XX ASSEMBLAGES IN FOCUS: ASPECTS OF THE CULTURAL LANDSCAPE IN THE PERIPHERY OF THE ANCIENT MAYA SITE OF PACBITUN, BELIZE

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Archaeological investigations in the periphery of the ancient Maya site of Pacbitun have revealed a complex pattern of cultural features such as a causeway system and agricultural terraces interspersed and associated with landscape features such as caves and springs. The primary objectives of the ongoing landscape studies around Pacbitun are to: 1) ascertain the construction periods of the causeway system and its corresponding architecture; 2) determine how the caves were being used and who controlled access to them; and 3) continue to trace the development of Pacbitun as a major ceremonial center. This paper presents preliminary results of our findings to date. In order to determine the relationship between the site center, the causeway system, and the caves in the Pacbitun periphery, the results will be compared with other ancient sites on intra- and inter-regional levels.

Introduction

Pacbitun, an ancient Maya site located in the foothills of the Maya Mountains in the Cayo District of Belize, presents archaeologists with the unique opportunity to investigate the relationship between the site core and various caves, located in its nine square km periphery. The recording of natural and cultural features situated in this area will help us to better reconstruct various aspects of the ancient Maya society at the site. For example, recorded features, like housemounds, water sources, and constructed causeways provide clues about the socio-political and cosmological environment. Particularly targeted in this paper is the causeway system encountered during past field surveys, which connects the site core to a ritually used cave. Through the application of ArcGIS’s least cost path analysis tool, we will systematically test and discuss to what extent testable predictions can be made about the causeway routes linking the site of Pacbitun to its hinterland caves.

Pacbitun Background

Pacbitun is situated at the juncture of two eco-zones: the lowland tropical rainforest and the Mountain Pine Ridge (Figure 1). The surrounding terrain is hilly with naturally fertile soils trapped in low-lying catchment basins and valley-like depressions. First inhabited about 800 BC (Healy et al. 2007), Pacbitun reached its peak of cultural development during the Late Classic (AD 600-900) period at which time it likely controlled an area of nine square kilometers. Ceramic analysis indicates that the site was possibly abandoned by the beginning of the tenth century (Healy et al. 2007).

Cave Research 2010-2011

To date, approximately 25 caves have been identified in the Pacbitun periphery. Three of these caves were mapped in 2009 (Actun Merech, Actun Pech, and Tzul’s Cave) (Powis 2010). During the 2010 field season, the goal was to survey the area between the site core and these three previously investigated caves (Figure 2). Due to its location close to the other three caves, we incorporated a newly found cave, designated as Crystal Palace, to the area of investigation, widening the prior research area towards the East (Weber 2011; Weber and Powis 2010) (Figure 3). A primary focus of cave investigations during the 2011 season was Actun Lak, which was first recorded during reconnaissance the year before. It was chosen...
**Figure 2.** Location of Pacbitun in relation to Tzul’s Cave, Actun Pech, Actun Merech, and Crystal Palace.

**Figure 3.** Location of caves in the periphery in relation to each other.
for investigations because of the unusually high quantity of pottery found throughout, the presence of a group of stalagmitic formations with a natural pavement of fist-sized stones in front of it, and an area of intensive burning, all of which was unseen in the other known caves in the region.

Aktun Lak

Aktun Lak is 45 meters long and consists of three chambers and four ledges. Large quantities of pottery have been found throughout the cave, though a great majority of the sherds are now found swept to the sides of the cave and stacked in piles on small ledges and alcoves, all of which are activities of the land owner who has moved them aside to protect them from being trampled on by tour groups and other visitors to the cave.

We would like to briefly touch on three areas of the cave and present some initial observations made throughout the field season. The first is the entrance area where a five to seven course high terrace created a flat space in the otherwise sloping entrance area (Figures 4 and 5). Furthermore, it was placed along the cave wall directly in front of a three meter drop. The terrace was constructed of uncut stone and laid without mortar. Similar constructions are common in caves throughout the Maya area. For example, the Entrance 2 area of Actun Chapat excavated by Josalyn Ferguson (2000, 2001) in the late 1990s near the Macal River contains a series of step-like terraces that reach up to the ceiling. Amalia Kenward (2005) recorded terraces, single-course stone lines, and other masonry configurations throughout the caves in the Sibun Valley. Kenward argued that these constructions likely delineated paths through the caves. The positioning of the terrace in Actun Lak adjacent to the cave wall and 3-meter drop suggests a function for this construction that is unrelated to the movement of people through space (Kenward 2005). The formations of the cave choke off at this point, which prevents a person standing there from seeing deeper within. This setup negates the possibility that it was constructed as a viewing platform for audiences to witness activities being performed further within (Kenward 2005). On the other hand, it is situated in a location that is ideal for people outside of the cave to view activities being performed on it. In other words, it likely acted as a stage for activities meant to be witnessed from outside of the cave.

The second area is the group of stalagmitic columns located roughly in the middle of the cave with an associated rough pavement of fist-sized rocks covered in calcite that extends for two meters from the base of the formation towards the cave entrance (Figure 6). The immediate surface area around the formation has been cleared of larger sherds, but the ground remains composed largely of smaller pieces, suggesting that this was a major focus of ancient activity in the cave.

Archaeological investigations throughout the Maya area suggest that such cave formations were symbolically powerful items. For example,
Chechem Ha contains a stalagmitic stela surrounded by a circle of stones in its rear chamber (Awe et al. 2005). Stela 31 from Yaxchilan, Chiapas, Mexico, is a cave-harvested stalagmite that was literally stuck in the ground and carved (Tate 1992). The recently recognized practice of harvesting these features and placing them within constructions also speaks to their significance. The depiction of a stalagmitic tooth in the mouth of the zoomorphic cave on the murals from San Bartolo, Guatemala suggests that the ancient Maya recognized these features as vital components of caves. Perhaps the most compelling evidence of the significance of these cave features is reported by Ian Graham (1997). He discusses a carved formation at the mouth of a cave in the Peten, Guatemala that was in the form of a life-sized Chaak. This statue, which has since been destroyed, suggests that cave formations may have been understood as the embodiment of the rain deity (Graham 1997; Saturno et al. 2005). All of these examples may explain the ritual attention that the Actun Lak stalagmite group appears to have received.

Figure 6. Stalagmitic Column in Actun Lak.

The final area of the cave is the altar found beyond the stalagmitic columns just discussed. The altar is constructed completely from harvested cave formations including curtains and dripstone columns. Unfortunately, this area has also been disturbed as evidenced by the large pile of formations that have been stacked in an alcove behind the altar. The area that houses the altar can best be described as highly burned. Smoke clouding and charcoal ash cover the walls and ceiling. Water screening of soil samples collected at Barton Creek Cave by Mike and Vanessa Mirro and Chris Morehart from a similarly heavily burned area resulted in the recovery of large quantities of vegetal material as well as cotton textiles suggesting that bundled offerings may have been made there (Mirro 2007; Mirro and Mirro 2001; Morehart 2002; Morehart 2005; Morehart et al. 2004). These results prompted our excavation of two small test units where all soil material was collected and water screened.

While we have yet to perform the ethnobotanical analysis, what we can report is that very high quantities of organic materials were brought in and burned in this area. Several large pieces of wood, as well as several fragmented pieces of greenstone were recovered. These remains suggest that high elite personages were among those visiting the cave and performing rituals within. Its proximity to Pacbitun, only 1.5 km nearly due north, suggests that the elite were likely from that site.

Peripheral Research 2010-2011

Aside from the caves, other survey finds in the periphery included, ninety agricultural terraces, eighty housemounds, six reservoirs, four plazuela groups, three rock shelters, two chultuns, two springs, two wells, one sinkhole, two stelae found in the fields, and several other structures (Figure 7) (Weber 2011). We also resurveyed two causeways which had been recorded in the site core in previous years.

As a result of this work these causeways in and surrounding Pacbitun became a research focus. These raised roads built by the ancient Maya functioned not only as transport and communication routes, but also reflected different levels of social and political activities and thus can provide insights into these political
activities, social organizations, economics structures, and cosmological values on a site and regional level (Normark 2006). There are three causeways present at Pacbitun and in its periphery: Mai Causeway, Tzul Causeway, and Tzib Causeway (Figure 8).

The Pacbitun Causeway System

In the Pacbitun site core, the Mai Causeway begins adjacent to Structure 11 where it connects with Tzul Causeway (Figure 9). From there, it runs east for approximately 273 meters, before terminating in front of Structure 10. Tzul Causeway also starts at Structure 11 in the Pacbitun site core, similar to Mai Causeway. Modern construction has destroyed parts of the Tzul Causeway, especially where it crosses a modern road, but it re-emerges clearly visible on the other side. Approximately 900 meters from the site core, it intersects with another ancient Maya road, which was named Tzib Causeway (Figure 10). It then continues into the foothills, running for about 1.2 km until it terminates in front of Tzul’s Cave. In total, Tzul Causeway is approximately 2.6 km long. Tzib Causeway is much shorter, only about 600 m in length, and connects a plazuela group to a minor center (Weber 2011). Preliminary results of the 2011 field season excavations into the causeway intersection revealed the well defined boulders of Tzib Causeway connecting to Tzul Causeway. The different styles between the two causeways suggest different construction periods, however, further investigations, including ceramic analysis of the construction fill will be required to follow up on this matter.
Figure 8. Map showing the recently surveyed causeway system at Pacbitun. The Mai Causeway runs from Structure 10 to Structure 11 in the site center. The Tzul Causeway runs from Structure 11 to Tzul’s Cave. The Tzib Causeway runs from a plazuela group to a Termini Complex in the site core.

Figure 9. Map showing Mai and Tzul Causeways in the site core (after Healy et al. 2007; modified by Weber 2011).
Figure 10. Map showing the intersection of Tzul and Tzib Causeways.

Figure 11. LCP Analysis Model (after Weber 2011).

Least Cost Path Analysis (LCP) – Pacbitun to Tzul’s Cave

Considering the presence of several ritually used caves in the Pacbitun periphery, the question arose why the Maya built a causeway to Tzul’s Cave and not any of the others. Causeways in association with caves are less common than causeways connecting architecture or settlements, but they have been found. Because caves were an important aspect of the ancient Maya world, one intriguing question regarding the causeway system targeted Tzul Causeway and its actual course. Since the causeway runs into the mountains, the terrain becomes very steep at times. To test whether the ancient Maya built the causeway to Tzul’s Cave, based on the easiest route through the terrain or if there might have been another reason for its directional course, we decided to run a least cost path analysis, or LCP, from the Pacbitun site core to Tzul’s Cave (Figure 11) (Weber 2011).

In order to calculate the least cost path analysis, a slope file from raster data was created. Next we created the cost distance, an output raster in which each cell was assigned the accumulative cost to the closest source cell, namely the Pacbitun site core in form of a single-point shape file (ESRI 2011). Given the cost distance and the destination cell, here Tzul’s Cave, again a single-point shape file, we could then run the cost path analysis. Results showed a path running from the Pacbitun site core to the southwest for approximately 2.2 kilometers before running straight south for about 388 meters to Tzul’s Cave. When reviewing the surveyed Tzul Causeway, it becomes apparent that the LCP follows the route of the actual road (Figure 12). Since the LCP was run solely based on slope data, this indicates that there is not an easier route following less steep elevation values from the valley to the cave. The causeway was indeed built following the lowest topographic features (Weber 2011).

Discussion of Causeway Symbology

Another intriguing aspect of the causeway system at Pacbitun, aside from the termination of Tzul Causeway in front of Tzul’s Cave, is the intersection between Tzul and Tzib Causeway (Figure 13). Intersections in causeways often served as a way to connect terminal architectural groups with a more well-defined site core (Shaw 2008:73). Of course, the intersection of the Tzul and Tzib causeways could have been a simple consequence of connecting the minor center and plazuela group on either side of Tzib Causeway to the Pacbitun site core. However, this would still leave us with the question of why the intersection of Tzib and Tzul Causeways is where it is, since, to date, not other significant features have been encountered at this location (Weber 2011). Thus, more complex reasons behind causeway constructions need to be considered as well. For example, the process of building major causeways could have also served as a way to unify workers and establish a collective identity that would further the establishment of the territory as a single polity (Shaw 2008:111). The housemound distribution...
Figure 12. Least cost path analysis in relation to Tzul Causeway.

Figure 13. Causeway system with marked intersection.
in the periphery of Pacbitun is clustered just south of the intersection of Tzul and Tzib Causeways. More importantly, they are also located in close proximity to four ancient water basins, or aguadas, which are aligned with a spring and dug well in the mountains (Figure 14). Close water sources are vital to farming, and settlement close them it a logical consequence found in ancient agricultural settlement patterns, as farmers will try settle where they need to in order to farm. Elites residing in the Pacbitun site core, most likely relied on food provided by the commoners and had an interest of tying their loyalty to the site center. A causeway, with practical and symbolic functions, would have been the perfect project for elites seeking to integrate and manage population (Shaw 2008:111).

A long causeway like Tzul Causeway could have undergone several construction and extension phases. It could have possibly first been intended as a connection to the commoner farms, as a symbol of power domination and symbolic importance. Tzib Causeway along with its minor center and plazuela group could have been connected for this reason, further establishing a visible and prominent link to the site center (Weber 2011). An extension of Tzul Causeway from the intersection to Tzul’s Cave could have played into various aspects of this hypothesis, either further symbolizing the elite connection to the ritually charged cave or providing access to the cave for the commoners, again displaying dominance in the periphery, as it has been argued that for the ancient Maya, access to or control over sacred spaces and associated rituals served as a fundamental strategy for displaying, legitimizing, and negotiating social power (Prufer and Brady 2005). Here, the placement of monumental architecture over or near caves implied control over these sacred areas by the elites, who provided the financial backing for the construction of the monumental architecture (Prufer and Brady 2005). For example, while caves and cave ceremonies were used by both commoners and elites, elites could (and did in some cases) construct causeways to influence the pilgrimage to the cave (Prufer and Brady 2005).

Further, Stone (2005) argues that since caves and other topographic features have
inherent powers to open communication with spirits and ancestors, and could invoke a spiritual sense of the past which could not be duplicated by the built environment, it was necessary for the elite and the commoners to renew their ties with the sources of sacred power found across the landscape. Hence, pilgrimages to these natural sanctuaries were exploited by the elite to buttress their claim of divine status (Stone 2005:135). If the elite residing in Pacbitun were interested in displaying and reinforcing their power to the commoners residing in the periphery, Tzul Causeway would have been an adequate way to do so (Weber 2011).

Conclusion

As previously discussed, the analysis of the landscape and built environment can greatly contribute to the archaeological understanding of past societies. The GIS based least cost path analysis can help evaluate the components of movement and intention in these environments through predicting the most likely or unlikely route on which the ancient Maya might have build a causeway. The analysis of Tzul Causeway has shown that if the causeway had not been previously encountered, through running the LCP and then ground-truthing the result through a field survey, chances would have been good for it to be found. It has therefore been shown that predictive modeling can contribute important information to archaeological analysis as a research tool, but also as a supportive analysis device.

A common assumption to make about a causeway that leads to a cave would be to argue for cosmological and religious ideologies that caused the initial construction. While this explanation might very well be applied to the direction of Tzul Causeway from the site center to Tzul’s Cave, it does not address the encountered intersection, nor why a causeway was built to Tzul’s Cave but not any of the other caves in the periphery. Tzul’s Causeway could have possibly first been intended as a connection to the commoner farms, as a symbol of power domination and symbolic importance. Tzib Causeway along with its minor center and plazuela group could have been connected in order to establish a visible and durable link to the site center. An extension to Tzul’s Cave could have served to either further symbolize the elite connection to the ritually charged cave or provide access to the cave for the commoners, again, displaying dominance in the periphery with the multi-purpose causeway system whose use and meaning changed through time at Pacbitun.

The further investigation of the cave and causeway system in the periphery of Pacbitun through excavation and survey will hopefully provide us with more insights and continue to make a substantial contribution to our understanding of how ritual behavior and pilgrimages influenced settlement patterns or vice versa.

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