



Article

Use, Purpose, and Function—Letting the Artifacts Speak

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Abstract: Archaeologists have likely collected, as a conservative estimate, billions of artifacts over the course of the history of fieldwork. We have classified chronologies and typologies of these, based on various formal and physical characteristics or ethno-historically known analogues, to give structure to our interpretations of the people that used them. The simple truth, nonetheless, is that we do not actually *know* how they were used or their intended purpose. We only make inferences—i.e., educated guesses based on the available evidence as we understand it—regarding their functions in the past and the historical behaviors they reflect. Since those inferences are so fundamental to the interpretations of archaeological materials, and the archaeological project as a whole, the way we understand materiality can significantly bias the stories we construct of the past. Recent work demonstrated seemingly contradictory evidence between attributed purpose or function versus confirmed use, however, which suggested that a basic premise of those inferences did not empirically hold to be true. In each case, the apparent contradiction was resolved by reassessing what *use*, *purpose*, and *function* truly mean and whether certain long-established functional categories of artifacts were in fact classifying by function. The resulting triangulation, presented here, narrows the scope on such implicit biases by addressing both empirical and conceptual aspects of artifacts. In anchoring each aspect of evaluation to an empirical body of data, we back ourselves away from our assumptions and interpretations so as to let the artifacts speak for themselves.

Keywords: empiricism; materiality; archaeological theory; Maya

1. Introduction

Every day, without pause, we select certain items, with (or perhaps without) preferred qualities, to perform some task. Whether or not the selected item was the ideal choice, the proper design for the task, selected for expedience, or even the right tool for the job, in the end the object was used to perform the task at hand. The logic behind this act is known to us, our intentions describable, and merely one among the numerous choices made that day. Our personal rationale for why the coffee cup on the desk is holding pens and not coffee is known and explainable. We might acknowledge, if pressed, that the true purpose of a coffee mug is to hold coffee and not pens—thus violating that intended purpose—but no one is likely to raise any substantial objections or be mystified by our actions. The function of that mug (regardless of original purpose) is now to hold pens and not coffee, and that is how it will be perceived by those around us as well. In our daily lives, we see no contradictions to such behavior and so books frequently become doorstops and paperweights, while mugs proliferate across the desk holding pens.

Why then, as archaeologists, would we look at an artifact and accept that its type determines its use? ... that its form dictates its function? ... that its decoration necessarily imparts specific meaning or purpose to the object itself? If human nature, need, adaptability, and innovation were as dynamic as they are now—since people have always been people—then interpreting artifacts and assemblages is a multifaceted question of purposes, uses, and functions beyond formal descriptions and typologies. Archaeologically, we have a complicated task describing the actual life of artifacts. Granted, this is hardly a novel observation. Archaeologists have been discussing the contextual interpretations of artifacts, and the behaviors they reflect, since the outset.

In recent years, there has been a renewed interest and theoretical trend toward recognizing the interplay between the materiality of objects and the contextual perceptions—both past and present—that give rise to meaningful interpretations (e.g., [1–7]). The goal of those interpretations is to present our best understanding of what people were doing in the past and *why* they did so. Most importantly, we want to ensure that we are not imposing *our* “why” onto or in place of theirs, while diligently and rigorously supporting any assertions we make. Despite the discipline’s reflexive concerns over ideologically decolonizing the archaeological project, there has been something of a shortage of *pragmatic* methodologies for bridging conceptual gaps between culturally grounded intentions of people in the past and the intentions of those in the present. We cannot, ultimately, ask ancient people *why* their mug was holding a pen.

Theoretical lenses such as “symmetry” (e.g., [8–11]), “entanglement” (e.g., [12]), or “material engagement” (e.g., [13,14]) may serve to assuage our (justifiable) concern that archaeologists are carelessly tromping through the homes of other people’s ancestors, but none proposes how to give an *emic* indigenous voice *to* those ancestors. Instead, we theorize a methodological distinction between the analytical evaluation of artifacts and the qualitative inferences of interpretations and meanings. We can only observe that mugs seem to hold coffee or pens more or less often than not, then extend that as an inference to the intentions regarding both purpose and function for objects of that type or form.

Unfortunately, that approach easily conflates uses, purposes, and functions as relatively synonymous in the interpretations of artifacts. This is particularly evident in functional typologies for artifact classification. Function is generally attributed through a combination of physical characteristics and analogous forms, which is then imputed to both an artifact’s purpose and its use. Likewise, if texts, images, or ethnographic parallels can be found seeming to give explicit indications of any of the above (appearing to make those intangible intentions clear), what archaeologist would *not* take that as conclusive?

But... should we? We would likely still refer to our hypothetical container of pens as a “coffee mug” and not a “pen mug” regardless of the change in use. The mug may easily revert to holding coffee, or something else altogether, without significantly contradicting its prior use *or* its initial purpose. This is not true for all objects, however. For some, the purpose and function is held relatively sacrosanct irrespective of any other possible uses. For the former (i.e., our mug), purpose is insufficiently determining to wholly constrain its use or function. For the latter, perhaps an item of ritual or ideological significance, purpose overrides any practical range of functions and thereby determines its possible uses. This suggests a certain independence between intentionality and pragmatics that is not adequately appreciated in current approaches to interpreting artifacts and the materiality of behavior.

The problem is that use, purpose, and function are not truly synonymous. *Use* relates to actions, *purpose* to intentions, and *function* to technical capabilities. From our hypothetical examples, we can see that neither *purpose* nor *use* can necessarily be inferred directly from the other, while *function* is dependent on the perceptions of both. Instead, each aspect appears to be simultaneously determined by the *combination* of the others. This implies that *use*, *purpose*, and *function* are a system of independent normative dimensions whose interactions describe the scope of an artifact’s materiality. By recognizing the distinctions and interactions between these dimensions, we will outline a better methodology for reconciling intentionality and pragmatics. To do so, we will begin with describing how common practices in artifact typology can exacerbate the difficulties of materiality and present two curious

case studies that illustrate the problem. We will then look at some of the rationale behind theories of materiality, followed by a description of our model and its application.

In other words, archaeologists might not need to travel in time to ask why the mug was holding pens if use, purpose, and function are interrelated characteristics intrinsic to the object. The answer, if we can understand it, has already been given.

2. Functional Typology and the Lure Of Analogy

Our hypothetical mug is, of course, only one object. Archaeologists often collect hundreds or thousands of artifacts from a relatively small excavation. Conservation labs and museum collections can amass well into the millions of individual objects. Moreover, the vast majority of cultural materials collected from archaeological excavations are merely fragments, and it is not always obvious what the original artifact might have been. As a simple matter of practicality, we cannot always address every object *as* an individual artifact. Instead, we have to find ways to classify and categorize artifacts by generalized characteristics, aggregating like with like, as an assigned object type.

The most obvious systems of artifact classification, and perhaps the oldest, consist of classifying by physical and formal characteristics. These are, typically, further subdivided by stylistic or decorative commonalities that are in turn commonly identified by geographic regions and/or period of time. As a practical matter of data management this is both necessary and productive, but there is a hidden catch. It becomes very easy to implicitly ascribe, rather than derive from the things themselves, their uses and functions and purposes based on our contemporary perceptions of the analogous categories. The map easily becomes mistaken for the territory.

The use (and abuse) of inference by analogy has a long and storied history of debates in archaeology (see [15–20]), particularly when it comes to experimental or ethnographic analogy of artifact function. We do not intend to rehash those debates here, except to raise a specific exception with common approaches to functional typology. Our reasons for this will become clearer from our discussions below, but the essence of our objection is that the underlying premise of functional typology flattens much of the potential diversity in material behaviors more often than not. The problem begins with the conflation of *formal* typology with *functional* typology.

All systems of classification are inherently reductionist, since the generalization of traits is just that—finding an optimal reduction of within-class variation for a specific selection of traits that can then be cleanly separated into categories. Inasmuch as those traits are directly observable (e.g., size, shape, material, manufacture, surface treatment), such *formal* classification is immanently necessary and useful. Functional traits, however, are *not* observable. Function entails the evaluation and selection of the *potential* utility of an object's formal characteristics by the designer and/or user of that object. Since evaluation and selection involve some aspect of intention (i.e., an unobservable trait), function cannot be directly ascribed from form alone. Although we might *infer* a range of potential function from the utility of its formal observable traits, the *specific* function of the object is a matter of interpretation rather than observation.

Where this becomes even more problematic is in the incorporation of analogy into functional classification, whether by ethnographic and ethno-historical comparison or by common or implicit perceptions related to a specific artifact form. Analogy is, of course, a very useful tool for inference but can also easily mislead. Analogy only gives an *illusory* sense of observation. By this, we mean that the observer sees an activity “X” being performed with an object *similar to* object “Y”, which implies that “X” could be done with “Y”. While this may be useful for exploring the range of *possible* functions for an artifact, it does not intrinsically constrain function *to* that analogous use. In short, the use of analogy can only suggest, support, or refute *inferences* and help generate hypotheses. Much like first impressions, the illusion of observation can be (and often is) stubbornly persistent. Such analogies can quickly become attached to an entire class of artifact, solely by virtue of this appearance of “proxy” empiricism, and become “common” knowledge. They remain, however, inferences at best and assumptions at worst—neither of which is an especially solid foundation for typology.

The two examples below illustrate the interpretive consequences of conflating form and function, privileging perception over observation, and confusing map for landscape. In the first case, the standing functional interpretation for a specific class of vessel was found to be grounded more on impressions and expectations than on evidence [7]. For the second example, what now appears to be its own class of artifact had long gone relatively under-appreciated by being subsumed under a broad classification [21]. Both are situations in which the interpretations for the broader intersections of object and behavior surrounding an artifact had been obscured by the practices of archaeology itself. The voices of the archaeologists did not leave room for the object to get a word in.

2.1. The Curious Case of “The Missing Chocolate”

The first case study involves a well-known type of elite-owned Classic Period Mayan cylinders (AD 550–900), commonly referred to as “chocolate” vases or pots (Figure 1). These cylindrical vessels are typically tall, thin-walled, straight-sided containers ranging in size from a hand-held cup to ones large enough to hold two or more liters of liquid. These particular vessels bear hieroglyphic texts stating something like “his/her drinking vessel/instrument for cacao”. These same vessels are often decorated with beautiful scenes of ritual events or palace life. The vessel form is broadly cup-shaped, tends to bear decoration that has to do with food and ritual, and often mentions a known foodstuff (typically maize or cacao) in the glyphic text found along the rim known as either the Primary Standard Sequence (PSS) or the dedicatory sequence (see [22–24]).



Figure 1. Example of a Mayan vase bearing hieroglyphic text. Image courtesy of Justin Kerr K5229.

In the 1980s, the interpretation of these vessels as fancy drink-ware for chocolate was corroborated with the positive identification of the biomarkers for cacao (i.e., alkaloids *Theobromine* and *Theophylline*) by Hurst et al. [25] in the Rio Azul vessel. Although the Rio Azul is a lidded storage vessel rather than one of the cylindrical vases, it was the first identification of a text-bearing vessel with matching residues, having *kakaw*—“cacao”—written twice in hieroglyphics. With that evidence of text naming vessel content, it seemed reasonable to conclude that the vases also likely held what the texts identified and were therefore used for drinking just as the glyphs seemed to say. Truthfully, if our modern minds

did not immediately put together the likely scenario of someone drinking the named substance out of that vessel, it would be odd.

The problem emerged when no subsequent residue study chemically identified the biomarkers of cacao in *any* of the hieroglyphically labeled cylinders. Other unlabeled cup-shaped vessels had tested positive for cacao's alkaloid traces, but no labeled ones tested positive aside from the Rio Azul. The chemical methods of identifying the relevant alkaloids employed in the analyses were well-established and consistent with proven techniques, but numerous factors can affect the preservation or contamination of organic residues. Although considerations of organic preservation and deterioration cannot be fully discussed here (consider [26–28]), they were thoroughly addressed in the research agendas. Ancient American pottery was not fired in a kiln, and therefore remains rather porous. This means that, in some cases at least, we should be able to find viable residues absorbed into the ceramic fibers within the vessel walls even if surface residues are not found.

In fact, residues were being found in various vessel forms and the variety of residues that could be detected was expanding as the techniques were refined and the methods were applied more widely. Even still, there were no further examples of cacao in a labeled vessel other than the Rio Azul. Not surprisingly, few of the labeled cylindrical vessels had been tested prior to 2007, in part because the Rio Azul vessel had made the question somewhat moot—the vases' text said they were for the drinking of cacao, and the Rio Azul had seemed to confirm it. The persistent lack of finds, however, made three possibilities clear: (1) not a large enough sample of cylinders had been examined; (2) the cylinders held something else; and/or (3) these vessels never held anything.

At this point, well over a hundred of the labeled “chocolate” vases have been tested, and none have found any of the biomarkers consistent with cacao. The lack of cacao residues was not, however, the only inconsistency suggesting there may be a problem with the standard interpretation of the “chocolate” vases. Squaring the lack of chemical evidence with the common interpretation started a cascade of other questions. There was no staining of the porous interiors that would result from evaporation or absorption of a liquid, but instead some showed areas of vertical abrasion and pocking as though they held something dry rather than liquid. The diverse sizes and shapes range from small cups to very large containers (e.g., more than one liter), suggesting drinking from many of these vessels would at best be an awkward proposition. Other vessels had been repaired during ancient times in such a way (e.g., crack-lacing) that would render them unusable for holding liquids. Even without such repairs, the interior surface treatment (e.g., burnish or slip) combined with the high porosity of the vessel walls would have caused a significant amount of liquid to be absorbed [7].

We are left, then, with a collection of vessels whose purpose was “for drinking” but are often in sizes that are not necessarily ideal to drink from, or apparently ideal for holding a liquid for any great duration. We have texts on those vessels that say they are for cacao, and yet they show no traces at all of the cacao beverages they ostensibly contained. The contemporary interpretation as elite drinking vessels presumes both to be true, but the empirical data on use contradict both the purported purpose (i.e., cacao vessels) and function (i.e., drinking vessels). We can, however, assume that the ancient Maya knew *exactly* what they meant by the text, used the vessels in *just* the manner they intended, and that the vases functioned in *precisely* that manner. It is only the *interpretation* of text, vessel, and intentions that are conflicted. Instead, we need to consider what viable interpretations are possible for all of the above while accounting for *all* of the empirical data. What else might “for drinking of cacao” mean if it is *not* referring to the act of drinking cacao from the vessel itself? If there is a logical way to answer the question that is not self-contradictory, then that answer makes for the stronger interpretation.

2.2. When Is a Flask Not a Flask? When It is a “House”

Small objects, even those impeccably crafted, tend to garner less notice than the large and ornate artifacts or monuments. Curiously, these small objects can be deceptively complex in their broader importance. One such class of small-ish artifact are the Classic Period flask containers. These flasks were commonly referred to as poison bottles, pilgrim's flasks, *veneneras*, pigment bottles,

medicine bottles, or snuff bottles (see, for example [29–33]). Some of these names seem to imply distinct uses, while others borrow by analogy from specific ethnographic traditions. Present in many collections, most were described in catalogs and reports in passing—curious and beautiful, but not overly interesting.

One such small flask in particular showed that maybe not all “poison bottles” were the same. In 2012, one of these small flasks (Figure 2) was found to hold the chemical traces of processed tobacco (primarily nicotine, see [34]). More remarkably, there was glyphic text on the flask that read *y-otoot* ‘*u-mahy*—“the home of his/her tobacco.” In what is effectively the opposite of the previous case study, this was a case of content and text matching when it was not necessarily expected and a class of vessels for which the purpose, use, and function had been *under*-specified rather than presumptively ascribed [21]. Finding nicotine residue matching up with ‘*u-mahy* “tobacco” would have been interesting enough, but it also became quickly apparent that there was something curious to the use of *y-otoot*—“home of”—in the text. A number of similar flasks have inscriptions suggesting that at least some were also the ‘*otoot*—“home”—of something ([35], p. 8), while other flask-like vessels were actually designed to look like thatched-roof houses.



Figure 2. Mayan flask bearing the hieroglyphic text “‘*u-mahy*”—“his/hers tobacco”. Image by J. Loughmiller-Cardinal, courtesy of the Library of Congress, Kislak collection.

Boot [36] later noted that ‘*otoot* carries the specific connotation of a home or dwelling, rather than a particular structure (i.e., a house), which suggests a certain intention of purpose to its use. Once that pattern started becoming apparent, it turned out that quite a few of the various flask-like containers were likely related, despite their formal dissimilarities. Whether small sculpted flasks labeled as ‘*otoot*, paneled flasks of similar volume bearing house-like elements, or animal or anthropomorphic effigy flasks appearing in similar contexts, there appeared to be a functional connection as something’s dwelling place. Even more curiously, it appeared that the small under-appreciated flasks may have been hiding in plain sight within the Classic period artwork all along. Along with two well-known examples of small *olla*-shaped flasks in use (Kerr rollout images K1377 and K3460), other images were found depicting flask-like items strung and hanging from around the neck, waist, or inserted into

headaddresses and back-racks (see, for several examples, [21]). It would seem that many *'otoot* had been depicted within the images, unnoticed until there was reason to look.

The next logical question, of course, becomes one of whether all flasks were considered an *'otoot*, and if not, when is something an *'otoot* and when is not it? It does not seem to refer to a particular form or configuration of vessel, and in fact there are a number of objects that have texts indicating them as an *'otoot* for something that is neither flasks nor even necessarily pottery ([36], pp. 169–170). It is not used to describe every container, and seems to be associated with primarily small or portable containers. There is still insufficient information to determine if only certain substances needed a “home” to be kept, but tobacco certainly appears to have a strong association.

3. Isolating Use, Purpose, And Function For Artifacts

Even accepting that *use*, *purpose*, and *function* are interrelated but distinct concepts, discriminating and defining the boundaries between them is surprisingly complicated. Each seem intrinsically, almost irreducibly, related to the others. Artifacts, by definition, are artifacts *because* they were intentionally made and/or used [1–3,6]. Even in the case of expedient tools, the transformation from “object” to “artifact” involves a mental state of intention (i.e., “I will use *this* to accomplish *that*”). Intention appears to clearly initiate purpose and therefore is a predicate to use, with function seemingly dependent on the intersection of the two.

The above scenario describes a hierarchical relationship—intent to purpose, goal to function, and action to use—in a specific order of causation (Figure 3). Going back (again) to our proverbial coffee/pen mug, by putting pens in the mug and not coffee the goal and action were supplanted and the purpose of the object was then *redefined*. Importantly, the purpose and function of that specific mug changed with the use and not the purpose or function of the broader *type* of object.

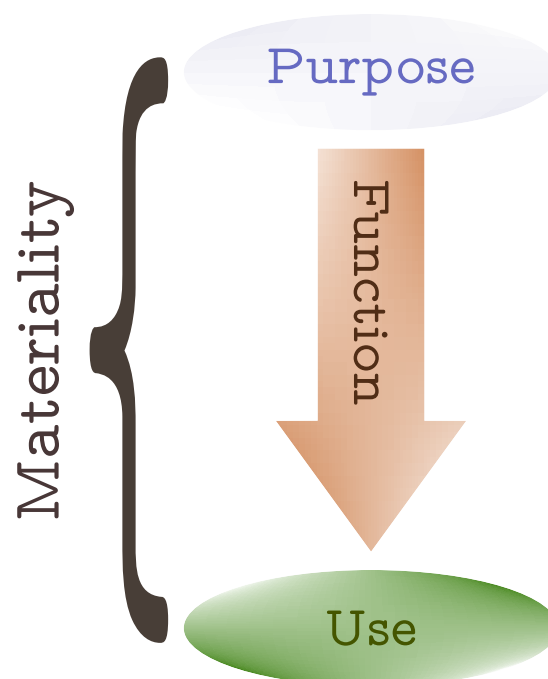


Figure 3. Hierarchical view of materiality.

Part of the complication is that there is no coherent way to discuss the function of any artifact without reference to the intent behind it (see [2,37,38]). Typically, though, there are multiple intentions involved. Purpose, function, and use each may have some predicate intention that may or may not be identical or even originate from the same intentional agent, and so it makes little sense to conflate them. In the hierarchical relationship described above, intention initiates a chain of causes and effects, with each subsequent step (and its associated intention) dependent on the preceding one. This

explanation is problematic, however, as we have already demonstrated that use, function, or purpose can each be altered independently of the others, and are unconstrained by any a priori classifications. That very independence may provide clues towards a preferable model.

If we consider use, purpose, and function as distinct and separate entities (Figure 4), each with its own associated intention—i.e., *what* is done with the artifact (use), *why* that artifact is designed or chosen (purpose), and *how* that artifact is employed (function)—the relationships between them would depend on their operating (in this case, behavioral) intersections. Likewise, each pair of intersections—purpose and function, function and use, purpose and use—similarly represent independent relationships. If we consider the behavioral domains that are described by each of those pairs, some familiar patterns start to emerge. The natures of the behavioral dynamics related to each intersection resolve to commonly referenced normative social structures.

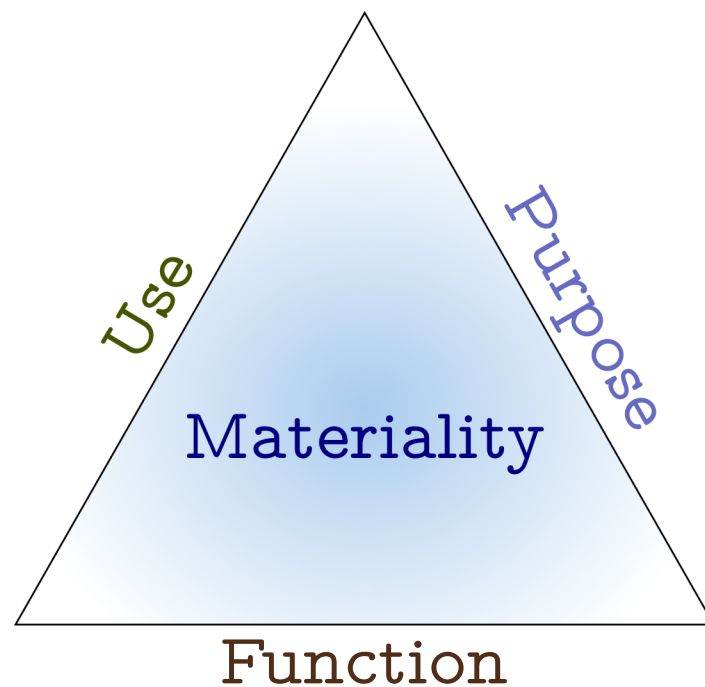


Figure 4. Materiality as discrete dimensions—use, purpose, and function.

Consider that (1) a purposive *why* involves the intentionality of how an artifact *should* be used, and (2) a functional *how* entails the practicalities of what *could* be done with it. Therefore, use and purpose (*what* and *why*) equate to pragmatics or practices, while use and function (*what* and *how*) equate to the actual performance of the associated behavior, and finally purpose and function (*why* and *how*) directly express the normative ideals guiding that performance and practice (Figure 5). These three concepts (i.e., *practice*, *performance*, and *norm*) cleanly provide the core attributes for interpreting the interaction of human behavior and material things. In short, they define the interpretive domains for materiality.

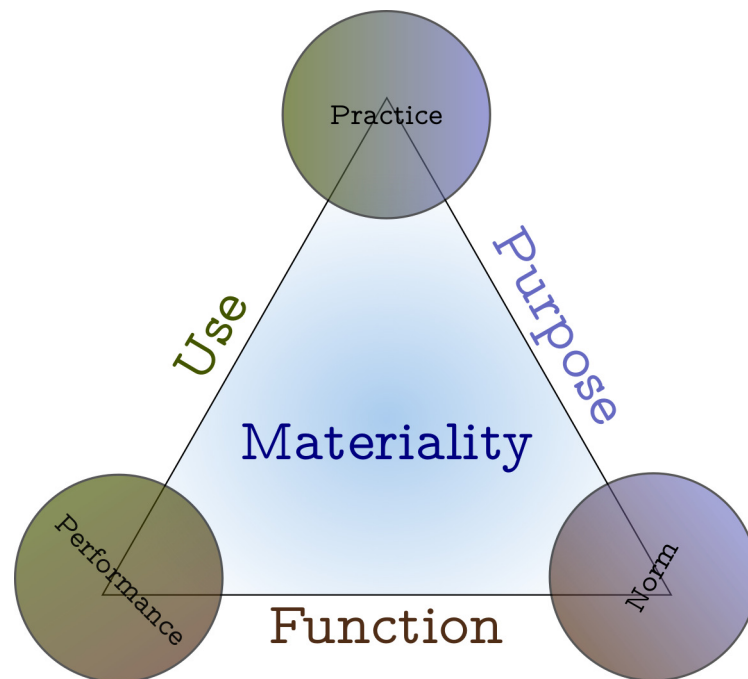


Figure 5. Triadic model of artifact materiality.

Intentions, Materiality, and Artifacts

Our goal, as archaeologists, is to build the strongest (empirically supportable) chain of inference (e.g., [19,39–43]) between the material evidence and the behaviors (i.e., the intentional actions). While there is a substantial body of literature exploring those inferences in a macroscopic sense (e.g., site formation processes, regional interactions, assemblage analysis, or ethnographic analogies), the behavioral interpretations of artifacts themselves have received surprisingly less in-depth theoretical attention. Not to suggest that the association of artifacts and behavior has not been explored (e.g., [1–5,7,38]), but that the specific narrow interface by which intention translates to implemental action is still murky in archaeological theories of materiality.

Most work on the intentional nature of artifacts deals with the concept of *function*. Artifact function has traditionally been problematic for a couple of reasons. Firstly, the term *function* itself is ontologically ambiguous in the sense that the concept is used to describe both the implemental aspects of physical utility *and* the intentional or social aspects by which that utility is systemically situated. Secondly, common approaches to functional explanation itself (see [44]) often fail to specify which of those aspects of function are being addressed.

In the case of material artifacts, the function of an artifact relates not only to how the object was actually used, but also a combination of social contexts and intentions by both the maker and the user of the object. In other words, a functional description for artifacts entails a particular set of causal relationships between intention, form, and utility. Houkes and Meijers [2] (p. 119) note that this comes, in part, from a duality of connotation in the term *function* itself, stating:

... artefacts have a ‘dual nature’... technical artefacts, that is, the products designed by engineers for practical purposes, are both physical bodies that have geometrical, physical, and chemical characteristics, and functional objects that have an intrinsic relation to mental states and intentional actions. This thesis can be developed in different directions, for example, conceptually, by connecting the two ‘natures’ in a coherent conceptualization (Kroes 2006), or epistemically, by arguing that functional knowledge cannot be reduced to knowledge of physical characteristics (Houkes 2006).

Similarly, the theoretical framework underlying the current “symmetrical” approaches (e.g., [8,9,45]) recognize this same duality between utilitarian and symbolic aspects of material culture. (Olsen [9], p. 586) describes this interrelationship of the material and the social, saying:

However far back we go into prehistory humans have extended their social relations to non-humans with whom they have swapped properties and formed collectives (Serres 1987, p. 209; Latour 1999, p. 198). If there is one historical trajectory running all the way down from Olduvai Gorge to Post-Modernity, it must be one of increasing materiality: more and more tasks are delegated to non-human actors, more and more actions mediated by things (Olsen 2003).

Advocates of the symmetrical approach cite the counter-productivity of untangling material versus social interpretations, since the material is (in that view) innately social. Strongly influenced by Bruno Latour’s actor-network theory, with various other influences such as the assemblage theory of Deleuze and Guattari, this approach to material objects prioritizes the entangled system of relationships between things and people.

Whether framed in terms of the duality of intentions (i.e., technical versus functional) or as an intermediary between intention and action, the function of an artifact described by these approaches is related directly to intentions. Intention begets function, which in turn determines the role of the artifact in its implementation. Either formulation, however, conflates the causes and effects. If intention and action are both satisfied by the artifact, which is both the product *and* implement of the intended action, it becomes both cause and effect simultaneously. The artifact’s utility becomes conflated with its purpose. However, throughout its lifetime of uses, an artifact can be subject to numerous intentions as discussed above.

The duality between artifact as designed object and artifact as a tool of implemental action is especially problematic in archaeological contexts. The necessary predicate intentions of both the maker of an object and its subsequent user(s) are unknowns, so conceptualizing function along these lines is archaeologically impractical. Therefore, the term *function* remains ambiguous, where dualistic concepts of function can equally refer to why an object was created, how it was used, the social context of its use, behavioral activities denoted by the object’s presence or use, or some amalgamation of the above. Similarly, archaeological derived concepts of materiality cannot rely on a symmetrical social embedding of object and context, as if they were equivalent or indistinguishable entities sharing some abstract form of agency, for much the same reason that duality is problematic.

Our assertion is that this ambiguity occurs because there is an additional dimension to the set of relationships that these views of materiality have conflated. Instead, our archaeological goal is a simultaneous understanding of an artifact’s utility and purpose as discrete elements, best assessed through multiple empirical and inferential lines of evidence (e.g., [39]). Our reorganization of the common concepts surrounding *function* into a multi-faceted system—i.e., use, purpose, and function being the material attributes forming the edges with the three vertices of norm, practice, and performance representing the behavioral expressions—shares some commonalities with Preucel’s pragmatics (e.g., [46,47]) and Alexander’s theory of social performance (e.g., [48,49]). The point that the current conceptualizations and usage of the term *function* (as it pertains to materiality) are not reducible solely to physical form or characteristics, however, remains especially pertinent to archaeological interpretation.

An artifact’s design and physical characteristics impose constraints on its use and potential range of uses, but nothing in the design or physical aspects *intrinsically* ensures a use that was intended by its designer or guarantees an *expected* function by common social perceptions. That being the case, physical characteristics cannot be viewed as adequate or sufficient empirical data to ascribe all three aspects (i.e., function, use, and purpose) reliably. Artifact function can only describe a range of *possible* uses based on those physical capabilities. Since we are never in a position to witness direct use, and we

cannot rely solely on an artifact's morphological characteristics to necessarily specify that actual use, we need a method to deduce compound materiality from data that is archaeologically accessible.

4. Use–Purpose–Function Model For Materiality

The model that we are proposing separates each of the aspects of materiality from any implicit hierarchical structure between intention and action. This limits the connotations of the terms *use*, *purpose*, and *function* to much more discrete definitions. By doing so we avoid the intermingling of intentions with actions. Where each of the aspects in this triad intersect, we define here as their behavioral expressions *norm*, *practice*, and *performance*. Our purpose is to delineate an archaeological ontology for materiality in which each term is as discretely bounded as possible and to identify the empirical basis we seek, without the conflation and overlap of concepts.

4.1. Use, Purpose, and Function

The first, and perhaps most straightforward, to address is the nature of artifact *use*. Use refers only to the specific manner in which a *particular* object was employed and *not* the possible range of uses for which such an object *could* be employed. Use is the *consequence* of some conscious intention by an active agent. The use of an object (e.g., putting pens in a mug), but not the object itself (i.e., the mug), is the manifest implementation of that intention. In other words, the mental state of intention is an attribute of the active agent, but does not attach to the artifact itself. Note that *use* may be either a direct or indirect implementation of intention and action. A specific artifact may be implemental as one component in an assemblage or process (i.e., as an indirect catalyst or facilitator). Similarly, the use of an object may be a symbolic, representative, or communicative action instead.

Purpose is certainly the most abstract and ephemeral of the triad, but is in many ways the most concretely bounded. Purpose is, quite simply, the intentions of active and sentient agency that initiate some implemental action. In other words, purpose is an intention to *do* something. As we have discussed above, there are often multiple intentions associated with an artifact—minimally those of the maker, the user, or witnesses. The distinction we are making by separating purpose as a discrete element or dimension of materiality is that purpose, as an intention, is not *entirely* determinate. Purpose alone does not initiate action. Purpose is the intention to bring about the consequence of an action. This subtle, but critical, distinction allows the attachment of multiple purposes to an object. Since intentions are not strictly determinate, there is no *primacy* of intention over function or use and therefore no hierarchical presumption, which is otherwise implicit in most theories of materiality.

The concept of *function* has received the most attention and, as seen in the preceding sections, has proven to be one of the more difficult to address coherently. The problem is, in part, that the term *function* is used in such a diverse array of contexts that it is difficult *not* to attach other parallel but extraneous connotations when discussing it. Perhaps a more apt terms to use here would be *functionality* rather than function, since the operating definition (for our purposes) is related to the physical and technical capabilities of an object. In the use, purpose, and function triad we are proposing here for artifact materiality, function is segregated from intentions inasmuch as the functional dimension of an object describes only how an object *could* be employed to fulfill some intended use.

4.2. Performance, Practice, and Norms

Although use, purpose, and function describe the dimensions of materiality, the characteristics of the intersections between those dimensions—i.e., *performance*, *practice*, and *norms*—are what become visible as the materiality of behavior. Each of these characteristic aspects of behavioral materiality are comprised of the interactions of a unique pair of the use, purpose, and function dimensions.

1. The combination of use and function, or what action is done with an artifact in conjunction with how that action is accomplished, comprises the behavioral performance of fulfilling an implemental action.

2. The use and purpose associated with that artifact, or what is done and why it is done in that manner, entail the social practices that guide the context and content of an action with an artifact.
3. The intersection of function and purpose delineate the social norm or norms describing how a material artifact should be employed and in what contexts such an implementation is appropriate.

We previously described use, purpose, and function as the “what, why, and how” of an artifact, but it is through the performance, practice, and norms that those mental states of material behavior become visible.

The *performance* of a material behavior, in the sense of some action by an intentional agent implemented through some material object, refers to the manner and method in which that behavior is accomplished. Performance is the “what” and “how” described by the interaction of use and function. Use captures the method of the implemental action itself, and function captures the manner in which the action is conducted. Performance is the physical manifestation and visible enactment of behavior. Since neither use nor function specifically indicate the mental state of intentionality or rationale behind an action, describing performance is the most observable (therefore empirically confirmable) dimension of artifact materiality. Performance combines the physical capacity of an object to be used to carry out some action with the act of actually doing so.

The *practice* of a material behavior, where artifact use intersects with an agent’s purpose, involves the set of intentions for which a particular object and an implemental action are considered suitable. Practice, as we define the term here, is what some references to social function typically intend to describe. The conversion of intended outcome into expressed behavior (i.e., from purpose to use) entails a purposive intention and its socially contextualized practical implementation. That conversion requires the knowledge of what object to use and why in order to use it for that purpose. Unlike performance, which is a matter of purely logistical potential for use of a material object, practice incorporates the applicable social knowledge concerning both the action and object. Practices are not directly observable, since they involve contextual knowledge of mental states, but the *patterns* of use that they prescribe may be.

Whereas performance and practice are related to the specific and actual use of an artifact, the *norms* of materiality pertain only to potentials and purposes. Norms, in this narrow and restrictive sense of the term, refer to the knowledge of why certain criteria are required to satisfy an intended purpose and how an object may be utilized to do so. Norms, as we are defining them here, specifically refer to the social information related to material behavior. Similar to practices, norms are not directly observable and can only be inferred indirectly through their latent influences on other patterns. Material norms are always indeterminate, however, since purpose is indeterminate and function only entails the potential of an artifact’s capabilities.

5. Materiality and Its Archaeological Interpretation

Archaeologists are still left with a substantial quandary when it comes to interpreting materiality. Specifically, there is no direct link between mental states, such as *intention*, and their empirical expression in the archaeological record. Instead, we have to build our interpretations by weaving together multiple threads of inference in order to link the observable with the unobservable. In the case of materiality, if norm, practice, and performance represent the intersections of use, purpose, and function then we need to find an empirical expression of those in terms of the artifacts and their contexts.

The goal is to identify which empirical attributes of artifacts can be used to indicate an underlying structure to their associations, and to isolate observation of those attributes from bias introduced by the interpretive implications of those observations ([43], p. 61). In archaeology, spanning the empirical gap between the archaeological record in the present and activities in the past is well-established as a set of analogical inferences (e.g., [15,17–20,50–53]). In practical terms, the empirical support for archaeological analysis (particularly so for any sort of quantitative analyses) depends on prioritizing the present, material aspect of the observable archaeological record in order to inform the interpretation

of the unobservable past activities and place. Ultimately, it comes down to making a clear distinction between what can be observed and what cannot.

We obviously cannot observe past intentions, so purpose and its associations (i.e., norms and practices) must always be inferred from other information. Although the norms (*how* and *why*) of the behavior of interest certainly affect the form and content of the archaeological record, their primary link to observable archaeological resources is by structuring the patterns of activity areas and associated artifacts, thus structuring the practice and contexts of performance. Determining normative constraints is most often the objective of archaeological interpretation rather than the data. Understandably, behaviors and their associated artifacts, as practices in the sense of *what* and *why*, are empirically problematic in that they require some prescriptive rationale (i.e., a purposive *why*) that is inherently unobservable except through its patterning effects.

By the set of associations we have described, the full materiality of an artifact is delineated across three domains of information (i.e., use, purpose, and function). Consequently, the materiality of the *behaviors* with which those artifacts are associated can be expressed by the intersection of each pair of domains as practice, norms, and performance. Therefore, by solving for an empirical correlation between any two within each of those triads it should necessarily indicate or constrain the range of possibilities for the third. The only archaeological path towards discerning the intentional normative dimensions of the problem is through the triangulation of the material patterns of performance, use, and function. This sort of triangulation is nothing new to archaeological practice. Archaeological interpretations have always been inferential and inductive, given the nature of our data. Accordingly, our methods rely on empirical support if those inferences are to have solid foundations ([43], p. 60). Basically, we need to work backwards from effects to causes.

The triangulation of unobservable materialities in archaeological artifacts is not substantially different. Instead of a temporal gap between present archaeological resources and past activities, the interpretation of use, purpose, and function entails bridging a conceptual or ideational gap. To do so, the material artifacts and their various networks of associations (whether by spatial organization or corresponding assemblages) need to provide sufficient empirical data with which to identify at least two of those three elements of materiality described above. Since we have no direct and viable empirical links for purpose, norm, or practice, we need to be able to find use, function, and performance from the available archaeological data.

5.1. Triangulating Artifact Materiality from Empirical Data

Since our goal is to find empirically supportable ways to interpret artifact materiality from the archaeological record, we want to work (as much as possible) from directly observable sources of data. We have identified a few of these in the preceding discussions—i.e., use, function, performance, and possibly the patterns (if not the content) of practices—from which to build a supportable chain of inference. If we can identify the material patterns and range of performance for an object (i.e., its use and function), we should then also be able to determine at least the limits of a range of practices (i.e., use and purpose). If we can at least determine the limits of the range of possible practices, especially if we can archaeologically identify some of the material patterns of those practices, it would then be reasonably supportable to demarcate a relative domain of purposive intentions associated with an artifact.

What we have been describing throughout is merely a conceptual form of triangulation, by which we work from the relationships between two or more points of reference to extrapolate some unknown point. In this case, having empirical data on what and how, we are trying to find a reasonable means to extrapolate why. Function, inasmuch as it *only* refers to how an object could be employed (contra to the technical or social connotations of the term described above), may be reasonably discerned from the technical capabilities of the object. We also have empirical methods that can reasonably describe use or uses (e.g., use-wear or residues analyses). Knowing, or having reasonable belief regarding, what and how (use and function) independently is not enough, though. We also have to have access to the linking relationship between those dimensions to be able to make reasonable inferences about

the remaining unknowns. Performance, the intersection between use and function, is not *directly* observable (having occurred in the past) but its effects can (or should) be detectable archaeologically.

In short, if we can determine use, function, and performance with any confidence from the data, there should be sufficient information from which to make reasonable inferences regarding practices, even if the specific purpose remains unknown. Building the chain of inference further, however, the possible range of purposes shrinks proportionally to the strength of data available for performance and practice, given that function and use can be reasonably established. Once the range of purpose can be narrowed down, we have effectively completed our triangle of material dimensions (use, purpose, and function), joined by two of their “vertices” of relationships (i.e., performance and practice), which then completes the set of intersecting relationships for the materiality of both artifact and the associated behavior. Finding a reasonable interpretation of the material norms associated with object then becomes a matter of summing up the set—the norm *must* be the remaining normative association of function and purpose.

5.2. A Toy Example

Thus, what would all of these abstractions about intentions and dimensions and intersections mean, in practical terms, for our hypothetical mug if we were to find it archaeologically? Our motivation has been to draw a set of empirically grounded inferences from which the more ephemeral, and more anthropologically interesting, aspects of artifact materiality can be given their proper voice. The rationale and framework for interpreting materiality that we have outlined above should, with minimal assumptions, allow us to form a reasonable approximation from observable characteristics for each edge (use, purpose, and function) and vertex (performance, practice, and norm) making up that metaphorical triangle of materiality. By using the observable characteristics of our mug, what it might have held, and what we can reasonably surmise that it did hold, we should be able to infer something of its innate story. What, then, would our mug have to say for itself?

Imagine some archaeologist in the future excavating our office space and finding our rather simply-decorated “metaphor mug” (intact, for simplicity’s sake) with a couple of pens still in it. Intuition may say “pen holder” but, being a diligent and conscientious researcher, they send it back to the lab for further analysis. The analyst (who conveniently just happens to be an archaeo-chemist with very thorough empiricist predilections) finds traces of ink, but not just from the pens found with it. Not satisfied with the obvious conclusions, however, they also run organic analyses and find that the mug contains small traces of caffeine and various other organic compounds that are definitely *not* from ink. Informed by the model we have described here, what should the future researcher conclude about our mug?

The object itself has the physical capability to hold all manner of things (e.g., hot or cold liquids, small objects), but could also be used as a candy dish, weigh papers down, hold a potted plant, or any number of other perfectly reasonable possibilities. The range of function is relatively broad by virtue of the mug’s physical properties. There is empirical evidence, though, for a relatively narrow subset of those possible functions, consisting of only two specific (but unrelated) uses for this particular object (i.e., pens and coffee). In performance, then, the mug would be both a container for coffee and container for pens, but *not* simply a generic container due to the relative *difference* between range of function and range of use.

Since performance is subsequently limited to a relatively narrow range, and function is clearly not the limiting factor, we can infer that the restricting dimension must be the intentions attached to the practice (i.e., purpose). Conversely, given that the range of uses was not *strictly* limited to coffee, coffee-like substances, or even consumable liquids more generally, it is also possible to infer that the restricting purpose was not particularly narrow, either. We do not *know* those purposes specifically, but we know that they both kept our uses to a narrow subset of functions while not being so narrowly defined as to preclude diversity. Purpose and use (i.e., practice) were more closely aligned than either were with function (Figure 6). This means that, by triangulation, we can assign a relative *weight* not

only to the dimensions of use purpose and function, but also to the relative *influence* of performance, practice, and norm. We can describe the overall materiality of the mug with a fair degree of specificity, but still can only speak to the materiality of that *one* mug.

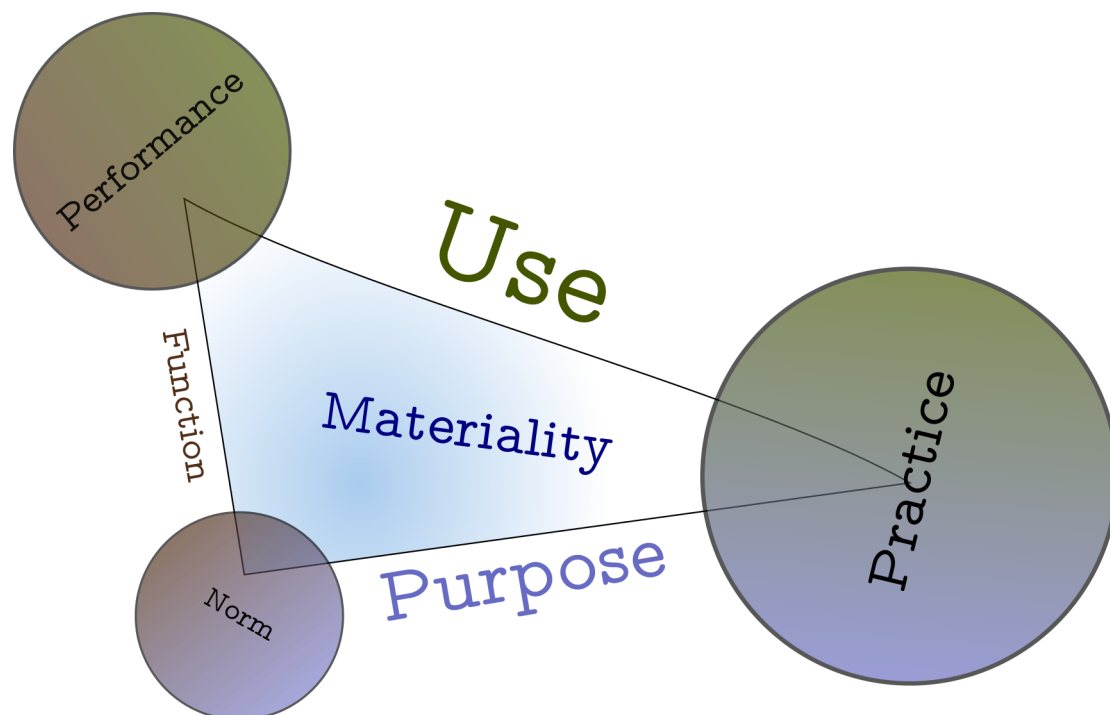


Figure 6. Triadic model showing use and purpose balanced, with *practice* as dominant.

Again, being the diligent researcher, our future archaeologist excavates a series of such offices and finds numerous very similar metaphor mugs. Since they are formally similar, the range of function stays relatively fixed. If they *all* were shown to have only held coffee and/or pens (i.e., within the same set of identified performances) we would then have a consistent pattern of practice. What if, instead, the range of uses expanded (i.e., use and function tended towards parity), or if only a very small portion of the mugs ever held pens or anything but coffee (i.e., use and purpose were aligned)? What if the mugs were widely distributed, but never showed any sign of being used for *anything*? What if decorated mugs with pithy sayings are only used for coffee, and plain ones for coffee or pens?

For each scenario, the balance and influence shifts between use, purpose, and function as well as their combinations, giving different strength to the practical or intentional aspects of the behaviors. By specifying and triangulating from these dimensions to evaluate these relative weights, and deriving patterns from them, it is not difficult to imagine the interpretive implications of various possible configurations of the dimensions. For example, utilitarian or expedient tools would prioritize parity between function and use, while function would more likely be closely aligned with purpose for specialized tools.

5.3. The Language of Things

Iconography, hieroglyphs, or texts offer archaeologists what tantalizingly seems to be the greatest possible direct link to the behavior of the peoples in question. They provide an apparent means of assessing some aspect of thought and intention. The myriad of archaeological appreciations of linguistic assessments for text and image in ancient contexts and on artifacts is well beyond the scope of this discussion. Instead, our present interest is only in the presence of text and/or image on an artifact.

Imagine our mug again, long forgotten among the collapsed remains of the office. The coffee mug, remaining mainly intact or at least with all pieces present, is discovered in excavation, carefully bagged, identified, and eventually re-assembled by the patient lab staff. Much to their surprise, the coffee mug

bears text (assuming it can be read) stating, “World’s Best Mom” along with a big “#1” and a cartoon trophy. Should we conclude that it may have actually belonged to a renowned and highly celebrated matriarch? Should we further infer that the *whole world* had held some competition or search for the best and most worthy mother to be so honored and celebrated? Was this an annual competition? Conversely, it would be presumptuous to simply assume that the statement must be mere hyperbole.

The mug has been *used* to present text, but function and purpose are under-specified. Now consider that the mug was chipped at some point prior to its deposition, the interior heavily stained from many uses for coffee, and (presumably) later re-purposed as a pen holder. Where would the archaeologist begin? Which is more important towards the interpretation—the cup, the condition, the text, the context, or some other feature?

If we started our analyses with the text on our mug we would want to know (1) what it is saying (i.e., its lexicon), (2) how is it saying it (its syntax), and finally (3) the statement’s meaning (its semantics). Notice, though, that we arrive again at the basic triad discussed above (i.e., what, how, and why), which brings us back to use, function, and purpose. More importantly, if we consider those same intersections—paralleling those of use–purpose, function–use, and purpose–function—we also find linguistic equivalents in practice, performance, and norm. In this case, the intersections are of lexicon with semantics (practice), lexicon with syntax (performance), and syntax with semantics (norms). The underlying structure of the linguistic and textual analyses can be expressed equivalently to that derived above with respect to artifacts. In other words, materiality can equivalently be viewed as the “language” of things.

Whether an artifact is the medium for communication or (symbolically) the communication itself, the dynamic of this triad and its intersections remains the objective of interpretation. Ultimately, each aspect of information informs and constrains the others. Both the sides and the angles of the triangle are subject to the relative weights and proportions of the whole. Even *if* the text is a direct reflection of the thoughts and intentions of the people in question, it would remain necessary to evaluate and consider the text *as* an artifact as well as the text’s relations *to* the artifact. Otherwise use, purpose, or function may easily be overlooked. The very presence of text or image is itself a use of that artifact—one of obvious intentionality. The choice of applying text, image, or decoration is a conscious action. If we conflate *any* aspect of the use–purpose–function triad, we are unlikely to identify the others appropriately.

6. Discussion

What has been presented here is an elaboration on various more informal themes and approaches applied to previous work. The three-part concept of use, purpose, and function was previously applied to the two case studies described at the beginning (the “missing chocolate” in [7]; and “flask as house” in [21]). In both of those studies, empirical evidence showed that classification practices based on form and presumptive function had greatly obscured pertinent aspects of the behavior surrounding those artifacts. In both cases, use and function had been conflated and had therefore misidentified the purpose. This article formalizes aspects of those applications of use, purpose, and function into a fuller model, explicitly defining those three dimensions and introducing the material implications of their intersections.

We began and ended our theoretical discussions with our hypothetical mug. The true question behind the mug, however, was really one of how we, as archaeologists in the present, can honestly and accurately describe the intentions of people in the past. Specifically, are we describing the artifacts that they used in a way that *they* would see as the recognizable and mundane objects of daily life? If not, then are we not really just imposing our own perceptions of the *things* of life? To do so would not allow much room for the voices of either ancient peoples or their descendants, and would instead only project our contemporary view of the world onto the past. Instead, our goal as archaeologists is to get out of the way of those past voices as much as possible, and we have argued here that the best way to do so is by grounding our interpretations as firmly as we can on the empirical. The model we have

proposed, with respect to the materiality of behavior, prioritizes building chains of inference from the empirical attributes of artifacts towards the unobservable. Our intent is specifically to minimize the imposition of our own voices, and let what was already written into the artifact's stories come from the voices of their authors.

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