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Using Actor-Network Theory to Characterize the Production of Ancient Maya Caching Events at Cerro Maya (Cerros, Belize)

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Abstract

Inspired by actor-network theory, this research uses an operationalized archaeological actor-network approach to characterize and examine human-object relationships associated with ritual caching deposits (votive bundles of objects) at the site of Cerro Maya (formerly Cerros), Belize. Designed to be broadly applicable for archaeological studies, our archaeological actor-network approach made it possible to inductively examine, characterize, and diachronically compare the complex arrays of human and nonhuman relationships. In contrast to previous studies that characterized caches mainly in symbolic terms, we treated caches as traces of the small-scale actor-networks that emerged during the production of ancient Maya caching events. More specifically, our actor-network methodology made it possible to characterize caches and caching events in terms of the relationships between materials, temporality, objects, places, and groups of people, their intentions, and actions. The inductive and diachronic focus of approach also allowed us to compare arrays of caching actor-networks over time while considering the social affect that caching events had on subsequent caching events and the site's social development. This approach demonstrates that even simple artifact clusters can be viewed as proxies for highly complex networks of interlinked social relations that play roles in shaping important historical interactions and social orders over time.

Keywords Actor-network theory · Preclassic Maya · Social relations · Ceramics · Rituals · Temporality

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Introduction

This study uses a modified actor-network approach to examine and characterize the human and nonhuman relationships that produced and shaped ancient Maya caches (bundles of objects) and the corresponding ritual events wherein they were buried. This new methodological and theoretical approach is undertaken at the early Maya site of Cerro Maya (formerly known as Cerros). Our approach contrasts with archaeological approaches (*e.g.*, Coe 1959) that have focused generally on defining essential properties of artifacts to define or clarify typologies (Trigger 1989:195, 289 and 388) or to determine their symbolic meaning (Freidel and Schele 1988a, b; Chase and Chase 1998; Pendergast 1998; Walker 1998; and Estrada-Belli et al. 2003). More specifically, Michael Coe's (1959:77) early work mainly defined caches as markers of the architectural inauguration (dedication) or termination. A third category "intrusive" was given to caches buried in architecture that was associated with neither building phase (Coe 1959). Coe's approach to caches as fixed assemblages with definable properties amenable to classification was common in culture history approaches that attempted to categorize and understand artifact variation (Trigger 1989: 289, 303). While adhering to Coe's categorization scheme, many Mayanist archaeologists moved forward to explore and categorize caches in terms of their symbolic meaning.

Focusing on cache symbolism, Linda Schele and David Freidel's (from 1988a, b to 1993) work identified symbolic arrangements and items within caches that demonstrated that Maya caching activities were related to a unified Maya cosmological world view that was also connected to Maya kingship (see Freidel and Schele 1988a, b; 1989; 1993). Following Schele and Freidel's approach, many other studies explored how caches represented elements of Maya cosmological and spiritual beliefs (Pendergast 1998:61; Estrada-Belli et al. 2003; Chase and Chase 1998:303; Walker 1998). Some of these studies went a step further and argued that symbolically powerful caches sanctified architectural spaces where they were buried in a manner that was important to the stabilization of rulership while also "integrating" social orders (Chase and Chase 1998:3240, Freidel et al. 2002:70). In sum, Coe's early approach treated caches as proxies to classify architectural use, whereas the later symbolic approach explored caches as markers and indicators of a common adherence to a system of pan-Maya cosmological beliefs and social organization (Vadala 2016:40).

Although extremely important insights, these traditional approaches did not explore how Maya caches were experienced as a durational and important process of social life that was contextualized and affected by social relationships built on historically organized human-object relationships. Ethnographic analogies of contemporary dedication events (*e.g.*, Vogt 1998) support this perspective: dedication ceremonies producing caches are important multi-day ritual events that produce important social relationships. Beyond producing material depositions, contemporary Maya dedication events are contextualized expressive elements (*e.g.*, prayers, processions, songs) that are just as important as the material depositions in the caches themselves. Viewed as inanimate beings that need to be animated, architectural constructions require cache deposits or offerings and organized ritual actions to awaken and prevent a complete building's life force from wandering (Gillespie 2000; Harrison-Buck 2012; Stross 1998; Vogt 1998). Furthermore, as the ethnographic data shows, we also take the position that the meaningful nature of caching ritual emerged and developed through a

specific alignment, setup, and ordering of social processes that were enacted prior to and during caching events. Focusing on the networks of social relations produced when ordering and installing caches has allowed us to emphasize how, by creating caches, conducting rituals, and building structures, cachers developed networks of relationships that sacralized, drew in, and affected various aspects of ancient life at Cerro Maya and other Maya settlements.

To examine the emergence of social relationships and the corresponding social affects of caches, we use Bruno Latour's (2005) actor-network theory (or ANT), outlined in *Reassembling the Social* to systematically infer, model, and characterize the relationships between materials, objects, places, groups of people, intentions, and actions that were associated with caches at Cerro Maya. Latour's extremely flexible actor-network approach allowed us to map relationships as durational networks of arrayed social relationships mediated by human-object relationships. Beyond exploring, charting, and mapping networks of relationships, the actor-network approach also provided us the means to highlight the networked effects of human-object relationships.

Latour's actor-network theory required us to adopt a new ontological perspective on artifacts, objects, people, history, and reality itself. Latour (2005) redefined the notion of "assemblage" to propose that people, objects, places, organisms, events, and time exist as an active ensemble of fluctuating relationships between "actants" and the networks in which they are embedded. Latour's actor-network theory makes it possible to explore caches as assemblages participating in networks, by prioritizing the changing and often transformative relationships or networks that exist between entities, rather than by assuming fixed identities, properties, or essences of entities (Latour 1996, 2005; Harman 2009) and by highlighting the importance of non-human agency in social affairs (Callon 1986; Latour 1993, 2005, 2013). Rather than viewing caches as clusters of objects, this ontological approach meant that caches had to be approached as greater super-assemblages of actions, events, people, places, and relationships. With this in mind, this perspective allows caches to be viewed as more than clusters of artifacts but as meaningful affective networks connected and produced through events.

Various scholars have adapted elements of actor-network theory in innovative ways (see Van Oyen 2016a, 2016b; Martin 2005). Most notably, the symmetrical archaeology movement has adopted many positions found in Latour's actor-network theory (*e.g.*, Webmoor and Witmore 2008; Witmore 2007). Studies taking elements of a Latourian approach differ from ours. We have aimed to develop a comprehensive inductive actor-network methodology for characterizing actor-networks in archaeological terms rather than reconceptualizing material culture to highlight non-human agency and human-object relations (for such studies, see Olsen 2010, Knappet 2005, Van Oyen 2014:15–16). A full-fledged actor-network approach like that described in this research is fully compatible with symmetrical, object-oriented, and materiality-based research that is currently popular in contemporary archaeological studies (Olsen 2010; Webmoor and Witmore 2008; Witmore 2007). Despite taking inspiration from a different theoretical paradigm (Pierre Bourdieu's writings and social constructionism), our approach here is similar to that of Robb's (2010) project-based approach. Rather than focusing on a conceptual issue such as archaeological uses of the concept of agency as Robb (2010) does, our approach is meant to be read as a reproducible and adoptable inductive archaeological method. Broader and more detailed sociological

assessments of the characterized actor-networks also using Bourdieu's concepts can be found in Vadala (2016).

An archaeological version of actor-network theory adoption may not have arisen previously because ANT has very few methodological imperatives that detail the steps or procedures required to produce a successful ANT study. This lack of a strict methodological approach has led to criticism of the theory's lack of established research methods and procedures (Knappett 2011). That said, Latour (2005) and other progenitors of ANT like John Law (2004) view the lack of standardized or procedural methods as an important differentiator. The loose nature of ANT approaches makes it an open-ended, flexible approach, which requires researcher reflexivity.[1]

The most salient direction offered in ANT studies can be found in the oft-cited urging to "follow the objects" (Callon 1986; Appadurai 1986). ANT studies do this by including descriptive analyses of events that demonstrate the interplay of agencies and relationships between actors (Callon 1986; Latour 1988; 1993). The issue of a defined methodology becomes even more pertinent when applying ANT in archaeological contexts. Because ANT was designed for ethnographic approaches to extant societies and events, its loose methodological imperatives provide no guidance for approaching the abstracted events, activities, and patterns of behavior based on traces that archaeologists commonly deal with. Therefore, with these problems in mind, we had to create an approach to ANT.

To create a methodology, we adopted and blended previously used theoretical operators (described below) with the actor-network theory. The addition of these other theoretical operators is used to rectify some of the weaknesses of actor-network theory, such as a lack of focus on processes of temporality and infinite network extension. The new operators or modifications to Latour's approach are the Worknet, Extensive Frame, and Temporality which are explained in depth below. Although our method solidifies a generalized framework and methodology to apply actor-network theory for archaeological research, we believe this framework can and should be expanded or modified in an appropriate manner for other archaeological contexts focusing on other time periods, cultures, and societies. In other words, following the ANT imperative to focus on reflective research decisions and methodological choices, we support inclusion, application, and use of appropriate and well-reasoned theoretical operators or modifications to actor-network theory.

In the work below, we diverge from many early ANT studies in a few ways. For example, here we have chosen to examine networks produced through the production of caches as what Latour (2005) describes as "worknets," which is an inversion of the term network that highlights the importance of work or production. More specifically, worknets are special networks designed to set up and establish organized networks of social action. We have made this reflective choice to focus on worknets rather than networks because ancient Maya

[1] Supporting the flexible methodological program of ANT, John Law (2004: 157) argued that ANT was not developed to be a fully programmatic method. Instead, it should be regarded as an analytical "toolkit." When ANT studies highlight their methods, they do so in terms of their ontological commitments (for example symmetry, or the equal emphasis on understanding the natural and the cultural, rather than providing detailed steps that are required to gather or analyze data. These ontological commitments can be viewed as an intellectual tool providing a new way of looking at reality, but on their own, they alone provide little direction to guide research guidance.

caching events were inaugural events. By focusing on caches as worknets, we explore how the cache production process organized relationships that oriented future action. Another operator that we used which requires reflective decisions on the part of the researcher was borrowed from Alfred North Whitehead's (1920) notion of extension and labeled here as the "extensive frame." This operator allowed us to maintain analytical focus while limiting the scope of our analysis. In this analysis, the extensive frame restricts the analysis to the series of events that were directly responsible for producing caching events. As described later in this paper, the framing point is drawn from archaeological and supported by ethnographic data in order to focus research on the processes that were most salient to cache production at Cerro Maya. Beyond pushing researchers to choose an analytical frame that highlights indigenous logic, this approach also solves the common problem of "cutting the networks," which can technically go on forever (Latour 2005 and Strathern 1996). Finally, because we dealt with caching events that were connected intergenerationally (see Vadala and Walker 2020), we needed to highlight complex temporal relationships. With this in mind, we added a subjective temporal operator borrowed from Edmund Husserl. The reflective decision to include focus on the subjective element of time rectifies Latour's approach which, as Georgiana Born (2009:233) notes, focuses on "questions of space, scale and scope" instead of temporalities that articulate within these processes. Although a phenomenological approach may appear to be antithetical to actor-network theory, including a subjective temporally oriented operator here helped us highlight intergenerational relationships that had network effects on caching practices. More specifically, Husserl's terminology helped us highlight how people would have remembered past caching events as they prepared future caches. These terms and their methodological applications are detailed below alongside specific examples from our analysis.

This network approach revealed that the production processes that lead to caching events linked many elements of ancient Maya life (ceramic production, building construction, trade, food production, and more), while creating networks of action that were modified and changed before the settlement developed from a coastal village into a monumental trading center. Located in the Late to Terminal Preclassic period (200 BC-AD 200), Cerro Maya first began as a small village before finding success as a trading center because of its strategic location on Corozal Bay near the outlet of the New River and the Rio Hondo which connected it to larger inland Maya sites (Freidel 1979). Using iconographic evidence, Freidel and Schele (1988a; 1989; 1993) argued that Cerro Maya played a role in the development of the Classic Maya institution of divine kingship. More specifically, they argued a monumental cache, labeled Cache 1 and its contents was connected to the burial of a king and represented important Maya cosmological beliefs. Yet, this paper focuses on the "village period" before any form of divine rulership had taken hold of the community (see Cliff 1986). The caching events at Cerro Maya before 50 BC began as small, simple, *ad hoc* familial affairs that did not require large amounts of planning (Robertson and Walker 2015). The caches were often referentially linked to one another in a loosely organized way. Around the first century

AD when the site's inhabitants began the monumental construction that required planning, organization, and management, this changed. Caches began to assemble larger and more varied array networks of humans and non-humans.

Methodology of Networks: Extensive Frames and Worknets

Given that Cerro Maya emerged and grew into a monumental center during the formative period of Maya development, it provides an opportunity to explore how cache networks emerged and developed.

Adhering to an actor-network approach demands a markedly different position from the cache studies mentioned above. First of all, it means treating all artifacts and humans as actants that have agency to make things happen. Analytically, all actants must be treated relationally without the *a priori* assertions made in prior studies. Rather than defining elements through material categories, actants are defined by their stable and fluctuating relationships with other actants (Callon 1999:181; Law 1999:3). In our archaeological scenario, this means focusing on local artifacts, site contexts, and settlement history rather than generalized regional connections. Furthermore, the stable and recurring relations between local actants should be viewed as networks. That said, networks are dynamic, and change does occur (Latour 2005). With all this in mind, caches can be approached as a nexus of actants involved in persistently dynamic contextual networks.

To highlight how these cache networks emerged during the formative Maya period, we used Latour's notion of "worknet." This concept is used to describe individual networks of action that produce or set up larger networks of action, emphasizing the events and relationships between and among events that were instrumental in turning objects, actors, actions, and places into caches. More specifically, Latour (2005:132) used the worknet concept to describe "the labor that goes on in laying down networks." According to Latour (2005), worknets instigate and mediate actions of actors that use the resultant networks. They also provide a vector for the generation and maintenance of the networks they aim to produce. This upfront labor is often overlooked in social analysis and has not been employed previously to study caches.[2] In this case, our worknets are defined as the action vectors that are organized and channeled to produce caching events. Latour notes that worknets also help actors make sense of the subsequent networks they produce. Following Latour's notion that worknets mediate action, we treat the production of caching events as potential instigator networks for subsequent actions, such as future caches, dwellings, or constructions.

Data from ethnographic research supports our use of the term worknet. More specifically, we rely on ethnographic data focusing on contemporary Zinacanteco dedication ceremonies from ethnographer Evon Vogt (1998). Vogt and other researchers, such as Brian Stross (1998), have compared contemporary Maya house dedication ceremonies with prehispanic Maya caching events. Vogt specifically argued that house dedications stem from "pre-Columbian Mayan ceremonial life" and not Catholic beliefs. As multiday ceremonies, dedication events are really a series of organized ritual processes involving construction phases, the containment of spiritual energies, ritual sacrifices, cooking, deposition of food items, the purification of spatial energies, and the symbolically organized ranking orders of participants, elders, and shamans (Vogt 1998:21–22). The complex organization and the

[2] Latour (2005:132) argued that the initial setup of important network components often goes undocumented when networks attain some degree of self-sustainability

steps required during dedication events are thought to be instrumental in the setup of dwelling spaces. At the same time, they are foundational to the birth, health, and continuation of what is often thought to be living architectural space (Stross 1998; Vogt 1998). Echoing Latour's sentiment regarding how worknets help actors make sense of the networks they produce, ethnographer Brian Stross (1998:32) noted that the ritual steps connected to producing items to be cached in buildings "inform every step of the construction." In short, worknets constitute the cumulative and interrelated tasks required to produce caching events. The notion of the worknet focuses analysis on initial generative actions that produce, organize, and maintain networks, while setting the stage to explore vectors of social affects connected to worknets.

Framing the Worknet

Like networks, characterizations of worknets are potentially endless, especially when the material origins of a given artifact are considered. To address the issue of infinitude, we conceptually borrow Alfred North Whitehead's concept (1920) of "extensive abstraction" to implement a network-cutting procedure called the "extensive frame."[3] Defined as the key cumulative series of events or flows of action that produced each caching worknet, the extensive frame is an analytical device that limits and focuses description of a worknet to intrinsic processes and events. Determining the extensive frame is a reflexive and inductive process that produces an analytical operator that highlights the beginning and ending of the processes and related events. In our case, the frame denotes a generalized starting point for the assembling of each caching event and ends with the caching event itself. As described below, the frame is chosen using basic archaeological inferences, well-defined material associations, and ethnographic evidence.

Examining the context of the caches and cache objects in detail allowed us to choose extensive frames. Before ethnographic analogy was applied, we used an inductive contextual approach to examine where and when the frame should be applied for each type of worknet. This meant abstracting an extensive chain of events related to "building," "ceramic," and "other" worknets. For example, in the case of a building-worknet, Coe's (1959) early work and the corresponding archaeological data indicate that caches were connected to the construction events of the buildings in which they were buried. Because of this strong association, the caching event and its production were viewed as connected to the construction of the architecture. In other words, because archaeological evidence suggested that caching and building events were connected, we considered construction to be an important aspect of caching production and a connected "building" worknet. Highlighting the extensive frame for a building worknet also meant framing the various construction phases and related events.

Ethnographic data supports this position, indicating that the caching events were instigated by the construction of a given building in which they occurred (Vadala 2016). In simpler terms, the process of cache production was likely triggered by home construction events. Caches accompanied new constructions for several important reasons. Stross' ethnographic data suggests that producing a cache would have been spiritually and energetically necessary to inform other key stages of the construction.

[3] Based on Whitehead's "extensive abstraction," extensive frame is a heuristic device that encapsulates a series of events that transform the objects, actors and places related to caching events.

Additionally, ethnographic reports and archaeological interpretations of excavated caches indicate that caches functioned to sacralize structures at the end of construction episodes (Pendergast 1998; Stross 1998; Vogt 1998). With this in mind, the close of the extensive frame would be the final phase in which the cache was deposited and buried, the structure completed, and other duties, ritual processes, and events associated with caching production ended.

Ceramic worknets were determined by examining the features of the ceramic items themselves. Ceramic items with evidence of wear demonstrate that they were used and produced in events that were not directly tied to caching. In this study, ceramics like these were utilitarian items. Mainly found in the earliest caches, Robertson-Freidel (1980) noted that these artifacts appear in a variety of domestic contexts and are not unique to ritual deposits. It appears that utilitarian items were probably produced and used in daily life and then selected for use in a caching event. Alternately, specific cases in which use-wear is not present and a ceramic item is what Robertson-Freidel (1981) called a special-use or ritual ceramic—that is, a ceramic that appears to have been made for a ritual event—indicate an extensive frame that should include the various production stages of the items. To highlight the difference between *ad hoc* selection and special production, the extensive frame will begin at the selection phase for items that are not deemed special-use ceramics.[4]

Overall, this step highlights the unique processes (*e.g.*, selection of items) that contributed to each cache. To reiterate, the frame should still delimit the network elements of each given worknet resulting in key contributing factors which are intrinsically connected, non-independent, and significant to the "setup" labor involved. Although ethnographic data is not required to produce an extensive frame, if available, it should be used to refine and delimit the extensive frame in a manner that aligns with local values or indigenous forms of local logic.

Four Key Processes of Worknets

Within the frames that delimit the temporal extent of a given worknet, there are four general network elements that are critical to characterizing and describing the articulations of the worknets required to produce caching events: (1) actions, (2) groups of task-oriented actors, (3) objects/places, and (4) temporalities (temporal orientations). Delimiting networks in this manner is a key step in producing a solid and reproducible description of the worknets while also demonstrating how these networks are connected and thereby produce agency among actants. As Latour (1996:376) argued "there is nothing better or sturdier than a circumstantial description of networks" to understand the broader networks that shape actors and give them agency.

Actions and Agency

To characterize caching worknets, we employ the actor-network maxim "follow the objects" (Callon 1986:4). Latour's (2005:44) definition of "action" contrasts with generalized theories of practice. Accordingly, he argues "action is not done under the full control of the consciousness; action should rather be felt as a node, a knot, and a conglomerate of many

[4] See Vadala (2016:149) for cases of special-use ceramic production in the context of ceramic worknets.

surprising sets of agencies that have to be slowly detangled," avoiding the overtly human-centric bias that is typically found in practice approaches (Giddens 1986; Bourdieu 1977). As Lotta Alhonnoro (2014:22) notes, giving objects agency and not placing the individual at the center of practice "shifts focus to the interplay of various actors," in actor-network theory, allowing the relationships that people have with objects to be seen in a new way. Actions can be approached as mini-networks of agencies that emanate from objects, people and groups.[5]

This analysis therefore concentrates on exploring and interpreting evidence of past actions that produced caches. Specifically, we focus on characterizing actions situated within networks of human and non-human agency. To characterize the actions that produced caching events, we follow the objects as Latour suggests, but in archaeological terms. By approaching cache items as the traceable material accumulations of events, we can reconstruct the key actions that contributed to the deposition and production of each cache and its architectural context. Because this study's caches involved ceramics, architectural construction, and often the inclusion of non-ceramic artifacts, each cache was studied in terms of three key worknets: a construction worknet, a ceramic worknet, and an "other" worknet. This allowed us to identify the key actions, actors, and events that produced each object. More specifically, worknets were identified for each object, including architecture, and described by material origins, artifact form, associated function and use, and artifact transformation (breakage, mending, modification).

Determination of the required tasks for constructing small residences relied upon Robert Wauchope's ethnographic data (1938) with added detail from excavations at Cerro Maya. The required tasks for building monumental architecture utilized Elliot Abrams' ethnographic and interpretive data on the labor and energy requirements at Copan (1984, 1987; 1989). For ceramics and the other items, the events that transformed and moved cache materials into finalized caches were inferred from material traces on the artifacts themselves using previous functional and experimental studies. For example, Cache B contained a Cabro Red bucket fragment (SF-4007), with drilled holes at a major break, indicating mending and continued use. Thus, we can recognize sequential events during which (1) the vessel was broken, (2) the vessel was mended, and (3) the vessel was used again. For ceramic items, Robertson-Freidel's (1980) interpretation of function helped determine the use events that occurred before vessels were cached. Cache C, for example, contained a Poknoboy Striped jar (SF-1360), interpreted as a domestic cooking pot (Robertson-Freidel 1980:39). The interior blackened use wear on the vessel indicated it had been used as stew pot for stone boiling before being selected for caching, and therefore was not made specifically for caching. Using these three types of material traces (material origins, artifact

[5] ANT advocates argue that agency is produced by action within the context of webs of materialized relationships that exist between humans and nonhuman entities (Law 2008; Law and Mol 2008). Latour calls this the principle of symmetry (2005). To defend this position, he argues that (2005:76) "ANT is not, I repeat not, the establishment of some absurd symmetry between humans and nonhumans. To be symmetric, for us, simply means not to impose *a priori* some spurious asymmetry among human intentional action and a material world of causal relations." The symmetry of ANT was designed to put the natural or material world on even analytical footing with the social world. In other words, the division between nature and culture was dissolved. For this to happen, two arguments had to be made, defended, and accepted. On one hand, Latour's notion of symmetry means that the natural world cannot be reduced to a secondary social phenomenon. On the other hand, symmetry means that the social world cannot be just a by-product of the natural world (Latour 1996; Bloor 1999). This notion of symmetry is a clear departure from David Bloor's (1976) notion of sociological symmetry, which places agentive emphasis on society rather than on nature (Bloor 1999; Latour 1992).

form, and artifact usage), we were able to characterize the course of action that transformed various materials in each cache assemblage and use that information to further contextualize caching events.

Groups

The first network used here is Latour 's (2005:34-37) "groups," that are defined as the pre-assembled actors or clusters of actors that are grouped together. More specifically, we characterize groups after Latour as follows: "we follow the actors' own ways and begin our travels by the traces left behind by their activity of forming and dismantling groups" (2005:29). Here, he implies that, like actants, we should not have *a priori* assumptions about group formation, identity, or membership. Instead, analysts must look for traces of groups when they appeared or disbanded. Archaeology can do this in general terms for groups of people and objects. Here, we identify groups *via* traces that are left from the caching production worknets. These traces emerged from the actions of cache production groups that assembled during the production of each cache. To explore and characterize these traces, we explored and characterized groups as sets of actors (human and nonhuman) that when articulated, had the capacity to perform specific tasks (goal-oriented actions) related to caching worknets within a given environment. For example, a large group of appropriately skilled adults (100+) with tools, food, knowledge, and materials would have had the capacity to perform the tasks required for many stages of monumental architecture production at Cerro Maya (see Abrams 1987, 1989 for examples of a similar energy approach at Copan). A small group of individuals with food, tools, and materials that numbered around five, however, would not have had the capacity to produce monumental architecture in a reasonable amount of time. Although this approach at first seems anthropocentric which is opposed to the democracy of objects in ANT approaches, we view the aforementioned tasks as actions emerging from fundamental articulations of human and object agency. Specifically, we consider tools as mediators between objects, materials, people, and the meanings that were materially transcribed in caches.

To account for different coordinated goal-oriented actions, each group was defined by different specific tasks within each extensive frame thereby placing the emphasis on action. This makes it possible to identify and characterize multiple task-oriented groups within each extensive frame, while avoiding assumptions about social groups. In sum, actions define groups and the relationships between groups, thereby highlighting the variety of relationships between tasks and task-oriented groups that formed.

Objects and Places

Groups and their capacity for action are intrinsically tied to the humans and non-human objects that help or hinder productive action (Latour 2005). Descriptions of worknets include objects, materials, plants, animals, minerals, and places. Jim Dolwick (2009) argued "besides performing tasks, objects help stabilize, mediate, frame, articulate, enforce, and give meaning to action." Here, objects that contextualize the actions of a given group are considered in terms of their capacities to stabilize, mediate, frame, articulate, enforce, and give meaning to action. We use Latour's (2005:39) term "mediator" to show how caches act as mediators of meaning, agency, and action to "transform, translate, distort, and modify the meaning or the elements they are supposed to carry." In this analysis, we begin exploring

objects in these terms while focusing on characterizing worknets and delineating the agency of the assembled caches themselves. Although various forms of object agency are at hand during the production stages of caching events, we highlight how the assembled agency of objects has powerful social affect on human actors and the ongoing generation of caching worknets.

Connecting Caching Events: Temporality

Additionally, our approach takes up the suggestion of Bayliss *et al.* (2007:2) who argue that archaeological analyses should consider A-series time which is "how people experienced the flow of time and saw themselves in time, both looking back to the past and forward to the future" (Bayliss et al. 2007:2; see also Gell 1992). To explore temporality as Bayless suggests, we began by building our framework on top of Bayesian modeled radiocarbon dates from prior research (Vadala 2016; Vadala and Walker 2020). We also adopted the concepts of protention and retention from the German phenomenologist Edmund Husserl (1991) to help characterize the worknets temporally. As previously mentioned, a subjective phenomenological approach may not initially seem apropos to the material-semiotic flat network approach of Latour. That said, as several other researchers have pointed out, his approach lacks a focus on important temporal processes (Piekut 2014: Carter 2019). Benjamin Piekut (2014) argues this omission, noting that it makes diachronic comparison involving different time scales exceedingly difficult, whereas Carter (2019) argues that it makes political, specifically rhetorical, analysis impossible. In our case, we have found the need to use Husserl's subjective terms to show how human actors designed non-human worknets with a temporal focus that allowed caches to mediate and transmit memory, while also inserting them into the future, anticipating future actions and transformations. Beyond this, temporalized worknets provide enough information to perform detailed historical analysis dealing with the maintenance and articulation of larger networks, even regional networks, that were instrumental to Cerro Maya's rise and fall (Vadala 2016; Vadala and Walker 2020).

More specifically, we use Husserl's terms "protention" and "retention" to illustrate how the production of process involved in caching events generates arrays of relationships, objects, meanings, and connotations that assemble together to mediate, stabilize, and frame networks of broader social interaction. These terms highlight subjective temporal processes that occur within human subjects experiencing the flow of time. More simply put, retentions are things that are past, but are remembered in a novel context. Normark (2004:55) describes retentions as "primary memory that maintains what has just been experienced." Protentions, on the other hand, are extensions of consciousness to the future. Following Gell (1992:225), Normark (2012) argues that retentions can act "as the background of old beliefs to [sic] which newer beliefs are projected." Gell (1998:241) extends this approach beyond human consciousness to objects, arguing that objects carry retentions of the past that project and intermingle with future projects.

Normark (2012) provides an archaeological example of such a system, observing that "an ancient ceramicist manufactured a vessel by copying the form and style of an earlier vessel made by him/her or someone else. The new vessel also became the prototype for a future vessel." Inserting this into ANT, we approach cache objects as multidimensional actants that gain meaning from network position and connectivity to other networks in the past or future. For example, we argue that the ceramic olla from Cache F retains meaning related to its use

as a medicinal container. We can argue that this meaning is a retention associated with the olla's position within a network of ceramic vessels, actions, and objects associated with its use as a medicinal containment unit. Furthermore, each cache can be seen as an assemblage of retentions drawn from prior caches as well as the objects that were assembled during caching events. This is especially important for caches that were remembered and referenced by descendant generations (less than four generations in this case) and ancestrally linked groups of actors. With this in mind, we approach each caching event as a worknet within the context of larger social networks. In sum, we treat caching events as assembled retentions related to specific objects, people, places, and actions; previous caching events are treated as wholes and caching itself as a traditional practice.

Cerro Maya

Cerro Maya was occupied mainly in the Late Preclassic period (200 BC-AD 200), also known as the formative in terms of Maya social development. During this era, Maya cultural traditions coalesced into shared, organized, regional social institutions characterized by highly developed writing, religious ideologies, and architectural traditions. The Chetumal Bay region was home to a growing population during the Late Preclassic, with sites such as Santa Rita Corozal, Colha, Ichkabal, and Oxtankah established by the Middle Preclassic period (Chiarulli 2016; Reese-Taylor 2016). By the time Cerro Maya was founded in the Late Preclassic, coastal and riverine trade networks were well established. It was likely a desire to take advantage of this canoe trade economy that prompted the founding of Cerro Maya, and Walker (2016:75) proposes that elite families from the large site of Ichkabal in Quintana Roo, which also controlled the port site of Oxtankah, sent families to establish Cerro Maya as a trading port. Marine resources, chert lithics, agricultural products, and other local resources contributed to the region being referred to as "the land of cacao and honey" (Chase 1986) in early ethnohistoric accounts.

Cerro Maya's initial generations built a substantial dock of limestone block construction designed to attract canoe traders, and lived in adjacent perishable structures in a small, waterfront village. Local items proposed to have been traded from this dock included honey, cacao, vanilla, alcoholic beverages, salt, fish, fruits, spices, and cotton, in addition to imported items (Robertson and Walker 2015). Several navigable river and lagoon systems drain into Chetumal Bay, and these acted as highways for canoe traders, allowing access to interior sites and their resources. Cerro Maya was located on a small peninsula near the mouth of the New River, giving it strategic access to riverine exchange networks. Material connections have been demonstrated between Cerro Maya and the site of Lamanai, located approximately 80 km up the New River, as well as to the northern Maya lowlands (Robertson 2016).

While its beginnings may have been humble, Cerro Maya quickly grew from a simple trading outpost to nucleated village, and finally to a small but important ceremonial center with monumental public construction, ballcourts, canals, and drained-field agriculture. The economic success and growth of Cerro Maya were mirrored by its development and expansion of ritual spaces, and this is reflected not only in its architecture, but also by symbolic expressions in the form of caches. In the Maya region generally, caching activities became more common with the increased dependence on maize agriculture during the Middle Preclassic period (1000–400 BC) for example at the sites of Ceibal and Cival (Chase and Chase 2012:255; Inomata *et al.* 2015). Estella Krejci and Patrick Culbert (1995:103)

noted very little variation in caching protocols during the Preclassic period. According to Pendergast (2006:59), Maya caches tend to fall into one of three context categories; private/domestic spaces, public/communal spaces, and monument-related, such as those found in association with stela or altars.

Cerro Maya held caches in all of these spaces throughout the site's short occupational history. The most elaborate caches found in monumental architecture at Cerro Maya contained imported exotics and valuable perishable items. Here, we focus on caches from residential structures, which tended to contain locally acquired, mundane household items such as cooking pots (Krejci and Culbert 1995; Freidel and Schele 1988a, b). As ethnographic data suggests, the caches were assembled, deposited, and sealed as a key component of multi-stage ritual events that were intimately tied to construction practices, and the generation and affirmation social relationships among arrays of human and non-actors and the landscape (Stross 1998; Vogt 1998). Here, residential caches can be explored as traces of a series of discrete events rather than long-term depositional processes. By understanding caches as discrete events, we gain a dynamic perspective of each cache, the ritual practitioners, the spatial and temporal contexts, and the actions that shaped its deposition.

The temporal and contextual pattern of cache placements provides a framework for comparative analysis that can document consistency versus variation over time. Cache contents are typically the main focus of analysis, and placing them within a relational framework adds a depth beyond simple cataloging. The number and types of items placed within a cache are revealing based on specific placement spatially as a grouping, as well as their individual characteristics. For example, how many items are pottery vessels versus other artifacts or ecofacts, visible vessels contents, placement orientation (upright, upside down), and condition (intact, presence of a "kill hole", or smashed). Identifying relationships or a thematic pattern is an important interpretive step, as is the consideration of the contents of pottery vessels. A vessel created specifically for a cache that was new and empty at time of placement and was not previously used to hold food or other organic substances is presumed to have intrinsic value based on factors such as style, decoration, material source, or an ascribed status perhaps reflecting its spiritual embodiment, human creator, or owner. On the other hand, a vessel that was used to hold and serve food, drink, or ritual offering may derive some of its value from association with those ingredients, such as economically or ritually important plants. Thus, an ingredient such as cacao, tobacco, or even a special combination or recipe may be thought of as an important participant in the human-object interaction, in this case with the object being a now-unseen plant. Among the Maya, ritual use of pottery represents the materialization of the connection between the landscape, the living, and the spirit world. The food-related function of pottery is also embedded in these connections, as evidenced today among the modern Maya and their traditional Day of the Dead ceremonies where offerings of food served in pottery vessels are left for the ancestors (Arnold 2018).

ANT Methodological Steps Applied in Archaeological Contexts

To apply our method, we followed the basic steps described briefly below. Focus on the Cerro Maya caches began by isolating a chronology, determining which caches were placed first, and whether their temporal order of placement could be identified with confidence. To maintain the temporal precision required for Bayesian modeling, a Harris matrix was constructed. Alongside AMS dates, the Harris matrix was used within Oxcal to produce a

precise Bayesian chronology (Vadala and Walker 2020). Next came a focus on determining and characterizing the context of their location; domestic, public, or monument-related spaces and related status association. After this, we focused on clearly understanding the contents of the caches, their placement, arrangement, vessel contents, and associated artifacts. Beyond Bayesian modeling, these steps are commonly used in most archaeology studies. This setup process provides enough contextual information to examine and characterize the worknets associated with caching practices. The first step of this process was sorting and ordering objects/places into generalizable categories that describe flows of action. As previously mentioned, these primary worknets are ceramic, architectural, and other.

To describe the flow of action as worknets, we applied the concept of the extensive frame to focus our analysis on the actions and processes most salient to caching practices. Casting this net back in time but also beyond the contents of the cache meant that we highlighted actors and objects such as people and architectural space as elements of the cache worknet. In our case, this was supported by extensive ethnographic analogy. With the focus area defined, we then defined the series of procedures that the object/actions underwent as they were assembled into caches. This meant a continual focus on highlighting other actors and the groups of human and nonhuman actors involved in the transformations of objects and architectural spaces into caching events. With complex actors such as humans, we also aimed to highlight their temporal relationships to objects throughout the various stages of cache production. This resulted in inductive characterizations of a series of worknets which we then compared to understand how they were connected and changed through time. This final step allowed us to examine and highlight the different relationships and affects caching practices produced in the development of social relations at Cerro Maya. This process was also used to examine the rise of hierarchy associated with later caches at Cerro Maya (Vadala 2016; Vadala and Walker 2020).

Analysis of Two Caching Groups

For the sake of brevity, we confine our discussion to two groups of caches from Cerro Maya's early waterfront village (Cliff 1982; Garber 1983; Walker 2005; Vadala 2016). Group 1 (Fig. 1; caches A–F) includes caching networks associated with the earliest events at Cerro Maya occurring within close spatial proximity to the shoreline between 120 BC and AD 65 (see Appendix Table 1 for detailed description). The caches were interred during construction of perishable residences. Group 2 (Fig. 2; caches G–H) includes non-residential caches that date slightly later, AD 25–92. Cache G was deposited in a plaza abutting an early public masonry platform near the waterfront. It supported a perishable superstructure interpreted as a bundle house or temporary mortuary facility (Walker 2016:64–67). Cache H was deposited on an extensive 2-m-high plaza, marking completion of its eastern margin. Caching events G and H are spatially and chronologically proximate (see Appendix Table 2 for detailed radiocarbon dates). In summary, caches A, B, C, D, E, and F are from the Cerro Maya's early village occupation and caches G and H are from a period in which Cerro Maya was undergoing a transformation into a larger community with substantial masonry public buildings (Freidel 1986; Reese 1996; Walker 2005; Vadala 2016). Below, we compare individual caching events with the variance between groups and characterize the overall development of caching worknets.

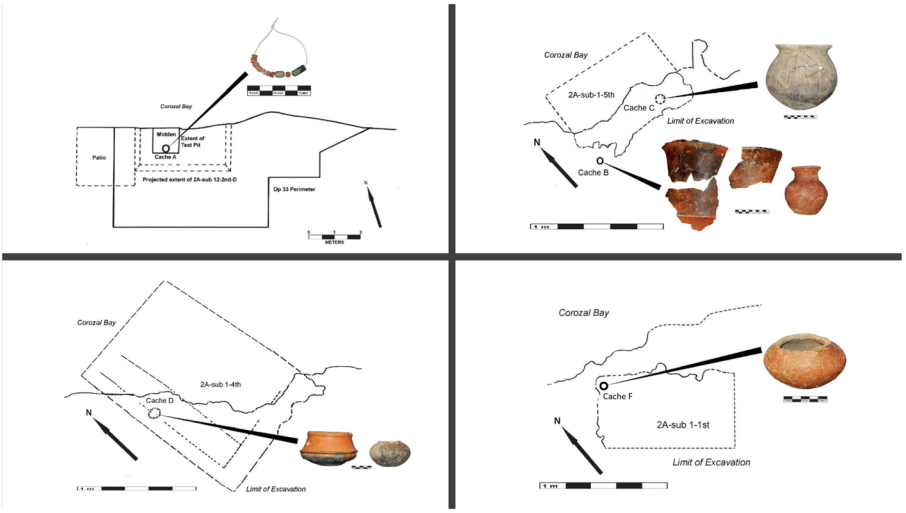

Fig. 1 Group 1 caches (A, B, C, D, and F) mapped in the context of projected architectural constructions (compiled and drafted by Walker 2013 after Cliff 1982)

Group 1 Caches A–F Construction Worknets

In our sample, architectural construction networks accompany the earliest caching event at Cerro Maya, cache A. The extensive frames for caching worknets (see below) must begin with the first steps of that architectural construction. However, while the caching worknet extensive frame ended with the deposition of the cache, the construction worknet usually continued until the building was put into service. Robert Wauchope's 1938 monograph details ethnographic data on the 8 to 80 days it took to build small, perishable structures or homes. Retentions of past acts of construction and linkages to spiritual networks would have necessitated at least one, if not more, caching events to appease and feed the house and plant spirits, and to ensoul the dwelling itself (Vogt 1998; Stross 1998).

Although the length of occupation after construction would have varied, Wauchope (1938) found it roughly corresponded to a social generation or the life of the individual who constructed the house. In terms of protentions, when constructing a house, builders were probably focused on building a structure that would last into the future, over the course of their lifetime. Brian Stross' (1998:34) more recent research describes the main steps used by the Tzeltal Maya to produce a house that will be dedicated. In order, these are:

1. Planning: measurement of the house floor[6] (Wauchope 1938:156),

[6] Special measuring implements, most easily made of rope, could have been used throughout these processes. Stross's accounts mention that the basic unit of measurement is the outstretched human arms from tip to tip. If this were the case, a rope could be used to capture this length and act as a measurement tool, helping to store information about a basic metric of measurement, while also acting as a cognitive device to multiply and divide measurements (Birth 2012).

2. Leveling the floor,[7]
3. Gathering, cutting, and placing framing posts,[8]
4. Gathering thatch and weaving it into a roof,[9]
5. Making a drainage ditch,[10]
6. Cutting and placing siding boards or using wattle and daub to form walls,[11] and
7. Constructing and installing a door.

Small amounts of labor and resources were required to build small dwellings; a group of roughly five people with prehistoric building tools could have completed these tasks over the course of a month (Abrams 1994:103; Wauchope 1938) or, in the case of a Yucatecan village, up to 63 days (Redfield and Villa Rojas 1934). Wauchope (1938:140) observed that a male "watches and helps in the construction of houses as a child; he plans and supervises personally the construction of at least one house of his own; he assists in the building of many towns men's houses," further refining the group to a small number of adults with a few male children augmenting their tasks for as long as their labor was required.

Group 1 Caches A–F Ceramic Worknets

The ceramic worknets in group 1 are contextualized by a combination of three kinds of tasks: vessel selection, ritual breakage, and selection of appropriate depositional space. Because none of the vessels were specially produced for the caches, the extensive frame of the worknet begins with the selection of a vessel.

[7] At this early stage of construction, these measurements would have demarcated where clay was to be placed and how the floor would be formed. The space would have been leveled to create a new floor. Earlier foundations and the soils and clays would have acted as a medium for the new foundation. Cliff's (1982) records indicate that burnt clay floors were created for the structures in this group. Therefore, the gathering, placing, and firing of clay were important tasks. Gathering clay from a local source would have been a strenuous task, because clay is heavy. A digging implement likely mediated between the actor and soil, allowing gobs of clay to be gathered from the earth. Special tools like baskets would have enabled the transport of large quantities of clay to the construction area. Clay was also used for walls if the building was of wattle and daub construction, which has been documented at Cerro Maya. The clay required that water be added to keep it pliable during the construction process. Construction of the foundation would guide the vertical rise of the structure.

[8] The forest would have provided poles, lining, thatch, and ties (vines), but also presented hazards that could have made the transport of raw materials difficult. Much of the labor that went into the house construction was dedicated to gathering these materials from the surrounding forests. Wauchope (1938) noted that there were many "observations" that dictated when trees could be collected, for example, poles could only be collected during a full moon (Wauchope 1938). If not collected under the right conditions, the raw materials collected from the forest could be weak and cause the building to collapse. If a similar belief were held by the people at Cerro Maya, it should be considered a form of protention. Gathering and cutting poles for the new house would have required tools that acted as intermediaries between the vegetation and human action. Axes allowed such materials to be released from the forest and blades were used to cut vines to an appropriate length for transport to the construction site.

[9] In the Maya area, the thatch for the roofing could have been made from several types of grasses or palms (Wauchope 1938). Either way, grass or palm, such materials would have been cut from the local environment with shearing tools.

[10] The soggy costal topography of the area surrounding the home would have mandated the need for drainage ditches. Making drainage ditches would have involved a pole-like digging implement.

[11] Archeological evidence indicates that Ancient Maya houses most likely used a wattle and daub construction style that required weaving together thin panels made from wood strips and in many cases branches. Mixtures of binders (limestone dust), aggregates (earth and sand) and reinforcement materials (fibrous plant matter) made from earth and clay were then used to infill the woven branches making a solid panel (Wauchope 1938).

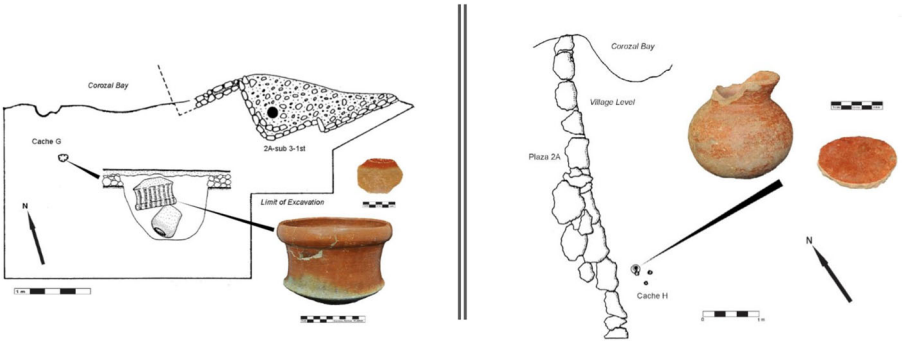

Fig. 2 Group 2 caches 'G and H' mapped in the context of projected architectural constructions (compiled and drafted by Walker 2013 after Cliff 1982)

The two Tuk Red-on-red Trickle vessels in the group 1 (Caches D and E) would have been present in most households but used only on special occasions associated with the celebrations and commemorations of the occupants to present and serve food (Robertson-Freidel 1986:116). Included in caches, these locally produced special occasion vessels would have been retentions of those events.

The small jars in Caches B, D, and F, in contrast, were probably imports,[12] valued as much for their contents as they were as vessels. Despite the analysis of hundreds of thousands of sherds, these small, thick bodied pots with little interior space have only been found in ritual contexts (*e.g.* caches, burials and terminations) at Cerro Maya. If they were kept in houses and their unidentified contents were used domestically, their sturdiness perhaps accounts for their absence in household middens. The jars would have been retentions mediating the containment and use of whatever they held. One such vessel from Cache F, SF-1612, a small jar with its neck removed, was analyzed for organic chemical residues by Duffy (2021). An untargeted analysis by liquid chromatography-mass spectrometry indicated the presence of nicotine and cotinine (tobacco), theobromine (cacao), capsaicin (chili pepper), plus a variety of aromatic compounds such as camphor, pulegone, and vanillin. These residues may well represent the remains of a spicy and aromatic combination of ingredients that was highly significant within the context of this house dedication ritual event. Further chemical residue analysis of other caches could reveal and highlight that other similar jars, possibly containing medicinal or herbal concoctions, were important to the meaning of the cache. The broken neck may be a form of ritual breakage as discussed below, an act which may have also facilitated access to the ingredients stored inside (Robertson-Freidel 1980:252, 299).

The Cache B fragmentary small bucket (SF-4007)[13] and jar in a cache pit in the southeast corner of Structure 2A-Sub 1-5th, and the Cache C small Poknoboy Striped jar (SF-1360) in the southwestern corner of the same structure are functionally as well as temporally linked as

[12] These vessels appear to be related to Tipikal Red-on-striated, a type from the Northern Plains (Robertson 2016). At Cerro Maya, the ollas are only found in burials, caches and termination deposits and are not part of the usual ceramic inventory in domestic deposits.

[13] Walker (2013) designated a number of fragments as caches. Later work by Robertson and others (nd.) on 2A-Sub 4 indicated that the Cerroseños curated large pieces of vessels that they had broken during termination rituals (Garber 1983). If these fragments were subsequently deposited in caches, Walker's designation of a number of fragments as caches has validity.

part of one dedicatory event (Cliff 1982:228–9). SF-1360, a miniature version of the large stationary cooking vessel commonly present in all households, is the only recovered example of the smaller size. Despite its unusual size, the charring on both the exterior and interior round bottom of SF-1360 indicates it had been used before being selected for Cache C. The Maya probably served the stew prepared in the cooking vessel in the small bucket (Robertson-Freidel 1980). The importance of the serving vessel is signaled by its being placed in an intentionally dug cache pit whereas the cooking pot was smashed in place on its side in a shallow depression of loam.

With exception of the small jars, all the vessels in group 1 are functionally associated with the preparation (cache C), and presentation or serving of food (caches B, D, and E), linking them to various food preparation and consumption networks. More importantly, these caches mediated a retention associated with these quotidian activities as they were enlarged to feed and nurture the living house.

As far as we know, the small jars were only disposed of in sacred contexts, leading to the second task of vessel breakage. All the small jars were transformed into non-useful vessels before being included in their respective caches by breaking off the neck of the vessel (SF-800 in cache D and SF-1612 in cache F) or by punching a hole in the unusually thin base of SF-502[14] (cache B). Although the incurving rim bowl (SF-492) from cache E has no basal hole, approximately one-quarter of the rim is missing. Similarly, the Poknoboy Striped cooking pot (SF-1360), smashed *in situ*, is missing a large part of its lower body and base. The fragmentary nature of SF-4007 makes it uncertain whether it was functional or not, but it was not in pristine condition when it was put into cache B. This pot must have been important, however, because it was crack-laced (mended). Since only a fragment of the vessel found its way into the cache, the fragment may have been curated from an earlier unknown context for a time when a cache was deemed necessary. A material relationship and history linked the social group to this mended fragment, giving it the capacity to act as a retention of the whole vessel just as the material traces of repair retentions both breakage and mending. It may also have a retention of the location of other fragments from the same vessel deposited elsewhere.[15] Only the Tuk Red-on-red: Modeled bowl was intact when it became part of Cache D.

Whether these vessels were pierced or broken, the action transformed the vessel by ending its useful life. A damaged vessel mediated a transformation, a change of affairs, a change of state from a whole vessel to a fragmented vessel, from a container to non-container, from a functional tool to a meaningfully cached symbolic object. By breaking the object, a ritualist produced a retention of other ritual destructions while moving away from the retention of the whole ceramic object. At the same time, by breaking the pot, the ritualist temporarily redirected the future or protention of the cache object away from its history of use. The pot no longer was intact, and its function was changed in the act of breakage.

All the group 1 vessels are closely related to ceramic vessels found on the Northern Plains (Robertson 2016). Consequently, they acted as retentions of distant places, people, or events in the north, as well as the probable origin of the original Cerro Maya colonists.

[14] The form of SF-502 is an unusual olla with thinner walls, an elongated ovoid shape, and an everted rim.

[15] In Prehistoric Brittany, Chapman (2008:199–200) found that fragments of objects served as tokens for whole objects that were curated for later deposition at significant events. This posited strategy of *enchainment*. Conceptually, symbolically and materially connected two different places together. Similar practices involving the use of vessel fragments have been documented elsewhere at Cerro Maya (Walker 1998 and Robertson nd).

In contrast to the paired caches B and C, placing Caches D and E on the medial axis of Structure 2A-Sub 1 temporally oriented them towards a specific type of protention or future action because they would be walked over every day for the life of the structure (see Joyce 1992 for a similar example of deliberate placement). If the social actor had knowledge of the cache, this location provided the capacity to trigger memories of the cache and the caching event.

Building on the previous floors, and living on top of the same space, it is likely that these caches were produced by a family-related group that were connected by similar traditional toolsets, important cached objects, shared ancestral space, ancestral beings, and possibly even similar experiences and memories of the landscape. A maximum of roughly 100 years separate caches D and E; however, they potentially overlap for a span of 57 years (Appendix Table 2). It is possible that cache D and E were deposited by the same familial group (and its associated nonhuman actors) with cache E as a retention of cache D. Although the vessel forms and functions differ, cache E is a retention of the same placement and deposition space as cache D. Cache E probably acted as a retention of its previous use as an upper-class serving vessel (Cliff 1982; Walker 2013).

Group 1 Other Worknets

Group 1 also includes cache A, which contained a bracelet of greenstone, conch and *Spondylus* sp shell beads. Like the earlier renovation offerings in Op 34 (Robertson and Walker 2015) but unlike later caches, cache A included no pottery and may be a continuation of the practice of making a ceramic-free offering when renovating a structure as the village expanded to the east.

The extensive frame for this worknet begins with the selection process. Probably chosen for inclusion in the cache because it embodied the retentions of an heirloom, the bracelet acted as a retention of the activities or relationships required to obtain the greenstone from distant places.[16] The spondylus and conch shell beads, both local varieties (Sharpe 2016, personal communication), had the capacity to mediate the retention of the maritime environment in which the owner lived as well to mediate a retention of the owner who wore it. Rather than being buried like the other caches, this item was laid on the floor and then buried within the next construction episode. As to what effect this had on the future dwelling, we can only assume that the protentions that guided the inclusion of the cache were probably related to those previously mentioned related to the house as a future dwelling.

Group 2 Caches G and H Construction Worknets

Caches G and H were analyzed together because of their overall material and spatial similarities. Both caching events were community events involved in the dedication of a "bundle house" (Walker 2016) and the main plaza, respectively. In contrast to

[16] The closest source was the Motagua River Valley in Guatemala. For more on jade sourcing see Seitz et al. 2001

residences, the construction of the Structure 2A-Sub 3-1st-C masonry platform and deposition of Cache G required the mobilization of a larger variety of interlinked construction worknets. Unlike the *tierra quemada* floors of most residences, this structure had a plaster floor and patio. Facing west, the platform's masonry retaining walls were rounded with inset corners. A single outset step protends the outset staircase typical of later civic buildings at Cerro Maya and connects the masonry platform to the plaza. Postholes found atop the platform suggest a perishable superstructure was positioned on it or belonged to the subsequent structure, 2A-Sub 3-1st-B (Cliff 1982:358). Although the superstructure was a thatch structure like the earlier constructions from group 1, an additional series of construction tasks were necessary to build the stone platform. The following are the materials and main tasks involved in the construction of Structure 2A-Sub 3-1st-C, modified from Abrams' (1987) study at Copan:

1. Procurement: earth, cobbles, water, tuff, trees for construction and for fires
2. Transport: earth, cobbles, water, limestone plaster, trees
3. Manufacture: shaping cobbles and beams, making plaster
4. Pre-construction (measurement and foundation): leveling of the earlier structure with materials to infill depressions
5. Masonry construction: platform masonry retaining wall, platform fill, cobble surface, plaster
6. Superstructure construction: wood, thatch, ties (vines) mud (daub)

Structure 2A-Sub 3-1st-C would have required a larger variety of materials and tools and greater planning and organization than a residence. Abrams (1987) argued that larger construction projects relied on communal labor pools that were probably organized by family groups. Therefore, it can be assumed that family groups were probably organized around the variety of tasks required for construction. For example, several groups may have been assigned to procure and transport the needed raw materials. Other groups may have been assigned to manufacturing beams and plaster. Each set of tasks required tools to perform them. Abrams's (1987, 1989) analyses also concludes that most of these steps did not require specialists. The intermingling and interaction that resulted from these construction projects likely increased connectivity between family or kin groups.

Because this structure used a construction style and techniques different from earlier buildings, the retentions that guided its construction are hard to define. In terms of protentions, the builders of this structure intended it for a different future use. The stone foundation required more effort and planning to build and would have been more resilient to weathering and storms, a concern in a storm-plagued coastal village. Its larger size and raised perishable structure also indicate that the architects and builders were planning for larger groups of people who would need more space participate in ritual activities in future. The architecture continued the trend of requiring greater labor and material investment.

The construction of the 80 × 104 m, 2.5 m high main plaza (Freidel 1986: Appendix Table 1:1), with which cache H is associated, would have significantly increased the required labor and material investment. Building the plaza required a different set of procedures, including flattening land, quarrying boulders and fill, roughly shaping

limestone blocks, gathering clay and marl mortar, building construction pens for stability, gathering additional limestone and crushing and heating it to produce plaster, and finally covering and smoothing a large plaza with plaster. Its construction, involving the movement of an estimated 20,800 cubic feet of material, would have required a fair amount of labor management and organization. Built with internal construction pens (layers of fill separated by smaller rubble and marl pauses), construction efforts would have had to have been organized and managed (Freidel 1986:5). The groups building the plaza would have been moderately large with large numbers of organized human actors and a large set of prehistoric construction tools. The exact number of workers and tools required cannot be estimated. Abrams (1987) explained that more workers can be used to build something faster, or fewer workers can be used to build something over more time. The C14 dates support a short construction time period. Following these activities, cache H was deposited 30 cm east of the north-south eastern retaining wall of the main plaza. Cache H consists of a necklace olla, a sherd lid, and three disk-shaped lithics arranged in a triangular pattern.

The retentions and protentions that guided the construction of the main plaza and the deposition of Cache H would have been related to the burial of the village and the new architectural space that was to come. The last of a series of hurricanes caused massive damage to the village (Walker 2016:59). Rather than rebuild the village, the Cerroseños conducted a ritual similar to earlier renovation rituals, but on a more massive scale. They laid down a layer of marl and light gray clay over the entire village and smashed many pots, leaving one-quarter to one-half or more of each vessel in place. Retentions involved the interactions between the workers building the plaza and the ruined remains of the village (which were retentions of the storm and the former village). In terms of protentions, the height of the plaza may have been chosen to mitigate problems caused by hurricane flooding. Although they might not have known what would be built on the main plaza, the workers had to have known that they were setting the stage for massive new forms of architectural construction at Cerro Maya.

Group 2 Ceramic Worknets

Like the worknets for the group 1, the ceramic worknets for group 2 are framed by selection and ritual breakage. Cache G included an overturned small Tuk Red-on-red Trickle bucket (SF-799) covering a Hukup Dull drinking vessel (SF-798). The bucket was a Special Occasion type similar to the bucket in cache B, and the drinking vessel, like the jars in the group 1 caches, was a form found only in caches, burials, and termination deposits. In this instance, a worked sherd lid (SF-854) was on top of the drinking vessel, suggesting to the excavator that the upright vessel contained a liquid when it was cached (Cliff 1982:354). Walker (2013) has suggested that the bucket and the Hukup Dull cup signify drinking rituals during the caching ceremonies. If the bucket carried retentions of the bucket in cache B (SF-4007), it also is retention of a ceremonial meal that involved both eating and drinking. The parallel to the paired caches B and C is strengthened by the excavator's supposition that there was a second cache placed to the west of the staircase, but not excavated (Cliff 1982:354). Perhaps this unexcavated cache contained a cooking vessel. By acting as retention, the ritual consumption of food and drink required to dedicate the building, Cache G transforms the actual consumption by people into an offering to the gods.

During the caching ceremony, the Tuk Red-on-red Trickle bucket was ritually punctured with a blow from the outside; the plug was recovered from the bottom of the cache pit. Because caches invariably mediated retentions of caching as a wider practice, retentions of ending the useful life of vessels in similar rituals (caches B, D, and F and possibly E) informed a similar action for cache G. Puncturing the bucket also transformed the vessel from use in this world to use in the underworld. A mottled, burned orange area on the north edge of the cache pit, suggests that the vessels were sent on their way by the burning of copal or other incense (Cliff 1982:254).

The location of cache G created space for quite a few people to witness its deposition and the building of a subsequent floor around it, suggesting that more than just a kin-based group was involved. The group that selected these vessels and punctured the bucket may have been a community group that shared resources and tools during the construction of the associated architecture. This group may also have participated in the meal that occurred, using other larger buckets and more drinking vessels deposited elsewhere.

Cache H included a small Hukup Dull jar (SF-290) thought to contain a valuable imported substance similar to the ollas found in caches B, D, and F. It was placed directly into the dark gray loam, its rim flush with the top of the matrix. The neck was partially broken off, suggesting that the protentions and retentions were similar to those of the other ollas. By breaking the neck, SF-290 acted as a retention of previous vessel "killings", while departing from the retention of the vessels past usage as an intact vessel. Breaking the rim, forever modified the protention of future action for the ceramic because the vessel could not function as a whole vessel. A small worked sherd lid (SF-297) may have been related to the retention of the vessel's early life history when the lid was used to cover the vessel and retain the contents. The selection, killing and placement of the vessels was likely carried out by the same group of workers defined in the group 2 construction worknet.

Group 2 Stone Tool Worknets

Cache G and cache H are the first caches that include worknets related to stone tools. The extensive frame for this worknet begins with the selection of stone tools made of honey brown chert from Colha, Belize, and a small obsidian blade (cache G), probably from the El Chayal source in Guatemala. This small blade may have been chosen for inclusion because it carried a retention of use in the construction project to cut vines and other plant material, or because of use during a ritual meal to divide portions of food. Both the obsidian and the Colha chert also may have been chosen because they acted as a retention of previously long-distance trades and were therefore valuable.

Along with the olla (SF-290) and its worked sherd lid (SF-297), cache H contained a variety of simple stone tools. Three discoidal chert tools, a hammerstone (SF-291), a straight perforator (SF-292), and a core tablet for making obsidian blades (SF-293) (Mitchum 1994:193), were carefully placed in a triangular arrangement (Cliff 1982: 282–4) with the shoulder of the olla below the hammerstone. The arrangement of these disks may have been a protention of the Maya origin myth of the three-stone hearth at the locus of creation (Walker 2013:14), appropriate as the Cerroseños celebrated burying the coastal village within the main plaza that would be used for new activities. This three-stone hearth arrangement may have also been retention that attested to the success of the coastal village as a trading center than had nurtured the "hearths" of the inhabitants. In addition, two other hammerstones (SF-294 and SF-311) and four bifaces (SF-295-6 and SF-309-10) of Colha

honey brown chert were found in the dark gray loam nearby (Walker 2013:14). In the absence of a cache pit, their association with the construction of the main plaza can only be assumed. Selected because they carried retentions of past construction activity as it related to the construction of the plaza, putting them all together may have acted as a retention of a full toolkit indicating an important relationship with invisible spirits or gods that may have been associated with the completion of the large plaza.

Discussion

The caching worknets of group 1 emerged from the contexts of kin-related groups working with local resources and tools during the lead-up and construction of small family domestic dwellings. The early inhabitants cached a relatively limited array of ceramic vessels which were primarily used to hold valuable substances or used to prepare and serve consumables. Considering the ethnographic data mentioned above, it also appears these kin-groups used arrays of objects, rituals, and actions to feed and sustain the spiritual world. In parallel, they used arrays of human and non-human actors to build their own houses and feed and sustain their families. In these early caches, ritual breakage of the vessels commonly occurred thereby indicating breakage was a key ritual tradition or a remembered worknet process. Yet, the variety of ceramic vessels used, and the placement or orientation of the caches also indicate there was an important amount of choice involved in producing a cache.

Caching production produced a variety of network effects for the early cachers. This is because many tasks and objects were required to produce even the simplest caches. As demonstrated above, these early worknets required the assembly of a large variety of objects, people, and temporalities. These include connections to objects such as tools, materials, and local places. Although not archaeologically recoverable, ethnographic data suggests that caching rituals were also connected to timed ritual processions, prayers, songs, *etc.*

As a result, caching production contributed to the development and maintenance of social capacities to organize non-human actors while synchronizing the actions of human actors that created important meanings, connections, and relationships between diverse arrays of humans and nonhumans. Working together during synchronized human action produced shared ritual experiences for the human group actors. These shared experiences strengthened social relationships and important social bonds. These bonds also extended to nonhuman entities such as ensouled architecture and ancestral spirits that were often associated with the dwelling places. In sum, creating organized relationships while assembling the diverse arrays of actors and actions resulted in the collective human and non-human efforts that transcribed and produced unique contextual historical and social meanings for the participants of each caching event.

The group 2 caches, deposited during the transition from village to monumental center, also varied greatly in terms of production. Contextualized by the construction of a large public masonry platform to support a bundle house or ancestor shrine, cache G firstly differs from previous caches in the scope of labor required for construction. Furthermore, the ceramic contents of cache G mediated a vastly different array of retentions as well. More specifically, cache G was shaped by a retention of associated eating and drinking rituals. This indicates a new aim of the selection and assembling process that went into cache production. Cache H, on the other hand, contextualized by the construction of the main plaza, contained a selection of tools probably used in plaza construction. These bear no

similarity to the contents of other caches. Both caches G and H likely involved groups of human and nonhuman actors drawn from the larger community. These groups were probably largely composed of large numbers of unskilled laborers that brought their toolsets and experience to bear on this community-wide project. At least a few labor coordinators and architectural specialists were probably also necessary to organize the complex interplay between large numbers of people and objects involved in the production of the large new community oriented architectural spaces.

Cache H bears special consideration because it was connected to the construction of a plaza that covered the village after a devastating hurricane event. Given that the plaza buried the early village, a shared history of village life, and places that underwent years of caching rituals, cache H was a very important historical turning point of the people Cerro Maya. The plaza that buried, preserved, and encapsulated the village, that in a sense, became a massive sitewide cache. With this in mind, cache H's worknets drew people to materially engage the site's generalized local history and past thereby creating an important community-wide connection to place. This act of communal preservation of the early village site may have produced an affective state of closure for the community helping them look towards a new future while honoring the past. A collective sense of closure may have resulted in an increased sense of community solidarity, facilitating the site's massive transformation (that occurred directly after the plaza construction) into a monumental trading site.

Marking a change in social dynamics, the resulting net effects of group 2 caching production shaped the development of hierarchical social organization at Cerro Maya. For group 2, caching production engaged, organized, and structured relations in larger 'groups' that included arrays of materials, preorganized groups of kin related actors, specialized social actors, and large quantities of tools. Although these projects were probably community driven, given the scope of these new projects, leaders would have had to hierarchically organize work groups, organize, and manage tools, resources, materials, and groups of workers to see the completion of these projects. All said, working together socially and materially organized and created relationships that connected even larger and more diverse arrays of productive actors. As an effect of this large community-focused but probably hierarchically organized effort, it can be assumed that these worknets should have resulted in a net rise of social solidarity and also social differentiation at the same time.

Obviously, the amount of organization and social synchronization (temporal and geographical) required for these caches marks a dramatic increase from group 1. As previous studies show (Vadala 2016; Vadala and Walker 2020), and this study indicates the change to large-scale community caching events and the emergence of communal actions related to caching production played an important role in the site's continued development of social hierarchy. Vadala (2016) shows that shortly after cache H (less than 50 years), the production of caching events becomes an important elite ritual that was practiced in regular intervals at Cerro Maya's monumental center. With this in mind, it is clear that large Maya monumental elite caches that many other scholars have focused on probably had roots in first familial and later community-focused caching events that were all unique historically emergent affairs.

This aligns with Freidel and Schele's (1988a, 1988b) studies that argue ritual caching events played an important role to the tradition of Maya kingship that would dominate in the Maya Classic period. Early studies like Freidel and Schele's (1988a) research on caches were fundamentally important because they explored how caching rituals, items, iconography, and cosmological beliefs, associated with caching during Cerros Maya's monumental

period, played important roles in the development of Maya hierarchy and cosmological beliefs. Yet unlike our study, they did not explore the local historical origins of caching rituals. This is not surprising because very few archaeological studies have examined the early Maya caching practices in any detail. Delving into the tradition of producing caching events, we see how the production of caching rituals were expansive affairs that shaped ancient Maya life and Cerro Maya's social history. Taking expansiveness into account alone, it is apparent that the net effects of cache production played an important role in the ongoing development of social hierarchy that would shape the Maya history at Cerro Maya.

Conclusions

As a whole, this study has taken an actor-network theory perspective that approaches caches, cache preparations, and construction events as key elements in a series of cache setup and assembly processes that entangled many different elements of life. To examine what initially appeared as disparate arrays of actions, key actions and actors were viewed as three distinct flows of process labeled as worknets (*i.e.*, construction, ceramic, and "other" worknets). These worknets were then used to identify retentions and protentions that mediated representations of past or future actions to determine how the actions and actors associated with caching events changed through time.

Furthermore, the actor-network approach allowed us to characterize and explore object agency in terms of how the selection of cached objects mediated human-material relationships that emerged during events. Many caches (cache D and cache E), potentially mediated retentions of former caching events connecting the past and present through ritual interactions that arose from the human-human and human-object relationships produced during the assembling or production of cache events. Even in cases of caches that were not temporally connected, the human-object and human-human relationships shows how people created pragmatic understandings where caches represented and mediated retentions of other caching events, people, actions, and other places. Although many of the early caches discussed here seemed simple, when considering the worknets as a whole, it is obvious that caching events should be approached as important networks that channeled important agencies or social affects. Caches were more than just static bundles of objects, markers of building process or cosmological ideals. Instead, they were markers of historical process in which people actively engaged the past, present, and future in different ways.

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Appendices

Table 1 Descriptions of caches

Cache	Group	Provenience	Architectural Construction	Depositional Context	Contents	Interpretation
A	1	Op 33a-60	A-Sub-12-2nd-D	resting on top of midden surface	SF-1965 -1978; 2 jadeite beads, 3 coral beads, nine conch beads articulated as a wristlet	dedication event for new residential construction
B	1	Op 1 h-9	2A-Sub 1-5th	pit in southwest corner of residence	SF-502 small jar, SF-4007 smashed bucket fragment	house dedication corner cache
C	1	Op 1c-15	2A-Sub 1-5th	pit in southeast corner of residence	SF-1360 cooking jar	house dedication corner cache
D	1	Op 1 L-09	2A-Sub 1-4th	pit on medial axis of residence	SF-800 small jar with neck broken, SF-801 small bucket	house dedication medial axis cache
E	1	Op 1 m-3	2A-Sub 1-2nd	pit on medial axis of residence	SF-492 low bowl	house dedication medial axis cache
F	1	Op 1j-43	2A-Sub 1-1st	pit	immediately west of residence	SF-1612 small jar with neck broken, drilled dog tooth
house			dedication corner cache			
G	2	Op 33a-11	2A-Sub 3-1st	plaza fronting centerline of only masonry building in waterfront village	SF-798 drinking mug, SF-854 lid for drinking mug, SF-799 bucket with kill hole and fragments from kill hole, obsidian blade fragment under bucket	public building dedication
H	2	Op 1b-6	Plaza 2A	construction fill in eastern edge of Plaza 2A	SF-290 small jar, SF-297 lid, SF-291-293 three discoidal bifaces in triangular arrangement	public dedication event associated with construction of Plaza 2A that buried the village

Table 2 Descriptions of caches D and E

Sample Number	Original Reference	Provenience	Structure	Actual Event Dated	Material Dated	Correlated to Special Deposit
Beta-347320	Cliff					1982:311–312; Vadala 2016
Radiocarbon Age	30	180–40 BC; 10–1 BC		191–38 BC (94.5%) 9–3 BC (0.9%)		120 BC-AD 9
Beta-389034	Vadala 2016	Op 1 L-06	2A-Sub 1-4th	flooring of 2A-Sub 1-4th	charcoal	terminus post quem for pit 1A-19 that held Cache D, cut into Flooring of 2A-Sub-1-4th
Beta-389039	Vadala 2016	Op 1 m-2	2A-Sub 1-2nd	house dedication for 2A-Sub 1-2nd	charcoal	seals cache, therefore terminus ante quem for Cache E
Beta-389033	Vadala 2016	Op 1j-18	2A-Sub 1-1st	meal debris associated with interment of Burial 24	charcoal	Burial 24 and terminus post quem for Cache F, which was deposited in pit Feature 1A-22 that cut into Burial 24
Beta-347319	Vadala 2016	Op 1b-06	none	end of midden use and burial of village beneath Plaza 2A	charcoal	terminus post quem for Cache H that sat on midden

Sample Number	AMS Date	ConventionalRadiocarbon Age	Range +/-	2-σ Rangees Walker 2005 and Vadala 2016	IntCal 13 (OxCal)	Bayesian Modeled (95% probability)
Beta-347320	Y	Radiocarbon Age	30	180–40 BC; 10–1 BC	191–38 BC (94.5%) 9–3 BC (0.9%)	120 BC-AD 9
Beta-389034	Y	2080	30	85–75 BC 55 BC-AD 60	92–68 BC (4.2%) 61 BC- AD 65 (91.2%)	46 BC-AD 32
Beta-389039	Y	2010	30	20–10 BC; AD 1–90; AD 100–125	21–10 BC (2.6%) 2 BC-AD 125 (92.8%)	25 BC-AD 54
Beta-389033	Y	1950	30	45 BC-AD 70	48 BC-AD 72 (95.4%)	3 BC-AD 65
Beta-347319	Y	1990	30	40 BC-AD 80	44 BC-AD 85 (95.4%)	AD 25–92

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