Bits and Pieces: A Case for Holistic Analysis in the Study of Ceramic Archaeology

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BITS AND PIECES: A CASE FOR HOLISTIC ANALYSIS IN THE STUDY OF CERAMIC ARCHAEOLOGY

by

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A Case for Holistic Analysis in the Study of Ceramic Archaeology

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I. Acknowledgments

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II. Abstract

Midwest North American ceramic archaeology is at a crossroads; on the one side of the spectrum are researchers insisting that the only sufficient approach to artifact analysis is quantitative; on the other are researchers supporting the continuation of qualitative analysis as the main approach to the study of ceramic artifacts. In addition, instinct and inherent skill in ceramic analysis are often cited more often than scientific methods. These two sides seem to become more polarized in their views as the field of archaeology evolves and new generations of students and archaeologists begin to publish and present their research. In this paper, a Middle to Late Woodland site in Northern Iowa (Lonergan et al., 2015), Site 13DK96, is offered as an example in which to apply a holistic approach to ceramic analysis and to the archaeological understanding of ceramic vessel ware types, one that incorporates multiple components of both sides of the
analytical spectrum in order to fully understand a ceramic ware type at an archaeological site and to define it sufficiently for future researchers to consider and consult in their analyses.

### III. Introduction: Iowa Site 13DK96

I first encountered Site 13DK96 in the summer of 2015. Site 13DK96 is a Middle to Late Woodland habitation site in Northern Iowa located between two small lakes and west of Big Spirit Lake in a region of Iowa colloquially known as the Prairie Lakes Region, which is understood to stretch into Minnesota and into South Dakota to a less significant degree. (Lonergan et al., 2015).

There had already been one summer session of excavation completed before my arrival, and I was immediately tasked with handling and analyzing the substantial assemblage of ceramic vessel sherds recovered from the site during that period, in addition to whatever happened to be recovered during the field school session that summer (which I participated in). After three years of field school excavations (two of which I was present for), thousands of sherds have been recovered, ranging from very small, fractured sherds to palm-sized and diagnostically relevant rim, neck, and body sherds. Three ceramic ware types were supposedly present at the site: Fox Lake, Lake Benton, and Arthur Cord-Roughened (Benn, 1982), three common Middle to Late Woodland Midwestern ware types (Note: Originally, it was proposed that La Moille Thick, another Woodland Midwestern ceramic ware type, was also present at Site 13DK96; however, the number of sherds that have been recovered that could potentially be La Moille Thick is statistically insignificant, and the sherds are too small and damaged to be definitively diagnostic. For more information about La Moille Thick, please consult Ch. 6 of Alex, 2010).
Site 13DK96 provides a unique chance at analysis of a Woodland Period site; unlike many other sites in Iowa, Woodland or no, 13DK96 has been completely undisturbed by agricultural activity and largely undisturbed by environmental factors such as erosion. The stratigraphy of the site, therefore, is well-preserved, and the artifacts remain relatively in context. I was interested in using the artifact assemblage from the 2014-2016 excavations of Site 13DK96 to perform a cognitive archaeological analysis of sorts in order to propose possibilities for the social reasoning behind the use of three distinct ware types in such close proximity to one-another. I had a few hypotheses, such as differing standardized uses of the vessels or perhaps even differing design schemes being utilized between kin groups. Research and analysis into these ware types and their relationship to one-another at Site 13DK96, however, only continued to prove increasingly frustrating; I found that the ware types were not as well defined as they should be for identification and cataloguing, that they were not separated from one-another to a degree that was sufficient to call them separate ware types, and that their definitions had not been retouched or reconsidered since their original identification and naming in the late 1900s (Benn, 1982).

Though the ware types seem distinct from one another as they are described in the paper by Benn (1982), those distinctions quickly disappeared when attempts were made to apply them to the assemblage from Site 13DK96. Frequently, there were some insecurities on the part of myself and my colleagues on how to classify many of the sherds present at the site. In addition, I often contradicted myself on my own classifications, moving a sherd from one ware type to another. I realized that in order to begin the analysis I hoped to, the ceramic sherds at Site 13DK96 needed to be more distinctly defined. I elected to fundamentally reconsider my approach to their classification, incorporating as many methods of ceramic archaeological
analysis as possible in order to construct a solid foundation of understanding to build further analysis off of (which I am currently in the process of doing with Site 13DK96). I hope that this discussion and others like it will bring the fractured field of Midwest North American ceramic archaeology back together again.

Woodland-Period Cultural Features

The Woodland period signified a time of many cultural and social changes in the Midwest, such as the use of new technology such as pottery, developments in mortuary practices, experimentation with new methods of getting food and materials such as horticulture, and changes in social structure such as the construction of villages and the appearance of chiefdoms (Reiners, n.d.). Due to the importance of this time period to Midwest prehistory, it is essential to understand the social and cognitive complexities of the Woodland peoples. One efficient way to gain this understanding is through careful analysis of art and craft products, such as ceramic vessels. The following definitions for the ceramic ware types present at Site 13DK96 have been proposed by past researchers and are summarized in Benn (1982); they are considered by the author as subject to significant adjustment in the future.

Fox Lake

The Fox Lake ceramic ware type was first identified in 1955, and was later elaborated on in 1976 and 1979 (Benn, 1982). It is considered to be a Middle to Late Woodland ceramic ware type, placing its dates of use between 100 B.C. and A.D. 1000 (Perry, 1996). It is further divided by Benn (1982) into early, middle, and late components. Fox Lake ceramics are made by coiling a single line of clay on top of itself and thinning the resulting structure with a cord-wrapped paddle, resulting in a roughened texture on the exterior surface of the vessel. Occasionally, this
resulting texture may be subsequently smoothed over on some vessels, resulting in a less defined texture. The color of the clay tends to be yellow-red (5YR5/6) to dark gray (10YR3/1) with the interiors being dark gray, as well (5YR4/1 to 7.5YR3/0). The temper is usually coarse and sandy, resulting in a chunky, compact paste that is “massive in structure” (Benn, 1982:41). No Fox Lake sherds are completely undecorated, but the decoration may vary from simply cord-wrapped paddle impressions up to the rim and incising on the rim to cord-wrapped paddle impressions up to the shoulder and dynamic designs on the shoulder up to the rim that can include trailing, embossing on the interior and exterior of the rim of the vessel, cord-wrapped stick stamping to produce banded designs on the interior rim and exterior rim and shoulder of the vessel, and punctates (some of which potentially go through the entirety of the vessel). The vessels tend to be conoidal in shape (Benn, 1982).

Lake Benton

The Lake Benton ceramic ware type was first identified in 1955 and was later elaborated on in 1976 and 1979 (Benn, 1982). It is considered to be a Middle to Late Woodland ceramic ware type, placing its dates between 100 B.C. and A.D. 1000 (Perry, 1996). Lake Benton ceramics are built and thinned with a cord-wrapped paddle, resulting in a roughened texture on the surface. Occasionally, this resulting texture may be subsequently smoothed over on some vessels, resulting in a less defined texture. The color of the clay tends to be brown to dark brown (7.5YR5/4 to 7.5YR4/2), with their interiors being very similar in color and their cores tending to be darker (10YR3/2). The temper is described as being composed of crushed rock and sand, giving the paste a granular texture. No Lake Benton sherds are completely undecorated, but decorations other than cord-wrapped paddle impressions are usually isolated to the shoulder up to the rim of the vessel and varies from trailing, embossing on the interior and exterior of the
vessels, cord-wrapped stick stamping to produce banded designs (sometimes multiple bands of designs may be stacked on top of one another down the shoulder), punctates (some of which go through the entirety of the vessel), and dentate stamping (potentially with a comb-like tool) that produces trailing bands of squared dots down the shoulder. The vessels tend to be subconoidal in shape (Benn, 1982).

**Arthur Cord Roughened**

The Arthur Cord Roughened was first named by Benn (1982) and has been difficult to place on the archaeological timeline. Due to its proximity to both Fox Lake and Lake Benton sherds at Site 13DK96, however, it is cautiously suggested that Arthur Cord Roughened is likely to also be a Middle to Late Woodland ceramic ware type, depending on new information gathered by pending excavations and radiocarbon dates. Arthur Cord Roughened ceramics are built and thinned with a cord-wrapped paddle, producing a crosshatched-type texture on the surface of the vessel. The color of the clay is generally dark brown on the exterior (7.5YR3/2) and may be lighter on the interior (10YR4/2-5/6). The cores of the sherds tend to be gray-brown (10YR3/2). The clay appears coarse and is tempered with crushed rock and coarse sand, giving the paste a granular texture. No Arthur Cord Roughened sherds are completely undecorated, and unlike Fox Lake and Lake Benton (which are difficult to distinguish from one another based on decoration), Arthur Cord Roughened is very distinct. Arthur Cord Roughened sherds tend to simply display the cord-wrapped paddle impressions that are also displayed by Fox Lake and Lake Benton, but in the absence of any other design elements like trailing or cord-wrapped stick stamping. Another distinguishing characteristic of Arthur Cord Roughened is the appearance of cord-wrapped paddle impressions that intersect with one another, producing a crosshatched or checkerboard-type appearance. The entire vessel surface can sometimes be smoothed over,
resulting in less intense cord-wrapped paddle impressions, crosshatching, and checkerboard-type patterns. The crosshatching or checkerboard-type patterns are usually isolated to the area of the vessel either beginning at the shoulder or just above the shoulder to the rim. The vessels tend to be subconoidal in shape (Benn, 1982).

Figure 1. Photograph of a partial excavation of an intact hearth feature in a test unit at Site 13DK96; a large ceramic sherd was found within this feature and is presumed to have been in context when it was recovered. The excellent preservation of the stratigraphy and context of Site 13DK96 provides sturdy evidence for further analysis.
Figure 2. The front and back of a large sherd recovered from Site 13DK96 during the 2016 excavation that seems to represent the shoulder and neck of a ceramic vessel. The punctate pictured appears to have been intentionally pierced through the entirety of the vessel wall, and is not an isolated design element in the ceramic assemblage from Site 13DK96. This will be discussed further in the “functional node” section.
Figure 3. The front and back of a sherd from the neck or shoulder of a vessel recovered from Site 13DK96 during the 2016 excavation. The color of the clay would suggest categorization as Fox Lake; however, the banded patterns and darker core suggests a categorization of Lake Benton (Benn, 1982).
Figure 4. The front and back of a sherd from the neck or shoulder of a vessel recovered from Site 13DK96 during the 2014-2015 excavations. The lines on the surface of the vessel that seemed to surround the dentate pattern were puzzling; were they accidental or intentional trailing? Without enough sherds with similar designs to compare it to, it would be impossible to tell.
Figure 5. The front and back of a sherd from the neck or shoulder of a vessel recovered from Site 13DK96 during the 2014-2015 excavations. The presence of definite trailing surrounding a similar design schematic to the one represented by the sherd in Fig. 4 may suggest that the trailing on the sherd in Fig. 4 was intentional.
Figure 6. Sherds from the 2014-2015 excavations of Site 13DK96 that were categorized as representative of the Fox Lake ceramic ware type in 2015. Note, however, the apparent presence of dentate patterns on the sherd in the upper left hand corner; these patterns were supposedly characteristic of the Lake Benton ceramic ware type (Benn, 1982).

Figure 7. Sherds from the 2014-2015 excavations of Site 13DK96 that were categorized as representative of the Lake Benton ceramic ware type in 2015. Note, however, the presence of several sherds where the cord-wrapped paddle impression reach all the way to the rim; this was supposedly characteristic of the
Fox Lake ceramic ware type, but the color of the clay in these sherds seems to be closer to that described to be characteristic of Lake Benton clay color (Benn, 1982).

Figure 8. Sherds from the 2014-2015 excavations of Site 13DK96 that were categorized as representative of the Arthur Cord Roughened ware type in 2015. Note that these sherds are distinctly and noticeably different from the Fox Lake sherds pictured in Fig. 6 and the Lake Benton sherds pictured in Fig. 7, according to an observational comparison of the designs on their surface and the color of the clay.

IV.  Research Problem: Constructing a Holistic Approach

The methods that have been included in the proposed approach were discovered in several different contexts, from new and improved methods discussed by various researchers during the 60th Annual Midwestern Archaeological Conference in October of 2016 (Drane, 2016; St. Germain, 2016; Redmond, 2016; Pagel, 2016) to suggestions made by fellow researchers in both ceramic archaeology and artifact analysis in general (J. Skeens, personal communication, October 7th, 2016). Analysis was structured around what will henceforth be referred to as four
main “analytical nodes”: geographical distribution, function, overall design, and composition. No one node is proposed to have more influence or sway on the definition or understanding of a ceramic vessel ware type; they are all multifaceted parts of a comprehensive whole. No one node should be considered as the “first step” in the analytical process; each node may be fulfilled in any order, as the completion and/or research into each node will undoubtedly influence the approaches to the other nodes. However, it is proposed that each node must be fulfilled in some manner in order for a holistic understanding of the ceramic materials in question to be formed and a “ceramic ware type” to be appropriately defined and separated from other ware types. It should be noted that in this case, “holistic” means more than “interdisciplinary”; though interdisciplinary methods are suggested, a truly holistic understanding of a ceramic ware type should approach the formation and definition of said ware type from as many angles as possible, a requirement which the proposed analytical nodes attempt to fulfill.

A somewhat similar approach to ceramic analysis was undertaken to analyze a significant assemblage of Roman-period (3rd Century A.D.) ceramic materials uncovered between 1989 and 1995 in Rome, Italy, dubbed the Palatine East Pottery Project (PEPP). The approach suggested several methods for ceramic fabric analysis, ceramic vessel form classification, quantitative descriptions of the ceramic materials recovered, and the documentation and dissemination of the information gathered (Ikäheimo & Peña, 2007). Their discussion of a need for holistic analysis at the PEPP site inspired this proposal; however, it is suggested that the methods discussed in this thesis are more suitable to Midwest North American ceramic archaeology and is also more conceptually applicable universally, as several of the approaches outlined in Ikäheimo & Peña (2007) are specific to Roman-period ceramic vessels.
The remainder of this section will define the analytical nodes, offer suggestions for various approaches to fulfilling the nodes, and discuss the relevance and usefulness of each node to researchers’ overall understanding of a ceramic ware type in the context of cognitive or social archaeological analysis.

Figure 9. A proposed framework for the holistic analysis of ceramic archaeology. The concept of a “ceramic ware type” lies at the center, with the four analytical nodes of geographical distribution,
function, overall design, and composition feeding into it. From the four analytical nodes come several suggestions for approaches to understanding these nodes.

**Geographical Distribution Node**

Understanding the geographical distribution of a proposed ceramic ware type is undoubtedly an important step in ceramic analysis, as it provides key information that will inform researchers’ understanding of the scope of the ware type’s influence as well as the ware type’s place in social interactions. Here, the geographical distribution of a ceramic ware type is understood to be the literal boundaries to which the presence of the ceramic ware type in the archaeological record may stretch. A researcher should understand which North American states the ceramic ware type belongs to, which regions within these states it will most often be present in, and the geographical features of this region (i.e., presence of lakes, mountainous regions, plains, etc.). This, of course, is subject to change over time as more excavations in the area in question may be conducted; however, it is proposed that a potential ceramic ware type that is only known from a single, isolated site is not sufficient to define a ceramic ware type, as the evidence from a single site does not provide enough information to determine variations in the ware type’s context, construction, design, and function. The geographical distribution node currently contains only one recommendation for approach: the creation of an online ceramic database.

**Creating a Ceramic Database: Standardization and Simplification**

Researchers have already begun to recognize the need for some sort of widely-available artifact database, particularly in the realm of Midwest ceramic archaeology (Drane, L., 2016). An archaeological database could be as general as a series of general qualities and attributes given to a user in a list, and the user could “check” these qualities and attributes (such as temper quality,
clay color, design themes, etc.) to indicate their presence or absence on the ceramic artifact that the user is trying to identify. The database would then return a list of ceramic ware types that have the qualities and attributes that the user selected. A similar, more mathematical approach was taken to the creation of a ceramic database in the form of the Pottery Informatics Query Database (PIQD) outlined by Smith et al. in their 2014 paper. The PIQD takes 2D and 3D scans of ceramic artifacts and compares them to scans contained within the database, checking for morphological similarities. It proved effective in a case study handling ceramic materials from Iron Age Jordan (Smith et al., 2014). While this is exciting progress into the development of a ceramic database, it perhaps is not the most accessible; many smaller institutions and collections, for instance, may not have access to technology to produce 2D and 3D scans. This was a difficulty I myself ran into when I was seeking to develop 3D scans of the materials from Site 13DK96. Secanto (Section Analysis Tool) is another ceramic database that compares ceramic profiles to those stores in the database and returns possible matching ceramic ware types to the user (Mom, 2006). While this is an interesting approach, many Woodland-period ceramic ware types, in particular, have similar profiles; in addition, several archaeological sites, in the Midwest and otherwise, do not have ceramic sherds that are complete enough to determine a vessel profile.

Therefore, the most logical first step is to create an accessible database that simply requires the observations of the user. To create this database and ensure that it is effective and useful to researchers, however, it is proposed that ceramic analysis must focus more on the standardization and simplification of terms used to describe various aspects of ceramic materials. Terms used to describe stylistic elements of the vessel, for example, should become more specific and widely used and recognized by researchers, as well as less colloquial (i.e., using the
term “fingernail impressions” to describe a pattern that wasn’t necessarily made with a fingernail). This particular node is possibly the most daunting, as it will require a great deal of time and effort to compile (Pagel, 2016); however, the potential it holds for the future of ceramic archaeology is immeasurable.

**Function Node**

The function node seeks to create an understanding of the use of the vessel in the context of an archaeological site. Questions that can be asked of this node include: What was contained in this vessel? Was it used for cooking or storage? Is it a specialized or generalized vessel? Was it used in a domestic setting or a ritual/funerary setting? Was it used to hold or cook specific foods or beverages? It is proposed that there are two approaches to fulfilling this node, the first being the collection and analysis of residues retrieved from ceramic sherds and the second being defining the functional shape of the vessel itself. By determining the nature of this node in relation to a possible ceramic ware type, one can determine if separate ware types exist in an assemblage based on distinct functions.

**Residue Analysis**

If sufficient amounts of burned or crusted residue is present on the interior of a ceramic sherd, chemical analysis may be performed on the residue to determine what was cooked or stored in the vessel before its interment. Lipid analysis, in particular, is very useful to this approach because, as Malainey (2010) points out, “lipids are present in virtually all human food, they have a relatively high stability with increased temperature (up to 400°C), and their decomposition from cooking temperatures is minimal, compared to carbohydrates and proteins” (Malainey, 2010:201). The determination of a residue’s composition is based on “fatty acid composition, the
presence of general or specific biomarkers, and/or by determining the stable carbon isotope values of specific lipid components” (Malainey, 2010:201). Once the results of any residue analysis has been retrieved, it is proposed that the results may then be examined carefully to determine if there are any statistically significant similarities and differences in ceramic vessel contents and uses between proposed ware types.

**Defining the Functional Shape of a Vessel**

Though perhaps it is uncommon in Woodland-period Midwest North American ceramics, vessel shapes can suggest their practical function. In Ikäheimo & Peña (2007), vessel functions are determined by shape and divided into several distinct functional groups, including tableware, bowls, dishes, etc. Certainly, if a vessel shape betrays its function (i.e., a jug shape is likely used for storing and distributing liquid food or drink), it should be taken into consideration when determining the nature of the function node. Since many Midwest Woodland-period vessels tend to be subtle variations of a “pot” shape, this will not be discussed in great detail; in other cases where vessel shape tends to be less varying, one should consider seeking residue analysis to determine the nature of the function node.

However, one interesting discussion of the functional shape of a vessel in relation to the sherds from Site 13DK96 does become apparent in reference to the appearance of through-and-through punctates in a few of the sherds (see: Fig. 2 and Fig 6.). One suggestion presented for this design feature is that it served as an eye through which to thread a rope in order to create a handle for the pot. This, therefore, could change the purpose of these punctates from a stylistic shape to a functional one, and demonstrates the fluidity of these nodes during the process of analysis and their tendency to inform one-another.
Overall Design Node

The overall design node is a particularly large and complex node, and will probably show the most variation in approach out of all of the nodes. This node seeks to incorporate many of the qualitative methods that are currently applied to ceramic analysis. This node summarizes the observable features and patterns of a ceramic ware type, specifically those that required artistic choice on the part of the creator. It is proposed that though a determination of the nature of the overall design node is not enough to separate one ware type from another on its own, it can assist in an understanding of a ware type’s function and importance to an archaeological site.

Identifying Craft Manufacturing Techniques

It is proposed that the process of creating a craft is as important to a holistic understanding as the finished craft itself is. If clear differences in tool use can be observed (i.e., wheel throwing instead of hand shaping; the presence of dentate stamping on Lake Benton and its proposed absence on Fox Lake and Arthur Cord Roughened (Benn, 1982), this could reflect a preference of the creator, or perhaps a kingroup-specific tradition passed down through generations. Schroeder et al. (2016) identifies another possible source for identifying similarities and differences in ceramic production techniques: the twisting of cords.

Schroeder et al. (2016) produced a 3D rendering of ceramic sherds using photogrammetry. They then produced a “reversed” 3D model of the sherds, where any impressions made with cords in the vessel surface became convex instead of concave. After this was completed, it was possible to determine how many strands of thread were twisted into a cord, and even which direction the cord had been twisted in. Though this work is still in progress, if there are statistically significant patterns in both the number of threads that are used
to make a single cord and the directionality that the cord was twisted in, the difference could be attributed to something as individualistic as artist choice or habit or something as far-reaching as techniques passed down through generations.

Abstract Thematics and Defining Motifs

It is certainly wishful thinking that the function and significance of a ceramic vessel will simply be listed in some way on the ceramic vessel, but if one carefully analyzes what is called herein the “abstract thematics” of a vessel, one can begin to create this list themselves. “Abstract thematics” encompasses elements of ceramic vessel surface design such as geometric patterns and textures (as well as directionality of these patterns, if there are any), human and animal motifs, the presence or absence of paint in vessel design, and the stylistic shape(s) of the vessel.

The presence of motifs on a vessel and the types of motifs present are important to identify when conducting ceramic analysis, as they can provide information about the society and culture that they originated from. One should clarify what kind of motifs are present, first and foremost; are there human, animal, or geometric motifs? Some combination of the three? Why might this combination exist?

Analysis of motifs can provide unique insights into social networks. Gilman et al. (2014) demonstrates this approach through a combined analysis of faunal remains and ceramic materials at a site from the Mimbres Classic period (A.D. 1000-1130) in New Mexico. Gilman et al. (2014) found that the remains of scarlet macaws were often associated with Classic Mimbres Black-on-white ceramics that depicted various images that were incredibly reminiscent of Maya iconography, including some renditions of stories about the Maya Hero Twins. The authors surmise that this association suggest direct trade between the Maya and the Classic Mimbres
peoples as opposed to through “middle-men,” which facilitated the distribution of Maya iconography through stories with the trade of scarlet macaws (Gilman et al., 2014).

**Defining the Stylistic Shape of a Vessel**

Vessel shape is not always purely designed to ensure efficiency of function; embellishments and aesthetical improvements are present as part of some ceramic ware type definitions. Stylistic shapes can be useful in social archaeological analysis, as Smith demonstrates with their 2006 paper. In this paper, Smith (2006) analyzes a class of prehistoric Huron ceramic vessels that were made by children. These vessels, Smith (2006) argues, have a distinct style, and through the analysis of the stylistic forms of these vessels, they demonstrate that children were not only a part of “intergenerational learning/teaching interactions” (Smith, 2006:65), but also that children played a key role in influencing stylistic change of ceramic ware types over time (Smith, 2006).

Keeping the example of the through-and-through punctates revealed at Site 13DK96 in mind, it should be noted that great caution should be taken in attributing the solitary label of “stylistic shape.” Unlike functional shape, something should only be attributed to solely stylistic shape if the form can be explained by nothing else; more often than not, shape will be both functional and stylistic (for instance, the specialized stylistic forms of the prehistoric Huron pottery described by Smith (2006) also served a social function as teaching instruments for children who were learning how to make their own ceramic vessels). It’s possible that distinctions between these shapes could be teased out through the use of experimental archaeology by recreating modern renditions of the vessels in question and attempting to attribute the form to a function by literally using the vessel.
Composition Node

The composition node seeks to define the physical makeup of a ceramic ware type, i.e. the materials used in the creation of the ceramic objects. This can include features such as clay type and source, temper material and source, and design element material and source (which is discussed briefly above in the “overall design node” section). This node is useful in separating apparently similar ware types from one another based on consistently difference clay, temper, and/or design element material sources.

Temper Quality and Material

Occasionally, one can identify distinct differences in temper quality and material by looking at the cores of ceramic sherds, either with a microscope or the naked eye. Often, with this approach, it is fairly simple to identify grit, grog, sand, shell, or bone tempering, as well as the size of the tempering overall (i.e. coarse, fine grained, etc.) If a proposed ware type appears to include a different form of tempering (for example, grit in one and shell in another) than that of a similar ware type, this observation of temper quality and material could serve to separate them.

Ceramic Petrography

Ceramic petrography is the middle ground of compositional analysis between the wide focus of mere observation and the fine-grained analysis of portable X-ray fluorescence (PXRF). Ceramic petrography involves creating paper-thin slices of ceramic sherds and placing these slices between two glass slides. The resulting slide is then placed under a standard polarizing microscope, which makes the geological inclusions in the sherd “light up” under the microscope lens in a predictable way (in other words, based on the colors observed, one can determine whether an inclusion is limestone, granite, etc.) Through procedures such as point-counting
(systematically observing, recording, and analyzing the amount of each geological inclusion that appears in a thin section), one can separate, combine, or better define ware types through comparisons of statistically significant amounts of differing or similar geological inclusions (Quinn, 2013; this volume in incredibly helpful to any researcher who is unfamiliar with ceramic petrography and point-counting).

Several complex analyses have been directly informed by a compositional understanding of ceramic ware types through point counting. Fitzpatrick et al. (2003) demonstrated the usefulness in outline trade and social networks with ceramic petrography; using thing sections of ceramic vessel sherds recovered from Palau, Indonesia, the authors demonstrated that not only were these vessels being manufactured with locally obtained materials, but that they were then also being transported to other islands in surrounding archipelago, as well as to some islands outside of it (Fitzpatrick et al., 2003).

In another study using ceramic petrography, Blanco-González et al. (2014) were able to confirm refits of separated sherds from central Iberian ceramic vessels (Later 6th millennium B.C.) through systematic comparisons of thin sections from sherds that were proposed to fit together through qualitative analysis (Blanco-González et al., 2014). In other words, an understanding of the compositional node through ceramic petrography can influence the understanding of other analytical nodes in the model, such as functional and stylistic vessel forms.

**Portable X-Ray Fluorescence (PXRF)**

PXRF is certainly the most fine-grained compositional analysis of the three suggested approaches to compositional analysis. It has been demonstrated that shooting X-rays at ceramic
materials causes the atoms within the ceramic to “emit X-ray photons of a characteristic energy or wavelength” (Guthrie, 2012) (in other words, the photons emitted from each atom is predictable enough that the elements within the ceramic material can be identified). This produces a graph that reveals spikes in certain elements within the ceramic material, which can be taken and compared to the results of PXRF analysis of other ceramic materials (Guthrie, 2012). In addition, PXRF is non-destructive, unlike ceramic petrography (Forster et al., 2011).

PXRF analysis of ceramic materials has proven useful in separating ceramic materials from one another through the elemental comparison of each material’s components. In their discussion of the usefulness of PXRF to archaeological ceramics, Forster et al. (2011) applies the method to a test sample of Chalcolithic-era ceramics from central Turkey. After applying PXRF analysis to the assemblage, the authors conclude that PXRF provides an accurate method of separating or combining ceramic ware types based on their geochemical composition (Forster et al., 2011). In another study, Frankel & Webb (2012) utilize PXRF analysis to elementally define Bronze Age ceramics from the Republic of Cyprus. Through this analysis, the authors were able to determine that at some sites, decorative and elaborate vessels may have been imported, while at others both elaborate and plain, simple vessels were produced using locally obtained materials (Frankel & Webb, 2012). In short, PXRF can provide information that allows for complex social and trade networks and boundaries to be more accurately defined.

V. Conclusion and Discussion

Midwest North American ceramic analysis is in need of revitalization. No one argues that ceramic analysis is important to a complete understanding of an archaeological site, but with increasingly different opinions on the approach that should be taken to this understanding, it is
difficult to complete these analyses in a way that will provide a sufficient understanding of the ceramic ware types that are present at a site and their relationships to one another. Using my own frustrations with the process of ceramic analysis of an assemblage from a Woodland-period site in Northern Iowa, Site 13DK96, as a guide, I’ve outlined four analytical nodes for future research in ceramic analysis: geographical distribution, function, overall design, and composition. The nodes bridge the gap between qualitative and quantitative analysis, using healthy amounts of each to inform the process of analysis. Using all four of these nodes, researchers can form a more holistic and comprehensive understanding of ceramic ware types at archaeological sites. There are multiple approaches to defining each node, and each one has been demonstrated individually to be helpful on other archaeological sites.

This is a very preliminary proposal. It is too early to say if the nodes are truly exhaustive, but it is likely that they are not; more research must be done both into the effectiveness of this model and the effectiveness of the approaches it suggests. This network will, in all likelihood, eventually need to be revised, but as it stands, it’s a good start to a discussion that the field of ceramic analysis has needed to have for several years.
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