower Mississippi Valley traditions on the northeast, the Caddo traditions to the north, and the central coastal traditions.
- Syntheses that update and refine Aten's (1983) existing typology for the upper Texas Coast.
- Develop a complementary seriation based on surface treatment and decorative motifs.
- More rigorous and systematic recording of basic technological attributes to order to more fully understand forming techniques (production) and performance characteristics (use) of the various defined types.
- Studies that look at technological and typological attributes in tandem in order to fully characterize ceramic assemblages.
- Physicochemical studies to investigate clay sources, document the intra- and inter-site spatial patterning of various pottery traditions, and enhance dating.

Coastal Bend and Central Coastal Plains

- More detailed analyses of extra-regional comparative data, as well as investigations of more discrete components at sites dating to the terminal Archaic and initial Late Prehistoric (ca. A.D. 500-1200), are needed in order to elucidate the origins of Rockport Ware (Ricklis 2000).
- More rigorous and systematic recording of basic technological attributes and the variability of the Rockport Wares in order to elucidate aspects of ceramic production and use. For example, studies of variability in vessel forms and sizes may correlate with site size, occupational intensity, and function (Ricklis 2000).
- Syntheses that update the existing type-variety classification scheme for the Rockport wares.
- Studies that look at technological and typological attributes in tandem in order to fully characterize ceramic assemblages.
- Physicochemical studies to investigate clay sources, document the intra- and inter-site spatial patterning of various pottery traditions, and enhance dating.

Lower Coast

- More investigations in the region to enhance intra- and extra-regional comparative data for ceramics.
- Reanalysis of the few earlier ceramic collections (Anderson 1932) to more rigorously record basic typological and technological attributes for comparative analyses.

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Prehistoric Ceramics in the North Central Texas, Prairie Savanna, and Central Texas Archeological Regions

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This relatively large swath of Texas encompasses a diversity of geologic, natural environment, and cultural settings (Bureau of Economic Geology 1996a, 1996b; Raisz 1957). Based on internal similarities in material culture (e.g., projectile point styles, site types, and feature types) this larger geographic area has been subdivided into three archeological regions: the North Central Texas, the Prairie Savanna, and the Central Texas archeological regions. The boundaries between these three regions remain relatively imprecise and tend to shift as new information is added to the cumulative body of archeological knowledge for each region. In general, they represent geographic transitional zones whose archeology reflects influences from adjacent archeological regions at different points in time (Fields et al. 2002; Kenmotsu and Perttula 1993; Perttula 2004). Late Prehistoric sites often show marked inter- and intra-regional differences in settlement patterns, chronology, and artifact assemblages. Ceramic assemblages, in particular, suggest a generalized fluidity of boundaries among the indigenous groups occupying and interacting in these three regions.

North Central Texas Ceramics

North Central Texas is an environmentally diverse ecoregion with respect to its geology, physiography, vegetation, climate, soils, wildlife, and hydrology (Bureau of Economic Geology 1996a, 1996b; Raisz 1957). Its western margins are bounded by the Rolling Plains. Moving eastward, the region encompasses the resource-rich river valleys of the Oak Woods and Prairies and the grasslands of the Blackland Prairie. These resource-rich habitats would have provided a variety of plants and animals for the early inhabitants of north central Texas.

Culturally, much of the region falls within what may be the southernmost extension of the Plains Village adaptation and represents a frontier margin of interaction with many neighboring cultural groups. Its archeological boundaries are rather arbitrary often being defined more by what it is not than by what it is. Geographically, the North Central Texas archeological region is bounded by the Red River on the north and extends roughly from the eastern edge of the Blackland Prairie on the east to the edge of the Rolling Plains on the west. Its southern margins are generally seem as encompassing the drainage basins of the upper Trinity River, the middle and upper Brazos River, the middle and upper Red River basin, and possibly the upper Colorado River basin (Lynott 1981; Maynard Cliff, personal communication, 2010).

Native ceramics in North Central Texas reflect influences from several directions at different points in time. Shell-tempered technology may have been present in the region by as early as A.D. 200. Somewhere between A.D. 700 and A.D. 900, sandy paste pottery appears in the archeological record. Around A.D. 1000, a more widespread grog, sand, and bone-tempered pottery tradition appears in the archeological record. Sometime around A.D. 1300, a distinctive Southern

plains-related shell-tempered ware appears (Lebo and Cliff 2010). Whether any of these wares were actually manufactured in North Central Texas during the Late Prehistoric is an intriguing research question that has yet to be fully addressed. This is because the ceramic assemblages found throughout the region often exhibit a range of technological attributes similar to ceramic traditions found to the north along the Red River (i.e., Nocona Plain), to the east (i.e., various Caddo types), and the west/northwest (Mogollon and Panhandle types).

One of the earliest described ceramic types in the region is Nocona Plain, a shell-tempered, plain to minimally decorated, ware recovered at the Harrell site (Hughes 1942). Krieger's (1946) reanalysis of the roughly 600 pottery sherds in the assemblage (none could be refitted into whole vessels) indicated that the site could be divided into two stratigraphic units, with the pottery occurring only in the upper level in association with Scallorn points. Krieger considered Nocona Plain pottery to be one of the primary "traits" or characteristics of the Henrietta Focus, noting the similarities between the Harrell site sherds and whole ceramic vessels found in graves in East Central Oklahoma and Northeast Texas. Thus, Krieger (1946) believed the Harrell site to be the "type site" of the Henrietta Focus and viewed it as the southernmost expression of the Plains Village tradition. Most Plains Village sites date to between A.D. 1000 and A.D. 1300 or later, in the latter part of what is generally considered to be the Late Prehistoric, with most of the cultural debris at the site accumulating after A.D. 1200.

A recent reexamination by Brack (1999) of the Harrell site assemblage found that at least 25-30 separate vessels are represented in the ceramic assemblage. He concluded that most of the vessels were round-bottomed jars with restricted necks averaging 15 cm in diameter, most with flared out rims with small openings. At least four bowls were also represented in the collection. The vast majority of the site's sherds (98 percent) are shell-tempered plain wares; however, a few sherds had simple decorations, primarily rows of appliquéd nodes. Other decorative techniques on the vessel body were vertical fingernail marks, incised diagonal lines, and stamped impressions. From Brack's comparative study of shell-tempered pottery from North Texas and Oklahoma, he believed that the pottery at the Harrell site was the most technologically varied of any assemblage, and this confirmed Krieger's earlier conclusion that the pottery found at the Harrell site closely resembled pottery found at sites along the Red River, and the Washita/Canadian River drainages in southern and western Oklahoma (Drass 1997; see also listed website links). The variety of pottery and relatively large number of vessels suggests to some that much of the pottery found at Harrell was locally made.

Interestingly, the assemblage found at the Harrell site displayed a rather heterogeneous mix of culturally distinct artifacts, including both Southwest and Caddo pottery types. Half a dozen different types of projectile points were also recovered in association with each other, along with marine shells from the Pacific and the Gulf of Mexico, sandstone pipes, and obsidian from the Rocky Mountains. The presence of exotic goods and an admixture of ceramic types suggest contacts with and/or occupation of the site by a variety of cultural groups.

The geographic location of the Harrell site places it in an area of different ecoregions (cf. Griffith et al. 2004) and cultural zones. Situated on the eastern flank of the Rolling Plains in the Western Cross Timbers ecoregion of southern Young County, approximately 15 km west of the Cross Timbers and 15 km east of the Broken Red Plains at the confluence of the Salt and Clear Forks of the Brazos River, the site would have been a favorable spot on the landscape. If one assumes that different artifact styles (i.e. projectile points and pottery types) and exotic goods (i.e. marine shell) reflect culturally (linguistically, economically, politically, and socially) distinct peoples, then the assemblages recovered at the Harrell site suggests that different cultural groups occupied and/or interacted at this location.

This assumption is supported by other archeological work in the area. For example, during a survey of the South Bend Reservoir, eight sites in Young County yielded ceramics dated between A.D. 1200-1500. Two identifiable pottery types were recovered, Nocona Plain and Sanders Plain, as defined by Krieger (1946) and Suhm and Jelks (1962). The co-occurrence of both pottery types at several different sites point to occupations by groups with contacts, affiliations, and incursions to the north and northeast, as well as east (Saunders et al. 1992).

In summary, much is still unknown about the ceramic sequence in this region. Furthermore, it may not be appropriate to assume that the varied ceramic assemblage found at the Harrell site is necessarily a good example of a specific North Central Texas ceramic ware (i.e., Nocona Plain). The site location, artifacts, and features suggest that it existed in a culturally permeable frontier area. Thus, a more detailed technological analysis of the "varied" Nocona Plain ceramic assemblage from the Harrell site is needed in order to assess its similarity to or affiliation with pottery associated with adjacent areas (i.e., south central Oklahoma, Northeast Texas, and central Texas).

Upper Trinity River Basin

Despite the number of pottery bearing sites that have been excavated in the upper Trinity River basin, there is little substantive data regarding ceramic development and production in the region. Prikryl's (1990) synthesis of the prehistory of the Elm Fork as well as investigations carried out at Joe Pool Lake on the Mountain Creek drainage (Peter and McGregor 1988) are perhaps the most detailed with respect to the occurrence and use of ceramics. While making valuable contributions to refining the cultural chronology for North Central Texas, they have also exposed the limitations and discrepancies found in earlier ceramic analyses of many regional assemblages.

A number of small assemblages yielding shell-tempered plain wares have been recorded in the upper Trinity River basin, in and around the Dallas–Forth Worth Metroplex. Historically, the shell-tempered pottery that is recovered from sites in the Trinity River basin have been classified as Nocona Plain (Story 1990:359); however, Prikryl's (1990) reexamination of the ceramics from the Ledbetter site (41DN5) has brought typological identifications into question. The Ledbetter site has one of the largest ceramic assemblages found in the Elm Fork drainage, and Prikryl (1990)found that many of the Ledbetter sherds had been

tempered with bone, crushed limestone, or fossil shell rather than the mussel shell typical of Nocona Plain.

In general, the so-called Nocona Plain sherds from the Trinity River sites are often thicker and more crudely formed than the sherds upon which the original definition of Nocona Plain type was based (Krieger 1946:109-111; TARL collections). Based on these findings, and the lack of systematic analysis conducted on material collected in the 1950s, Story (1990:359) also suggests that a thorough reanalysis of sites in the upper Trinity Basin is long overdue.

Efforts to identify locally produced ceramics have also been undertaken by Kvernes (1998) through comparative analysis of ceramics from three North Central Texas sites. The ceramic assemblage at the Fountain site (41TR136) on Village Creek (Hanson and Kvernes 1997; Kvernes 1998), while the Mountain Creek sites, Cobb-Pool and Baggett Branch, are discussed by Peter and McGregor 1988). The analysis of these three sites was based primarily on petrographic analysis of a large number of sherds, excluding rims. The analysis of 27 sherds from the Fountain site, 157 sherds from the Baggett Branch, and 624 sherds from Cobb-Pool provided some interesting results (Kvernes 1998:54):

- There was a definite variation in thickness: average thickness of Fountain site sherds was 7.5 mm, and the thickness of the sherds from the Mountain Creek sites (Baggett Branch and Cobb-Pool) were 8.25 mm and 6 mm, respectively.
- Percentage of shell temper at the Fountain site was 5 percent and 18 percent at the Cobb-Pool site.
- Vessel groups at Fountain and Baggett Branch sites numbered less than 15 vessels each, but more than 44 vessels were found at the Cobb-Pool site.

Kvernes (1998:54) noted that "it is common to assign Late Prehistoric sites in the North Central Texas region a Caddo affiliation, especially those with ceramics." Kvernes also notes that Raab (1982:88), Skinner and Connors (1979:52), and Lynott (1981) made most of their Caddo identifications in the Upper Trinity region on the basis of putative decorative similarities (i.e., engraved, punctuated, and incised wares). However, Kvernes notes marked differences in assemblage size, vessel form, temper type, and decorative elements between sites in North Central Texas and Caddo sites to the east. The strongest evidence for non-Caddo ceramics in the Upper Trinity is the presence of mussel shell-tempered ceramic wares that predate A.D. 1400.

In short, Kvernes (1998) presents consistent and rather fundamental chronological and artifactual evidence that suggest that the local population may have developed a distinct Upper Trinity ceramic tradition of mussel shell-tempered plain ware. Kvernes also presents evidence from a petrographic study by Ferring and Perttula (1987) indicating that Sanders Plain red-slipped ware was not just of Caddo origin, but was made by both Caddo and Southern Plains groups, further substantiating Kvernes case for the non-Caddo ceramic origins of

Upper Trinity River basin ceramics. Some of the sherds analyzed actually came from a site (41DN344) within 50 km of the Upper Trinity sites.

In general, the Upper Trinity area needs new attention to detail with regards to the ceramics. Did the Fourche Maline Woodland pottery tradition spread into this area prior to the Early Caddo period? Were there two different shell-tempered pottery traditions in North Central Texas? If so, what are their temporal and spatial relationships? Research questions abound.

Abilene Area Ceramics

Although some of the earliest archeological work in the state was done in the Abilene area (Ray 1929, 1931, 1935), the results of those investigations have never been fully reported. Cyrus Ray (1935:75) recorded numerous Late Prehistoric sites in the Abilene area; however, many were surface scatters he observed in plowed fields. Unfortunately, documentation for many site locations has been misplaced and little or no analysis has been conducted on ceramics in the region since the 1930s. Nevertheless, published data from four of these sites provide a general idea of the range of Late Prehistoric artifacts found in the Abilene area (Ray 1935). Most of the pottery-bearing sites described by Ray (1935) contained all or most of the Toyah lithic assemblage and the ceramics included a wide variety of wares containing various tempers (mussel shell, grog, bone, and limestone), as well as Rio Grande glaze ware from New Mexico (confirmed by H.P. Mera [see also Griffin 1935]). Ray (1935:71-73) went on to say that "the type of arrow head which occurs most frequently" in pottery sites was the Perdiz point, but he also documented at least three other arrow point types including Fresno, Washita, and Harrell points that occurred in almost equal numbers with Perdiz points and ceramics at sites in the Abilene area.

North Central Texas Summary

Much of our knowledge of Native ceramics in North Central Texas is still not well-defined because much of what we know about assemblages in the region comes from early archeological investigations done in the 1930s, 1940s, and 1950s (Hughes 1942; Ray 1935; Sayles 1935; Wheat 1940), and many of the individual site investigations were too limited in scope to fully document the sequence of occupations. Compounding this, investigations up until the 1980s used imprecise chronological frameworks (Story 1990:358) that have since been superceded. Few of these early collections have been reexamined and few comprehensive syntheses have been done that incorporate data from later investigations.

The diversity in the ceramic assemblages recorded throughout North Central Texas demonstrates the variety of cultural influences in this region during the Late Prehistoric and Protohistoric periods. Limited comparative data is available to support a clear temporal framework or to distinguish the variety of ceramic wares that are present. Research problems identified in the Texas

Historical Commission planning document are still applicable today (Kenmotsu and Perttula 1993:118-120), as little progress has been made on these topics. Suggested future research should focus on fine tuning the chronology through excavation of sites with securely dated contexts, as well as more detailed analysis of the range of ceramic technological attributes, including variations in paste attributes through petrographic analyses. Instrumental Neutron Activation Analysis (INAA) studies should also be conducted in order to more fully document the spatial distribution of ceramic wares. Other lines of research would focus on assessments of how ceramics are a reflection of subsistence practices and are indicators of population mobility.

Prairie Savanna Ceramics

This region also represents a geographic transition zone whose archeology reflects influences from adjacent archeological regions at different points in time (Fields et al. 2002; Kenmotsu and Perttula 1993; Perttula 2004). Ceramics along the eastern margins of the Prairie Savanna have a strong affinity with the ceramics made by the Caddo cultures of East Texas (Fields 2004; Shafer 2006). A recent study by Shafer (2006) has defined a distinct Central Texas prairie assemblage that resembles material assemblages found at the George C. Davis site, in Cherokee County, in East Texas. Based on technological similarities, Shafer hypothesizes that these Late Prehistoric people of the prairie, which he refers to as the "Prairie Caddo," were culturally distinct from other populations occupying portions of the Central Texas Prairie during the Late Prehistoric. Thus, it appears that an indigenous ceramic tradition with ties to the east/southeast may have existed in the region by about A.D. 1200–1300 (Rogers 1995; Shafer 2006).

Ceramic assemblages found along the east/southeastern boundaries of the Prairie Savanna often exhibit regionally distinct technological traditions that are closely related to the "Mossy Grove Culture/Traditions" (Story 1990). In general, the Mossy Grove tradition defines the broad context of late prehistoric cultures in the area, wherein sites represent both a general cultural pattern and a regional cultural tradition that partly parallels the Caddo tradition/culture to the northeast and encompasses the archeological remains of what were probably different ethnic and linguistic groups (Moore 1995; Perttula 1993; Story 1990). Assemblages often exhibit commingled occupations with ties to both the Southeast Texas Mossy Grove cultures and the Caddo cultures (Moore and Moore 1996; Rogers 1993, 1994, 1995).

Along the southern margins of the Prairie Savanna, ceramic assemblages exhibit strong coastal influences (Hall 1981; Kalter et al. 2005; Rogers 1995, 1997; Skelton 1977). In particular, sandy paste ceramics with bone inclusions have had an enigmatic, low frequency representation in Southeast Texas since their first appearance in the archeological record ca. A.D. 1000 (Aten 1983). Characterized by the addition of "5-25 percent bone fragments" in a sandy paste, they are otherwise undistinguishable from the sandy pastes of Goose Creek wares

and vary technologically from the later bone-tempered wares described as Leon Plain.

In summary, archeological evidence from numerous sites in the Prairie Savanna archaeological region indicate an area of shifting cultural boundaries. Ceramic assemblages are technologically diverse and understanding this diversity will require a more comprehensive approach to ceramic studies than has been accomplished to date.

Central Texas Archeological Region

Pottery is a late occurrence in the Central Texas Archeological Region, with sandy paste and Caddo wares being the earliest documented pottery in this region. Sometime around A.D. 1200, sandy paste ceramics appear in Central Texas and have occasionally been found alongside Scallorn points at sites such as Panther Springs (41BX228) on the southern edge of the Edwards Plateau (Black and McGraw 1985) and the Wheatly site (41BC114) on the Pedernales River (Greer 1976). Sandy paste and Caddo ceramics have also been recovered on the western Edwards Plateau. For example, both sandy paste wares and ceramics that are technologically similar to Caddo wares (i.e., bone-and-grog-tempered brushed surfaces) were recovered at a site in Mason County with occupations dating from A.D. 1350-1700 (Black et al. 1997). Both sandy paste ceramics and Caddo ceramics have also been recovered along the eastern margins of Central Texas (Roger 1995).

Around A.D. 1300-1350, the distinctive Toyah culture appears in Central Texas and rapidly spreads east/southeast onto the Blackland Prairie and the inland coastal plain. This Toyah interval brought with it a distinctive artifact assemblage (Johnson 1994; Prewitt 1985; Ricklis and Collins 1994). In most of Central Texas, the ceramic types Leon Plain and, less often, Doss Redware occur in association with Toyah phase materials (Johnson 1994; Prewitt 1985; Ricklis and Collins 1994); however, the presence of pottery in Toyah assemblages does not necessarily denote a distinct socio-ethnic grouping (Ricklis and Collins 1994; Shafer 2006). Rather, different socio-cultural groups adopted the Toyah lithic complex in conjunction with bison hunting, while maintaining their own stylistically distinct ceramic traditions. This adaptive strategy is most pronounced at the margins of the Toyah cultural area, where pottery was stylistically influenced by pottery traditions already in place in the adjacent areas of East Texas (Shafer 2006) and the Texas coast (Hall 1981; Rogers 1995). Thus, it appears that parsing out the temporal and spatial nuances of culturally distinct ceramic assemblages will require more-targeted research that includes the study of a broader range of technological data and associated special analyses such as petrography and INAA.

The two ceramic types commonly associated with the Toyah phase are Leon Plain and Doss Red ware:

> Leon Plain- bone-tempered, coiled plain ware, buff to an almost pinkish-orange or salmon in color. May display a burnished/ slipped/polished surface. This ware may also be vertically brushed

(i.e., Bullard Brushed), and may be weathered, appearing pitted, or possess a slightly uneven surface similar to an orange peel but with small areas still exhibiting some burnish/slip/polish. Abundance of bone temper as well as the size of the temper in paste varies considerably from slight to dense. Thickness of individual sherds generally falls between 4-8 mm, with most sherds somewhere near the middle of this range. Leon Plain ceramics are considered a diagnostic of the Toyah interval sites; however, vessels are seldom found intact. Identified vessel forms include jars, bowls, and ollas —with bowls appearing to be the most common form (particularly on the Edwards Plateau). Variation in terms of the quality (uniformity, burnish/slip/polish, thickness, etc.) is tremendous. Some sherds are on par with many Puebloan, Caddo, or even Maya, Inka, and/or Chimu wares, while other Leon Plain sherds may best be described as utility ware. This observation raises the question of whether there may have been prestige/ritual wares (perhaps something on the order of fine china in a contemporary household today) as opposed to more serviceable daily ware (Arnn 2005). Distribution is broad (from the Blackland Prairie east of the Balcones Escarpment into eastern New Mexico and from Floyd County south into Coahuila, Mexico, and Jim Wells County) and still not clearly defined (Boyd 2010). This distributional range is so broad that it is unlikely that only a single culture group was subsumed within the distributional range of Leon Plain. This suggests some sort of widespread interaction sphere (see Arnn 2007) and also raises the question of why and precisely how ceramics were adopted by broad spectrum foragers. This question warrants further investigation along social interaction lines.

Doss Red ware is virtually identical to Leon Plain in except in coloration and surface finish which is almost always burnished/slipped/polished. It has recently been suggested (Doug Boyd, personal communication, 2010) that much of what we recognize as Leon Plain may have begun as Doss Red ware and simply weathered to a buff or pale orange color. Doss Red ware occurs less frequently than Leon Plain and if the latter hypothesis proves to be the case, then the "scarcity" of Doss Red ware relative to Leon Plain ware may be simply due to poor preservation characteristics (a problem endemic to much of Central Texas). This question seems best answered by pursuing technological lines of investigation rather than social.

Based on cursory and unaided visual observations the Fall Creek collection may contain several distinct wares differentiated primarily on the basis of tempering agents (some appear to have mussel shell and others have micaceous/quartzite/granitic particles). Considering the location of this site the mineral constituents are no surprise, but do suggest a limited spatial distribution

that may correspond to a specific socio-cultural group. The origin of the mussel shell-tempered sherds is unclear but the site is located on a major river between the Edwards Plateau Woodland and Llano Uplift ecoregions and within 16 km of the Limestone Cut Plain and Balcones Canyonlands ecoregions and within 40 km of the Western Cross Timbers ecoregion. Therefore, this site's central location is conducive as a gathering place for several distinct socio-cultural groups. This collection warrants re-examination and analysis (i.e., petrography and INAA, minimally) along both technological and social interaction lines of investigation.

Caddo-like ware has been found on the Lampasas Cutplain and adjacent areas (Type site 41BQ285). Thin sections, petrographic analysis, and INAA were conducted on five sherds.

Petrographic analysis identified two paste groups (Paste Group 1 and Paste Group 2). Sherd #51, representing Paste Group 1, was interpreted as being a Caddo ceramic made in East Texas, whereas Paste Group 2 was interpreted as locally manufactured from "perhaps onsite, sources" that were "likely immature alluvial deposits" (Perttula et al. 2010:86).

Paste Group 1 (#51)

Sherd #51 constitutes Paste Group 1 and appears to be a grog-tempered sherd from an engraved carinated bowl with a panel of diagonal engraved lines along a rim. This type of sherd decoration is consistent with "several defined Caddo pottery types" from the Early and Middle Caddo periods and, along with the Perdiz points and calibrated radiocarbon dates associated with it, are consistent with a Middle Caddo period date for this sherd (Perttula et al. 2010:80).

Paste Group 2 (#52, #53-1, #53-2, #53-3)

Paste Group 2 consists of the remaining four sherds. The paste of these sherds is porous and reddish-brown with abundant quartz particles (likely as temper) and minor amounts of feldspar with minor amounts of other minerals, suggesting different clay sources (Perttula et al. 2010:86). Three of these sherds are also contain either pieces of fired clay or grog and one piece (#53-?) also has sparse bone temper. Two sherds (#52 and #53-1) have burnished exteriors and two sherds (#53-2 and #53-3) have single fingernail punctations.

INAA

The samples from 41BQ285 were projected against the entire MURR ceramic database (over 55,000 samples). Interestingly the only single match was #51 (grog-tempered engraved carinated sherd) and it matched with a sherd sample (UT015) recovered from Bosque County submitted by Darrell Creel. Sample UT015 was assigned to the Central Texas (CT) 2 Compositional Group which is "very closely related" to the Titus Group (now defunct as a defined group, see Perttula and Ferguson 2010) identified from Caddo samples from eastern Texas. Comparison of all 41BQ285 sherds with each of the 11 East Texas sub-regional groups in the East Texas Caddo database produced only one "reasonable match" and that between sherd #51 and the sub-region 3 core group in the lower Sulphur

River basin of northeastern Texas. However, even this was a "very tenuous assignment," and in general the 41BQ285 sherds possess rare earth element concentrations too low for assignment in any of the Caddo sub-regional groups (Ferguson and Glasscock 2010:95). Nevertheless, the link to the Central Texas Group 2 is "much more secure," although CT-2 is recognized as "probably too inclusive" and that a large scale reanalysis of the entire INAA database on a sub-regional scale may benefit future Central Texas projects (Ferguson and Glasscock 2010:96). Furthermore, inclusions of igneous rock in most of these sherds strongly supports the conclusion that the source of clay for these sherds is Central Texas since igneous rock *does* occur in Central Texas and igneous rock does *not* occur in East Texas (Perttula et al. 2010:101).

In summary, both INAA and petrographic analysis indicate that the 41BQ285 ceramics were produced in Central Texas. This begs the question: precisely who produced these Caddo-like ceramics in Central Texas?

Summary

Texas ceramics are often classified and conceptualized in very broad terms: Toyah, Caddo, Plains Villager, Pueblo or Southwest ceramics. Although there are many subcategories among these admittedly broad terms, few of them speak to any indigenous or local ceramic tradition in terms of either development or cultural affiliation. In short, Texas' status as a cultural sink or sump, in which everything of any real significance was either developed outside of or brought into Texas from elsewhere has, in general, remained consistent (w/the possible exception of Caddo ceramics). Nevertheless, in the middle of the region there was a rather abrupt emergence of a ceramic tradition among, of all peoples, hunting and gathering groups. The reasons for precisely how, when, why, and where this occurred have not even begun to be addressed.

In addition, while many archeologists tend to subsume many Central Texas ceramics under Leon Plain (Toyah) and many North Central Texas ceramics under Nocona Plain, clearly the numbers and character of other artifact classes (particularly arrow point types) and features as well as different ceramic wares presented above suggests some cultural as well as material variation in Central, Prairie Savanna, and North Central Texas. Many of these ceramic examples are in old collections that have probably not seen the light of day since Suhm and Jelks (1962) classified them in their early tome on Texas ceramic types. Ceramic analysis has made some significant advances in 50 years. The latter statement is not a criticism, but rather points to the necessity for updating ceramic studies in the state.

It is clear that many questions concerning Texas prehistoric ceramics still exist and that some are best dressed from a technological perspective. For example, the issue of whether Leon Plain and Doss Red ware are simply two sides of the same coin is an important and interesting challenge that may shed some light on ceramics over a very large portion of Texas. Similarly, some of the best examples of ceramic diversity are sitting in curation facilities awaiting re-analysis using more current techniques, suggesting enormous potential in terms of

academic research (i.e., students writing Master's thesis or Doctoral dissertations utilizing these collections). Research by subsequent generations of archeologists was the original intent for establishing these collections in the first place.

In summary, we have not exhausted the research potential for documenting ceramic variation in Texas. Simply documenting the extant variation is viewed here as an initial step in comprehending the ceramic universe in these three regions and understanding the role of ceramics in prehistory. It also seems clear that this cannot be achieved by implementing a single theoretical or methodological school of thought. Instead, we need a "combined arms" approach utilizing both technological and socio-cultural avenues of investigation as well as a willingness to suspend our belief in some of the more normative aspects of previous assignations and interpretations. On a purely personal note the senior author of this section believes that this is perhaps one of the most exciting times to be involved in Texas archeology and hopes that we can maintain the forward momentum in order to motivate archeologists to accept and eventually implement the ceramic standards proposed in Ellis and Perttula (2010).

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Links

Overview of the Southern Plains Village complexes of Oklahoma created by Dr. Richard Drass at the University of Oklahoma. Follow the links for information on the Odessa-Yates site, an important Plains Village site in northern Oklahoma.
[http://faculty-staff.ou.edu/D/Richard.R.Drass-1/]

Website of the Oklahoma Archeological Survey. A good source of information on Plains sites research and annual Plains Archeological Conference.
[http://www.ou.edu/cas/archsur/]

Panhandle/Plains Woodland Ceramic Traditions

Chris Lintz

Ceramic studies are not well developed in the Texas Panhandle. Most of the research issues tend to still focus on the identification of the specific cultural affiliations of recovered ceramics from sites.

In a general sense, the Early Ceramic period (ca. A.D. 200 to 1000) has two main residential cultures. The proverbial Plains Woodland (Lake Creek focus) with "thick" pointed bottom cordmarked pottery with affiliations to the east, north and northwest is located in the Canadian River and points to the north. The Palo Duro Complex with plain brown pottery presumably with Mogollon Southwest affiliations through the Jornada region extends from the Canadian River south-- especially along the rolling Plains; some connections with the Pecos River brownwares have not been adequately investigated. Decorations and vessel forms are poorly identified. It is possible that scoria temper is present in the Red Deer Creek valley during this period, but this distinctive ceramic type is note well defined or dated. Some of the pit structures at the poorly published Green Belt Reservoir Texas Archeological Society Field School might also fall into this or the next time period.

The Middle Ceramic Period (A.D. 1100 to 1500) has an abundance of cultural groups that are still being identified and characterized. In extreme southwestern panhandle is the plain brown Mogollon sequences characterized by the villages around Andrews Lake (Mike Collins' master's thesis ca., 1968). The Antelope Creek phase around Lake Meredith is characterized by globular cordmarked pottery with almost no other decorations, except rare diagonal lip incisions. Decorations are present in less than 2% of the sherds. Suhm, Krieger and Jelks mention temper as sand and some bone; but I've rarely if ever see bone, and I see a whole bunch of grog inclusions masked by bone grease to resemble chunks in the same colored paste.

In the North Canadian River of the central Oklahoma Panhandle are a dozen stone slab house sites with cordmarked pottery with grit grog pottery and perhaps 5-10 percent decorated pottery-- some nodes, some lip tabs, mostly diagonal lip incisions. The relationship to Antelope Creek is presumed but undemonstrated.

The Odessa Complex (with shallow to deep oval pit houses ca. 2 m in diameter) and Buried City Complex (with stone slab houses 8m on a side) have cordmarked vessels of similar forms, but pottery is often smoothed over cordmarked to the point of resembling plain wares-- decorations include chevron and comb (parallel lines) incisions over cord-markings on upper bodies, collared-like rims, diagonal and diamonded rim incisions. rarer forms (mostly from Kansas, but also found in Texas) include bulls eye

incisions on upper bodies; decorations range from 5 percent to perhaps 15 percent. Some sherds may have lip tabs and nodes on the rim. Scott Brosowske includes Buried City into his Odessa Complex and also includes cultures found southwestern Kansas and the eastern Oklahoma panhandle. Buried city also reports the use of corn-cob impressed vesels that also look a little like cordmarked vessels.

Some pottery from the Indian Springs site on John Erickson's ranch have moderately high degrees of decoration but there is also a moderately high percentage (ca. 10%) of brush pottery that could date as early as AD 900. If people expect to see cordmarked wares (which are also present), a cursory inspection will not register that the brushing has no fiber twist to the "cord." Temper is highly variable and includes mostly grit, grog, grit-grog.

In far western Oklahoma and extending into Wolf Creek are plain and cordmarked pottery called Quartermaster wares that is distinguished by the use of burned fossil temper. There are also a few houses in western Oklahoma in the Zimms Complex that have the central channel like Antelope Creek, but use picket post walls, like at the Hank's site. The pottery of Zimms needs more attention, but is probably relevant to the regional perspective.

The Late Ceramic Period (A.D. 1500 to 1750) has the Tierra Blanca and Garza complexes, also related to the Edwards and Little Deer of western Oklahoma. Several detailed ceramic studies have been completed and the pottery tends to be plain wares, and brushed wares that are usually sand tempered. A relatively high percentage includes Southwestern and Caddo trade wares, so some sites may be rendezvous or trade fair locations with many visiting groups that mix indigenous and non-indigenous pottery types.

Many museums and private collections also have distinctive thin black plain pottery with spaced corn kernel divots; these are on site that could be Athabascan wares. Apachean wares from the southern Plains have been defined in an *American Antiquity* article by Baugh and Eddy.

The point of this review is that:

1) few systematic ceramic descriptions occur and regional and cultural parameters are still being worked out;

2) it is sometime difficult to separate cordmarked, brushed, and cob impressed wares, unless you are thinking and looking for it;

3) it is sometimes difficult to separate plain ware from smoothed over cordmarked unless you are thinking and looking for it;

4) incised design motifs are still being compiled but are apparently culturally significant to regional variations.

5) temper is critically important especially for fossil shell temper, true shell and bone temper (very rare and rare), scoria, crushed rock, sand and especially grog temper. Indeed, microscopic examination on fresh breaks or thin sections are needed to spot grog temper in the panhandle-- unlike that of the Caddo area.

6) Given the crudeness of most ceramic studies prior to 1980, interpretations of surface treatment and tempers are probably unreliable, and

7) We need basic descriptions and quantifications for most assemblages to get a handle on the ceramic diversity of the Southern Plains-- in other words, perhaps basic descriptive guidelines for surface treatments, decorations, paste, and temper are sorely needed for most site ceramic descriptions.

Guide to Ceramic Studies in the Trans-Pecos Region, Texas

Harry J. Shafer

The Trans-Pecos (El Paso and La Junta) regions offer many opportunities to address a variety of research issues using ceramics. These regions are, after all, part of the American Southwest where ceramics have been the centerfold of materials analysis for over a century. Because of the excellent contextual information offered across much of the Southwest, identifiable architecture, tree-ring dating, sedentary societies who made lots of pottery to be used in multiple ways, and lots and lots of sherds, archaeologists have advanced ceramic studies to the maximum. Many of the analytical approaches applied to ceramics across the Southwest are applicable to the Trans-Pecos region.

In the El Paso area, for example, archaeologists have defined not only a good ceramic sequence, but also changes in architecture from pithouse to surface rooms, to pueblos, and shifting settlement patterns. Ceramic studies have been used to explore a number of research questions related to the shift from a more mobile settlement pattern to a more sedentary one, trade and exchange with other Southwest groups (especially the Mimbres and later Casas Grandes, Salado, and Cibola), pottery manufacture, among other things. Research issues ceramics have been used to address in the Trans-Pecos region include: chronology, land use, trade, socio-cultural behavior, subsistence patterns, community organization, migration, vessel production and distribution. Sherds are one of the largest material culture classes in the region, and archaeologists have attempted to milk them for all they are worth. In order to achieve these goals, the following procedures have been used.

Major Analysis Goals

- Typology and Classification using published descriptions. Ceramic types and styles are used to place sites temporally, identify local vs. non-local ceramics;
- Ceramic period dating of site assemblages used to assess whether a site was occupied continuously or at different times during the ceramic period.
- Vessel form, function, and distribution are used to characterize site activities and organization. Rim sherds are more informative and are given more thorough analysis.
- Ceramic production determined through vessel composition style and manufacturing needs, specifically INAA and petrographic analysis.

Ceramic Chronology

1. Typology and seriation
2. Ceramic micro style (Mimbres B/W and El Paso Bichrome and Polychrome)
3. Rim sherd index

4. Rim sherd profiles
5. Painted design styles
6. Ceramic cross-dating
7. Context (e.g. architectural style, feature association).

Ceramic attribute analysis

Sherds from surface sites are often small and present a challenge to the analyst. Nevertheless, in addition to typology and classification, sherds may be analyzed for the following attributes:

1. Rim, body, handle
2. Ceramic type
3. Vessel form
4. Rim form
5. Orifice diameter
6. Rim angle/body angle
7. Lip form,
8. Lip thickness
9. Vessel function—based on vessel form, orifice diameter ranges (processing, serving, storage, cooking, ritual)

Vessel Function

The determination of vessel function is based on:

1. Form
2. Decoration/surface treatment
3. Orifice size
4. Vessel size, volume
5. Vessel height
6. Body diameter
7. Wall thickness
8. Rim thickness
9. Body Thickness (15 mm below rim)
10. Context
11. Use-Wear—based on use-wear, residue, etc.

Production

1. Petrographic—temper analysis
2. INAA trace-element analysis

3. Petrographic and INAA combined
4. Spectrographic analysis, or ICPS
5. X-ray fluorescence

Interregional Interaction

1. Identification of intrusive ceramics from Casas Grandes, Mimbres, Salado, and Cibola areas.
2. Frequency of intrusive ceramics
3. Vessel forms of intrusive wares (cooking, serving, etc.)
4. Context of intrusive wares (kiva, ritual, burial, etc.)

Specific issues

1. Chronology. Chronological refinement continues to be a focus of research because of the lack of precise dating methods in the El Paso area (i.e., no tree-ring dates to directly date components).

2 . Mobile versus sedentary lifeway. Vessel form and function. Researchers have found that rims of small jars tend to be thicker than large jars. Changes in vessel form may be related to either subsistence change or to more complex social integration. Vessels with smaller mouths may have been made for storage or for liquids; vessels with larger mouths may have been made for cooking. But, each class may have had multiple uses as well. Whalen showed suggested that changes in composition of El Paso Brown paste and consequent changes in heat conductivity and vessel strength may relate to cooking behaviors or perhaps mobility.

3. Regional interaction and exchange. The two-way interaction between the Mimbres and Dona Ana people, and between Casas Grandes/Mimbres Postclassic/Salado/ Cibola/ Gran Quivira and El Paso phase people are recognized only through ceramics. The intrusive ceramics are not just coming in; El Paso ceramics are going out as well in significant numbers. These interactions have yet to be explained other than through trade or exchange (But why would a guy/gal at Paquime want to trade for an El Paso Polychrome jar when their own pottery is more superb?).

4. Social aggregation, migration, and dispersion. Ceramics are being used to examine these kinds of issues.

Contextualizing Time and Space of Late Prehistoric Texas

John Arnn

"If the goal is to gain a better understanding of the ceramic universe in Texas then we need to implement standards/guidelines that will enable all archeologists working in Texas to address the broadest range of research problems, without making those standards/guidelines so detailed that we limit our ability to pursue new lines of research as they arise. This requires taking into account the multi-dimensional aspects of ceramics (i.e., production, use, and distribution) and the full array of research questions associated with Texas ceramics."

Linda Ellis in an e-mail to CTA Ceramics Group members, 2010

Varying Perspectives of Time and Space

The map pictured in Figure 1 depicts several different archaeological/material cultures, historic Native American groups, and linguistic groups and is based on several different sources (see Arnn 2007). A critique of this map would likely note that it is not particularly precise, includes too many different categories representing differences of kind rather than degree, many overlapping in time and space, and that some of these things are outdated and others have yet to be proven—all true. However, it does capture many of the kinds of things that archaeologists discuss, all in the same breath, when talking amongst themselves about Late Prehistoric Texas, and it fits on an 8.5 x 11 page. Thus, it manages to convey some realistic, if ambiguous, aspects of archaeological discussion as well as the variability of classifications and categories that are or were present and, more importantly, that archaeologists either consciously or unconsciously use to contextualize the Late Prehistory of Texas. Obviously there are some gross over-generalizations, such as lumping various New Mexico societies under "Rio Grande Puebloan Culture Area". However, there are also some subdivisions within areas (e.g., Caddo, Karankawa, Rio Grande Puebloan Culture Area) which are intended to convey greater cultural diversity. Therefore, the ambiguity and imprecision in this map, nevertheless, approximates how archaeologists perceive this era and provides a good reason why we should begin to strive for greater resolution.

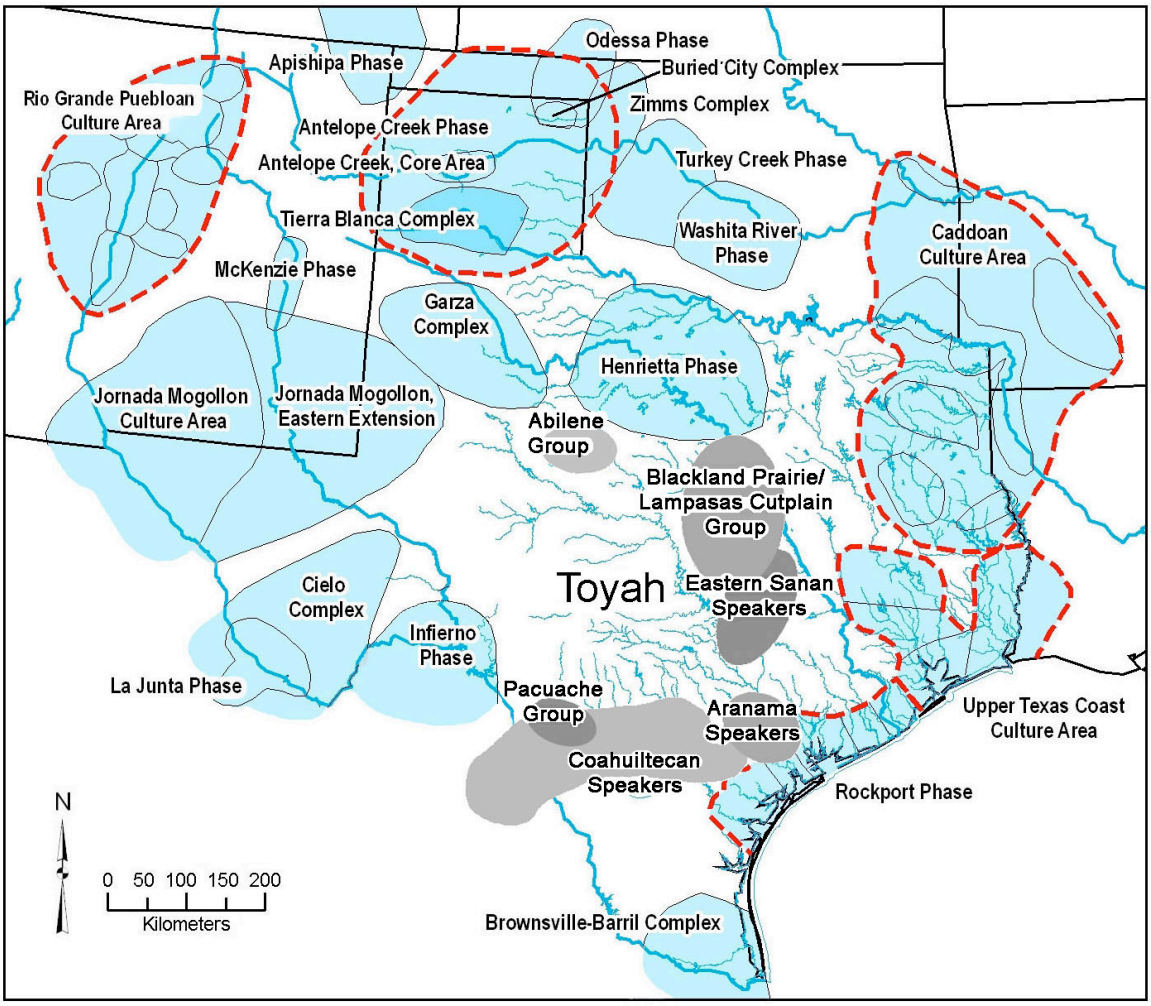

Figure 1. Late Prehistoric Texas and Oklahoma, and parts of New Mexico.

As an alternative we might also consider the map below (Figure 2) which shows the Athapaskan migration. Ostensibly, Texas ceramics also include Apache ceramics.

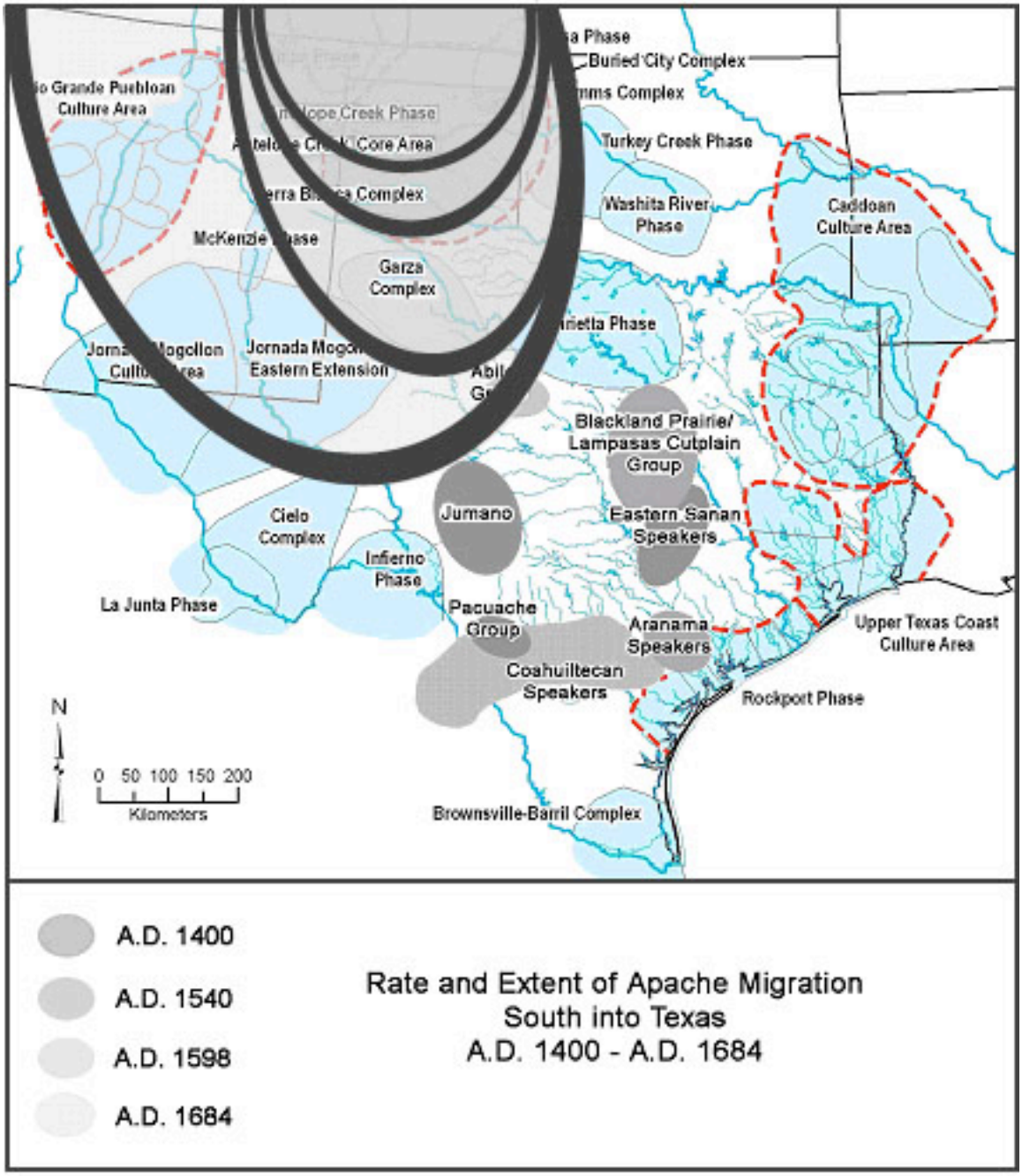

Figure 2. Rate and extent of the Apache Migration south into Texas between A.D. 1400-1684.

Time

In terms of absolute dating techniques there are at least two primary issues that cloud discussions of chronology with respect to ceramics, particularly those focusing on late prehistory, a time in which ceramics became widespread across Texas (e.g. Late Prehistoric II, Middle and Late Caddo, Toyah phase/interval, Henrietta phase, Plains Village (Middle Ceramic) and Late Ceramic, Jornada Mogollon, Infierno phase, Rockport

phase, Brownsville/Barril Complex, and the various temporal divisions of the Upper Texas Coast ceramics, to name a few). The first issue is the ambiguous nature of radiocarbon dates which present a range of more or less likely dates for each individual sample rather than a single specific date. The second issue involves archaeologists' perceptions of their dates and how they choose to use dating results in their work. Relative dating techniques also represent a significant contribution to chronology. However, absolute dating is discussed here because it shares similar resolution and interpretation issues with relative dating despite the implicit (and frequently misplaced) value many archaeologists seem to place on absolute dating.

The problem with resolution is rather straightforward, widely recognized if not explicitly stated, and easily illustrated by looking at the short history of Toyah chronology. Despite early compilations of radiocarbon assays that appeared to support a generally north to south trend in the appearance of Toyah artifacts and assemblages (Prewitt 1985), later assays argued for an almost simultaneous appearance of Toyah material culture throughout the region (Ricklis 1994). Although one may dismiss the discrepancy between these two conclusions as a matter of sampling (more frequent sampling occurred earlier in the north compared to the south), it is important to note that both early and later compilations radiocarbon results were not particularly precise. The precision of both assay compilations often ranged from 100 to 150 years (plus or minus) of a specific date. Therefore, when the combined range of variation (200 and 300 years) is compared to the 400 year Toyah interval these dates span ambiguously large portions of time offering little temporal specificity. Ellis and Ellis (1999) reached a similar conclusion in reviewing dates for the Upper Texas Coast.

The precision of absolute dating techniques continues to improve and the advent of AMS dating and, where applicable, Bayesian statistics has resulted in a slightly narrower range for many dates. However, there is a lot of discussion and very little consensus on what types of things to date, what facility should conduct the dating, as well as how and when various types of statistical methods should be incorporated (e.g., Bayesian). Other types of absolute dating (e.g., thermoluminescence [TL], optically stimulated luminescence [OSL], etc.) have not figured prominently in discussions or applications. Moreover, until a general consensus has been established within the archaeological community as to the techniques and methodologies used there will be little or no standardization making it difficult to conduct comparative studies and refine various extant chronologies in the region (Texas).

Returning for a moment to the early formative discussions of Toyah chronology, another complicating factor is the implicit and, in some cases (Johnson 1994: 239), explicit culling of dates due to a priori assumptions. In this case the assumption that Toyah material culture was an exclusively prehistoric phenomenon. For example, in Johnson's (1994: 237-240) discussion of the Buckhollow site (41KM16), 15 radiocarbon samples of wood charcoal from hearths were presented out of which more than half (n=8) fell within the historic period (post-A.D. 1521), even after the relative area under the probability distribution was applied (Johnson 1994:238-239). However, Johnson pointed to inconsistencies between the results from two different labs that conducted radiocarbon

dating. Despite corrected dates and tree-ring calibration conducted on the 15 samples, Johnson (1994:237) stated "Of course, nonstatistical information can sometimes be used to help cull the intercepts, as when historic-period intercepts can be rejected when the site context is entirely prehistoric."

Although Johnson rejected the significance of historic period dates from the Buckhollow site, he, nevertheless, clearly documented and reported all 15 radiocarbon samples, making it possible to review and discuss these dates more than 15 years later. While it is true that none of these dates were AMS assays and, thus, the precision of all the dates is rather broad, Johnson was reluctant to accept the results from only one of the labs: "Since Toyah culture is known to be prehistoric, the present University of Texas assays are probably less reliable than the Beta Analytic dates because they produced historic, or nearly historic, calibrated ages" (Johnson 1994:239). The latter statement leaves little doubt that Johnson conceptualized Toyah as a prehistoric culture and the absence of historic artifacts at this site contributed to his reluctance to accept historic period intercepts in the dating results.

However, the precision of absolute dating techniques has improved considerably since the Buckhollow site was excavated and AMS dates from several Toyah interval sites in Central Texas post-date Johnson's terminus for Toyah and calls into question his concept of a strictly prehistoric material culture. Three Toyah residential sites (Varga; 41ED28, Flat Rock; 41KM69, Little Paint; and 41KM226) excavated less than 75 miles from the Buckhollow site yielded AMS, OSL, and dates well within the historic period. Quigg (2008:535) reported 54 percent of the Toyah component dates from the Varga site "…are younger than 400 B.P., post-dating the arrival of Europeans in Southern Texas." This indicates that Toyah components at the site "…could easily have extended into the Protohistoric period" (Quigg 2008:293). This conclusion is further substantiated by the recovery of two Guerrero or mission style points and a modified flake made from glass at the Varga site (Quigg 2008:293).

Preliminary findings from the Little Paint and Flat Rock sites in Kimble County, Texas (Steve Carpenter and Steve Tomka, personal communications, 2010), report similar results with 50 percent of the AMS dates (41KM226) and 50 percent of the OSL and TL dates (41KM69) post-dating the arrival of Europeans in South and Central Texas. In addition, excavations conducted by the Southern Texas Archaeological Association in the upper deposits of a Toyah component in a rockshelter in Bandera County (41BN207) yielded samples of charred remains with calibrated dates of AD 1460 to 1660 (Cal 290-490) and A.D. 1480 to 1670 (Cal 280-470 BP), respectively (McKenzie 2009:2).

Therefore, regardless of European artifacts occurring in Toyah sites it now appears that several intact Toyah components date to the Historic Period. The increasing number of historic-period intercepts from sites within the Classic Toyah Area also raises the question: Should Toyah continue to be characterized as strictly "prehistoric"? Clearly some sites were occupied well after European contact. Although the precise impact of Europeans in this region at this time is debatable, there seems little point in dismissing 50 percent of the dates from a Toyah site because we *believe* Toyah to be

prehistoric. Johnson is by no means alone among Texas archaeologists that selectively cull radiocarbon dates. In fact, there are very recent examples (2008-2010) of this occurring in both Cultural Resource Management reports and the *Bulletin of the Texas Archeological Society*. What sets Johnson's (1994) work apart from most is that he clearly states in his discussion of chronology how and why he selected specific dates. In short, Johnson (1994) leaves no room for confusion and there is no question how he reached his conclusions. If archaeologists are going to selectively cull their dates as standard practice, they are encouraged to follow Johnson's example rather than leaving the reader to dig through the appendices in order to observe all the dates and wonder how and why the author used some dates while leaving others out.

Space

Archaeologists have long recognized that material cultures often correspond with specific biotic provinces and ecoregions—in the simplest of terms, spaces. Many spaces also contain their own distinct environmental zones and microenvironments with high density as well as low density resource patches. It is adaptation to these specific areas that warrants terms such as "*specialized* broad spectrum foragers" for groups occupying such spaces. Although we may never know the names or languages of the communities and/or cultural groups that occupied these areas, it may be possible to determine the nature of their subsistence and settlement patterns based on the specialized adaptations to local environments and, by extension, the extent of their territories and areas and the frequency, extent, and intensity of their interaction with other communities and groups in different areas.

Specialization indicates participation by a specific community of individuals in daily practice played out across a landscape composed of various residential as well as specialized sites containing specific types of artifacts, features, and activity areas which reflect adaptation to those specific environmental conditions. These practices and the resulting archaeology identify the people of a community/band with a specific and local range or territory. This approach to hunter-gatherer behavior also reinforces the now generally accepted view that different site types represent the constituent parts of a community composed of nuclear families (Binford 1980; Kelly 1995; Willey and Phillips 1958). Moreover, if the daily practice seen in the residential bases provides the baseline data necessary for community identity construction, then participation in a wider social aggregate in a broader but, nonetheless, specific environmental setting provides the constituent elements necessary for the construction of cultural identity found within marriage/linguistic groups.

This does not imply forager identity is based solely on environmental conditioning factors. But it *does* acknowledge a fundamental and significant aspect of hunter-gatherer identity—their intimate relationship with a specific landscape. Moreover, this identity is at least implicit, if not explicit, in the material culture found within the territory of a specific community and/or the combined ranges of communities within a hunter-gatherer social aggregate such as a marriage/linguistic or cultural group.

Therefore, when conducting hunter-gatherer studies it seems reasonable to define and use specific terms to describe the space that is under investigation.

However, with notable exceptions (Ellis et al. 1995), Texas archaeologists do not exhibit much rigor in defining these spaces and they certainly do not apply any field-wide standard to the spaces they discuss. In short, spatial terms are applied interchangeably and "willy-nilly" across an area "bigger than France." This is particularly true with respect to the term "region," which can and often is used within a single report to refer to the space immediately (within a few hundred meters) surrounding a site, a space and/or a "culture" (as in "Culture Area" or "Culture Region") covering either several hundred square kilometers or several thousand square kilometers surrounding a site, as well as the entire State of Texas (Arnn 2007).

In addition, soils and geologic "regions," as well as biotic provinces are often invoked in the same context with little or no distinction made between terms (e.g., Edwards Plateau, Central Texas Mineral Region, Central Texas Archeological Region, Hill Country, Classic Toyah Area, Austin phase, etc.). This ambiguity has led to decidedly provincial (rather than "regional") perspective of space in the Texas archaeological literature that is apparent to anyone outside of Texas. In short, those unfamiliar with Texas archaeology cannot readily understand the spaces and boundaries we (the Texas archaeological/archeological community) regularly intuit amongst ourselves. The way space is described in Texas archaeology can sometimes be confusing even to those of us *in* the community. The point here is that if we as an archaeological community are standardizing fundamental elements of our analyses and reporting then surely the way in which we define space is a significant place to start. The question is how should we go about doing this?

Although some may advocate no change and others may advocate adopting only their specific terminology, the primary issue here is avoiding confusion and focusing on specificity rather than reinforcing proprietary knowledge and rugged individualism—to put it mildly. Texas has a lot to offer in terms of archaeology and we can only benefit from greater precision. Therefore, it seems prudent for archaeologists, particularly advocates of the cultural ecology approach, to focus on environmental and cultural variation in the most precise of terms rather than broadly essentializing people, plants, and animals as various and interchangeable areas, regions, soils, provinces, cultures, etc.

In fact, the U.S. Environmental Protection Agency (EPA) completed an assessment and compilation of the type, quality, and quantity of environmental resources in Texas in 2004. The EPA defined 12 large ecoregions (Level III) each containing numerous (over 50) smaller ecoregions (Level IV) "identified through the analysis of the spatial patterns of biotic and abiotic phenomena, including geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology" (Griffith et al. 2004). This study was designed to produce a "spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components" which are "critical for structuring and implementing ecosystem management strategies…"(Griffith et al. 2004).

For example, there is no question that the Toyah region as a whole incorporated numerous ecoregions as defined by the EPA. The "Classic Toyah Area" defined by Johnson (1994) encompasses seven of the 12 Level III ecoregions for the state and includes 16 different Level IV ecoregions (Griffith et al. 2004). When Johnson's (1994) Shared Toyah Area is considered, more than a dozen more ecoregions can be included. This indicates far greater environmental diversity existed within the greater Toyah region than most archaeologists have previously indicated. Even at the Level IV scale these ecoregions are large, suggesting that even smaller subdivisions are distinguishable and that greater diversity once existed in these ecoregions.

If federal, state, and local agencies find such detailed constructs useful for researching, assessing, managing, and monitoring ecosystems then it seems likely that they would also be useful to archaeologists studying forager ecology and social interaction. These data make it difficult to ignore that the entire State of Texas is characterized by significant ecological diversity as well as fluctuations in various ecological resources. Although some will no doubt argue that the ecoregion map (Griffith et al. 2004) does not represent prehistoric ecology, it is certainly more specific than anything else we have used or, in this case, not used. In addition to using this as a basis for defining ecological spatial parameters, we also advocate greater precision with respect to terminology. For example, if the term "region" and/or "area" is used within a report then these should be explicitly defined at the outset and their use consistently applied throughout the report. The latter will likely appeal more to rugged individualists than implementing an entirely new set of spatial terms—no matter how precise. Nevertheless, the point here is that terms should be explicitly defined at the outset and consistently applied as *de rigueur*.

Fundamental Research Issues of Ceramic Chronology and Distribution (Time & Space) in Texas

(1) Time and Space

A. When were ceramics adopted among various peoples in Texas (e.g., East Texas Woodland period cultures, Toyah, etc.)?

B. Why was ceramic adoption not contemporaneous across the area? (e.g., were some areas more conducive [perhaps due to the presence or absence of suitable clay] than others for the development of ceramics?)

C. Context:

1. Was adoption related to technological innovation (e.g., a new form of container technology, or a new form of processing technology)?

2. Was adoption related to socio-political innovation (e.g., related to alliances, powerful elites, social status practices [e.g. *asi* vessels], religious practice, shared by different Woodland or Toyah groups?

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Research Issues Concerning Colonial Period Ceramics in Texas

Steve A. Tomka, with contributions by Timothy K. Perttula and Tom Middlebrook

General Introduction

This document is a brief summary of the current state of knowledge regarding Colonial Period aboriginal ceramics in three regions of the state that have been the focus of mission activities in the State: East, West and South Texas. Timothy K. Perttula and Tom Middlebrook have collaborated on the East Texas summary, Steve Tomka produced the South Texas section, and he also attempted to pull together the information on West Texas Colonial Period ceramics, relying heavily on the work of Myles Miller and other (see refs).

The goal of the document is to briefly summarize selected research questions that should be pursued when studying a Colonial Period assemblages of aboriginally-made ceramics. The intent, as it should be with the overall analytical protocols under development for other regions of the site, is not to stifle research questions and methodological approaches but to define at least a minimum number of research questions that ceramic analysts find, and have found, worthy of investigation. The nature of research is such that on-going investigations should spawn new research issues and questions, and it is not the intent in developing these suggested research issues to limit innovation or the pursuit of novel research.

Chronological Considerations

The chronological position of the Spanish and French Colonial period is often imprecisely defined due potentially to the fact that intermittent exposure of natives to Spanish visitors started during the first half of the 16th century (the 1530s Cabeza de Vaca landing on Padre Island; the 1540s DeSoto-Moscoso entrada in East Texas and Coronado's 1540s entrada on the High Plains). However, the systematic and at least the semi-permanent presence of Spanish and/or French colonizing populations in what was to become the state of Texas did not occur until the late 17th century, and when it did occur, it centered on different regions of the State. The first mission site in the State, Mission San Lorenzo, was founded in 1680 east of El Paso. La Salle's colony on the banks of Garcitas Creek in Victoria County was established soon thereafter, and the first missions in East Texas followed in the early 1690s.

Two possible approaches may be used with respect to Colonial period chronological considerations: (1) consider the Colonial period as beginning with the earliest entries of Spanish and French into Texas (e.g., early 1500s); or (2) consider the period between 1530s and 1680s as a protohistoric period and start the Colonial period in the 1680s. This latter period is the chronological period of concern for the study of Colonial period aboriginal ceramics in Texas. Using the same logic, 1830 should be considered the end of the Colonial period since it represents the year of secularization of

the last mission in Texas, Nuestra Señora del Refugio. These beginning and end dates are proposed simply as temporal markers while it is recognized that, as in the case of any other cultural process, the pace and types of changes that were brought about through colonial influences and interactions with native peoples were not even and uniform across the State and differed in approach between the French and the Spanish.

Clearly, the missions of West Texas had a more rapid and direct influence on the natives living nearby than those of the rest of the state. The native groups of East Texas were adversely impacted by European contact to the same degree only after the establishment of Mission San Francisco de los Tejas and Santísimo Nombre de Maria along the Neches River in 1691. Nonetheless, the establishment of a permanent, or so it was thought, seat of influence upon native groups is seen as having much greater influence on natives than the intermittent visits into the State, and while gifting during these *entradas* introduced some new artifacts into the inventory of native-made goods, the principal impact is seen to begin on the material culture of the local natives once these artifacts come to replace the native assemblages through habitual/daily use.

According to the Crown, the missions were to serve to both concentrate the otherwise nomadic populations of the region into fixed areas and make them readily available for religious conversion and training in skills and lifeways that were utterly foreign and irrelevant to hunter-gathers. While the presidios, with their small complement of soldiers, was to make an impact on the French who had competing interests on the continent, their main role appears to have been to protect the mission's population when under attack from hostile natives and replenish the inhabitants of the missions, often through force if necessary.

Historic Ceramic Traditions of Southern Texas

Two principal types of Native-made ceramics are present in most Colonial Period sites in southern Texas, particularly those of Spanish affiliation. These are the historic period version of the Rockport Ware and the historic period version of Leon Plain, or Goliad Ware.

The Historic version of the Rockport type is a thin-walled ceramic made of sandy paste and while undecorated vessels do exist, most are frequently decorated with curvilinear designs executed in black asphaltum. Five distinct types of Rockport Wares have been defined: Rockport Plain, Rockport Black-on-gray I and II, Rockport Incised, and Rockport Crenelated (compare Suhm and Jelks [1962] and Weinstein and Hutchins [2002]).

The Goliad ware is an undecorated gray ware fired on open-fires rather than in kilns and containing moderate to abundant bone temper. Paste color ranges from various shades of gray, to yellowish-brown, and red, in part conditioned by firing conditions, the type of clay used, and the presence/absence of slips. The ware was defined based on a study of a large sample of sherds obtained in the 1950s from the third location of Mission

Espíritu Santo de Zuñiga on the bank of the San Antonio River in Goliad. The mission at this location was occupied between1749-1830.

Three types are recognized within the ware: Goliad Plain, Goliad Red-on-buff, and Goliad Black-on-buff. The Goliad Red-on-buff is decorated with thin red painted wavy lines and dots found on the outside of the vessels. The Goliad Black-on-buff type is decorated with similar wavy lines but the lines are executed in black asphaltum paint. Bottle necks tend to exhibit vertical wavy lines. The use of asphaltum as a decorative medium may denote some type of affiliation with the Rockport Black-on-gray type. Goliad Plain is the dominant type in most collections from the inland coastal plains and San Antonio missions. Many researchers assume that the Goliad ware is a historic descendent of the prehistoric Leon Plain type (Hester 1989; Ricklis 2000a, 2000b; Walters 1997). Unfortunately, no direct evidence exists linking the manufacturers of Leon Plain wares to the Colonial or Mission period (see below).

Cultural Affiliation of the Ceramic Wares

In part based on the convergence of mission residence and continuity in ceramic manufacture traditions, Ricklis suggests that: (a) the sandy-paste, asphaltum-coated/ decorated ceramics found at Mission Rosario represent the archaeological correlate of the historically documented Karankawan tribes known to have resided at Rosario Mission and (b) that these ceramics represent a technological tradition affiliated with the prehistoric coastal Rockport phase. Through this argument, Ricklis connects the prehistoric wares with the historic wares and links the historically documented Karankawa with prehistoric potters that were responsible for the Rockport phase ceramics (Ricklis 2000b:106).

Similar linkages cannot be made as easily regarding the historic Goliad wares. When the ware was first defined, it was assumed (Mounger 1959; Campbell 1962:335) that members of the Aranama ethnic group, who were the primary occupants of the mission at its second and third locations, were responsible for the ceramics. Ethnohistoric records support this interpretation. For example, in 1783, Fr. Mariano Cardenas, in an appraisal of the state of the Texas missions, noted that the Indian women at Espiritu Santo "…are the ones most dedicated to work and are almost always busy making ollas, bowls and other things of clay, for which they have great skill and with which they trade with the Spaniards of the Presidio of La Bahia" (Ricklis 2000a; author's translation). Accounts as late as the mid-19th century mentioned the fact that Aranama potters continued to furnished the entire town of Goliad with ceramic wares (Mounger 1959:94).

However, the antiquity of pottery making by the Aranama is difficult to determine. Statements in O'Connor (2001:24-25) seem to suggest that the Aranama learned to make pottery from the Spanish. O'Connor states that the women "…were taught to spin and weave.." and they "…became quite proficient in making wool blankets and clay pottery." The Aranama were reported to have occupied an area inland from the Karankawa that stretched between the lower Guadalupe and San Antonio rivers (Newcomb 1961:Map 1), and perhaps as far as east as the lower Colorado River

(Campbell and Campbell 1996:45). Krieger (cited in Mounger 1959:67) and Newcomb 1961:49) maintain that the Aranama are the same as the Mariame visited by Cabeza de Vaca in the early 1530s. Interestingly, Cabeza de Vaca does not mention that the Mariames were pottery makers, suggesting that they may have adopted pottery making sometime after the early 16th century. Furthermore, the abundance of Goliad wares in the San Antonio missions is difficult to explain if the Aranama were the only group manufacturing the ware. The Aranama are recorded to have been present in the Bexar County missions in only small numbers (Mission San José n=2, Solís in 1767 [Mounger 1959:68]); Mission Valero n=8, [Campbell and Campbell 1996]), with most of their members being concentrated at Mission Nuestra Señora del Espiritu Santo de Zuñiga and Mission Nuestra Señora del Refugio (as late as 1817). Given the small number of Aranama residents in the San Antonio missions, one would have to assume that the Spanish used the Aranama residing at Mission Nuestra Señora del Espiritu Santo de Zuñiga to furnish ceramics for all other South Texas and coastal missions under Spanish jurisdiction and were therefore instrumental in supplying these missions with wares made at Espíritu Santo.

Another intriguing aspect of the Aranama connection is that some authors have assumed that the Aranama were of Coahuiltecan stock (Bolton 1914:27), although based on the few Aranama words recorded, linguistic analysis suggest closer ties to the Tonkawa stock (Swanton 1940:144). This later connection seems to be supported by the fact that when the Aranama left Mission Espíritu Santo after its relocation to the San Antonio River in 1749, they joined the Tawakoni and Tonkawa living in villages located in North-central Texas (Mounger 1959:71) Newcomb (1993) has shown, however, that the Tonkawa did not arrive to Texas until early in the 17th century and therefore, even if the Aranama were responsible for the bone-tempered pottery made at Espíritu Santo, they could not have been the manufacturers of the prehistoric Leon Plain antecedents of the ware.

It is also possible that some native groups living in Southern Texas may have manufactured ceramics. After all, some bone-tempered ceramics are found in prehistoric contexts in parts of South Texas (Hester and Hill 1971). Many of these wares are similar to the Leon Plain ceramics that were manufactured between A.D. 1250 and A.D. 1650/1700, and may be part of a ceramic tradition on the southern fringe of the Toyah phase area. Unfortunately, while we do have bone-tempered ceramics appearing in Late Prehistoric sites in the region, historic accounts of native groups, collectively referred to as Coahuiltecans, do not mention the use and/or manufacture of ceramic wares by these groups. For instance, Cabeza de Vaca's accounts of the Native groups inhabiting parts of South Texas do not mention any pottery making groups in the early 1530s in the region (Bishop 1933). Other later entradas, dating from the 1690s and thereafter, also are silent on ceramic manufacture by native groups. Furthermore, archaeological investigations at the gateway missions of San Bernardo and San Juan Bautista indicate that native-made ceramics similar to the Goliad ware are not present there (Eaton 1989:254), suggesting that the south-of-the-border origin of the ware is not likely.

Selected Research Issues

1) Given the uncertainty regarding the native group or groups responsible for the manufacture of Goliad wares, one of the first research issues that should be addressed and resolved is the establishment of the association of a given historic group or groups with the manufacture of this pottery.

2) Associated with this issue is establishing what is the technological and historical relationship between the so-called Goliad Ware and the prehistoric Leon Plain ceramics.

3) While Rockport Ware types are well defined and characterized, the typological utility of Goliad Ware is questionable. Because at the present time, all mission-associated plain wares are lumped into the Goliad Ware category, the analytical category contains a great deal of technological and morphological variety that may be much more meaningful than the overall ware category itself. Therefore, it is suggested that research be focused on defining and documenting the technological and morphological variability present within South Texas Spanish Colonial ceramics and mapping its spatial and perhaps temporal distribution.

4) Do Goliad wares represent a greater variety of morphological/functional forms than Leon Plain? If so, is this in response to the influence of Spanish Colonial wares and the "colono" phenomenon?

5) The presence of plain ware ceramics manufactured by hunter-gatherers under relatively mobile land-use strategies, and the presence of similar plain ware ceramics made within the missions, under presumably more sedentary contexts, provides a great opportunity to investigate the impact of sedentarization on ceramic technology. Do the wares get thicker as suggested by general theory? Is there a difference in the degree of processing of the paste and temper between wares made by mobile versus semi-sedentary hunter-gatherers?

6) From a technological point of view it will be important to understand the role/function of bone tempering of South Texas colonial period ceramics, particularly in the face of other tempering agents that may serve equally well but at lower energetic and processing costs. That is, why temper a clay paste with bone when the production of bone temper is a relatively labor intensive activity and temper such as sand can be more readily acquired and employed? Does the presence of the bone tempering in both the Spanish Colonial and Late Prehistoric periods provide the historical link to demonstrates the historical continuity between the manufacturers, or is there a technological factor underlying the pattern?

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Historic Ceramic Traditions in East Texas

Timothy K. Perttula and Tom Middlebrook

In East Texas, European contact with the Caddo Indian peoples—the principal, if not exclusive, aboriginal group living in this region—began in the 1540s with the DeSoto-Moscoso entrada (Chipman and Joseph 2010; Corbin 1989; Perttula 1992) through the region. The effects of the entrada on the Caddo peoples is still being debated, but one possible consequence of the initial contact between the Caddo in East Texas and the Spanish was the production of chalice-shaped ceramic vessels (Turner 1978:98-100; Perttula 1992:27) in Titus phase (ca. A.D. 1430-1680) communities in a restricted area of the Big Cypress and Sabine River basins. These chalice-shaped vessels are known from less than 10 sites (Fields 2008:3).

More permanent and extensive European-Caddo contact in East Texas came only after the mid-1680s, in the form of the establishment of several missions and presidios (Chipman and Joseph 2010:83-147), by the Spanish amongst the Caddo, the Ais, and Adaes groups, along with ranchos after the 1770s in the Los Adaes and Nacogdoches areas, as well as the development of civilian settlements and administrative centers, as well as centers of trade, principally the town of Nacogdoches. There were also several French and Spanish trading posts operating in East Texas (including the post of San Luis de Cadohadacho on the Red River, operating from ca. 1731-1780s, see Gilmore 1986). In almost every instance, except for the Plaza Principal excavations in Nacogdoches, sherds from Caddo Indian-produced ceramic vessels (and sometimes ceramic pipes) dominate the archeological assemblages at these sites.

Only two of the Spanish missions in East Texas have been located to date, archeologically investigated, and their large ceramic assemblages analyzed: Mission San José de Nasonis (1716-1719, 1721-1730) (Perttula et al. 2009) and Mission Nuestra Señora Dolores de Ais (1716-1719, 1721-1772) (Carlson and Corbin 1999; Corbin 2007; Corbin et al. 1980, 1990). The mission and presidio at Los Adaes—now in western Louisiana but once the capitol of Spanish Texas—has also been located, and excavations conducted there, primarily at the Presidio Nuestra Señora del Pilar de los Adaes (1721-1773) rather than at the associated Mission San Miguel de los Linares de los Adaes (Gregory 1973; Gregory et al. 2004; Gregory and Avery 2007; Girard 2007). It is well to be reminded that the Caddo, or other associated or nearby tribes such as the Ais or Adaes, never settled at any of the missions established in their communities (see Barr 2007; Corbin 1989). Thus, the ceramics found in mission and presidio contexts were made by the Caddo in their local communities and villages, and then provided to the Spanish missionaries, soldiers, and settlers for their use. As such, the ceramic assemblages provide insights into the functional, stylistic, and technological practices and traditions of the Caddo potters in historic times who produced the ceramics, as well as provide insights into the choices and needs of the European consumers for the kinds of ceramics they needed from nearby Caddo settlements.

At Mission Nasoni (41RK200), more than 8580 Caddo ceramic sherds are in the collection. There are also collections from two contemporaneous and nearby non-mission historic Nasoni sites (41RK191 and 41RK197, n=559 sherds) (Perttula et al. 2009:Table 1). The Nasoni Caddo ceramics, both bone and grog-tempered, found at the mission—presumably in areas where they were used and discarded by missionaries and soldiers—include plain wares, utility wares, and engraved and slipped fine ware vessels. Brushed and incised vessel sherds, as well as plain sherds from undecorated vessels and from the lower parts of decorated vessels, dominate the ceramic assemblage at the mission. Fine wares comprise only about 3 percent of the sherds. The most recognizable engraved elements at the mission and the Nasoni Caddo sites include ticked horizontal and curvilinear lines from Patton Engraved vessels, and later forms of Poynor Engraved (*var. Cook* and *var. Blackburn*) also appear to be present in the mission assemblage.

The aboriginal ceramics from the two Nasoni Caddo sites are a good bit different when compared to the assemblage of ceramic vessel sherds from the mission. The Nasoni Caddo sites have overall high proportions of decorated sherds, particularly engraved and brushed sherds, as well as more utility ware vessel sherds, especially brushed-punctated, punctated, and incised rim sherds. Conversely, at the mission, there are more plain wares but less engraved fine wares. The overall percentage of brushed vessel sherds is at least two times lower at the mission compared to the Nasoni Caddo sites. The predominance of bone-tempered Caddo wares at the mission, as well as the dominance of brushed utility wares and Patton and Poynor Engraved fine wares, indicate that the Nasoni Caddo potters living around the mission between 1716-1730 were part of a spatially broad and temporally long-lasting (beginning ca. A.D. 1250) Caddo ceramic tradition that developed in the Neches, Angelina, Attoyac, and middle reaches of the Sabine river basins.

The aboriginal ceramic assemblage from Mission Dolores de los Ais (41SA25) is dominated by Natchitoches Engraved fine wares, along with Emory Punctated-Incised and Ebarb Incised (usually engraved at this site), and an unnamed plain ware (Corbin et al. 1980, 1990; Carlson and Corbin 1999). Brushed pottery is absent in the assemblage. These wares are consistent in terms of the paste and primary tempering agent, which is bone (80%). Patton Engraved, a diagnostic fine ware type for the historic Hasinai Caddo groups to the west (including at Mission Nasoni), is a minor type at Mission Dolores, with either bone or no discernible tempering agent. It is likely that this fine ware is not part of the local ceramic tradition (Corbin 2007:15).

At Presidio de los Adaes (Gregory 1973; Gregory and Avery 2007), the same wares predominate (Natchitoches Engraved, Emory Punctated-Incised, a Constricted Neck Punctated type, Ebarb Incised, and a distinctive plain ware), but the Natchitoches Engraved paste at the presidio is almost always tempered with shell. The other wares at Adaes are typically tempered with shell (60 percent) and/or bone (40 percent). The general view is that the different common wares were manufactured by the local Adaes for Spanish use in the presidio. Patton Engraved also occurs at Los Adaes, but not as a resident ware; Womack Engraved, a widely distributed early- to mid-18th century Caddo

fine ware and not a resident ware at the presidio, occurs in very low numbers that this ware is also believed to be non-resident. Brushed jars are quite rare at los Adaes. Corbin (2007:16) considers the ceramic assemblages at both los Ais and los Adaes as related constituent groups, separated by differences in the paste of the ceramic wares: the Ais made bone-tempered wares and the Adaes predominantly made shell-tempered wares.

One distinctive aspect of the los Adaes ceramics is the appearance of plain wares with features seen otherwise on European-manufactured ceramic vessels. This includes Colono-ware pitchers with handles, brimmed plates, and vessels with foot rings (Gregory and Avery 2007:72-75). Similar Colono-wares have been recovered in post-1779 archeological deposits in Nacogdoches (see below).

Following the closure of the Zacatecan missions in eastern Texas in 1772, approximately 300 Adaeseños returned to the area near Mission Guadalupe in 1779 to establish the pueblo of Nacogdoches. Soon Nacogdoches replaced Natchitoches as the key trading center between Europeans and Texas Indians (Burton and Smith 2008). There are currently eight recorded post-1779 to 1830s archeological sites near El Camino Real de los Tejas in downtown Nacogdoches that have aboriginal low-fired coarse earthenwares: Adolphus Sterne (41NA144), Acosta-Durst-Taylor House (41NA182), Guadalupe del Pilar (41NA223), Thomas J. Rusk Fountain (41NA291), Reese Andrews (41NA302), Pocket Park (41NA303), Morris Jackson (41NA304), and Charlie Mann (41NA320); Reese Andrews, Pocket Park, and Morris Jackson sites are on the west side of the Plaza Principal.

Recent excavations at the three sites on the west side of the Plaza Principal focused on eight pit features apparently in use and then filled during the late Spanish Colonial period through the Republic of Texas period. The sheet midden surrounding all these pits contain very rare Historic Caddo sherds (e.g., Patton Engraved and Natchitoches Engraved). Based on a seriation using the European ceramics found in the pits, the eight Plaza Principal pits can be sorted between those filled prior to the town de-population following the Magee-Gutierrez expedition (1779-1813) and those that date to after Mexican independence (1821-mid-1830s). In general, the earliest pits had the highest frequency of aboriginal ceramic sherds relative to European ceramics. In four pits dating prior to 1813, 46-75 percent of all the ceramic sherds were aboriginal, while aboriginal sherds comprised only 25 percent in an 1820s pit, and 14 percent of the sherds in an 1830s pit.

The majority of the aboriginal ceramics found in these late Spanish Colonial pits are plain undecorated sherds (58-76 percent of the sherds in each pit). Large sections of discarded vessels have been reconstructed from the pits, several of which are undecorated (dubbed locally as Pocket Park Plain); these are consistent in form with hemispherical bowls (or "cazuelas") and deep flaring-rim jars illustrated by Jurney and Perttula (1995) from the Coushatta Carl Matthews (41PK2) and Carolina Bluffs (16BO207) sites. Trade between Spanish merchants and the Coushatta is well known from the late 18th century to the 1820s along the Coushatta-Nacogdoches Trace. The plain hemispherical bowls may

also be compared to Womack Plain as described from the ca. 1750s Gilbert site (Story 1967).

One aboriginal vessel found in Feature 2 at the Morris Jackson site suggests possible contact between Nacogdoches settlers and Choctaw traders. This simple bowl has an inverted rim with a Fatherland Incised-like design (cf. Neitzel 1965; Brain 1979) alternating with sections of parallel engraved lines filled with white kaolin pigment.

A large jar was recovered in Feature 2 at the Reese Andrews site that has a globular body and a constricted, slightly everted rim that is decorated with three rows of punctations on a "swollen" band just below the lip. This vessel is similar to "Constricted Neck Punctated" jars from Los Adaes (Gregory and Avery 2007), the handless jars with the "Tunica Mode" described by Brain 1979), and perhaps to some Emory Punctated vessels (Story 1967). Several of the early pits also had plain wares with European influences (Colono-ware) in form and function (Gregory and Avery 2007), usually in plate form. Interestingly, none of the reconstructed vessels from the Plaza Principal pits suggest any direct connection to local Historic Hasinai Caddo ceramics.

In the civilian settlement of Nacogdoches, in addition to the extensive collection of aboriginal sherds from the recent Plaza Principal excavations led by Tom Middlebrook, a small assemblage of Caddo sherds came from contexts at 41NA223 that suggested they may be associated with the site of the 1804 Guadalupe del Pilar mission church (Perttula 2008a). The 41NA223 sherds are from engraved and/or slipped fine ware vessels (bowls and carinated bowls), wet-paste decorated utility ware vessels (jars and simple bowls), and plain wares (bowls and jars); vessel forms and decorations are consistent with East Texas Hasinai Caddo ceramics, being part of a bone-tempered tradition that has existed since ca. A.D. 1250. The vessels are thin-walled forms tempered primarily with bone, fired principally in a low oxygen or reducing environment, and were either burnished (in the case of the fine wares) or smoothed (in the case of a number of the utility ware sherds) on one or both vessel surfaces. These vessels were probably made from local clays, except for a few shell-tempered vessel sherds among the utility ware and plain ware collections. These shell-tempered vessels may have been obtained from other Caddo groups living in north Louisiana (see Girard 2007; Gregory and Avery 2007).

The Bernardo D'Ortolan ranch and associated land grant, just outside Nacogdoches, was held by a prominent Frenchmen Bernard D'Ortolan, and Spanish colonial military official, from 1796-1813, and then by family associates until the early 1840s (Perttula 2008b). During the course of archeological investigations conducted at the site over the last few years, a small sample of aboriginal Caddo ceramic sherds were found on the *rancho* in contexts indicating that Caddo ceramic vessels were in use during the *rancho* occupation. These vessels had to have been obtained by the D'Ortolan *rancho* through purchase or trade from one of the Caddo groups living in the Angelina River valley after the 1790s. The D'Ortolan site investigations indicate that during the last days of the 18th century and the first quarter of the 19th century, Caddo groups living in the Nacogdoches area made bone-tempered brushed utility ware ceramic vessels as well as vessels (of uncertain decoration) tempered with grog and mussel shell.

Selected Research Issues

(1) Were there functional, stylistic, or technological changes in Caddo ceramic assemblages through time during the colonial period (ca. 1685-1836)? Did the aboriginal groups manufacture vessels of European shape and function (i.e., Colono-ware) that were intended for European use, and if so, under what contact circumstances? How does this ware differ from the plain, fine, and utility wares otherwise produced by the Caddo? Did these aboriginal groups use these Colono-wares, and in what contexts?

(2) Since the Caddo, Ais, and Adaes ceramics found on East Texas colonial sites were produced for use by French and Spanish colonists and settlers, how were they used by these European groups? What European preferences are represented in these assemblages for vessels of particular function and decoration made by the aboriginal groups, and how do these assemblages differ from those from contemporaneous aboriginal habitation sites?

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Brief Summary of Colonial Period Ceramic Traditions of West Texas

Spanish activities in the El Paso district of West Texas began about 1659. They centered on the ford of the Rio Grande and focused primarily on trade and transportation. The native tribes that were affected by Spanish activities through this node were the Janos, Julimes, Mansos, and Sumas. Given the geographic proximity, groups living in New Mexico, including the Piros, Tiwas, and Tompiros, also were influenced.

The Pueblo Revolt of 1680 highlighted the role of El Paso as a potential firewall that would stop the revolt from spreading south of the river, into northern Mexico. This set into motion a push to establish a base from which the re-conquest could be launched and a more permanent and influential role could be played. The date also marks the start of the Colonial Period in West Texas (Perttula et al. 1995:Table 4). Mission San Lorenzo, founded east of El Paso in 1680, was one of the first missions to be established on Texas soil. It was followed by the establishment of the Socorro (Gerald 1990) and Isleta missions by Pueblo Revolt refugees from New Mexico. The Socorro Mission was established by Piro, Tano, and Jemez tribes while Isleta Mission was established by the Tigua tribe. Other missions and presidios followed throughout the 18th century.

Preceding the Colonial Period, El Paso district ceramic traditions consisted of the local El Paso Brown ware tradition that seems to have ended around A.D. 1450, only to be replaced by poorly defined locally made wares (Perttula et al. 1995:217). The establishment of the Socorro and Isleta missions brought about the new Ysleta and Socorro Brownware tradition (Peterson et al. 1994:209-211), also referred to as "Valle Bajo Brownware (Marshall 1997:155-198), within the context of a cultural milieu that inseparably connected El Paso to New Mexico as trade and movement of peoples continued between the two regions.

The paste of the wares ranges from bright red to light gray in color dependening on the degree of oxidation during firing. Wall thicknesses range from 5-10 mm (Marshall 1997:Figure 7.1), and there is some vessel form variability within the wares. Typically the temper in the sherds recovered from the El Paso district consists of fine to medium grained sands (Hill 1994:209-211). However, there is also evidence that different vessel forms are tempered with distinct aplastic agents (Miller and O'Leary 1992:154). While petrographic evidence suggests that the bulk of the wares were locally made, petrographic work on Isleta brownwares (Miller and O'Leary 1992:143) suggests that some vessels may have been made elsewhere and brought into the district. Some historic brownwares are decorated and Leach et al. (1996) distinguish three types within the 41EP5203 and 41EP5204 collections: red-on-brown, red-on-white, and white-on-brown. Decorations tend to be confined to the rims and their immediate vicinity and consist of curvilinear designs (see Leach et al. 1996:Figures 13.1-13.10; Marshall 1997:Figure 7.9). Some of these decorative styles, such as those extending onto the main portion of the body and consisting of flower motifs, may be post-Colonial in age (Leach et al. 1996:200). Smudging, either on the interior or exterior vessel surfaces, is present on

some vessel forms (Leach et al. 1996:Figures 13.4-13.13-10; Marshall 1997:Figures 7.5-7.6).

In general, Spanish Colonial brownwares are characterized by small numbers of vessel forms, some of which show influences derived from Spanish-made wares (e.g., candle stick holders, flat plate-like vessels, vessels with support legs; Perttula et al. 1995:217), and also exhibit limited rim morphologies (Miller and O'Leary 1992). Bowls and jars tend to be the most common vessel forms (Marshall 1997). Miller and O'Leary (1992) note that there is a greater degree of standardization in vessel form and size. This standardization may also be in response to Spanish influences. In contrast, however, the brownware assemblage from the Isleta WIC Clinic site shows a significant degree of variability when it comes to firing conditions (Miller and O'Leary 1992:143). This may suggest that pottery manufacture was an activity engaged in by a significant proportion of the population under a variety of household rather than "specialized workshop" conditions.

By the late 1800s, wheel-thrown commercial ceramic production dominates the wares produced in the El Paso District.

Selected Research Issues

Researchers working with historic aboriginal ceramics in this region should consult the literature cited below and develop project-specific research questions and research themes beyond those listed below. The list of research issues is intended to serve only as a beginning for ceramic-centered research in the El Paso district. The research issues highlighted here are to a small extent similar to those identified in the South Texas regional summary:

1) Determining whether the increased level of standardization in ceramic form and size noted in the Colonial Period Brownware assemblages reflects the influence of Spanish potters or differences in the organization of manufacturing technology compared to that documented in the prehistoric brownware tradition.

2) Does the Colonial Period Brownware tradition represent the culmination of new identify formation among native tribes that were drawn together within the missions of El Paso?

3) The concentration of several native tribes from distinct parts of West Texas and New Mexico, each with its own ceramic traditions, into the newly established missions of the El Paso district offers an ideal context within which to study the archaeological manifestation of technological styles and the impact of co-residence on the sharing of technological traditions.

4) The continued interaction between the refuge tribes that established the El Paso district missions and Southwestern groups offers a ideal laboratory for the study of the manufacture and distribution of ceramics within expansive regional networks, particularly along the Camino Real (Perttula et al. 1995:217).

5) The suggestion that functionally distinct vessel forms may have form-specific aplastic additives is intriguing and represents a very different approach to ceramic manufacture than Leon Plain and the so-called Goliad ceramics. Further investigation of this practice and its origins may be warranted.

6) Examine ceramic technological traditions within the context of particular settlement and subsistence systems at the regional level (Perttula et al. 1995:219).

7) Refine models of ceramic production, use, exchange, and discard among mobile hunter-gatherers using geochemical and petrographic methods of study (Perttula et al. 1995:219).

8) How did the role of ceramics change in local societies as subsistence changed from the reliance on wild resources to domesticated plant and animal resource (Perttula et al. 1995:219)?

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