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MAYA *SACBEOB*

Form and function

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Abstract

This article reviews currently available data on Lowland Maya *sacbeob* (raised roadways) to create a tripartite system of road classification and explore why the Maya built such constructions. Rather than simply classify *sacbeob* as "intrasite" or "intersite," roads are divided into "local intrasite," "core–outlier intrasite," and "intersite" based on length and function. This classification system is then employed on a data set of 190 *sacbeob* to explore the degree to which it may have been some sort of a reality for the ancient Maya. The practical and symbolic aspects of roadways are also discussed, with the aim of beginning to explain why *sacbeob* are present at some sites while absent at others. Possibilities from environmental to temporal variation are reviewed, as are the ways in which plazas may or may not have been able to substitute for constructed routes. The Inka road system is also briefly summarized to provide an analogy to better understand Maya systems. Finally, an appeal is made to researchers to view *sacbeob* not as a single type of artifact, but as a class of features with a range of types and functions.

Mayanists have extensively documented and reported the existence of *sacbeob* (raised roadways) as part of community and regional settlement-pattern studies. The alignment and orientation, height and width, and construction techniques of these causeways have been diligently recorded as part of mapping efforts at large and small sites. Yet most research focuses on the documentation of what a particular *sacbe* connects and disregards larger issues, such as the role that *sacbeob* played in Maya culture and the variability in form and function within this broad feature class.

This paper seeks to begin this task and synthesize our current understanding of these constructions by amassing data from the northern and southern Maya Lowlands and from inter- and intrasite *sacbeob*. The current system of road classification in the Maya area warrants the proposal of an alternative tripartite division. In addition, I argue that *sacbeob* of all types may have served a number of functions, including those related to transport, boundary maintenance, water management, and religion. These efforts will not only highlight *sacbeob* in a variety of settings; they will also point out areas in which data are lacking as a means to guide future research. Although the sample by no means represents an exhaustive list of all *sacbeob* in the Maya world, it attempts to include all available ground-truthed documentation on *sacbeob*.

TYPES OF *SACBEOB*: FORMAL DISTINCTIONS

Archaeologists have long classified *sacbeob* into formal types in order to describe and analyze variability. Examination or attempted modification of any system of classification requires an initial consideration of the purpose of the system. Are these categories, as Ford (1954) and Dunnell (1971) postulate, strictly "heuristic devices and nothing more" (Dunnell 1971:47)? Or might the divisions archaeologists create have had meaning for the cultures that created the artifacts (Spaulding 1960)? Most accept that, minimally, a classification system should serve as a useful tool for the practitioner. The debate concerns whether archaeologists have the ability to discern types that a culture, such as the ancient Maya, recognized as functionally or stylistically distinct categories. I argue that, although all defined categories of *sacbeob* do overlap to some degree in terms of form and function (as do the lithic categories of macro- and microblade technology), the presence of Maya roadways in several distinct contexts and forms enables the creation of types based on cultural meaning.

Although height, width, and construction materials may vary to some degree, all features called *sacbeob* share a relatively similar form (Figure 1): large stones line the edges and cobbles gradually gradate to fine gravel near the surface of the road. The tops of *sacbeob* were paved with fine *sascab* (powdered limestone) and pressed smooth with stone rollers (Villa Rojas 1934). Occasionally, materials such as packed sediment (Folan 1991) or tamped earth and oyster shell (Vargas 1985) were substituted, according to local availability. For most *sacbeob*, the construction style and effect were that of an elongated house foundation or platform (Kurjack 1977:223; Kurjack and Garza 1981:301). Variability existed in the height, width, and materials, as it did with any other category of structure or feature. But these three particular variations do not seem to correlate with any functional, spatial, or temporal division. Instead, they may indicate the ability of a particular site or work crew to provide time, energy, and materials to a building or maintenance project at a given time. Documentation shows considerable variability in form, even within individual causeways (Shaw 1998; Villa Rojas 1934).

Rather than focusing on height, width, or construction quality, the classification of *sacbeob* traditionally focuses on their intersite or intrasite features based on the total distance the roads traversed and perceptions about the two loci that they connected. Much of this practice involves aspects of settlement-pattern analy-

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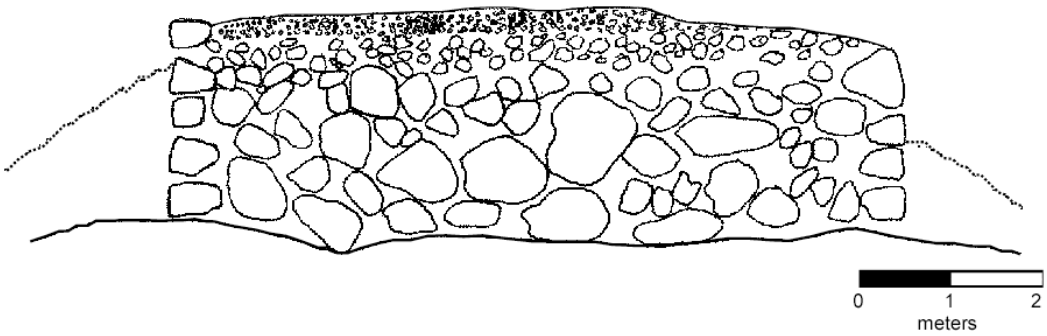


Figure 1. *Sacbe* section from Yo'okop's *Sacbe* 3.

sis, such as the presence or absence of significant structure-density drop-off between the points. Researchers also consider the history, architectural and ceramic styles, and perceived relationship between the connected loci. An intrasite classification refers to *sacbeob* connecting major architectural groups within the dense site core, while intersite indicates long-distance roadways passing through very low-density or uninhabited areas. Little confusion exists for most archaeologists in the application of this system because most examples are intrasite causeways that connect only major groups in the center.

The increased documentation of sites—in particular, of substantial northern centers such as Coba (Folan 1983a, 1983b)—has begun to call this system into question (e.g., Benavides 1981). Several sites show difficulty in being classified according to this dichotomy. At Calakmul (Folan et al. 1995), Caracol (Chase and Chase 1987, 1989,1996; Chase et al. 1990; Jaeger 1991), Coba (Benavides 1975, 1981; Gallareta 1981), Chichen Itza (Cobos and Winemiller 1997; Lincoln 1987, 1991; Piña Chan 1980), and Yo'okop (Shaw et al. 2001) (Figure 2) roadways exist that defy the traditional scheme by running for more than a kilometer to connect the core with outlying groups. These problematic roadways are often referred to as intrasite *sacbeob*, but I argue that, in addition to extending for a much greater distance, they performed functions that are unlike those of roads that ran for a few dozen meters within dense core zones.

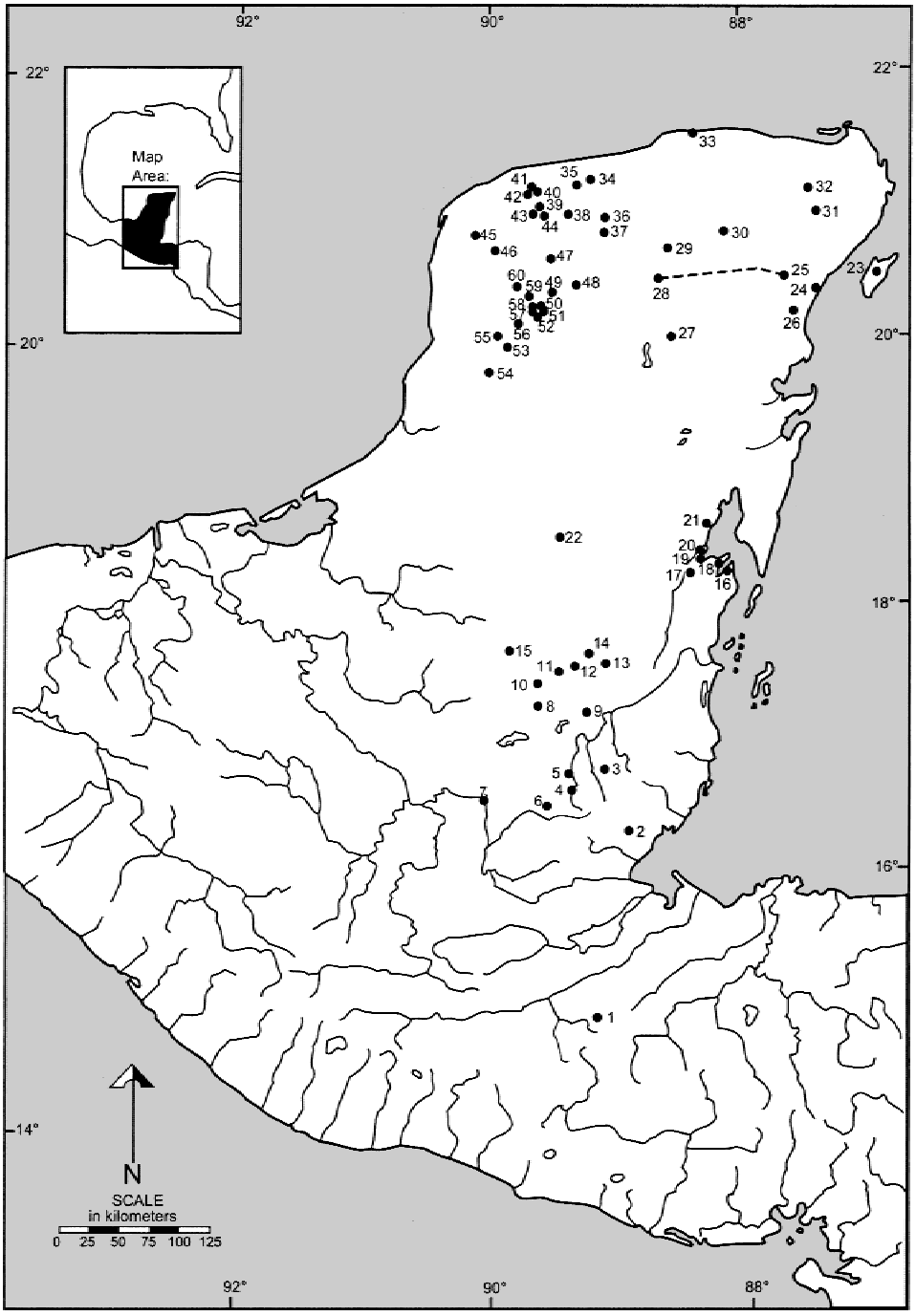
As a result of these cases, I maintain that a third category of roadways is needed based on length and, as will be discussed, functional differences. Following Benavides (1981:149–176), who divides the *sacbeob* of Coba into "regional," "zonal," and "local" types, I propose that three categories of roadways exist. The first, referred to here as "local intrasite," connects major architectural groups within and immediately around the site core. These roads extend 1 km or less and remain within high-density portions of the site. The second category, "core–outlier intrasite," runs 1 to 5 km to connect the core with more distant portions of the site, such as outlying groups. The linked loci were often separated by areas of lower-density population, yet they appear to have functioned as one political and economic unit. The final proposed category is the "intersite" *sacbeob*, which connect spatially distinct sites that are at least 5 km apart. Although the relationship among such entities may have included that of vassal states (Kurjack and Andrews 1976; Schele and Freidel 1990), the sites are at least nominally independent.

Examples of local intrasite *sacbeob* exist throughout the northern and southern Maya Lowlands (Table 1), although the north represents the majority of the data set. The core–outlier intrasite category also appears to be found primarily in the north (Table 2). Within this small group, *sacbeob* were used during the Postclassic period to link sites with seaports, as at Muyil, San Gervasio, and Xelha, as well as to link core areas with outlying residential/ceremonial groups. It should be noted that, according to Smyth et al. (1998), the Sayil–Chac *sacbe* connects two independent sites and fits into the intersite category. In this study, it belongs in this second group, as a core–outlier intrasite roadway, because of the short distance between the endpoints (Chac is 1.7 km northwest of the North Palace at Sayil).

The final group, intersite *sacbeob*, is also present primarily in the north (Table 3), with examples that include the 100-km Coba–Yaxuna *sacbe*. In the south, Caracol (Chase and Chase 1987, 1989, 1996; Chase et al. 1990; Jaeger 1991, 1994) and El Mirador (Matheny 1980, 1986a, 1986b) are the main sites with intersite road systems. Recent research at Calakmul (Folan et al. 1995) has indicated that this site also has a complex system of intersite roadways. However, as many of these Calakmul *sacbeob* have not yet been fully documented and ground-truthed, they were not included in this sample. All of the examples in this third group extend more than 5 km and connect separate sites. It should be kept in mind that, as historic and modern roads have often been built following the same course as older, established routes (Romanov 1973), some ancient intersite (and shorter) *sacbeob* may be masked by modern construction.

The concept and definition of "site" is reflected in the placement of *sacbeob* that cross short areas of density drop-off, such as the Sayil–Chac and Naranjal–San Cosmé roadways, in the core–outlier intrasite category rather than in the intersite grouping of *sacbeob* that link separate sites. For those researchers who define site boundaries, in settlement-pattern terms, strictly as a point at which a certain low-density population was exhibited, these roads do appear to fall into the intersite type. If "site" includes some political and economic dimensions, however, these examples fit better into the core–outlier intrasite category, with Chac and San Cosmé serving as outlying parts of larger sites rather than as independent political entities existing three or fewer kilomters away from the cores of larger sites. The differential nature of the settlement sizes, in combination with their close proximity to each other (less than the distance that many modern Maya walk to their *milpas*), makes it unlikely that the smaller sites, connected by causeways, would have been able to escape being integral parts of the political and economic systems of the larger powers (Kurjack and Andrews 1976; Kurjack and Garza 1981).

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1. Copan
2. Xnaheb
3. Caracol
4. Ixkun
5. El Rosario
6. San Juan Pueblito
7. Seibal
8. Tikal
9. Naranjo
10. Uaxactun
11. Xultun
12. La Honradez
13. Chan Chich
14. Kinal
15. El Mirador
16. Shipstern
17. Nohmul
18. Bandera
19. Cerros
20. Chan Chen
21. Oxtancah
22. Becan
23. San Gervasio (Cozumel)
24. Xelha
25. Coba
26. Muyil
27. Yo'okop
28. Yaxuna
29. Chichen Itza
30. Ek Balam
31. Naranjal
32. Oxlakmul
33. Isla Cerritos
34. Cansahcab
35. Uci
36. Izamal
37. Kantunil
38. Ake
39. Cuca
40. Dzibilchaltun
41. Tamanche
42. Komchen
43. Tiho
44. Yaxcopoil
45. Chunchucmil
46. Oxkintok
47. Mayapan
48. Chacchob
49. Yaxhom
50. Xcanheleb
51. Labna
52. Huntichmul
53. Tzum
54. Edzna
55. Halal
56. Dolores
57. Sayil
58. Sannacte
59. Kabah
60 . Uxmal

Figure 2. Location of sites with *sacbeob*.

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Table 1. Sites with local intrasite *sacbeob*

Site	Source
Ake	Roys and Shook 1966
Bandera	Sidrys 1983
Becan	Thomas 1981
Caracol	Chase and Chase 1987, 1989, 1996; Chase et al. 1990; Jaeger 1991
Cerros	Scarborough 1991
Chac Chacchob	Smyth et al. 1998; Webster 1979
Chan Chen	Sidrys 1983
Chan Chich	Houk et al. 1996
Chichen Itza	Cobos and Winemiller 1997; Lincoln 1987, 1991; Peña Castillo et al. 1991; Piña Chan 1980; Schmidt 1981
Chunchucmil	Garza and Kurjack 1980; Kurjack and Garza 1981
Coba	Benavides 1975, 1981; Gallareta 1981
Copan	Fash 1991; Willey and Leventhal 1978
Cuca	Webster 1979
Dolores	Dunning 1992
Dos Hombres	Houk 1996
Dzibilchaltún	Andrews 1981; Kurjack 1974; Stuart et al. 1979
Edzna	Andrews 1984
Ek Balam	Bey et al. 1998; Bey et al. 1997
Halal	Pollock 1980
La Honradez	Von Euw and Graham 1984
Huntichmul	Dunning and Kowalski 1994
Isla Cerritos	Gallareta and Andrews 1988
Ixkun	Maudslay 1899
Izamal	Lincoln 1980; Maldonado 1990
Kabah	Andrews 1975; Pollock 1980
Kinal	Graham 1967; Scarborough et al. 1994
Komchen	Ringle 1985
Labna	Gallareta et al. 1991; Pollock 1980
Mayapan	Andrews 1975
El Mirador	Dahlin 1984; Graham 1967; Matheny 1980, 1986a, 1986b
Naranjal	Taube 1995
Naranjo	Morley 1938; Von Euw 1975
Nohmul	Hammond 1985; Hammond et al. 1988
Oxkintok	Pollock 1980
Oxlakmul	Muller 1959; Romanov 1973
Oxtancah	Muller 1959
El Rosario 1	Laporte et al. 1999
Las Ruinas	Muller 1960
San Gervasio	Freidel and Sabloff 1984; Gregory 1975; Sierra 1994
San Luis Pueblito	Laporte et al. 1997
Sannacte	Dunning 1992
Sayil	Sabloff and Tourtellot 1991; Smyth and Dore 1992
Seibal	Willey 1990
Shipstern	Sidrys 1983
Tamanche	Kurjack and Garza 1981
Tikal	Haviland 1970
Tzum	Von Euw 1977
Uaxactun	Ricketson and Ricketson 1937
Uxmal	Carrasco V. 1993
Xcanaheleb	Dunning and Kowalski 1994
Xnaheb	Dunham 1990
Xultun	Morley 1938; Von Euw 1978
Yaxcopoil	Garza and Kurjack 1980
Yaxhom	Dunning 1988, 1992
Yaxuna	Shaw 1998
Yo'okop	Shaw et al. 2001; Stromsvick et al. 1955; Wilson 1974

Table 2. Sites with core–outlier intrasite *sacbeob*

Site	Source
Caracol	Chase and Chase 1987, 1989, 1996; Chase et al. 1990; Jaeger 1991
Chichen Itza	Cobos and Winemiller 1997; Lincoln 1987, 1991; Peña Castillo et al. 1991; Piña Chan 1980; Schmidt 1981
Coba	Benavides 1975, 1981; Brasdefer 1984; Gallareta 1981
Ek Balam	Bey et al. 1998; Bey et al. 1997
Izamal	Lincoln 1980; Maldonado 1990
El Mirador	Matheny 1980, 1986a, 1986b
Muyil	Witschey 1993
Naranjal–San Cosmé	Mathews 1998; Taube 1995
San Gervasio	Gregory 1975
Sayil–Chac	Smyth et al. 1998
Xelha	Sanders 1955
Yo'okop	Shaw et al. 2001; Stromsvick et al. 1955; Wilson 1974

Looking at *sacbeob* in terms of community and regional settlement patterns also allows the classification of systems of roadways. Linear systems, such as those found at sites such as Sayil and Labna, involve *sacbeob* that simply connect terminus-area architectural groups. Radial patterns, such as those found at Coba and Caracol, describe multiple roads that leave the core area and lead to outlying groups like the spokes of a wheel. In addition, it should be noted that some sites have spur causeways extending from roadways. However, such systems never contain so many branches that they qualify as a separate, "tree-like" pattern and may best be classified as modifications to or remodeling of basic radial or linear systems. Either type of system may involve one or more of these *sacbe* types.

Table 3. Sites with intersite *sacbeob*

Site	Source
Ake–Izamal	Lincoln 1980; Maldonado 1979, 1990; Roys and Shook 1966
Caracol	Chase and Chase 1987, 1989, 1996; Chase et al. 1990; Jaeger 1991
Coba–Ixil	Benavides 1975, 1981; Folan 1977; Gallareta 1981; Robles C. 1976
Coba–Yaxuna	Benavides 1975, 1981; Villa Rojas 1934
Izamal–Kantunil	Lincoln 1980; Maldonado 1979, 1990; Roys and Shook 1966
Kabah–Nohpat–Uxmal	Carrasco V. 1993; Dunning and Kowalski 1994; Garza and Kurjack 1980; Maldonado 1979
Tiho–Izamal (?)	Bustillos 1964; Roys and Shook 1966; Tozzer 1941
El Mirador	Matheny 1980, 1986a, 1986b
Uci–Cansahcab	Garza and Kurjack 1980; Maldonado 1979

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TYPES OF *SACBEOB*: A REALITY OR A TOOL?

We can never, with any certainty, determine whether the types described here are "real" in the sense of Spaulding's (1960) "discovered" types. But by examining available data on the length of roadways, it is possible to attempt to nullify the hypothesis that the tripartite division of local intrasite, core–outlier intrasite, and intersite existed as separate entities. The appearance of three distinct clusters of lengths (short, intermediate, and long) supports the hypothesis. A continuous distribution, however, reflects only classification types created by this archaeologist.

An initial challenge in looking for patterning with respect to *sacbeob* lengths is that, by strict counts, most roads are quite short, with approximately 70% of the sample running fewer than 500 m. It follows that the presence or absence of any single long example could significantly affect the results of the analysis. Therefore, an effort was made to increase the sample as much as possible by including all Maya *sacbeob* that have been reliably mapped and/or ground-truthed, regardless of time period, area, or construction technique (Tables 1–3). Measurements of *sacbeob* length were provided by researchers or taken directly from maps of varying quality. *Sacbeob* lengths taken from maps were intended to represent the distance over which roadways existed as distinct entities with discernible edges, often represented on maps as two parallel lines. These map measurements may have yielded results that differ by several meters from the original dimensions recorded by researchers (depending on the scale and quality of available maps), and for this reason they are not provided in Tables 1–3. But because larger-scale patterning was the primary issue, these errors were thought to be relatively insignificant for the purpose of hypothesis testing.

As only one variable, length, was present for all roads in the sample, simple histograms were used to determine whether the anticipated groups were actually present as distinct units in the sample. When examined together, Figure 3 (all *sacbeob* in the sample), Figure 4 (0- to 2,500-m *sacbeob*), Figure 5 (500- to 2,500-m *sacbeob*), and Figure 6 (2,700- to 8,000-m *sacbeob*) do demonstrate distinct gaps between the proposed groups, as well as the overwhelming dominance of short causeways in the sample.

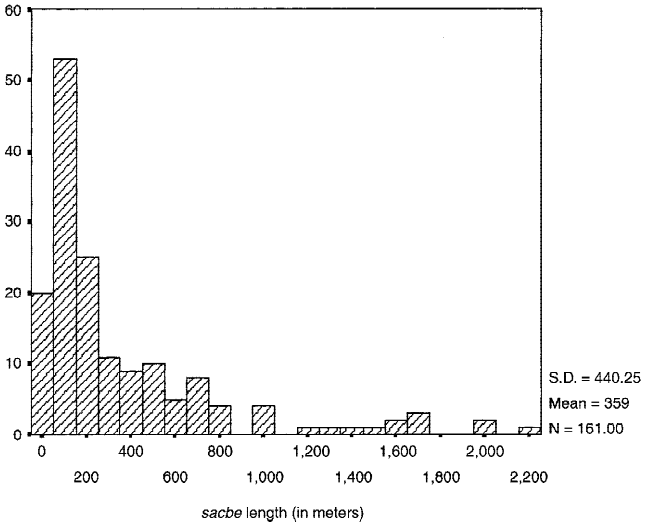


Figure 4. Lengths of 0- to 2,500-m *sacbeob* in sample.

Few roads between 1,030 and 1,320 m in length (the local and core–outlier gap) and between 4,000 and 5,643 m in length (the core–outlier and intersite gap) were seen in the sample. Although I do not claim that every *sacbe* in the Maya world has been included, the fact that information available on 190 roadways yielded this patterning does seem significant.

According to this sample, the proposed groupings appear to have been a reality for the Lowland Maya. Although I do not insist that the Maya themselves would have classified *sacbeob* in this manner, and I realize that the measurements and sample are a product of archaeologists' foci, the divisions are apparently related to something in the real world. The groups are possibly related to the distance normally walked by site inhabitants in a day, the length easily traversed by participants in a ritual, or the span over which political control may have been exerted and maintained under certain conditions.

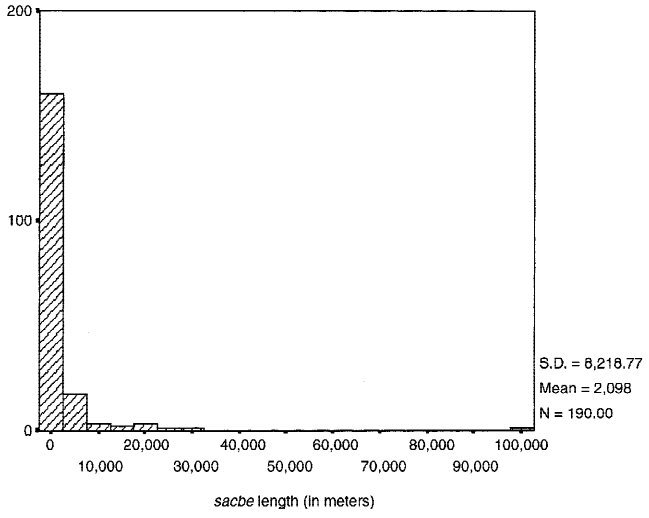


Figure 3. Lengths of 190 *sacbeob* in sample.

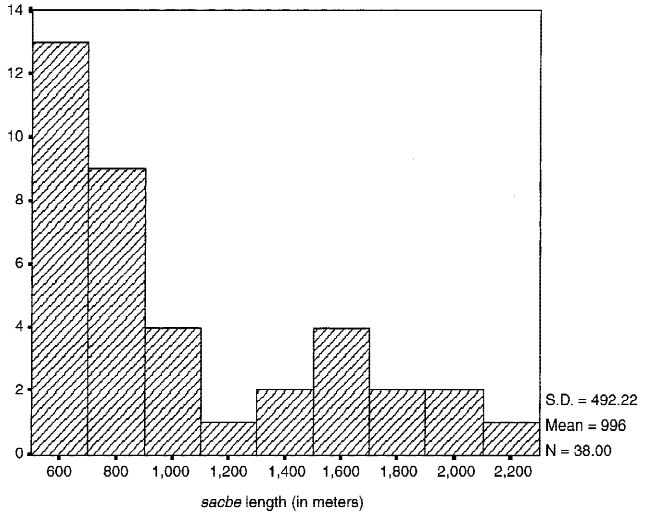


Figure 5. Lengths of 500- to 2,500-m *sacbeob* in sample.

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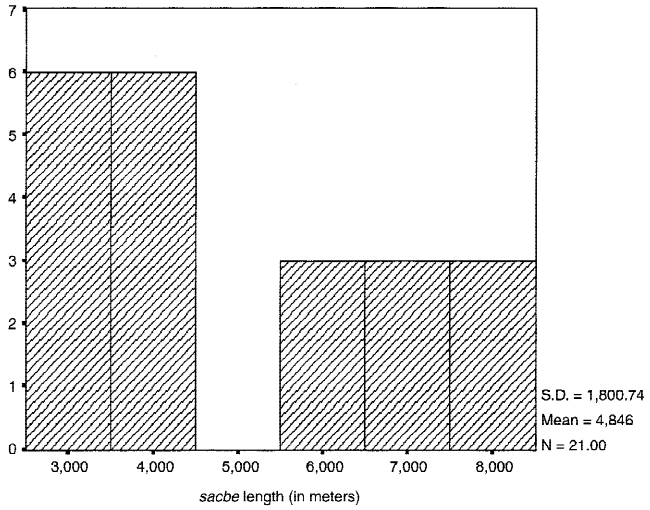


Figure 6. Lengths of 2,700- to 8,000-m *sacbeob* in sample.

TYPES OF *SACBEOB*: FUNCTIONAL DISTINCTIONS

In the same way that all *sacbeob* share a general form (Figure 1), they also share key functions: to connect two points in space and/or integrate whole sites (Chase and Chase 1996:807). These functions can be viewed in both practical and symbolic terms. From a pragmatic standpoint, straight roads, as most *sacbeob* are (with the exception of minor angle changes [see, e.g., Fash 1991; Villa Rojas 1934]), provide the most rapid means to traverse the distance between two points. This provides a distinct advantage over narrow, weaving paths through dense, thorny underbrush, particularly when passing over great distances, as does the 100-km *sacbe* from Coba to Yaxuna. In addition, in wet zones, raised roadways provide dry passage through *bajos*. Bureaucrats, military personnel, ritual specialists, traders, religious pilgrims, and farmers could have used these causeways to move goods and personnel into, and out of, site centers (Freidel and Sabloff 1984; Robles 1976), negating all barriers but distance (Kurjack and Garza 1981). Even the shortest roads might have provided a welcome, unencumbered path through congested core areas. Likewise, *sacbeob* also functioned to divert, channel, and/or collect water (Folan 1991; Scarborough 1998).

Sacbeob, or "white roads," also had critical symbolic functions. First, they provided a constant physical reminder of the close relationships among the groups using or inhabiting the connected points (Kurjack and Garza 1981). This relationship would have been emphasized and further cemented by cooperation in the construction and maintenance of a joint causeway. Historical records also emphasize the sacred nature of roadways; Lizana (in Villa Rojas 1934:189) states that causeways to the four cardinal points extended from pilgrimage centers. Dunning (1992:135) believes that, in terms of Maya cosmology, *sacbeob* are analogous to the Yucatec Maya *kunsansum* mythology, in which conduits of "life force" existed among the Underworld, the human world, and the Overworld. Serving as *axis mundi*, *sacbeob* may have represented the Milky Way, which has been likened by Freidel et al. (1993) to the *Wakah-Chan*, or World Tree. In this sense, roadways through and between sites served as cosmograms, or models, of the Maya universe. Folan (1991:227) further points out that some of the configurations created by road systems—and, therefore, by the points chosen for connect—may be related to actual astronomical alignments, such as the position of Polaris (Romanov 1973). Thus, roadways would have integrated important parts of a site, establishing them as protected territory united by the social relationships and the sacred power flowing between endpoints along the raised white conduits. In adition, *sacbeob* were frequently joined to important temple and palace architecture by ramps or stairways, making them part of large, complex ritual stations. In some cases in which such connections did not exist as actual stone *sacbeob*, the Maya believed that aerial routes, in the form of blood-filled tubes, tied together important locales (Folan 1991:225). These *kunsansum* were to have connected Coba to Zaci (Valladolid), Ichcansihoo (Merida), and Tulum, among other places. Although such entirely faith-based links may have been quite important, providing visible construction through which "life force" could flow would have given any two points an undeniable tie that could not be forgotten, denied, or readily removed.

A closer look at patterning reveals that the three categories constructed earlier based on form (largely on length) also have functional distinctions. Kurjack (1977:225) stated that many of the differences between *sacbeob* are a matter of scale, with longer examples simply bridging greater distance. With distance, however, the political importance of roadways also increases. Thirty-meter local intrasite causeways may be significant cosmologically and may even help ease core congestion, but they do not make bold political statements about whether territory is part of a site. Ten km or 100 km intersite *sacbeob* may do just that. I have argued (Shaw 1998) that the Coba–Yaxuna *sacbe* was placed to demonstrate some sort of political linkage, with Coba as the dominant power, between the two sites beginning in the Late Classic period. Such extensive political "interaction spheres" (Kurjack 1977:227; Mathews 1998) or alliances are not implied by roads remaining within the cores of sites. The intermediate category in terms of length, core–outlier intrasite *sacbeob*, appears to be transitional in terms of political meaning. Particularly where density drop-off occurs between endpoints, it may be important to use *sacbeob* as political statements, symbolically and practically linking core to outlier. However, cementing close personal relationships and maintaining a flow of "life force" throughout the site may also have been important functions for core–outlier intrasite *sacbeob*, as in the local intrasite examples.

Another domain in which function increases with *sacbe* length is that of practical transport. As stated, even over short distances causeways may have helped maintain clear paths through congested cores, linking elite residence and civic/ceremonial groups (the "Labna Plan" [Dunning 1994:24–25]). But as attested to by the number of sites substituting contiguous and semicontiguous courtyards for *sacbeob* as organizing factors in core areas (Dunning's "Nohpat/Yakalxiu Plan"), other architectural elements may have served these functions equally well in core areas. Over great distances, however, building *sacbeob* became more practical than attempting to clear and maintain contiguous plazas and certainly enabled more people and goods to move at greater rates than they could over winding, narrow paths. While a 20-km *sacbe* may have been symbolic, it was also, strictly speaking, very practical: goods move faster on highways than on hiking trails.

In contrast, the use of roadways for water management may have increased as lengths decreased. Scarborough (1998:141) has argued that, at Tikal and Cerros, causeways in the site core area were effectively used as dams, in combination with reservoirs and

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canted pavements, as part of a system of water storage. Leyden et al. (1998) also report the incorporation of *sacbeob* into water management at Coba. Although portions of long intersite *sacbeob* certainly could have served this purpose, short, strategically placed local intrasite roads throughout site cores, combined with natural and constructed features, are likely to have served to direct and trap water in desired locations at many sites.

SPATIAL DISTRIBUTION OF TYPES: EXPLAINING PRESENCE AND ABSENCE

If the various types of *sacbeob* performed critical practical and symbolic functions at, and between, many Maya sites, it seems reasonable to question why all major sites do not exhibit such causeways. Although the fame of the northern intersite *sacbeob* and a greater visibility due to a drier climate have perhaps made northern researchers more diligent about seeking and documenting causeways, there does appear to be a truly greater emphasis in the northern Maya Lowlands on *sacbe* construction. However, while numerous southern sites, such as Caracol and El Mirador, do contain major road systems, other southern sites and many smaller northern sites lack *sacbeob*.

Because *sacbeob* did perform such critical functions, this indicates that other types of features or artifacts must have been able to substitute for them, serving as alternative means to link and integrate architectural groups and sites symbolically and functionally. One group of features that might have taken the place of roadways comprises plazas or courtyards. As already noted in Dunning's "Nohpat/Yakalxiu Plan" (1994:24) and by Kurjack and Garza (1981:302), there are Maya sites that use these open spaces to unite the architecture clustered around them. When these courtyards are contiguous or semicontiguous, they may indeed serve to link a series of architectural groups distributed throughout the site core (Dunning 1994). Joining two points or maintaining traffic flow through an area using a plaza would also have been much less expensive than a substantial road because of the time and energy required for such a road's construction.

In addition to providing the surrounding structures with open space that could be used for pedestrian movement or economic and social activities, plazas were important symbolically to the ancient Maya. Freidel et al. (1993:139) point out that in Classic Maya texts, the word *nab* stands for plazas and large bodies of water. Rather than serving as paths through which "life force" could flow, as *sacbeob* did, sunken courtyards may have represented pools of water that served as portals to the Otherworld (Freidel et al. 1993). Constructions surrounding the plaza might then share access to this potential portal, just as structures along and at the termini of roads may have had access to "life force." However, many Maya sites (e.g., Copan, Tikal, and Coba) built both *sacbeob* and courtyards during the same periods but in different contexts, apparently indicating that one was not entirely able to take the place, functionally or symbolically, of the other. A connection between two points in this world apparently could not replace a connection to the Otherworld.

If plazas alone could not entirely substitute for roads, then perhaps other strategies were teamed with them to carry out some of the functions that *sacbeob* might have served. Constructing massive buildings both in the center and in outlying groups might have served as daily visible reminders that everyone within sight was part of the same powerful political and religious unit (Folan 1992:163; Kurjack 1977:219). Even sites with extensive *sacbeob* systems still relied on these monumental constructions. Although El Mirador had all three categories of roadways, it still invested in the enormous Danta complex (Howell 1989). These "mountains" (Schele and Freidel 1990:71) served as portals to the Otherworld, as temples, and as stages for the performance of rituals. The ornate nature of the exteriors, which were richly decorated with complex motifs, also spoke in the absence of ritualistic performance and, to those who were never allowed inside, about how and why the elite dominated. In this way, monumental buildings were as effective as, if not more potent than, raised roadways as reminders of elite control.

From a more practical standpoint, temples, palaces, and other monumental constructions in and away from the site core also provided the bureaucracy with bases from which the site could be administered. Major outlying groups physically placed administrators, religious and secular, close to the periphery and in the center (Adams and Smith 1981; Chase and Chase 1987). Their presence provided a practical and symbolic reminder of an all-present, connected system. In addition, building outlying centers or taking over nearby sites would have created more high-status living areas in and around the monumental architecture. This would have permitted more elites to be maintained than might have otherwise been accommodated in the site center alone. Nevertheless, isolated monumental constructions in the periphery lack the physical and overt symbolic ties that roads provide, because they serve as bureaucratic islands, not as administrative arms reaching from the core.

The question then remains: why are some sites able to dominate, manage, and/or coerce their populations without *sacbeob*, and why do others make such extensive use of these expensive, but effective, links? A one-to-one substitution of plazas and/or monumental architecture for roads does not appear to be the entire explanation. Part of the answer may include admitting that different types of sites existed rather than considering all sites as merely different scales and forms of the same basic entity. Freidel and Sabloff (1984:82–84) indicate that *sacbeob* are associated with religious structures and processions. This might imply that sites with extensive road systems, such as Coba, Calakmul, and Caracol, played a greater role as pilgrimage centers or ceremonial sites than as centers lacking *sacbeob*.

However, some roads seem to have had more political or economic emphases. Ixil appears to have served primarily as an "agricultural center" (Robles 1976), yet it was attached to Coba via a 19 km *sacbe*. Yaxuna was also linked to Coba. This Late Classic construction gave Coba an overt political extension into the strategic, contested north-central Yucatan, permitting a joint rule of Yaxuna with a Puuc area site during the Terminal Classic period (Shaw 1998). Work at Caracol demonstrates that there, too, *sacbeob* were used to incorporate previously independent centers, such as Cahal Pichik, Ceiba, Cohune, Hatzcap Ceel, and Retiro, with the rest of the city (Chase and Chase 1996). Terminus-area constructions in these outlying centers of Caracol lacked domestic and ritual items, indicating that "their primary function was integrative" (Chase and Chase 1996:807). Centers with extensive roadway systems do not appear to have been strictly one type of site.

Another logical possibility that might begin to explain the presence or absence of *sacbeob* is that of temporal or spatial patterning. If *sacbeob*, or even certain types of *sacbeob*, were built only during a limited time period, this might make sense. Many of the intersite roads of the north (Shaw 1998), and much of the Caracol system (Chase and Chase 1996:806), were built during the Late Classic. However, El Mirador, a Late Formative and Early Classic

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site (Matheny 1980, 1986a, 1986b), also made use of these extensive roads, as did Chichen Itza, a site that peaked in the Terminal Classic period (Cobos and Winemiller 1997; Piña Chan 1980), and Izamal (Lincoln 1980; Maldonado 1990), which seems to have reached its zenith in the Early Classic period.

Little spatial or geographical patterning is apparent in the distribution of road systems, either. *Sacbeob* are found in the north and south and from the hilly Puuc zone to entirely flat areas. It does seem logical that physical environment would account for the variable distribution of *sacbeob*. Anyone who has attempted to walk through the thorny scrub forests of the north can appreciate the advantage that a clear, paved, raised road would provide over a route through burning, prickly plants. However, if ease of movement were the only motivator, the Maya might instead have cleared simple swaths through the forest; no *sacbeob* were required. Additionally, many northern roads passed through areas in or around site centers that would have been maintained as cleared spaces. In practical terms, a Northern paved road would only have kept the vegetation from returning for a longer period of time. However, southern *sacbeob*, particularly those running through *bajos*, did provide a distinct advantage over simple cleared paths. Particularly during the wet season, foot passage through some zones would have been extremely difficult without such an elevated conduit. Indeed, many of the southern *sacbeob* do appear to have served this practical purpose. Yet not all southern roads are found in or adjacent to *bajos*, and not all northern causeways run through areas that would have been maintained as thorny scrub.

Topography, climate, and adjacent natural features are quite varied in the sample, without any definitive patterning with respect to length, presence, or absence. As sites in the north and south used roads from the Late Formative through the Postclassic periods, there does not appear to be any spatial or temporal patterning other than that created by the locations in which research has tended to concentrate mapping and excavation efforts (Figure 2).

Thus, it seems that *sacbeob* are a response to some set of conditions present at certain sites at particular times, but absent or resolved through other means in other instances. Perhaps the roadways, particularly the longer core–outlier intrasite and the intersite *sacbeob*, were a response to real or perceived political or military threats against relatively weak states. Kurjack and Andrews (1976) have suggested that *sacbeob* were an early form of boundary maintenance. We now know that road construction took place from Late Formative through Postclassic times, but the concept is still quite plausible. Where one site was attempting to control another center of equivalent size, or when direct control was being exerted over considerable distances, *sacbeob* may have been a means clearly to include an outlying area, or even a separate site, as a functional part of the "capital" (Kurjack and Andrews 1976:323). While shorter causeways "enhance[d] community interaction" (Kurjack and Garza 1981:308) and established important symbolic ties between major architectural groups (clearly important when a site feels threatened), long-distance roads carried out this function on another scale. In doing so, they changed the notion and scale of "community" to include areas linked functionally and symbolically by causeways. Although this still does not explain why many sites chose not to use *sacbeob*, it does indicate that *sacbeob* served as a means to define and maintain site boundaries.

ROAD SYSTEMS IN SOUTH AMERICA

In order to explore further the use of *sacbeob* in boundary maintenance, an analogy has been sought in another Latin American culture for which both archaeological data and historical records exist. Like the Maya, the Inka of South America are noted for their complex road systems. It is hoped that a brief review of these systems will provide analogies and insights into *sacbeob*.

Although the roads of many different cultures have been documented archaeologically in South America, only the Inka road system will be discussed here, as it is more thoroughly documented than the roads of earlier Andean states (e.g., Schreiber 1987; McEwan 1987). Furthermore, many Chimu, Moche, and Wari roads were often integrated into the Inka road system.

In addition to the imposition of provincial capitals, storehouses, ceramics, and architectural styles, an extensive road system marked the spread of the Inka empire (Moore 1996). This road system spread over at least 23,000 km of the largest pre-Columbian state (1.835 million square km) in the Americas (Hyslop 1984; Wilson 1999).

Inka road-construction techniques varied with the type of land surface being covered. Across desert sands, a series of wooden posts or stone piles served to guide the traveler, while the roadway itself was merely a pathway cleared of stones. In agricultural areas, 1- to 2-m sidewalls separated travelers and animals from crops. Stone paving and drainage channels were used to protect roads in wet areas by controlling water flow, while steps, retaining walls, and switchbacks were used on steep slopes. A wide variety of construction methods enabled Inka roads to link points at which populations could be effectively governed (Hyslop 1984).

In addition to permitting the movement of imperial bureaucrats and technical specialists, Inka roads led to religious sanctuaries and facilitated the transport of resources among areas of collection, manufacture, or production and other population centers, such as the capital of Cuzco (Hyslop 1984). In times of crisis, this network also served as the defensive infrastructure (D'Altroy 1992).

Although camelids were available in the Andes for transport, runners and human porters were often used (Hyslop 1984). For this reason, frequent "rest stops" were needed along roadways. *Tampu*, roadside lodgings and storage areas, were located along Inka roads (Stanish 1997). They were spaced a day's walk apart to furnish travelers with lodging each night, while providing storage for food, firewood, fodder, and other commodities the state required in any particular area. *Chaskiwasi* (messenger–runner posts every 1–8 km), shrines, and other small sites also lined Inka roadways (Hyslop 1984; LeVine 1992).

Thus, the road system served as an important means to consolidate Inka control by uniting the empire physically and conceptually. When an area was newly conquered, the road system served to station and move troops to defend against rebellion (D'Altroy 1992; Stanish 1997). After an area became more securely integrated, the economic functions that roadways served took on a greater importance. As a key component in state expansion and maintenance, road construction is likely to have been one of the first actions taken in any new territory lacking a pre-existing network.

I argue that Maya *sacbeob* shared many of these integrative functions. Just as the Inka state used roads to extend and maintain territorial control, *sacbeob* were used by Maya states firmly to establish outlying groups (with core–outlier intrasite roads) and other sites (with intersite roads) as both functional and symbolic parts of the site core (which itself was frequently defined and emphasized by local intrasite roads). Like the Inka roads, *sacbeob* may have facilitated travel to important religious foci, but they also moved goods and people as the populace and the state required. Once two points were connected by a Maya *sacbe*, a relatively permanent flow of cosmological life force, a span of political control, and an economic link were forged.

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Unlike the Inka, however, the Maya never developed an empire; hence, the road systems that exist in the Maya area were never connected into one unified system. Instead, they remain as reminders of the shifting mosaic of powers and strategies that covered the peninsula for hundreds of years. In seeking to understand them, we need to take into account this history: only by linking the political, the economic, and the religious (not necessarily separate spheres in the world of the Maya) in a diachronic manner can we begin to understand what motivated people to build and maintain tremendous constructions such as *sacbeob*.

CONCLUSIONS

Clearly, we have much to learn about why some Lowland Maya built *sacbeob* and others chose not to and about why some points were connected with roads while others were neglected. Scattered excavations and observations at many sites have thus far produced only a string of possible factors conditioning and encouraging *sacbeob* construction. Among the more promising, and testable, of these functions is that of boundary maintenance and site integration during times of real and perceived threats. However, as Houk (1996) points out, site planning (including the layout of *sacbeob*) is often a combination of many factors, including topography, climate, cosmology, astronomy, magnetism and geomancy, functional considerations, sociopolitical ideology, and simple chance or random events.

Clearly, more *sacbe*-centered mapping and excavation are needed to tease out any further patterning that exists. Combining road system studies with settlement and site-center investigations to discover the temporal and spatial relationships between architectural groups and *sacbeob*, exchange systems and road systems, and political alliances/enemies and causeways may help us generate and test more specific hypotheses. It is hoped that this paper contributes to this effort by asserting that *sacbeob*, just like temples and palaces, should be studied not as one specific type of artifact, but as a class of features that appears to have had multiple types and functions.

RESUMEN

Este artículo pretende revisar los datos disponibles sobre los *sacbeob* de los mayas con el objetivo de crear un sistema tripartito de clasificación de calzadas y analizar el porque los mayas construyeron tales estructuras. En vez de clasificar los *sacbeob* usando terminos generales como "intrasitio" o "intersitio," en este estudio se dividirán las calzadas en tres grupos; de "intrasitio local," "intrasitio central–remoto," y "intersitio." Estos terminos se basan en la longitud y la función de cada estructura. Los *sacebeob* clasificados como "intrasitio local" tienen una distancia de menos de 1 km y aparecen dentro de las áreas más densos del sitio. Las carreteras de clasificación "central–remoto" tienen entre 1–5 km de largo y sirven para conectar la parte central con las áreas más distantes del sitio, tales como grupos remotos. Los ejemplos de *sacbeob* "intersitio," miden más de 5 km de distancia, se encuentran principalmente en el norte. Este sistema de clasificación basado sobre un grupo de datos de 190 *sacbeob* fue implementado para tratar de conseguir respuesta sobre la siguiente pregunta: ¿hasta que punto los *sacbeob* de los mayas antiguos hayan sido una realidad deliberada o consciente? Los resultados nos proveen con histogramas que contienen "lagunas" entre los tipos.

También se discuten los aspectos prácticos y simbólicos de las calzadas, con el propósito de empezar a explicar porque los *sacbeob* están presentes en algunos sitios mientras no se encuentran en otros. Se considera de la posibilidad ambiental hasta la variación temporal, tanto como las maneras en que las plazas hubieran o no hubieran haber podido sustituir las rutas construidas. Ningún solo factor puede explicar la existencia o falta de calzadas, aunque las condiciones ambientales locales (tales como los bajos), la necesidad de establecer un derecho político en un área y la importancia simbólica de los *sacbeob* en la mitología *kunsansum* se discuten como razones importantes para construir calzadas. También se resume brevemente el sistema de carreteras incas para proveer una analogía para entender mejor los sistemas mayas. Finalmente, se apela a los investigadores para que vean los *sacbeob* no solamente como un tipo de muestra arqueológica, sino como un grupo de características que tienen una amplia gama de diferentes tipos y funciones.

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