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8. Charcoal As a Proxy for Use-Intensity in Ancient Maya Cave Ritual

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Abstract: Anthropological studies of ritual density examine why some societies or certain historical periods have more ritual than others. Because of the methodological difficulties of quantifying numbers of rituals occurring within a community and tracking their occurrence over long temporal periods, ethnographers seldom conduct these types of studies. This chapter demonstrates that archaeologists are in a position to conduct a similar research program by studying what I refer to as ritual use-intensity. Ritual intensity examines the changes over time in frequency, length, or number of participants involved in ritual performance by quantifying and analyzing the material remains of ritual practice. This new method is demonstrated using data from excavations at Chechem Ha Cave, an ancient Maya ceremonial site in western Belize. The observed variations in cave use serve as a unit of analysis that may be correlated with changing environmental, social, and political conditions in ancient Maya society.

Since the 1970s there has been a steadily increasing number of archaeological, iconographic, and epigraphic studies of ancient Mesoamerican cave sites (Brady and Prufer 2005). Like many other studies of ritual and religion, cave studies have focused heavily on symbol systems, religious ideas, or worldviews. Caves have been identified as sacred features of the Maya landscape that both reified cosmology (Brady and Ashmore 1999; Moyes and Brady 2005; Prufer and Kindon 2005; Stone 1992; Vogt and Stuart 2005) and functioned as ideological landmarks in the establishment or foundation of communities and community boundaries (Brady et al. 1997; García-Zambrano 1994; Moyes 2004; Vogt 1969).

One of the most important collective findings of cave studies is the establishment of caves as sacred space and their near-exclusive use as ritual venues by pre-Columbian people (Bassie-Sweet 1991; Brady 1989; Brady and Prüfer 2005; Heyden 1975; MacLeod and Puleston 1978; Stone 1995; Thompson 1975). Rites in caves are primarily related to agricultural fertility and rain making but may also include calendrical rites, accession rites, rites of foundation, scribal rites, termination rites, or others (see Brady and Prüfer 2005; Moyes 2006:31–45; Prüfer and Brady 2005). The ritual context is advantageous to the archaeologist because the identification of ritual assemblages has been one of the major issues facing studies of religion in the archaeological record (LaMotta and Schiffer 1999; Plunket 2002:1–4). The problem is compounded because the same artifact types may function in both domestic and ritual contexts (Hayden and Cannon 1984:239; Walker and Lucero 2000). Contextual analyses aid in ritual identification because interpretation of the record does not rely solely on objects (Marcus and Flannery 1994). This is an important point because, in theory, by isolating spatial patterns and artifact configurations, studies of material from known ritual contexts may help to inform ritual studies conducted in other venues or mixed contexts.

Cave studies have traditionally taken a synchronic approach to understanding ancient cave use. This is primarily because ethnographic analogy has served as the foremost interpretive paradigm (Brady 1989; Brady and Prüfer 2005). While this has been demonstrated to be a fruitful approach applicable to many questions, its widespread use has largely masked temporal changes in the way that caves were used. To better address changes and continuities in cultural processes one must turn to other approaches. Practice theory offers one possible avenue. This theory suggests that changes in how ritual is conducted may inform us about sociopolitical transformations. For instance, archaeological studies focusing on power relationships suggest that social disruption creates fertile contexts for individuals or groups to claim or extend power and control by manipulating ritual practices (Aldenderfer 1993; Saitta 1997; Schachner 2001; Whiteley 1988).

Sherry Ortner (1989:12) characterized the study of practice not just as a methodology to locate the point of view of agents but also as one that seeks to understand “the configuration of cultural forms, social relations, and historical processes that move people to act in ways that produce the effects in question.” It is not surprising that Ortner advocates a historical overview and considers the historical perspective vital to the study of changes in practice. This suggests that despite limitations of their data, archaeologists are in a unique position to evaluate ritual transformations over considerable time scales. However, most methods employed by anthropologists are not effective for archaeological research.

Behavioral archaeology provides a materialist approach for studying ritual change. This school of thought, first advanced by Jefferson Reid, Michael Schiffer, and William Rathje (1975), seeks “to explain variability and change in human behavior by emphasizing the study of relationships between people and their artifacts” (also Schiffer 1995). It shifts research efforts away from the interpretation of the meaning of artifacts to questions aimed at understanding the behaviors that created the site’s depositional patterns.
William Walker (1995) has been instrumental in adapting a behavioral approach to the archaeology of ritual. Walker pointed out that anthropology has traditionally conflated ritual studies with studies of belief systems. He contends that approaches to the study of religion should focus on the ritual behaviors that produced the artifact record rather than on the attempt to interpret meaning from artifacts. In Walker's model, it is the behavior or change in behavior that becomes a unit of analysis that may be articulated with other social processes. In terms of cave studies, this shift in perspective suggests new lines of inquiry that place emphasis on how and when a site was used rather than on the meaning of caves and their artifacts. Alternative questions such as these require new methodology aimed at addressing temporal behavioral changes.

This chapter introduces the study of use-intensity as a means by which to evaluate site usage as well as to define and describe changes in ritual behavior. The methodology is described and implemented using data from a study conducted at Chechem Ha Cave in Belize. The method provides a quantitative measure to evaluate variation in the intensification or cessation of rites conducted within the cave. Comparing multiple use-intensity proxies highlights changes in ritual practice. Once defined and understood, ritual transformations provide a unit of analysis that may be articulated with historical, social, and environmental factors.

Study of Use-Intensity

Use-intensity is closely related to what is known in anthropological studies as ritual density (Bell 1997:173). According to Catherine Bell (1997:209), density studies examine why some societies or historical periods have more ritual than others. She notes that density is rarely studied directly and laments that "there has been too little analysis of the historical and sociocultural dimensions of ritual systems to give much sense to the principles at work."

Ritual density is a difficult issue for ethnographers to address for two reasons. The first is that it is diachronic. One has to have a historical perspective to evaluate changes. Having said this, there has been some very interesting work using oral histories and historical documents, but these often have inherent biases that are difficult to control. The second issue is that the quantification of "density" is problematic. Ritual studies have relied heavily on ritual typologies to quantify the number of types of rituals within a society so that studies of density tend to become typological exercises. Use-intensity addresses both of these issues. It is unique because it potentially studies ritual density directly and offers a broad perspective over long temporal periods.

Charcoal Flecks As Use-Intensity Signatures

In the archaeological record, use-intensity is studied by identifying a material signature that correlates with ritual activity. The repetitiveness of ritual and the fact that it must be repeated in prescribed ways (Marcus and Flannery
1994:56; Rappaport 1979:176; Whitehouse 2004) suggest that material correlates will remain the same until there is a change in practice. At Chechem Ha, charcoal was identified as a proxy for ritual behavior.

This is possible because the ancient Maya burned wood torches to light nocturnal activities. Torch burning is reported both ethnohistorically and ethnographically in both caves and surface site contexts. According to Hernando Cortez, pitch pine for torches was an important trade item at the time of conquest (Scholes and Roys 1968:58). In communities near Chechem Ha Cave, modern torch use was reported at the village of Succotz (Graham et al. 1980:171) and Antonio Morales, the cave’s landowner, reported that he still uses ocoté pine torches at night to save on fuel costs. Modern Maya use pine torches to light their homes in numerous other communities as well (see Morehart et al. 2005 for examples). Sol Tax reported that pine torches were used for exploring and conducting rituals at the man-made caves beneath the site of Utañlan in Guatemala (in Tedlock 1992:149; Tax 1947:471).

The use of torchlight is documented in the Classic period iconographically and archaeologically. The Late Classic Lintel 24, found at the Maya site of Yaxchilan, has a bas relief carving that depicts the ruler Shield Jaguar I bearing a torch while his wife, Lady Xoc, conducts a bloodletting rite (Schele and Miller 1986:186). Torch bearing is also displayed in a painting at Jolja’ Cave in Chiapas. In the depiction a person holds a torch over what has been argued is a Period Ending ceremony (Bassie-Sweet et al. 2000). Recently a Late Classic polychrome vessel depicting a man bearing a torch was found in a cave near the large site of Minanha in western Belize (Gyles Iannone, personal communication 2005).

Pine remains have been recovered from numerous surface sites dating from the Early Preclassic to the Colonial periods (ca. 1100 B.C.—A.D. 1600; see Morehart et al. 2005:263 for discussion). Although reports tend to lack the functional description of the contexts from which the material was recovered, pinewood was used in a variety of economic pursuits. This includes its use as a fuel and as a construction material. Christopher Morehart and his colleagues (2005) note that pine is an excellent but smoky source of fuel because the resins contained in the wood are highly flammable.

Torch bearing as a source of light in caves is borne out in the archaeological record. Ceramic torch holders have been found at several cave sites (Brady 1989; Graham et al. 1980; Prufer 2002:614; Reents-Budet 1980) and fragments of wood torches have been recovered from numerous caves as well (Brady 1989:289–290; Gann 1925:111; Graham et al. 1980:169; Prufer 2002:614; Stone 1995:202). At Chechem Ha Cave a partially charred wood fragment was discovered within a stack of potsherds on Ledge 10. The wood appears to have fallen from a torch into its current position. All archaeological findings suggest that torches were the only fuel source used in caves. Because there is no indication of alternative fuel sources—for instance, oil lamps—it is unlikely that changes in fuel types occurred before the end of the pre-Columbian period.

No formal research has been conducted on the distribution of charcoal flecks in caves, but cave archaeologists note the presence of charcoal flecks in virtually every cave dark zone used by ancient Mesoamerican people. In a recent survey
of 53 cave sites in western Belize, the Belize Valley Speleothem Project found charcoal flecks on the floors or in ritual caches in every dark zone (Moyes et al. 2006). Christopher Morehart (Morehart 2002, 2005; Morehart et al. 2005) identified charcoal from seven caves surveyed in the Western Belize Regional Cave Project under the direction of Dr. Jaime Awe. Morehart noted the presence of both pine and hardwood species from these caves and found that the use of pine exceeded that of other woods (Morehart et al. 2005:261, Figure 4). Although the sample was small, all charcoal from Chechem Ha Cave was identified as pine. While Morehart and his colleagues argue that there are ritual connotations associated with the use of pine, they are less successful in demonstrating that the ancient Maya preferred pinewood for torches for ideological rather than utilitarian reasons. Although they demonstrate that pinewood, sap, or needles are used in ritual contexts ethnographically, they are not able to show a preference for its ritual use at archaeological surface sites as a result of the poorly provenanced contexts of their samples.

Additionally, it is hard to imagine a more reliable fuel source than pinewood because it burns so well. This is a major issue in large caves with long dark zones or in caves that require crawling and climbing to access the inner passages and may account for the preference of pinewood when it is readily available. One can imagine the fate of a small oil lamp with a floating wick or of a poorly burning torch under these conditions. This is particularly true for the negotiation of caves with interior water sources or for those in which one has to swim to access the areas used by ancient people for rituals.

The wide distribution of charcoal in caves suggests that torch burning produces a good proxy measure that may be used to determine various aspects of site usage or, for that matter, whether it was used at all. Experimentation using ocote pine collected from trees growing in the vicinity of Chechem Ha demonstrated that burning torches produce a constant rain of charcoal flecks. During the 2003 field season Antonio Morales taught project members techniques for the construction and lighting of pine torches. Morales cut pieces of the pine he had collected locally into sticks measuring 1–5 cm in width and 50–70 cm in length. As a holder, he used a piece of bamboo 50 cm in length split at the top to accommodate the bundle of pine sticks. Morales cut extra strips for project use so that we could experiment with the same material that grows in the vicinity of the cave today.

The torches for the experiment were made in similar fashion but with some variation. In order to approximate the diameters of pine bundles used in torch making by the ancient Maya, measurements were used from two ancient ceramic torch holders found at the Belizean sites of St. Margaret’s Cave (Graham et al. 1980:169) and Petroglyph Cave (Reents-Budet 1980:81–85, 122). Both were funnel shaped. The Petroglyph Cave example measured 12 cm at the rim, 5 cm in diameter at the base of the shaft, and 28 cm in length. The holder from St. Margaret’s Cave was of similar size, measuring 6 cm in diameter and 28 cm in length. A piece of PVC measuring 6 cm in diameter was stuffed with the pine sticks to simulate the ancient torch holders in size.

Although ancient Maya iconographic depictions illustrate torch bearers, there is little evidence to suggest the initial length of the sticks that were used
to make torches. However, Thomas Gann (1925:111) reported finding pitch pine sticks in a cave near Benque Viejo, which he described as “a few feet long.” The pine sticks cut by Morales were just over 2 feet, which agrees with Gann’s findings. Including the PVC pipe, the torch measured 68 cm in length.

As part of the experiment a tripod was set on a 2-m² white paper. The torch was attached to the top of the tripod and placed in the center. It was set at 1.5 m in height to approximate the distance from the ground to a hand-carried torch (Figure 8-1). The torch was lit and allowed to burn to the end. The torch burned for 22 minutes and produced 60.1 g of charcoal distributed over the 2 m². The small flecks (<1 cm) weighed 16 g and larger wood fragments accounted for the remainder of the weight. This was repeated three times. Torches burned an average of 22.4 minutes and deposited an average of 17 g of small charcoal flecks. The experiment demonstrated that pine torches tend to burn at a relatively steady rate and produce an average of 16.77 g of small flecks. This relatively constant rate of burning and charcoal deposition suggests that charcoal from torches would be expected to provide a good measure for use-intensity within the dark zone areas of cave sites.

The use-intensity measure must be distinguished from a measure of frequency of use because it is not possible to distinguish between charcoal deposits that are a result of more numerous or less numerous cave visits. Other factors that could affect charcoal accumulation are the participation of more or fewer individuals in a fixed number of rituals or the duration of rites. However, other data sets can help to inform studies as to which of these scenarios are more likely. What charcoal proxies do offer are estimates of the fluctuations in the amount of activity occurring in the cave over time. The presence or absence of charcoal flecks within excavated strata is of particular interest because their absence suggests periods of disuse.

One of the advantages of using charcoal as a proxy is that it is an indirect signature. In other words, if one is to conduct rituals in dark zones, regardless of whether particular woods have ritual connotations, torch bearing is a necessity. Therefore its use is not likely to be affected by changes in ritual practice unless there is a significant change in the number of people participating in rites.

Other Use-Intensity Proxies

Ceramics have long been considered by Maya archaeologists to be a proxy for cave use because of their pervasive presence at the sites. They may date from the Early Middle Preclassic to the Postclassic periods and are often used to detect the presence or absence of human activity. However, the use of ceramic artifact counts as a proxy for intensity is problematic because of possible changes in ritual practice. Rites may require more or fewer objects within the ceremonial context or may require that objects be carried away from the site. Therefore, the ceramic data provide independent but less reliable evidence of cave use. By comparing the charcoal proxies with the ceramic counts it becomes possible to evaluate changes in the ritual behaviors associated with ceramic deposition.
Figure 8-1. Top, Nathan Craig and Holley Moyes set up the experimental torch. Bottom, photograph of charcoal flecks produced by a single torch.
The Setting

Chechem Ha Cave has been under investigation by the Western Belize Regional Cave Project (WBRCP) under the direction of Dr. Jaime Awe since 1998. It is located in western Belize on the western bank of the Macal River near the Guatemalan border on the edge of the Vaca Plateau (Awe et al. 2005; Figure 8-2). The cave consists of a complex system with over 300 m of tunnels. The tunnel system is 198 m in length and consists of two primary conduits, Tunnel 1 and Tunnel 2 (Figure 8-3). There are four elevated side passages and 11 shelves located 3–7 m above the Tunnel 1 floor. Artifacts were found throughout the system in niches and alcoves lining the tunnel floors, in elevated passages, and on all 11 shelves.

On the basis of AMS dates from surface and subsurface contexts, the site was first used in the Early Middle Preclassic period (1100–820 B.C.), possibly as early as 1300 B.C. These are the earliest radiocarbon dates for Maya ritual cave use in the lowlands (Moyes 2006) and are contemporaneous with dates from the site of Blackman Eddy, the earliest radiocarbon-dated settlement in the Belize Valley (Garber et al. 2004). AMS dates from preserved corn cobs indicate that Chechem Ha fell into disuse by A.D. 960. This is important because the cave’s deposits provide an extensive temporal record from which to evaluate changes in cave use that spanned the entire 2,000-year development and collapse of the Maya Classic period sociopolitical system.

Chamber 2 Excavations

The charcoal use-intensity proxy data were collected from excavations in Chamber 2. A test pitting program, conducted in 2002, revealed that Chamber 2 was the area that contained the deepest subsurface deposits and best stratigraphy (Moyes 2002, 2006). This area, located near the center of the tunnel system, 134 m from the cave entrance, was necessarily traversed to reach the deeper cave passages (see Figure 8-3). Therefore the area provided a good record of overall cave usage.

Chamber 2 is roughly rectangular, measures 3 m × 8 m, and is oriented on a northwest–southeast axis (Figure 8-4). A large outcrop of limestone is present on the eastern side of the tunnel. The chamber is entered at the southeast corner and exited at the northeast corner so that the natural modern pathway forms a U shape around the outcrop. An alcove containing Early and Late Classic potsherd scatters on the modern surface juts out from the southwest corner of the chamber. Two ledges are situated above the chamber, Ledge 9 and Ledge 10. Ledge 10 was used during the Early Classic period. Two AMS dates suggest a date range of A.D. 240–540 and the ceramic assemblage is in agreement. The ledge appears to have been used heavily and almost one-third of the cave’s entire ceramic assemblage was located on this high precipice. The second shelf in the chamber, Ledge 9, contains very little material and on the basis of ceramic cross-dating belongs to the Late Classic period from A.D. 700 to A.D. 900.
Figure 8-2. Digital elevation map (DEM) of western Belize showing location of Chechem Ha Cave and surrounding sites (base map courtesy of Anabel Ford and the Belize River Archaeological Settlement Survey project; revised
Figure 8-3. Map of Chechem Ha tunnel system.

Figure 8-4. Map of Chamber 2 showing photomosaic of excavated area.
To evaluate the chamber’s use, my team excavated a 2-x-8-m area that spanned its entire length from the south to the north wall (see Figure 8-4). There were a total of 17 levels in the excavation and Level 18 was the bedrock floor. Each level was dated using wood charcoal. Dates were analyzed at the AMS laboratory at the University of Arizona and calibrated using Oxcal 3. They are reported at the 2-sigma probability range unless otherwise specified.

Recording charcoal flecks was problematic because they were small and potentially numerous. The problem was how to document them in a manner suited to the time constraints of the excavation. This was accomplished by using a GIS (geographic information system) technology recently developed by Nathan Craig and Mark Aldenderfer called photomapping (Aldenderfer and Craig 2002; Craig 2000; Craig et al. 2004). The technique uses digital photographs to record each level of each excavation unit. It was perfect for rapidly piece-plotting large numbers of charcoal flecks in the field.

The excavation was blocked off into 1-m grid squares in the field. Each square of each level was photographed and the photographs were imported into ArcMap 8.1 where they were rubber sheeted (or stretched) onto a grid. They could then be brought up onto the computer screen and artifacts could be digitized onto the photographs while viewing them in the field. This ensured the accuracy of the data. By stitching together the 1-m units, each level could be viewed in a single screen. A map was generated for each of the levels. Figure 8-5 illustrates the Level 6 photomap to illustrate the finished product. The GIS database was instrumental in providing counts of charcoal flecks in each level.

Results: Use-Intensity in Chamber 2

Levels 1–13 dated to the Maya era (Table 8-1). Level 1 was the modern surface. Although this level was AMS dated to the Early Classic period, Late Classic sherds appeared on the surface and on Ledge 9 above the chamber, indicating Late Classic use of the area. Levels 2–6 dated to the Early Classic period, Level 7 to the Late Preclassic, and Levels 8–13 to the Early Middle Preclassic. The number of charcoal flecks per level ranged from 265 to 8,244. A correction to the raw data was made because the excavated surface areas were not identical on each level. As the excavations progressed the cave walls curved inward and spatial areas narrowed toward the bottom. The total charcoal counts were divided by the area of the excavated level to produce a use-intensity index. Figure 8-6 is a graph of the variation in the data moving left to right from the youngest to the oldest deposits. Beginning in the Early Middle Preclassic period there are heavy charcoal deposits that diminish after 820 B.C. There is little charcoal found in Level 7. This level dated to 350–40 B.C. but is bracketed by much earlier and later dates. This suggests that the chamber received low-intensity usage for a long period of time.

Level 6 represents the period of heaviest charcoal accumulation in the cave’s history. It dates from the end of the Terminal Preclassic to the beginning of the Early Classic period from A.D. 130 to A.D. 420. By using a 92.6-percent probability range this date can be trimmed to between A.D. 210 and A.D. 420, which places
the previous period of low-intensity cave use between 820 B.C. and A.D. 210. Over the Early Classic period, charcoal accumulations gradually drop off and by the Late Classic period there is little charcoal in the chamber though there are Late Classic sherds on the chamber floor and on Ledge 9. When we group the data by phases we see that there was a great deal of charcoal present in the Early Middle Preclassic period, much less throughout the Late Preclassic period, and much more in the Early Classic period, exceeding that in the Early Middle Preclassic (Figure 8-7).

The ceramic counts provide a different picture of cave use. Using data derived from in situ vessel reconstructions we find that there were a total of 563 individual sherds, partial vessels, or whole vessels recorded in both surface and subsurface contexts. Of these, 470 were typed for chronology. When we view the two data sets side by side we find both agreement and discrepancies between them (Figure 8-8). The ceramic chronology determined that 4 percent of the as-
Table 8-1. Chamber 2 Excavation Data

<table>
<thead>
<tr>
<th>Level</th>
<th>AMS Date</th>
<th>Period</th>
<th>Excavated Area (m²)</th>
<th>No. Charcoal Flecks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A.D. 250–540</td>
<td>Early–Late Classic</td>
<td>12.77</td>
<td>265</td>
</tr>
<tr>
<td>2</td>
<td>A.D. 250–440</td>
<td>Early Classic</td>
<td>12.61</td>
<td>770</td>
</tr>
<tr>
<td>3</td>
<td>A.D. 400–560</td>
<td>Early Classic</td>
<td>12.47</td>
<td>2,155</td>
</tr>
<tr>
<td>4</td>
<td>A.D. 250–440</td>
<td>Early Classic</td>
<td>12.76</td>
<td>1,779</td>
</tr>
<tr>
<td>5</td>
<td>A.D. 240–440</td>
<td>Early Classic</td>
<td>12.3</td>
<td>3,341</td>
</tr>
<tr>
<td>6</td>
<td>A.D. 130–420</td>
<td>Terminal Preclassic/Early Classic</td>
<td>12.58</td>
<td>8,244</td>
</tr>
<tr>
<td>7</td>
<td>350–40 B.C.</td>
<td>Late Preclassic</td>
<td>12.58</td>
<td>815</td>
</tr>
<tr>
<td>8</td>
<td>1130–890 B.C.</td>
<td>Early Middle Preclassic</td>
<td>10.06</td>
<td>1,290</td>
</tr>
<tr>
<td>9</td>
<td>1000–820 B.C.</td>
<td>Early Middle Preclassic</td>
<td>10.1</td>
<td>2,884</td>
</tr>
<tr>
<td>10</td>
<td>1000–820 B.C.</td>
<td>Early Middle Preclassic</td>
<td>9.97</td>
<td>3,537</td>
</tr>
<tr>
<td>11</td>
<td>1190–920 B.C.</td>
<td>Early Middle Preclassic</td>
<td>9.47</td>
<td>1,390</td>
</tr>
<tr>
<td>12</td>
<td>1320–930 B.C.</td>
<td>Early Middle Preclassic</td>
<td>9.27</td>
<td>1,591</td>
</tr>
<tr>
<td>13</td>
<td>1130–910 B.C.</td>
<td>Early Middle Preclassic</td>
<td>10.25</td>
<td>917</td>
</tr>
</tbody>
</table>

The assemblage dated to the Early Middle Preclassic, 5 percent to the Late Preclassic, 39 percent to the Early Classic, 2 percent to the early part of the Late Classic, and 51 percent to the Late Classic periods. In the Early Middle Preclassic period charcoal counts were high but ceramic counts were at their lowest. Both charcoal and ceramic counts dropped in the Late Preclassic period, which suggests sparse usage of the site at that time. During the Early Classic period both the ceramic counts and charcoal indices increase considerably, suggesting an intensification of use. During the Late Classic there is a considerable discrepancy between the ceramic data and the amount of charcoal found in the deposit. Ceramic counts suggest that there is a greater intensity of cave use than indicated by the small amount of charcoal present on the Late Classic surface. During the Late Classic period over 51 percent of the entire ceramic assemblage was deposited in the cave during a relatively short 200-year time span.

Changes in Ritual Practice

These data create a behavioral profile of the site, which is instrumental for defining distinct changes in ritual practice and intensity of use over time. In the Early Middle Preclassic few ceramics were brought into the chamber although it was heavily used. Ritual activities at this time did not focus on the deposition of ceramics as in later times but were likely to have been performance based. The
Figure 8-6. Graph of use-intensity index showing numbers of charcoal flecks by excavated level divided by surface area of excavated space.

Figure 8-7. Percentage of total charcoal grouped by major period. Less than 1 percent of the total amount of charcoal dates to the Late Classic period.

possibility also exists that objects used in performance were taken away or that perishable materials left in the chamber have disintegrated.

Cave use falls off in the Late Preclassic period but increases dramatically at the Terminal Preclassic/Early Classic transition as evidenced by both the deposition of ceramics and the increased charcoal counts. The charcoal deposits suggest that the cave received its heaviest use at the beginning of the Early Classic period.

In the Late Classic period high ceramic counts indicate that the deposition of offerings was the primary focus of cave rites. During this period the sparse char-
coal deposition within the chamber precludes participants’ having spent long periods of time in the cave and suggests that they moved quickly through the site, most likely in small groups. Charcoal rain from pine torches would be expected to have produced denser carpets on the cave floor had participants lingered in the area.

These observations provide us with units of analysis that may be contextualized within broader sociopolitical and environmental circumstances. This in turn enables the archaeologist to understand religious rites within their original contexts. For instance, because Maya caves are integrally related to success in agricultural fertility, we might expect that changes in practice could be a reaction to environmental stress.

**Conclusion**

Current research goals in the archaeology of religion strive to correlate changes in ritual practice with social, political, and environmental factors thereby reconnecting religious rites with the contexts in which they took place and had meaning. From this example we see that the study of ritual intensity offers a productive new line of research. In this chapter I have suggested a new methodology for studying ritual sites by quantifying material manifestations of religious rites. The two use-intensity proxies, charcoal and ceramic counts, provided independent evidence from which to evaluate the temporal variation of site use. Because changes in ritual practice entailed variation in the patterns of ceramic deposition, it would have been difficult to determine how heavily the site was used on the basis of these data alone. It was only possible to decouple changes in the intensity of site use from changes in ritual form by using an indi-
rection signature as one of the proxies. The discrepancies between the two data sets were instrumental in highlighting behavioral changes. With these data in hand it is now possible to correlate the relative increase or decrease of ritual intensity with circumstances occurring in wider social and environmental contexts. This type of diachronic study that focuses on ritual behavior is destined to promote a better understanding of the role of ritual and religion in social production, reproduction, and transformation.

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