Skeuomorphs, Pottery, and Technological Change

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ABSTRACT Skeuomorphs are copies of prototype artifacts replicated in different physical materials in the derivative objects. The skeuomorph copy may or may not have a utilitarian function, and the original function of the prototype attribute may change or become less functional with successive copying. Because skeuomorphs are an imitation of the prototype model, they are iconic representations. Archaeological examples of pottery vessel skeuomorphs are presented and interpreted with evidence from ethnography, psychology, and modern material culture. This review lends support to the proposal that skeuomorphism is a causal factor in technological change. Skeuomorphs facilitate acceptance of innovations in artifacts by (1) materializing the pre-existing familiar value of prototypes as attributes transferred to unfamiliar derivative objects; (2) evoking positive social memories associated with the prototype; and (3) creating broader scales of value by creating novel variants of similar objects. [*skeuomorph, pottery, technological change*]

RESUMEN Los esqueumorfos son copias de los artefactos prototipos replicados en materiales físicos diferentes en los objetos derivativos. La copia esqueumorfa puede o no tener una función utilitaria, y la función original del atributo prototipo puede cambiar o llegar a ser menos funcional con copiado sucesivo. Debido a que esqueumorfos son una imitación del modelo prototipo, ellos son representaciones icónicas. Ejemplos arqueológicos de vasos de cerámicas esqueumorfas son presentados e interpretados con evidencia de etnografía, psicología, y cultura material moderna. Con esta revisión, presté apoyo a la propuesta que esqueumorfismo es un factor causal en cambio tecnológico. Los esqueumorfos facilitan la aceptación de las innovaciones en artefactos al (1) materializar el preexistente valor familiar de los prototipos como atributos transferidos a objetos derivativos no reconocidos; (2) evocar memorias sociales positivas asociadas con el prototipo; y (3) crear escales más amplias de valor diseñando variantes innovadoras de objetos similares. [*esqueumorfo, cerámica, cambio tecnológico, arqueología*]

The claim that the shapes and surface treatments of early ceramic containers were copies—skeuomorphs—of nonceramic containers is an old observation with considerable history, but U.S. archaeologists rarely discuss its significance for understanding technological change within the archaeological record. Most researchers privilege utilitarian or economic factors in the innovation and adoption of ceramic vessels and other artifacts. I propose that skeuomorphs, which include designs unrelated to utilitarian needs, were instrumental in the acceptance of innovations such as pottery. In presenting this interpretation of the role of skeuomorphs in the innovation and adoption of pottery, I review evidence from archaeology, ethnology, and experimental psychology.

First, I introduce skeuomorphism and identify ceramic vessel skeuomorphs. Next, I review archaeological approaches to technological change and consider how pottery skeuomorphism might inform these investigations. I present a different perspective that examines skeuomorphs not only as tools but also as iconic signs. This metaphorical quality of skeuomorphism—imitation through copying—facilitates the adoption of new and unfamiliar innovations in three ways. I propose that (1) skeuomorphs originate in the production process of the derivative object because maintaining

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similarity to the antecedent prototype is perceived as an active or necessary component of technology; (2) the imitative process renders a novel object less threatening and more desirable to potential adopters by transposing the familiar design characteristics of the prototype to the unfamiliar derivative object, allowing the novelty to be placed into a pre-existing cultural category that is already valued; and (3) skeuomorphs permit similar objects to be ranked along a relative scale of worthiness through the contrast in the different physical materials that compose prototypes and derivative copies, and the skeuomorph scale creates a motivation to adopt innovations because the resulting variation in similar objects confers prestige through possession.

WHAT IS A SKEUOMORPH?

The word *skeuomorph*, derived from Greek σκεῦος ("implement") + μορφή ("form"), was coined by H. Colley March (1889): "The forms of ornament demonstrably due to structure require a name. If those taken from animals are called zoomorphs, and those from plants phyllomorphs, it will be convenient to call those derived from structure, skeuomorphs" (Oxford English Dictionary 2015). There are two definitions of *skeuomorph*. First, skeuomorphs are design characteristics that had a utilitarian function in the prototype artifact but through time become nonutilitarian decoration in the derivative artifact (Colley March 1889). Skeuomorphs originate in utilitarian structure or design, but through copying to other media, the once-utilitarian attribute becomes a decorative trait. Modern examples include nonfunctional buttons on the cuffs of men's suit coats (Steadman 1979:114), decorative veneers such as copper-clad zinc pennies (Gessler 1998:229) or faux "cork" pattern on plastic corks (Taylor 2007:300–301), and nonfunctional columns, balconies, and shutters on "McMansions" and other kitsch architecture (Mouzon 2004). More generally, the term *skeuomorph* refers to a copy of a prototype object reproduced in a different physical material (Balfour 1893; Colley March 1889; Haddon 1902). For example, a ceramic copy of a woven basket is a skeuomorph (Figure 1). Skeuomorphs may be identified as whole objects or constituent parts (attributes) but are discussed collectively as design attributes.

Skeuomorphs are design attributes with meaningful content transposable across physical media. This representational quality of skeuomorphs marks them as a type of sign, an icon (i.e., Peirce 1955). Charles Peirce's concept of sign has proven useful in efforts to interpret the meaning of objects because, unlike symbols, the relationships between signs and referents may be logical or causal and, thus, nonarbitrary (Preucel 2006; Wallis 2013). As icons, skeuomorphs signify through similarity by duplicating some visual aspect of the prototype. Skeuomorphs are "solid" metaphors that represent concepts in physical form via shape, texture, and color; thus, the sensory impact and context of use may differ from verbal or image metaphors (Tilley 1999:44, 263, 265; cf. Knappett et al. 2010; Ortman 2000). Metaphor is basic to human thought processes and learning because it is

FIGURE 1. *A modern ceramic flowerpot skeuomorphing a basket. (Photograph by Lisa J. LeCount, used with permission.)*

a component of analogical reasoning and requires memory (Pinker 2007). Skeuomorphic objects may also have indexical or other modes of signification (Knappett 2002:105, 109; Wallis 2013:210–211), but here I limit discussion to skeuomorphs as iconic representations.

I propose that the metaphorical quality of skeuomorphs was instrumental in technological change because it facilitated the acceptance of innovations. Pottery vessels make excellent examples of this aspect of skeuomorphism and provide a means of tracing technological change in the archaeological record. By "technological change," I refer to the historical and social processes that encompass invention, innovation, and adoption of material culture. Conventionally defined as a linear sequence, invention is the initial creation of a unique object, while innovation follows as an improvement on the invention, adopted and spread through diffusion (Rogers 1983). Skeuomorphism cannot answer the question of why pottery vessels were invented, nor is it clear if skeuomorphism is a mechanism of invention. What can be documented with the archaeological evidence of skeuomorphism is that the shapes and textures of nonceramic containers have been a source for ceramic vessel design attributes from their earliest appearance. The copying of attributes from nonceramic to ceramic container best accommodates the process of innovation rather than invention, and so the central problem to consider is the role of skeuomorphism as a mechanism for the acceptance of innovations.

CERAMIC SKEUOMORPHISM

Ceramic skeuomorphs are not limited to incipient pottery, but skeuomorphic copying of preceramic prototype containers is ubiquitous in early pottery assemblages. Skeuomorphs may have facilitated acceptance of pottery during intervals

when ceramic vessels became an alternative to commonly used nonceramic containers. It is illustrative to review the characteristics of ceramic skeuomorphs because current behavioral and evolutionary archaeological studies of technological change focus on early pottery function and style.

As antecedent developments in container technology, gourds, wooden and stone bowls, shells, skulls, ostrich eggs, and fiber baskets and bags were prototypes for early pottery vessels, which were often shaped into forms that mimic the precursor container (Balfour 1893:114–115; Childe 1948:93; Clark and Gosser 1995:215; Haddon 1902: 97–109, 188–191; Holmes 1886:445–450, 470–472; Rice 1987:8, 13, 20; Sandars 1968:121). Not only are antecedent container shapes copied; so are physical attributes that reference the compositional material of the prototype container. As a result, fabric-impressed, cord-marked, and dentate-stamped decorations that imitate baskets and bags are common to early pottery traditions throughout the world (Aikens 1995:14; Balfour 1893:107–110; Close 1995:26; Cushing 1886:473–521; Gheorghiu 2008:184; Haddon 1902:91–93; Holmes 1903:67–80; Knappett 2002:110; Sandars 1968:121–122; Sherratt 1997:366–367; Steadman 1979:112). The oldest known ceramic vessels, dating 20,000–19,000 B.P. in China, are cord marked (Wu et al. 2012). Other ceramic skeuomorphs include incised, stamped, painted, molded, or applique lines that imitate the netting, string, or cord bindings used to carry or suspend prototype containers (Haddon 1902:108–110, 304), nodes that mimic studs or knobs on prototype wood vessels (Sandars 1968:122), rocker and dentate stamping that duplicates patterns of stitching on leather or bark containers (Cushing 1886:519–520; Sandars 1968:122), and nonfunctional rivets on ceramic copies of metal vessels (Broodbank 2000:270). Skeuomorphism reveals the potter's culturally determined conception of the proper shape and appearance of a vessel, copied from a familiar nonceramic prototype container.

Because shape and surface-treatment attributes of ceramic skeuomorphs reference preceramic prototypes, it is possible to identify the precursor model by a procedure of careful inspection and comparison. Shape and surface-treatment skeuomorphs may appear on the same vessel, but it is useful to briefly survey the archaeological and ethnographic evidence for each separately. Because most skeuomorph examples cited above are Old World references, and many U.S. archaeologists seem unaware or uninterested in skeuomorphism, I turn to New World archaeological examples.

Shape Skeuomorphs

The oldest pottery in the Americas is in Amazonia; the shapes are hemispherical bowls and thin-walled, neckless jars known as *tecomates* (Roosevelt 1995:124, 126). Subsequently, tecomates (appearing with other vessel shapes) are present as the oldest pottery in Mesoamerica (Clark and Gosser 1995:212) and the U.S. Southwest (Garraty 2011). The shapes of tecomates mimic gourds (Clark and Gosser 1995:215). Gourd containers predate ceramic vessels in the Americas (Erickson et al. 2005). In the U.S. Southwest, early pottery also copies baskets (Cushing 1886:figures 520–522).

Farther east, prototypes for the earliest pottery are wooden bowls, baskets, and fiber bags. The vessel shapes of Stallings, the earliest pottery in eastern North America, are thick-walled, hemispherical bowls and flat-bottomed basins optimal for stone boiling, a technology originating in the preceramic Archaic in this region (Sassaman 1995:225–226). While the prototype container for Stallings vessels is uncertain, hide and wood basins were used for stone boiling by peoples in areas of North America without ceramics (Driver and Massey 1957:229, 232), and wood bowls are known from preceramic sites in southeastern regions of the United States (Purdy 1991:212). Another early vessel form in eastern North America is a conical or bag shape that copied baskets and fiber bags (Holmes 1886, 1903). Woven, knitted, and plaited containers were suitable prototypes that predate the appearance of pottery in North America (Andrews and Adovasio 1996).

Surface-Treatment Skeuomorphs

Due to the greater specificity and detail of textures, decoration, and other surface treatments on pots, a comparative method to identify how these markings were made, the materials that were used, and the source of the materials is much better developed than the means to determine shape prototypes. In eastern North America, William Holmes (1884) pioneered the technique of taking casts of pottery surface textures with modeling clay to investigate the textiles and other materials that ancient potters used to make the impressions (Figure 2). Current studies using similar methods have identified specific ply, warp, weft, stitching, knotting, plaiting, and other patterns derived from fabric, bark, quill, or basket containers; when present as textured pottery surfaces, all of these impressions are skeuomorphs that reference nonceramic prototypes (for North America, see examples in Petersen 1996).

It is more difficult to identify the nonceramic prototype containers that inspired incised, punctated, pinched, and stamped ceramic decoration with the same degree of specificity as fabric impressing and cord marking. In the U.S. Southwest, Frank Cushing (1886:490–491, 508, figures 515–517) proposed that Pueblo coiled pottery developed from basketry based on his study of Zuni watertight "boiling baskets" and the mimicking of exact details of basketry plaiting on prehistoric corrugated pottery decoration. In eastern North America, much of the grooved, incised, and punctated decoration found on fiber-tempered and other early pottery is applied in linear patterns that mimic basketry (Figure 3). Even undecorated wares, when smoothed, burnished, or polished, may be skeuomorphing the shiny surfaces of prototype gourd or wood containers (Knappett et al. 2010:600–602). Surface-treatment skeuomorphs are often congruent with shape skeuomorphs; conical and bag-shaped ceramic vessels skeuomorphing the shapes of fabric

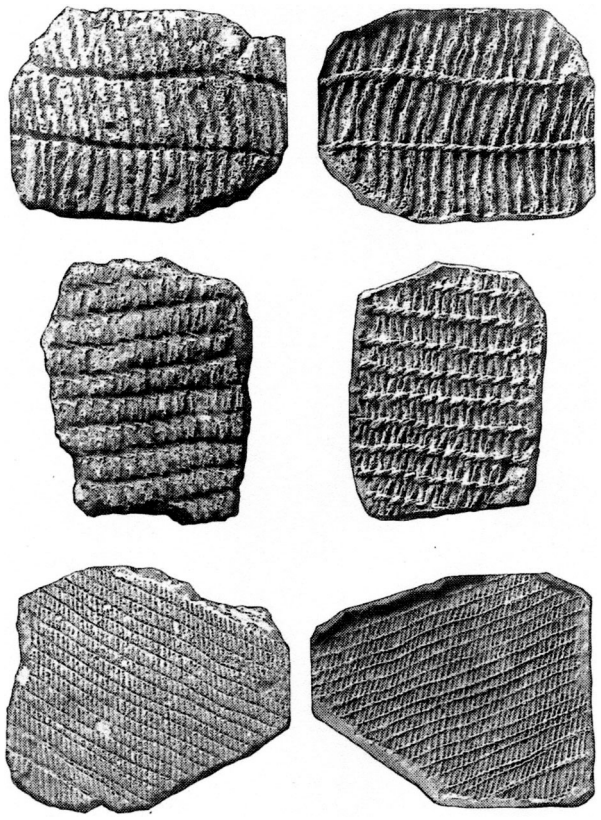

FIGURE 2. *Fabric-impressed and cord-marked surface-treatment skeuomorphing fiber containers: prehistoric potsherds (left) and corresponding cast impressions in modeling clay (right). (Reproduced from Holmes 1884: Plate XXXIX, image in the public domain.)*

bags are fabric impressed, and those vessels skeuomorphing cord and net bags are cord marked.

This review reveals that the definition of skeuomorphs as design attributes that are utilitarian in the prototype artifact but nonutilitarian in that the derivative artifact does not necessarily apply to shape skeuomorphs, which continued to serve the utilitarian function of container while signifying a specific nonceramic model. Surface-treatment skeuomorphs that appear to reflect the intention of potters to reference the prototype and the utilitarian function of the stampings, incisions, and other embellishments, if any, are more problematic. In short, skeuomorph design attributes can be both utilitarian and representational. The complex relationship between the utilitarian and representational attributes of skeuomorphs requires closer examination in the context of archaeological approaches to technological change in general and innovations in ceramic vessels specifically.

SKEUOMORPHS AND TECHNOLOGY

Archaeological frameworks for understanding the relationships between artifact function, style, and technological change have deep intellectual roots. Materialist perspectives have long considered technological change to be directed by utilitarian necessity, particularly since the emergence of Enlightenment natural science and classical economic theory that emphasizes rational choice (Harris 1968:22–23). In contrast, idealist perspectives originate in the mimesis of ancient Greek philosophy. The ancient mimesis concept emphasized technology as the product of human creativity expressed through imitative acts that transformed material things into representations (Puetz 2002). Materialist and idealist perspectives developed in dialectical fashion in the history of anthropology. Nineteenth-century unilinear evolutionists constructed universal technological stages, but progression from one stage to the next was said to be driven by the ideational domain through the psychic unity of man, racist theories of intellect, or by a diffusionism that assumed the benefits of new technology would be adopted (Harris 1968:105–107, 211–216, 376–377). Lane-Fox Pitt-Rivers (1906) in archaeology and Henry Balfour (1893) in the decorative arts examined the "evolution" of artifacts by a method of similarity seriation that included skeuomorphs, and while not denying utilitarian needs, change in artifact form was said to be the unconscious product of successive copying errors. Later, Gordon Childe's (1948) emphasis on technology as a catalyst of ancient "revolutions" had a strong utilitarian aspect, and even more so the economic functionalism of J. G. D. Clark (1952). In the United States, Boasian idealism suppressed evolutionist and materialist perspectives. Interest in technological change was mostly limited to constructing culture-historical continuities through artifact style, thought to originate in cultural borrowing, and ultimately in undirected superorganic patterning, as in Alfred Kroeber's (1919) study of hemline changes.

With cultural evolution's return in the mid–20th century, materialist utilitarian necessity soon eclipsed idealist concepts as the dominant explanation of technological change among U.S. archaeologists. Leslie White's technological determinism, Julian Steward's focus on subsistence and environment, and the subsequent influence of cultural ecology fueled the culture-as-adaptation paradigm shift to processual archaeology. At the level of artifact classification and analysis, the function-versus-style dichotomy maintained the division of material and ideational domains, with physical and mechanical traits analyzed as utilitarian necessities driving technological change and decorative style attributed to latent or manifest modes of symbolism, learning, communication, or social interaction of little direct importance to technological change.

Mimesis was revitalized in anthropology by way of art history, criticism, and phenomenology (Puetz 2002). Mimesis, as the capacity for similarity and imitation to influence the perception of reality, appealed to anthropologists because "the wonder of mimesis lies in the copy drawing on the character and power of the original, to the point whereby the representation may even assume that character and that power" (Taussig 1993:xiii). The implication for material culture is that artifacts influence how people respond to them, because the physical attributes of objects encode various cues that prompt emotional responses and create a

FIGURE 3. *Punctation on fiber-tempered pottery from the U.S. Southeast skeuomorphing basketry. (Photograph by Kenneth E. Sassaman, used with permission from University Press of Florida.)*

synergy of object and person (Gell 1998). While this new interest in creativity and representation has engaged Old World archaeologists, including a reconsideration of skeuomorphism (Hodder 1998; Knappett 2002), explanations of technological change in U.S. archaeology remain dominated by a utilitarian efficiency premise.

For example, there is extensive literature on the origins and adoption of pottery, with excellent summaries that

sort the topic into ecological, economic, and social models (Barnett and Hoopes 1995; Brown 1986; Rice 1999). I will not review specific models here, but I point out, as others have (Rice 1999:10), that a common assumption is present: early pottery was a tool that met the utilitarian needs of ancient communities in more technologically efficient ways than antecedent nonceramic containers under complex and changing ecological, demographic, and subsistence conditions. This utilitarian premise, either explicit or implied, interprets early pottery as an invention in container technology that proved superior to nonceramic containers in solving cost–benefit problems, especially in the preparation of foods. Prudence Rice (1999:10) refers to this "culinary hypothesis" for pottery origins as a "functionalist/adaptionist" rationale. An overemphasis on utilitarian efficiency may be obscuring other factors in the innovation and adoption of pottery vessels, such the social impact of skeuomorphs as iconic representations.

SKEUOMORPHS, PERFORMANCE, AND EVOLUTION

Skeuomorphism, long dormant in U.S. archaeology, should be reconsidered because these objects reveal the intersection between utilitarian and representational attributes that informs an understanding of technological change. Two current approaches in anthropology most concerned with technological change at the scale of artifact attributes, behavioral archaeology and evolutionary archaeology, examine this association in early pottery but do not explicitly address skeuomorphism.

Behavioral archaeologists measure ceramic vessel attributes to identify "performance characteristics," based on the conception that "design is driven by performance" (Schiffer and Skibo 1997:29). Vessel performance characteristics are analyzed because it is assumed that pots were made to fulfill specific tasks, that there is a relationship between specific attributes and specific tasks, and that the choice of attributes was governed by the evaluation of how well vessels performed the tasks. According to Michael Schiffer and James Skibo (1997), performance characteristics may be mechanical (the physical attributes of the pot that aid in utilitarian performance such as cooking, serving, or storage) or visual and sensory (the physical attributes of the pot that improved social performance such as decoration). Social performance is the social context of use in which the visual and sensory attributes convey meaning. Although concerned with social performance attributes, behavioral archaeologists identify mechanical performance characteristics as the primary drivers of technological change and conduct ceramic technology experiments to measure the efficiency of these attributes (e.g., Schiffer and Skibo 1987; Schiffer et al. 1994; Skibo et al. 1997).

Attributes identified as mechanical performance characteristics and evaluated by ceramic technology experiments include vessel surface treatments that most archaeologists regard as decoration and that are identified here as skeuomorphs. Laboratory experiments have assessed the relationship between textured pottery (i.e., fabric-impressed, cord-marked, dentate-stamped, and corrugated surface treatments) and such mechanical performance characteristics as heating efficiency (Schiffer 1990; Young and Stone 1990), thermal shock resistance (Schiffer et al. 1994), abrasion resistance (Skibo et al. 1997), mechanical stress (Pierce 2005), and "gripability" (Boulanger and Hudson 2012). Vessel shape attributes are also measured to identify mechanical performance efficiency. Results generally document positive relationships between the measured design attributes and increased mechanical performance efficiency. Measurable increases in mechanical performance efficiency are identified as (or strongly implied to be) the reason the attributes are present. Consequently, theories about the invention and adoption of pottery in behavioral archaeology emphasize the results of ceramic mechanical performance experiments to promote the utilitarian premise (Skibo and Blinman 1999; Skibo and Schiffer 2008:37–52).

Skeuomorphic traits are derived from ancestral prototypes. A historical perspective on the origin of attributes complicates the behavioralist claim that design originates in the technical choices of the artisan in response to inadequate artifact performance (Schiffer and Skibo 1997). A basket and its derivative ceramic skeuomorph copy both have a utilitarian function as a container, but the ceramic skeuomorph's specific shape and textured surface treatment are predetermined by the nonceramic prototype, not by the mechanical performance efficiency of the derivative pot. The mechanical performance efficiency of textured ceramic surfaces may be the unintended consequences of physical properties created by other motives, such as the desire to address social performance through iconic representations that reference the prototype. Ceramic technology experiments, removed from the social context of use and without benefit of a historical perspective on the origins of design traits, may not be entirely successful in differentiating utilitarian and stylistic attributes. Skeuomorphism is of interest to behavioral archaeology primarily as a social performance attribute that accompanies and complements mechanical performance efficiency.

Skeuomorphism, as an example of change in form through time, is compatible with the goals and methods of evolutionary archaeology, especially in the advantages it offers for documenting artifact lineage histories. Evolutionary archaeology applies Darwinian evolutionary concepts such as variation, inheritance, and differential reproductive success to cultural phenomena with evidence from the archaeological record. To achieve this goal, function is defined as "forms that directly affect the Darwinian fitness of populations" and style as "forms which have no detectible selective value" (O'Brien and Leonard 2001:3). By definition, function and style are kept strictly dichotomous concepts as the products of two distinct evolutionary processes: selection and drift.

From an evolutionary perspective, skeuomorphism is a form of mimicry and vestigiality. Skeuomorphic attributes have been central to efforts to trace a sequence of similar forms through time by means of phyletic (similarity) seriation. In early seminal examples, both Holmes (1886:456) and Flinders Petrie (1901:5) created sequences based on the transition from functional jar handles to their vestigial decorative derivatives. Current studies in evolutionary archaeology use powerful seriation models to chart evidence for "historical continuity," as in a sequence of similar forms, but also "heritable continuity," meaning a historic lineage of relatedness between forms (O'Brien and Lyman 2002: 59–108). Heritable continuity is demonstrated by "multiple instances of overlapping" that "serve to connect sets of material from different time periods" in the seriation model (O'Brien and Lyman 2000:402). Identification of functional and stylistic traits is a methodological challenge in these studies but may be documented in the differential patterning of traits in the artifact lineage histories of the seriation models (e.g., Neiman 1995).

Neither behavioral nor evolutionary archaeologists consider style unimportant. Behavioral archaeologists emphasize mechanical performance because they identify technological change as a response to needs or motivations. Evolutionary archaeologists critique this approach as "adaptationist" because "innovations arise independently of the process of selection" (Jones et al. 1995:18), and so, rather than intent, what matters to them is whether variant artifact forms confer selective advantages. But evolutionists also acknowledge that differential replication of an artifact form depends on "the effectiveness of the transmission mechanism" (Jones et al. 1995:19). Presumably, social performance is an influence on the effectiveness of the transmission, and skeuomorphism is an excellent material example of social learning by copying (Bentley et al. 2011).

What is left unexplained by mechanical performance efficiency and utilitarian need is the question of why considerable effort was expended to impart the visual and tactile characteristics of basketry weave, bag fabrics, and other nonceramic container textures and shapes to pots. Any number of variations within a class of shapes defined as a bowl or a jar may satisfy a minimal level of mechanical performance, as confirmed by the diversity encountered in the archaeological record. Skeuomorphs as iconic representations are relevant to the social performance contexts of motivation and intent, and in evolutionary terms, they may contribute to the effectiveness of the transmission mechanism of traits selected for differential replication.

SKEUOMORPHS ORIGINATE IN PRODUCTION

One explanation for skeuomorphs is that they arise out of juxtaposition or concurrence with another closely related technology (Houston 2014:59–60). Because ceramic skeuomorphs imitate the organic materials of nonceramic containers, and fiber, wood, and other antecedent container materials were physically brought together during ceramic production, skeuomorphism may be an integral aspect of early ceramic technology. Ethnographic observations of ceramic production practices provide the strongest evidence of this connection.

Nonceramic Containers and Their Materials in Pottery Production

Ethnographic observations document production links between baskets, cordage, fabrics, and pots. For example, cord bindings or basket molds are used in many potting traditions to support the clay body as pots are formed (Barley 1994:21; Cushing 1886:489–491, figures 526, 529; Drooker 1992:16–17; Gheorghiu 2008:182–184; Rice 1987:125, 133; Rye 1981:63; Shepard 1980:60). Cushing's (1886:497–499) observations of Zuni potters' use of basket molds and the congruence between the basketry weave and corrugated pottery led him to propose an "evolution of forms" from basket to pot (Figure 4). Some production methods use fabric or fiber to lift and separate the unfired pot from a mold (Arnold 1991:42; Drooker 1992:16–17). The paddle-and-anvil technique is a common method of forming pots, and the paddle may be wrapped in cord (Rye 1981:84–85). Observing that these production methods impart the shape of the prototype container to the pot as well as leave impressions on the unfired clay, it has been proposed that ceramic skeuomorphs originated in this manner when potters continued to intentionally replicate the prototype's shape and texture (Childe 1948:92; Cushing 1886: 484–491; Haddon 1902:108–110; Holmes 1886:445–450; Knappett 2002:110; Sherratt 1997:366–367; Steadman 1979:112–113).

Skeuomorphs, Similarity, and Contagion

If various ceramic vessel shapes and textured ceramic surfaces originated as the unintentional consequence of early pottery-production methods, we are still left with the question of why potters were compelled to replicate the shapes and surface treatments. Unintentional texturing of moist vessel surfaces by molds and bindings could easily be removed by the potter prior to firing. Why did potters consider it necessary to shape and mark a pot to look like a basket, gourd, or fabric bag? It has been argued, although mostly in passing reference, that skeuomorphs were motivated by sympathetic magic (Haddon 1902:5; Knappett 2002:111; Sandars 1968:121; cf. Frazer 1951:12–13). The ubiquity of skeuomorphs in precommodity production suggests a cross-cultural mode of magical thinking that considered fidelity to the shape and texture of the prototype model necessary to successful production. Current psychological perspectives identify both similarity and contagion as forms of magical thinking present in all normally developing humans (Rozin and Nemeroff 1990). The similarity principle is the rationale for homeopathic magic, an attempt to influence effects or outcomes through imitation. The related contagion principle is based on the logic that, once in contact, materials continue to exert influence on each other at a distance due to a shared

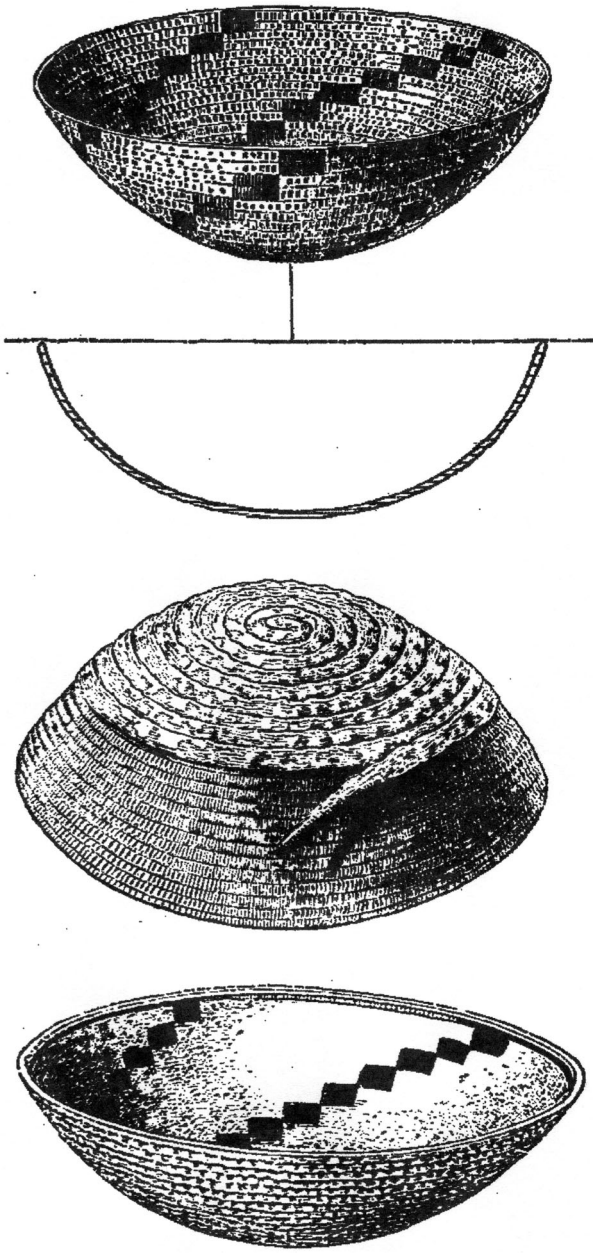

FIGURE 4. *Cushing's "evolution of forms" from basket to pot: (top) "food trencher of wicker-work"; (center) "food trencher of wicker-work inverted as used in forming food-bowls of earthen ware"; (bottom) "ancient bowl of corrugated ware." (Reproduced from Cushing 1886: figures 523–525, images in the public domain.)*

and binding essence; the essence is active and transferable through contact (Rozin and Nemeroff 1990:209–211). Similarity and contagion are often employed in routine practice simultaneously (Rozin and Nemeroff 1990:227); these are "performative-expressive" forms of magical thinking that communicate through metaphor and analogy to interpret the world (Tambiah 1990:58,136). Metaphor is the component of analogical reasoning that connects nonceramic containers to pottery vessels, and skeuomorphic copying replicates this understanding as solid metaphors.

In such cultural contexts, the skeuomorph as iconic representation is more than a means to reference the prototype; it is an active, practical, and necessary component of artifact production and performance. Magic is often instrumental in preindustrial crafting not because artisans are impractical but because magical thinking is the dominant cultural idiom in which technology is developed and applied (Gell 1988). Even when pottery production is no longer experimental or innovative, ceramic production activities may be accompanied by magic to influence outcomes (Rice 1987:124). To guarantee the proper functioning of the ceramic vessel, traditional potters following the similarity principle may have imitated the shape of the nonceramic container and added texture skeuomorphs because similarity was seen as a technological requirement for successful production. Acting on the contagion principle, potters may have copied shape and texture skeuomorphs to ensure the continued link between the completed pot and the nonceramic container molds and bindings brought into contact with the clay body during the production process.

SKEUOMORPHS AND THE ADOPTION OF INNOVATIONS

During the initial stages in the adoption of pottery, when ceramic vessels were novel objects, it cannot be assumed that the mechanical advantages of pottery vessels were always apparent to potential adopters. Early pottery was often low fired, easily broken, heavy, and required indirect heating for use in cooking (Reid 1989; Sassaman 2002; Schiffer and Skibo 1987). In many regions, wood, stone, gourd, basket, skin, and fiber containers continued to be used for similar purposes long after the adoption of pottery (Brown 1986:603; Driver and Massey 1957:229; Sassaman 2002:419–420). Moreover, traditions of food preparation are conservative and resistant to innovation (Farb and Armelagos 1980), so it is possible that the initial adoption of pottery in small-scale communities encountered opposition if it was perceived as disruptive to social norms (Sassaman 1995).

Under these circumstances, how did pottery come to be valued (in the general meaning of worth) and accepted? A crucial role skeuomorphism plays in technological change is to create acceptance of unfamiliar innovations by reference to objects with pre-existing value through the transfer of familiar design attributes from the prototype to the novel skeuomorph copy. The skeuomorph permits the viewer to assign a novel object to a pre-existing cultural category through metaphor, memory, and analogy. If the prototype referenced by the skeuomorph is valued, then the value may transfer to the novel object. But how does this transfer of value occur?

Experimental psychological research, summarized by Daniel Kahneman (2011), confirms that assigning a relative value to things and then making a choice of alternatives is strongly influenced by the social situations and physical environments in which the decision is made. Decisions are

often illogical, based on emotional responses to the social context. Decision-making entails Kahneman's System 1 and System 2 modes of thought. System 1 thinking is a fast, unconscious, emotional, and intuitive response. System 2 is a slower, logical rationalization. System 1 and 2 are sequential: perception of a situation, a System 1 response, followed by a System 2 assessment. The System 2 rationalization or logic occurs without conscious awareness of the System 1 bias. The research does not support many of the assumptions of rational-choice economic theory. Various forms of "cognitive bias" elicited by the circumstances of the decision-making environment lead to judgments about comparative value that are highly predictable. The cognitive bias most applicable to assigning value to a novel object rendered as a skeuomorph is the anchor effect. An *anchor* is a reference point (visual or verbal) that provides information that the decision maker then proceeds to overly rely on in making the decision. Anchoring is a form of suggestion (System 1), a "priming effect, which selectively evokes compatible evidence" to inform the decision maker (Kahneman 2011:122). In the case of skeuomorphs, the anchor is the design attribute (or attributes) that imitates a familiar valued prototype, and the observer's understanding of the skeuomorph metaphor supplies the "compatible evidence" (System 2). I suggest that the resulting anchor effect influences a potential adopter to be more favorably inclined toward a novel object if it is a skeuomorph than toward an alternative novelty without a familiar anchor.

Encounters with unfamiliar innovations trigger different emotional responses: traditionalists want the old, and "early adopters" want the new (Rogers 1983). As change is accommodated, some people may not want the same old objects, but others do not wish to relinquish the associated positive emotions. Within the social group, skeuomorphs are part of the social process that resolves this innovation dilemma. The signifying quality of skeuomorphs fosters acceptance of technology by creating value through evoking positive memories of familiar experiences associated with the prototype. Modern material culture illustrates this process. In the context of modern market capitalism, skeuomorphing of familiar design attributes is an intentional strategy to manipulate consumer emotions, either to render unfamiliar innovations less threatening or to signify an appealing association or connotation. For example, skeuomorphs are frequent in designs of personal digital technology, such as images of paper notebooks or rotary dials displayed on screen or early handheld PCs configured like calculators—all strategic imitations of familiar precursors. Nonfunctional architectural attributes on modern houses in the United States such as faux shutters and balconies, nonfunctioning lattice work or faux bindings on furniture, and faux wood veneers on automobiles are just some of the many skeuomorph anchors added to reference a past of traditional craftsmanship supported by patron wealth and status (and to obscure the fact of mass production). In the absence of commodity production, it is doubtful that ancient artisans created skeuomorphs as a strategy to sway adopters. As discussed previously, evidence suggests that skeuomorphic attributes produced in nonmarket societies originate as a production technology. However, the modern examples show that the power of skeuomorphs to positively influence the decision making of potential adopters has been thoroughly demonstrated.

Of course, the adoption and spread of new technology requires more than just individual responses; innovations must diffuse by copying the behavior of others (Bentley et al. 2011). The skeuomorph anchor is most attractive if it evokes a collective or social memory. Social memory refers to idealized conceptions of the past shared by members of a group, which are used by communities and leaders to rationalize social norms (Connerton 1989). The values associated with social memory may remain abstract or less cogent unless materialized with a physical reference point (DeMarris et al. 1996). Returning to pottery in traditional societies, where most material objects were produced and used in domestic contexts, early pottery was more acceptable as an invention and innovation in container technology if it was a skeuomorph that elicited a social memory of food and food preparation in time-honored ways. Because basket, wood, gourd, and fabric containers were familiar artifacts in the gathering, preparation, and consumption of food and antecedent to novel pottery containers, ceramic skeuomorphs of these objects were compelling references to valued social memories. Novel objects will gain wider acceptance if they serve social memory but also if the frame of reference expands so that groups can express identities through the new object; malleable ceramics are particularly accessible to archaeologists for understanding this process (e.g., LeCount 2010). Skeuomorphism allows individuals to satisfy emotional ties to past values while creating new value that allows expressions of new shared identities. That skeuomorphs may persist for generations after ceramic vessels ceased to be unfamiliar innovations is unsurprising. Successive copying of the skeuomorphic attributes created traditions maintained by social memories and norms, perhaps even without acknowledgment or knowledge of the original logic of the practice.

One more contemporary example, close to our focus on container technology, reveals how skeuomorphs enable social memory and shared identity in the context of technological change. A *tinaja* is a traditional ceramic water jar in Guatemala (Reina and Hill 1978). In recent decades, a plastic tinaja has become available that is a skeuomorph of the original with the same size, shape, and function (Figure 5). Compared to the ceramic tinaja, the plastic skeuomorph is lighter, cheaper, unbreakable, and comes in a choice of colors. By these measures, mechanical performance efficiency increased, but there was still a need to reference the traditional form to communicate and acknowledge social memory and shared identity. It is also possible that the plastic tinaja holds an additional attraction for some

FIGURE 5. *A plastic* tinaja *reproduced in the same form as the traditional ceramic vessel. (Photograph by Lisa J. LeCount, used with permission.)*

individuals: with the change in compositional material, the plastic version may be associated with positive attitudes toward the modernity that produced it and with the idea that to possess a relatively "special" tinaja signals a desirable status. This observation leads us to the final aspect of skeuomorphism active in technological change: that skeuomorphs can generate scales of value that motivate acceptance of innovations.

SKEUOMORPHS AND SCALES OF VALUE

Skeuomorphs evoke valued social memories and shared identities linked to the prototype. The signifying attributes of skeuomorphs applied to novel objects suggest that a social performance value—such as how, where, and by whom the object was used—is as attractive as a mechanical performance value to the potential adopter. Skeuomorphs extend the frame of reference that assigns value from familiar to novel objects, and they create new social performance value by association and connotation. The imitative and representational character of skeuomorphism makes it a significant mechanism of the value creation present in technological change.

Value categories increase when the same artifact form is copied across different physical materials. The change in the compositional material produces a new variant of a familiar object by altering color, luster, texture, and other physical properties. Although different physical materials produce sensory contrasts, the skeuomorph copy retains the iconic attributes that reference the prototype. A different material composition of a familiar object presents a paradox for the observer: it is the same, but it is different. If the skeuomorph copy in the new material is a novelty, a comparison is made to the familiar prototype, which must be re-evaluated relative to the new copy. If the skeuomorph copies come in multiple contrasting physical materials—fiber, wood, clay, stone, metal—this re-evaluation may be expressed as a rank order or scale of worthiness and desirability.

The source of the new value is not confined to the sensory contrasts or other physical qualities of the compositional material because this reevaluation process is inseparable from a cultural context (Papadopoulos and Urton 2012:31). The metaphorical meanings of the objects change and multiply with the act of copying and the social performance. Similar objects replicated in different compositional materials often have different values due to mechanical utility, material scarcity, and the labor and skill required to obtain the material and produce the item. But for potential adopters encountering the unfamiliar innovation, an association with social peers or influential people is an initial and powerful source of information about the value of objects and the associated technology. Studies in small-scale societies indicate that a mechanical performance or cost–benefit assessment of an unfamiliar innovation is less important to potential adopters than the opportunity to imitate a social peer or influential person who has adopted the novelty; in part, this is because potential adopters do not have sufficient experience to evaluate the novel artifact's mechanical performance characteristics (Henrich 2010:103, 108).

Here we see the relevance of ceramic skeuomorphs to social theories of pottery origins and adoption. Social models propose that pottery originated not as a common culinary tool but, rather, as a "prestige technology" for feasting (Hayden 1998). The potential for ceramic skeuomorphs to create a scale of prestige value relative to nonceramic containers has not gone unnoticed by archaeologists (Clark and Gosser 1995:216–217; Hayden 1998:43–45; Knappett et al. 2010). In metaphorical terms, the novel ceramic pot skeuomorphing a gourd becomes a "special" gourd with the capacity to confer prestige value through possession (Houston 2014:64–65). The social performance context for constructing the value scale is the manipulation of objects with vital meanings, such as social memory and shared identity. The value is not intrinsic to the object; rather, it is situational and negotiable. In making this observation, I follow the lead of a number of archaeologists who have suggested that value is a relational construct that emerges out of an active, reciprocal intersection of people and things, which results in social categories (Papadopoulos and Urton 2012). The scale of value created by skeuomorphs can be extended from object to person by possession along the scale of value to convey social distinctions. The higher value placed on the quality of "specialness" initiates the circular logic basic to the materialization of social differentiation: people with special objects are special people.

CONCLUSIONS

Skeuomorphism is a cross-cultural phenomenon of technological change in material culture. The skeuomorph may duplicate the prototype model in part or in its entirety, may or may not serve utilitarian functions, but always references the prototype through imitation. Skeuomorphs are

iconic signs that signify the prototype by similarity. Because skeuomorphs imitate prototypes, archaeologists can identify and trace historical relatedness in forms through time by seriation. Through a careful examination of this relationship with archaeological examples of pottery vessels and evidence from ethnography, psychology, and modern material culture, I propose that skeuomorphism enables adoption of innovative artifacts in several ways.

In nonmarket societies, skeuomorphs originate in the production process of the derivative object. This occurs because similarity is perceived to be an active component of technology, and maintaining a connection to the prototype expressed through similarity is considered necessary to the successful creation of the object. When familiar design attributes of prototypes are transferred to unfamiliar derivative objects, the signifying quality of skeuomorphs allows potential adopters to assign novel objects to pre-existing cultural categories associated with positive emotions and memories. In this way, skeuomorphs render novel objects more desirable and less threatening by reducing an individual's perception of risk in accepting an unfamiliar innovation. Skeuomorphs allow similar objects to be ranked on a relative scale of worthiness through the contrast in different physical materials that compose prototypes and derivative copies. This creation of value by an ordered set of similar objects furthers adoption of unfamiliar innovations because it provides a motivation to acquire novel facsimiles that confer prestige through possession.

In presenting the evidence for skeuomorphism in early pottery, I am not claiming that ancient peoples were uninterested in how pots met practical needs. Instead, the ubiquity of skeuomorphism in pottery, as in many other artifacts, suggests that prototype design attributes were copied in a process of social performance that complemented and supported the utilitarian benefits of technological change. I urge those who wish to understand technological change to incorporate skeuomorphism into their explanatory frameworks.

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NOTES

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REFERENCES CITED

Aikens, Melvin C.
1995 First in the World: The Jomon Pottery of Early Japan. *In* The Emergence of Pottery: Technology and Innovation in Ancient Societies. William K. Barnett and John W. Hoopes, eds. Pp. 11–21. Washington, DC: Smithsonian Institution.

Andrews, R. L., and James M. Adovasio
1996 The Origin of Fiber Perishables Production East of the Rockies. *In* A Most Indispensable Art: Native Fiber Industries from Eastern North America. James B. Petersen, ed. Pp. 30–49. Knoxville: University of Tennessee Press.

Arnold, Phillip J., III
1991 Domestic Ceramic Production and Spatial Organization: A Mexican Case Study in Ethnoarchaeology. Cambridge: Cambridge University Press.

Balfour, Henry
1893 The Evolution of Decorative Art. London: Rivington and Percival.

Barley, Nigel
1994 Smashing Pots: Feats of Clay from Africa. London: British Museum.

Barnett, William K., and John W. Hoopes, eds.
1995 The Emergence of Pottery: Technology and Innovation in Ancient Societies. Washington, DC: Smithsonian Institution.

Bentley, Alex, Mark Earls, and Michael J. O'Brien
2011 I'll Have What She's Having: Mapping Social Behavior. Cambridge, MA: MIT Press.

Boulanger, Matthew T., and Corey M. Hudson
2012 Assessment of the Gripability of Textured Ceramic Surfaces. American Antiquity 77(2):293–302.

Broodbank, Cyprian
2000 An Island Archaeology of the Early Cyclades. New York: Cambridge University Press.

Brown, James A.
1986 Early Ceramics and Culture: A Review of Interpretations. *In* Early Woodland Archaeology. Kenneth B. Farnsworth and Thomas E. Emerson, eds. Pp. 598–608. Kampsville: Center for American Archaeology.

Childe, Gordon V.
1948 [1936] Man Makes Himself. London: C. A. Watts.

Clark, J. Grahame D.
1952 Prehistoric Europe: The Economic Basis. London: Methuen.

Clark, John E., and Dennis Gosser
1995 Reinventing Mesoamerica's First Pottery. *In* The Emergence of Pottery: Technology and Innovation in Ancient Societies. William K. Barnett and John W. Hoopes, eds. Pp. 209–221. Washington, DC: Smithsonian Institution.

Close, Angelia E.
1995 Few and Far Between: Early Ceramics in North Africa. *In* The Emergence of Pottery: Technology and Innovation in Ancient Societies. William K. Barnett and John W. Hoopes, eds. Pp. 23–37. Washington, DC: Smithsonian Institution.

Colley March, H.
1889 The Meaning of Ornament, or Its Archaeology and Its Psychology. Transactions of the Lancashire and Cheshire Antiquarian Society 7:160–192.

Connerton, Paul
1989 How Societies Remember. Cambridge: Cambridge University Press.

Cushing, Frank H.
1886 A Study of Pueblo Pottery as Illustrative of Zuni Culture-Growth. Fourth Annual Report of the Bureau of Ethnology. Pp. 467–521. Washington, DC: Smithsonian Institution.
DeMarris, Elizabeth, Luis Jaime Castillo, and Timothy Earle
1996 Ideology, Materialization, and Power Strategies. Current Anthropology 37(1):15–31.
Driver, Harold E., and William C. Massey
1957 Comparative Studies of North American Indians. Transactions of the American Philosophical Society 47(2):165–456.
Drooker, Penelope B.
1992 Mississippian Village Textiles at Wickliffe. Tuscaloosa: University of Alabama Press.
Erickson, David L., Bruce D. Smith, Andrew C. Clarke, Daniel H. Sandweiss, and Noreen Tuross
2005 An Asian Origin for a 10,000-Year-Old Domesticated Plant in the Americas. Proceedings of the National Academy of Sciences of the United States of America 102(51):18315–18320.
Farb, Peter, and George Armelagos
1980 Consuming Passions: The Anthropology of Eating. Boston: Houghton Mifflin.
Frazer, James George
1951 [1890] The Golden Bough: A Study in Magic and Religion. Abridged edition. New York: Macmillan.
Garraty, Christopher P.
2011 The Origins of Pottery as a Practical Domestic Technology: Evidence from the Middle Queen Creek Area. Journal of Anthropological Archaeology 30(2):220–234.
Gell, Alfred
1988 Technology and Magic. Anthropology Today 4(2):6–9.
1998 Art and Agency: An Anthropological Theory. Oxford: Clarendon.
Gessler, Nicholas
1998 Skeuomorphs and Cultural Algorithms. *In* Evolutionary Programing VII: Proceedings of the Seventh International Conference on Evolutionary Programing. Pp. 229–238. Berlin: Springer-Verlag.
Gheorghiu, Dragos
2008 The Emergence of Pottery. *In* Prehistoric Europe: Theory and Practice. Andrew Jones, ed. Pp. 164–192. Malden: Wiley-Blackwell.
Haddon, Alfred C.
1902 Evolution in Art as Illustrated by the Life-Histories of Designs. New York: Charles Scribner's Sons.
Harris, Marvin
1968 The Rise of Anthropological Theory: A History of Theories of Culture. New York: Harper and Row.
Hayden, Brian
1998 Practical and Prestige Technologies: The Evolution of Material Systems. Journal of Archaeological Method and Theory 5(1):1–55.
Henrich, Joseph
2010 The Evolution of Innovation-Enhancing Institutions. *In* Innovation in Cultural Systems: Contributions from Evolutionary Anthropology. Michael J. O'Brien and Stephen J. Shennan, eds. Pp. 99–120. Cambridge, MA: MIT Press.
Hodder, Ian
1998 Creative Thought: A Long-Term Perspective. *In* Creativity in Human Evolution and Prehistory. Steven Mithen, ed. Pp. 61–77. Oxford: Routledge.
Holmes, William H.
1884 Prehistoric Textile Fabrics of the United States Derived from Impressions on Pottery. Third Annual Report of the Bureau of American Ethnology. Pp. 393–425. Washington, DC: Smithsonian Institution.
1886 Origin and Development of Form and Ornament in Ceramic Art. Fourth Annual Report of the Bureau of American Ethnology. Pp. 437–466. Washington, DC: Smithsonian Institution.
1903 Aboriginal Pottery of the Eastern United States. Twentieth Annual Report of the Bureau of American Ethnology. Pp. 1–201. Washington, DC: Smithsonian Institution.
Houston, Stephen
2014 The Life Within: Classic Maya and the Matter of Permanence. New Haven: Yale University Press.
Jones, George T., Robert D. Leonard, and Alysia L. Abbott
1995 Evolutionary Archaeology: Methodological Issues. Patrice A. Teltser, ed. Pp. 13–32. Tucson: University of Arizona Press.
Kahneman, Daniel
2011 Thinking, Fast and Slow. New York: Farrar, Straus, and Giroux.
Knappett, Carl
2002 Photographs, Skeuomorphs and Marionettes: Some Thoughts on Mind, Agency and Object. Journal of Material Culture 7(1):97–117.
Knappett, Carl, Lambros Malafouris, and Peter Tomkins
2010 Ceramics (as Containers). *In* The Oxford Handbook of Material Culture Studies. Dan Hicks and Mary C. Beaudry, eds. Pp. 588–612. Oxford: Oxford University Press.
Kroeber, Alfred
1919 On the Principle of Order in Civilization as Exemplified by Changes in Fashion. American Anthropologist 21(3): 253–263.
LeCount, Lisa J.
2010 Mount Maloney People? Domestic Pots, Everyday Practice, and the Social Formation of the Xunantunich Polity. *In* Classic Maya Provincial Politics: Xunantunich and Its Hinterlands. Lisa J. LeCount and Jason Yaeger, eds. Pp. 209–230. Tucson: University of Arizona Press.
Mouzon, Stephen A.
2004 Traditional Construction Patterns: Design and Detail Rules of Thumb. New York: McGraw-Hill.
Neiman, Fraser D.
1995 Stylistic Variation in Evolutionary Perspective: Inferences from Decorative Diversity and Interassemblage Distance in Illinois Woodland Ceramic Assemblages. American Antiquity 60(1):7–36.
O'Brien, Michael J., and Robert D. Leonard
2001 Style and Function: An Introduction. *In* Style and Function: Conceptual Issues in Evolutionary Archaeology. Teresa D. Hurt and Gordon F. M. Rakita, eds. Pp. 1–23. Westport: Bergin and Garvey.

O'Brien, Michael J., and R. Lee Lyman
2000 Applying Evolutionary Archaeology: A Systematic Approach. New York: Kluwer Academic.
2002 Seriation, Stratigraphy, and Index Fossils: The Backbone of Archaeological Dating. New York: Kluwer Academic.
Ortman, Scott G.
2000 Conceptual Metaphor in the Archaeological Record: Methods and an Example from the American Southwest. American Antiquity 65 (4):613-645.
Oxford English Dictionary Onlinee
2015 Skeuomorph. http://www.oed.com, accessed March 13, 2015.
Papadopoulos, John K., and Gary Urton, eds.
2012 The Construction of Value in the Ancient World. Los Angeles: Cotsen Institute of Archaeology.
Peirce, Charles S.
1955 Logic as Semiotic: The Theory of Signs. *In* Philosophic Writings of Peirce, Justus Buchler, ed. Pp. 98–119. New York: Dover.
Petersen, James B., ed.
1996 A Most Indispensable Art: Native Fiber Industries from Eastern North America. Knoxville: University of Tennessee Press.
Petrie, Flinders W. M.
1901 Diospolis Parva: The Cemeteries of Abadiyeh and Hu, 1898–1899. Egypt Exploration Fund Memoir, 20. London: Egypt Exploration Fund.
Pierce, Christopher D.
2005 Reverse Engineering the Ceramic Cooking Pot: Cost and Performance Properties of Plain and Textured Vessels. Journal of Archaeological Method and Theory 12(2):117–157.
Pinker, Stephen
2007 The Stuff of Thought: Language as a Window into Human Nature. New York: Viking.
Pitt-Rivers, Lane-Fox A.
1906 The Evolution of Culture and Other Essays. Oxford: Clarendon.
Preucel, Robert W.
2006 Archaeological Semiotics. Malden: Blackwell.
Puetz, Michael
2002 Mimesis. The Chicago School of Media Theory. http://csmt.uchicago.edu/glossary2004/mimesis.htm, accessed June 24, 2015.
Purdy, Barbara A.
1991 The Art and Archaeology of Florida's Wetlands. Boca Raton: CRC.
Reid, Kenneth C.
1989 A Materials Science Perspective on Hunter-Gatherer Pottery. *In* Pottery Technology: Ideas and Approaches. George Bronitsky, ed. Pp. 167–180. Boulder: Westview.
Reina, Ruben E., and Robert M. Hill II
1978 The Traditional Pottery of Guatemala. Austin: University of Texas Press.
Rice, Prudence M.
1987 Pottery Analysis: A Sourcebook. Chicago: University of Chicago Press.
1999 On the Origins of Pottery. Journal of Archaeological Method and Theory 6(1):1–54.
Rogers, Everett M.
1983 Diffusion of Innovations. Third edition. New York: Free Press.
Roosevelt, A. C.
1995 Early Pottery in the Amazon: Twenty Years of Scholarly Obscurity. *In* The Emergence of Pottery: Technology and Innovation in Ancient Societies. William K. Barnett and John W. Hoopes, eds. Pp. 115–131. Washington, DC: Smithsonian Institution.
Rozin, Paul, and Carol Nemeroff
1990 The Laws of Sympathetic Magic: A Psychological Analysis of Similarity and Contagion. *In* Cultural Psychology: Essays on Comparative Human Development. James W. Stigler, Richard A. Shweder, and Gilbert Herdt, eds. Pp. 205–232. Cambridge: Cambridge University Press.
Rye, Owen S.
1981 Pottery Technology: Principles and Reconstruction. Washington, DC: Taraxacum.
Sandars, N. K.
1968 Prehistoric Art in Europe. Baltimore: Penguin.
Sassaman, Kenneth E.
1995 The Social Contradictions of Traditional and Innovative Cooking Technologies in the Prehistoric American Southeast. *In* The Emergence of Pottery: Technology and Innovation in Ancient Societies. William K. Barnett and John W. Hoopes, eds. Pp. 223–240. Washington, DC: Smithsonian Institution.
2002 Woodland Ceramic Beginnings. *In* The Woodland Southeast. David G. Anderson and Robert C. Mainfort Jr., eds. Pp. 398–420. Tuscaloosa: University of Alabama Press.
Schiffer, Michael B.
1990 The Influence of Surface Treatment on Heating Effectiveness of Ceramic Vessels. Journal of Archaeological Science 17(4):373–381.
Schiffer, Michael B., and James M. Skibo
1987 Theory and Experiment in the Study of Technological Change. Current Anthropology 28(5):595–622.
1997 The Explanation of Artifact Variability. American Antiquity 62(1):27–50.
Schiffer, Michael B., James M. Skibo, Tamara C. Boelke, Mark A. Neupert, and Meredith Aronson
1994 New Perspectives on Experimental Archaeology: Surface Treatments and Thermal Response of the Clay Cooking Pot. American Antiquity 59(2):197–217.
Shepard, Anna O.
1980 [1956] Ceramics for the Archaeologist. Carnegie Institution of Washington, 609. Ann Arbor: Braun Brumfield.
Sherratt, Andrew
1997 Instruments of Conversion? The Role of Megaliths in the Mesolithic-Neolithic Transition in North-West Europe. *In* Economy and Society in Prehistoric Europe. Andrew Sherratt, ed. Pp. 354–371. Princeton: Princeton University Press.

Skibo, James M., and Eric Blinman
1999 Exploring the Origins of Pottery on the Colorado Plateau. *In* Pottery and People: A Dynamic Interaction. James M. Skibo and Gary M. Feinman, eds. Pp. 171–183. Salt Lake City: University of Utah Press.

Skibo, James M., Tamara Butts, and Michael B. Schiffer
1997 Ceramic Surface Treatment and Abrasion Resistance: An Experimental Study. Journal of Archaeological Science 24(4):311–317.

Skibo, James M., and Michael B. Schiffer
2008 People and Things: A Behavioral Approach to Material Culture. New York: Springer.

Steadman, Philip
1979 The Evolution of Designs: Biological Analogy in Architecture and the Applied Arts. Cambridge: Cambridge University Press.

Tambiah, Stanley Jeyaraja
1990 Magic, Science, Religion, and the Scope of Rationality. Cambridge: Cambridge University Press.

Taussig, Michael
1993 Mimesis and Alterity. New York: Routledge.

Taylor, Timothy
2007 Skeuomorphism. *In* What Are You Optimistic About? Today's Leading Thinkers on Why Things Are Good and Getting Better. John Brockman, ed. Pp. 300–301. New York: HarperCollins.

Tilley, Christopher
1999 Metaphor and Material Culture. Oxford: Blackwell.

Wallis, Neill J.
2013 The Materiality of Signs: Enchainment and Animacy in Woodland Southeastern North American Pottery. American Antiquity 78(2):207–226.

Wu, Xiaohong, Chi Zhang, Paul Goldberg, David Cohen, Yan Pan, Trina Arpin, and Ofer Bar-Yosef
2012 Early Pottery at 20,000 Years Ago in Xianrendong Cave, China. Science 336(6089):1696–1700.

Young, Lisa C., and Tammy Stone
1990 The Thermal Properties of Textured Ceramics: An Experimental Study. Journal of Field Archaeology 17(2):195–203.