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Territorial Organization of the Lowland Classic Maya

Epigraphy and locational analysis suggest that some previous models are oversimplified or incorrect.

Joyce Marcus

One of the most interesting, yet poorly understood, of America's pre-Hispanic civilizations is that of the ancient Maya. In particular, the civilization of the lowland Maya—which reached its "Classic" peak between A.D. 600 and 900—has fascinated laymen and scholars ever since 19th-century explorers first reported "lost cities" in the jungles of the Yucatan Peninsula (*1–3*).

The last 40 years have seen a great deal of the mystery stripped from the lowland Maya and replaced with hard-won anthropological data on their social and political organization. The sources of these data are threefold: (i) excavations into many of the major Maya ruins in Mexico, Guatemala, Honduras, and British Honduras (Fig. 1); (ii) analyses of Maya patterns of settlement; and (iii) some limited translation of their largely indecipherable hieroglyphic inscriptions in stone and wood. Two developments now seem likely to increase our understanding of the political and territorial organization of the lowland Maya. One is Proskouriakoff's discovery that a great deal of Maya writing (once thought to be mainly astronomical and cosmological) amounts to the historical records of ruling dynasties (*4*). The second is the application of locational analysis (borrowed from cultural geography) to Maya settlement patterns (*5*). This article reports on some results of those two new developments (*6*).

Previous Settlement Pattern Data

Published opinions on Classic Maya settlement patterns are so numerous, and many of them so speculative, that I can only touch on them briefly here. There is a commonly agreed-on hierarchy of major ceremonial centers, minor ceremonial centers, and hamlets. As Willey has summarized the situation (*7*, p. 13):

> All [scholars] agree that the ceremonial center was the religious, political, and, probably, commercial nucleus of Maya society and that these nuclei held some sort of sovereignty over specified territories. These territories have not been defined as to size although there have been some speculations that they may have ranged up to as much as a radius of 16 km. around a given center. Authorities also seem to agree that there were Maya, peasants for the most part, living scattered in hamlet clusters or single households at some distance from the centers.

This generalized model leaves many questions unanswered, because, as Willey goes on to point out (*7*, p. 14):

> Nothing has been asked of the possible role of the minor ceremonial center or the possible degrees of hierarchical gradation within such centers and their functions. Nor has probable regional variation within the Maya lowlands been taken into account.

To Willey's comments might be added many more. For example, on the basis of what criteria are major ceremonial centers distinguished from minor centers? Is it sheer size, number of buildings, types of buildings, or numbers of carved hieroglyphic monuments? In any case, do the centers form two classes, or is there a continuum from major to minor? If the former, what sociopolitical mechanisms tied minor centers to major ones, and in what way, if at all, were major centers linked to each other? Is there an overall organizational principle that pervades the entire Maya lowland, or is it, as one recent theory proposes (*8*), divided into a central core and a peripheral buffer zone?

I argue that there was, between A.D. 600 and 900, an overall organization of the entire Maya lowlands that was strongly influenced by the Maya's quadripartite view of the universe and that featured four regional capitals. Around these capitals developed the familiar hexagonal lattices of secondary centers predicted by the Central-Place Theory (*9*); tertiary hexagons developed around these secondary centers, and around these were villages and hamlets whose overall patterns probably shifted with the fallow cycle in slash-and-burn farming. Linking the secondary centers to the capitals were royal marriage alliances. Major centers can more easily be defined by hieroglyphic data than by sheer measurement, although the epigraphic data are confirmed by locational analysis. Finally, the core-buffer theory—so well-handled by Lattimore (*10*) in respect to the dichotomy of Chinese townsmen and Mongol nomads—has no reality in the Maya landscape, nor in their heaven, nor even in their hell.

The Maya "Cognized Model" of the Universe

Rappaport (*11*) has used the term "cognized model" to describe the mental picture that various ethnic groups have of the way the universe is put together. The cognized model of the Maya is relevant here because it corresponds so well to the way they viewed their own territorial structure.

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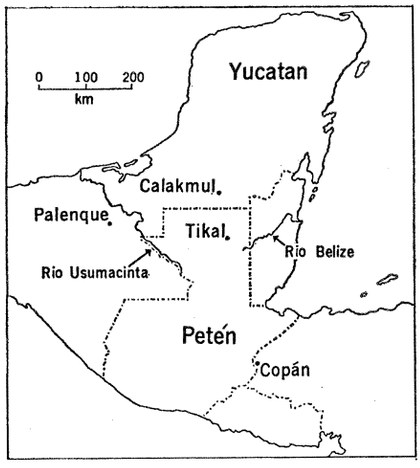


Fig. 1. The lowland Maya region, showing some of the archaeological sites mentioned in the text.

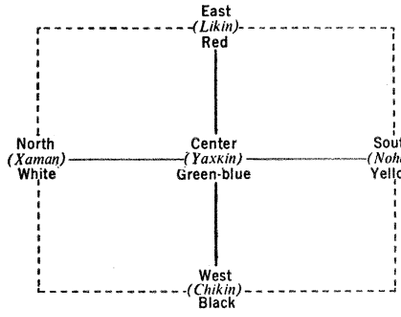


Fig. 2. The Maya conception of the earth's quadripartite organization, with world-directions and associated colors. Note that the Maya terms for the east-center-west axis all have the second syllable *kin* ("sun," "day," or "time"), which indicates the importance of the axis of the rising-setting sun.

For the Maya, heaven was a quadripartite and multilevel region supported by four divine brothers known as *bacabs*, who were the sky-bearers. Each *bacab* was associated with a particular color and had a particular set of rites associated with him. Four *chacs*, gods of rain and thunder, occupied the "angles of heaven" (*12*, pp. 135–136; *13*).

The earth was also divided into four parts (Fig. 2). Whereas we tend to begin our maps with north at the top of the page, for the Maya the most important direction was east, *likin*, "where the sun rises." North, *xaman*, was "on the right hand of the sun," while south, *nohol*, was on its "left hand"; the other important coordinates were west, *chikin*, and finally the center, *yaxkin*, over which the sun passed (*14*, *15*). The center and each world-direction had its particular god, and each was also associated with a color; east was red; north, white; west, black; south, yellow; and the center, green-blue. This system of color-directions was by no means unique to the Maya; it was widespread among North American Indian groups such as the Hopi, the Tewa, and the Oglala Sioux (*16*). This widespread distribution suggests that color-directions may be an ancient organizational principle.

The Organization of Regional Capitals

Hieroglyphic inscriptions indicate that the Maya also viewed their world as commanded politically by four capital cities, or "ceremonial-civic centers,"

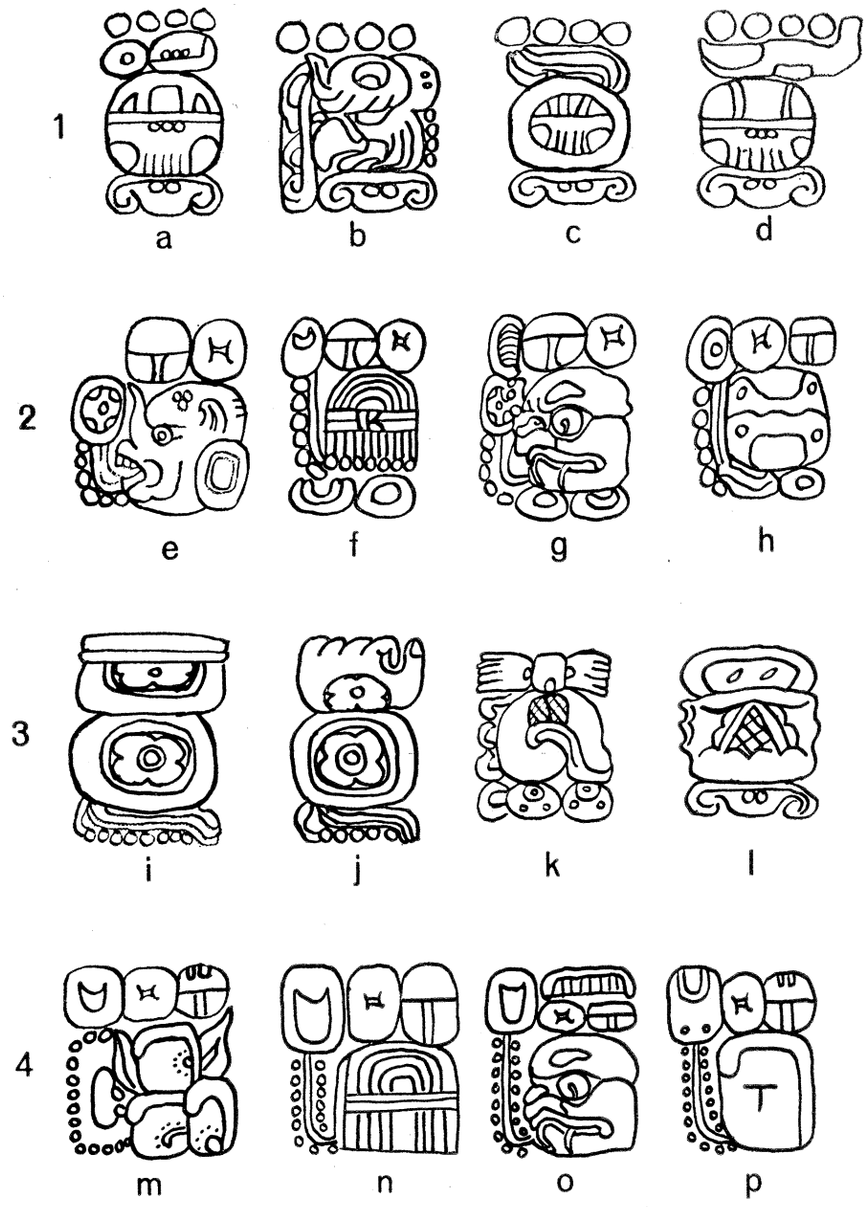
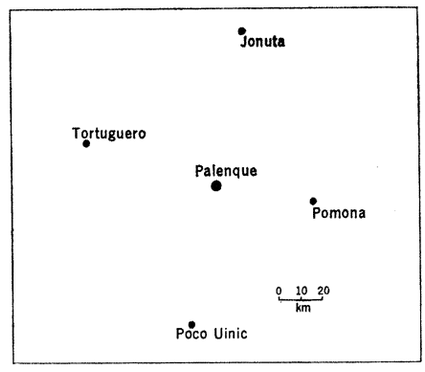


Fig. 3. Hieroglyphic inscriptions relating to the four regional capitals of the Maya. Lines 1 through 3 are from Stela A, Copán, Honduras (A.D. 731). Line 4 is from Stela 10, Seibal, Guatemala (A.D. 849). Line 1 might be a reference to the four *bacabs* (sky-bearers) of the Maya world or to the political supremacy of the four sites whose emblem glyphs follow on line 2. The emblem glyphs for the four regional capitals in A.D. 731 are (e) Copán, (f) Tikal, (g) Calakmul (?), (h) Palenque. Line 3 gives the four Maya world-directions (east, west, south, north, in that order). Line 4 lists the four regional capitals in A.D. 849: (m) Seibal, (n) Tikal, (o) Calakmul (?), (p) Motul de San José (?). Note that Tikal and Calakmul (?) retain their importance throughout this period, while Copán and Palenque are replaced by Seibal and Motul de San José (?) in the quadripartite structure. [Sources: Maudslay (*2*, vol. 1, plates 29 and 30); line 4 from Maler (*3*, plate 8)]

each located in one quadrant of the lowlands (*17*). Although power shifted from one center to another through the centuries, it appears that, at any given time, there were always four such regional capitals and that, regardless of their actual location (in terms of our system of mapping), they were viewed as occupying the four quadrants of the Maya universe.

Consider, for example, a *stela* (a free-standing, carved stone monument) from the site of Copán, Honduras (Fig. 3). This monument, Stela A, probably dating to A.D. 730 [9.14.19.8.0 in the Maya calendrical system (*18, 19*)], shows all four contemporaneous capitals (line 2) and the world-directions with which they are associated (line 3). In the preceding clause on the same monument, the Maya designated these four sites—Copán, Tikal, Calakmul (?), and Palenque—as having paramount political status (line 1).

The identification of each of these capitals was made possible by epigrapher Berlin's discovery (*20*) that some Maya sites have a specific "emblem glyph." Essentially, an emblem glyph is a hieroglyph that stands for the site, as well as the territory subject to it; the glyph could have originally referred to the royal dynasty that founded the site, although this is not certain. Interestingly enough, although the four capitals apparently could mention each other by name, no secondary center ever mentions a primary center except that to which it is subsidiary (*21*). This fact makes it possible to identify the various secondary centers dependent on a primary center, as, for example, in the case of Palenque (Fig. 4). Note also, in Fig. 4, the relatively uniform distances between Palenque and the secondary centers. This brings me to a locational analysis of Classic Maya site hierarchies.



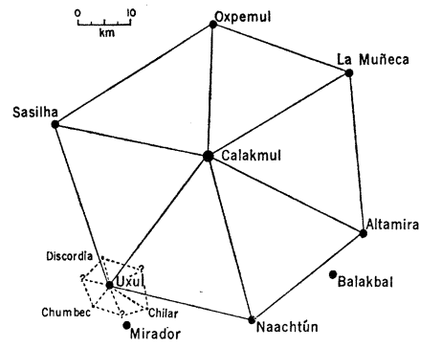


Fig. 4 (left). Palenque, one of the four regional capitals in A.D. 731, and the secondary centers, some of which mention Palenque's emblem glyph. Fig. 5 (right). Calakmul, one of the four regional capitals of the lowland Maya, surrounded by six secondary centers with almost equidistant spacing. (Balakbal, near Altamira, may have been part of the hexagon at an earlier stage of the Classic Period; Altamira probably replaced it in the Late Classic Period.) Note that Uxul (and probably other secondary centers as well) may have been surrounded by a smaller hexagon of tertiary centers. Mirador seems to be an important Early Classic center, with less importance in the Late Classic Period.

The Organization of Secondary Centers

Flannery (*5*) was the first to call attention to the fact that some lowland Maya centers showed the equidistant spacing and uniform lattices predicted for "service centers" by the Central-Place Theory (*9*). This finding requires a modification of earlier conclusions by Maya specialists—for example, Bullard's comment (*22*) that major centers in the Petén district of Guatemala were located primarily with regard to sources of water. (If this were true, one would have to conclude that sources of water show a remarkably hexagonal distribution.)

Using the survey maps of Bullard (*22*, p. 356) and Ruppert and Denison (*23*) for the Petén region, Flannery showed that each "major ceremonial center" (Bullard) or "site with *stelae*" (Ruppert and Denison) was located at a nearly uniform distance from its nearest neighbor; in the case of Bullard's survey, major sites had a mean spacing of 10.33 kilometers, with a standard deviation of only 1.9 km. By using new data, which were not available to Flannery—including the sharing of a single emblem glyph by the dependencies of a major center—I have been able to revise his maps (Figs. 5 and 6). It now appears that each regional capital was surrounded by five to eight virtually equidistant secondary centers. For example, between A.D. 600 and 900, Calakmul was the "central place" of a hexagonal lattice consisting of Naachtún, Altamira, La Muñeca, Oxpemul, Sasilha, and Uxul.

The secondary sites making up the hexagon around a given regional capital vary in size, probably on the basis of routes of travel and transport. For example, of the secondary sites surrounding Tikal, Uaxactún is the largest, probably because it lies on the route from Tikal to Calakmul. The next important stop on that route would be Naachtún, which is, appropriately enough, the largest secondary site in Calakmul's hexagon. Similarly, Nakum is probably larger than average because it lies on the route from Tikal to Naranjo.

There are also suggestions that each of the secondary centers was encircled by a smaller lattice of tertiary sites, as Uxul is apparently encircled by the Discordia, Chilar, and Chumbec sites (Fig. 5). The only reason this type of analysis cannot really be carried to tertiary levels (or further) is that most surveys have concentrated on major centers and have achieved only haphazard recovery of minor centers and hamlets.

Analysis also shows probable differences in population density from one area to another, the kind of regional variation suspected by Willey. Hexagons near Tikal and Naranjo show major sites "almost twice as densely packed" (15.8 km apart) as those near Calakmul (27.8 km apart) (*5*, p. 421), while those near Palenque may be even farther apart (Fig. 4). Assuming that major centers were designed to serve populations of roughly the same size, this suggests that the population of the Calakmul area may have been half that of the Tikal area. However, the distribution of population shows a mosaic of light and dense areas, based on the frequently ignored but very significant differences in environment and carrying capacity from one part of the Maya lowland to another. Far from having a dense core and a marginal buffer zone, some areas on the so-called periphery (for example, the Belize River Valley) have amazingly high densities (*7*). Moreover, there is no reason to believe that sites like

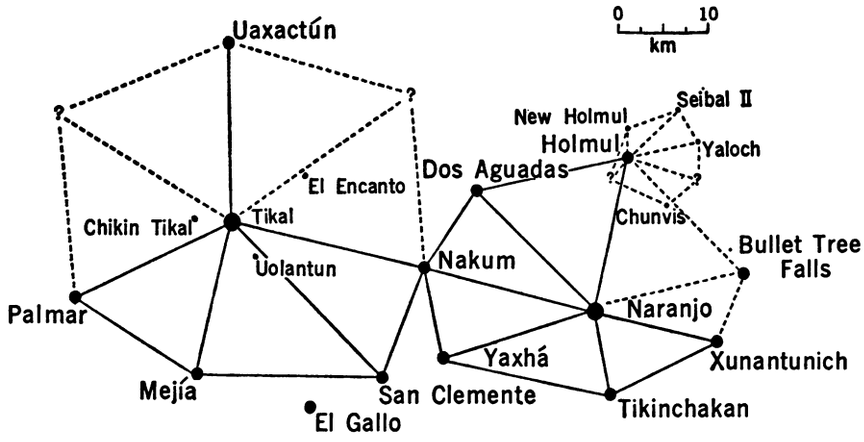


Fig. 6. Hexagonal lattices in the vicinity of Tikal, another of the four regional capitals, showing possible smaller tertiary cells nested within secondary cells. A royal marriage alliance linked Tikal with the secondary center of Naranjo. Nakum (on the Tikal-Naranjo route) and Uaxactún (on the Tikal-Calakmul route) are larger than average secondary centers, perhaps because of their locations.

Calakmul—a regional capital with 104 stelae, the largest number of any Maya center—had an organization any simpler than Tikal's. What epigraphy and locational analysis suggest, in fact, is that all four quadrants of the Maya lowlands probably had the same basic organization, superimposed on populations that varied in density.

Finally, the hexagonal structure mentioned above characterizes only areas without major rivers; along major watercourses, such as the Belize River, there developed what Willey calls "ribbon strip" settlement.

Royal Marriage Alliances

It remains now to delineate the mechanisms that tied major centers to each other and to minor centers. To do so, I must briefly describe the Maya class system. Like other Mesoamerican states, the Maya state had a professional ruling class that had almost no bonds of kinship with the common people (*24*). Below this ruling class, which consisted of royal dynasties with a slight patrilineal emphasis, were (at least at the time of the Spanish conquest) hereditary nobles, commoners, and slaves. The royalty and nobility were supported by tribute from the commoners, taking advantage of the fact that one farmer could support an estimated 12 persons (*19*, p. 26). One of the major mechanisms linking primary and secondary ceremonial centers was the royal marriage alliance. These alliances can be detected in three ways: by an apparent marriage glyph (*25*), by scenes showing a royal woman presenting a "marriage bundle," and by monuments portraying a royal bride from a regional capital after her arrival at a secondary center.

A convenient example is the marriage alliance that linked Tikal—one of the four regional capitals—with Naranjo, an important secondary center in the quadrant dominated by Tikal. Late in the 7th century A.D., a woman identified as being from the royal dynasty at Tikal (possibly the sister of the lord of Tikal) arrived at Naranjo to marry the local ruler. By A.D. 687, she had borne a son, who went on to be the ruler of Naranjo. The arrival of this royal bride and the birth of her son stimulated a flurry of monument carving at Naranjo. She is portrayed on Stelae 3, 24, and 29 at Naranjo (Fig. 7).

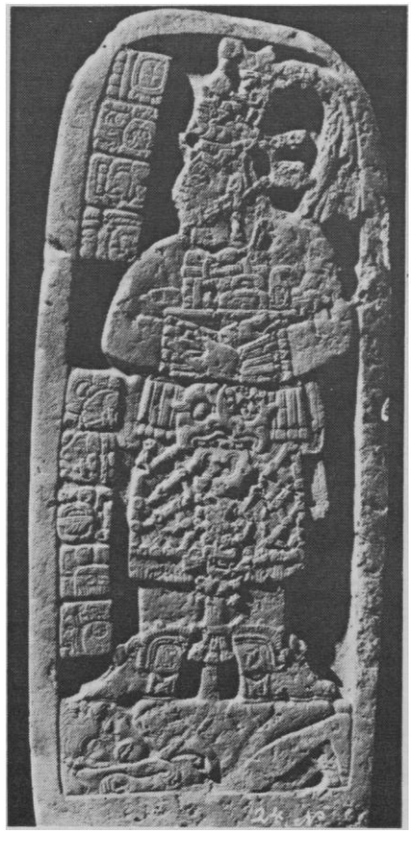


Fig. 7. Stela 24 from Naranjo, Guatemala. This monument portrays a royal woman from Tikal, whose marriage to a local ruler (and the subsequent birth of her son) gave the secondary center of Naranjo a status it had not formerly enjoyed. [Courtesy of the Peabody Museum, Harvard University]

Exactly what mechanisms linked the four regional capitals to each other are not yet clear. Fragmentary epigraphic data and standardized representations of members of military orders hint that military alliances may have been involved, but it would be premature to consider this clearly demonstrated.

Village Organization

Because the tiniest sites in the Maya region have not attracted much attention, little is known about the organization of villages and hamlets. Coe (*26*), however, has published a theoretical reconstruction of the social organization of Maya villages between A.D. 600 and 900, based on ethnographic, ethnohistoric, linguistic, and hieroglyphic data.

In Coe's reconstruction, the quadripartite organization of the Maya cosmos penetrates even to the village level. Villages were divided into four *tzuculs*, "wards consisting of exogamous patrilineages. Each ward was associated with a cardinal direction and with a color" (*26*, p. 107). Responsibility for village government rotated counterclockwise from one ward to the next, falling on the shoulders of *ah cuch cabs*, the pre-Columbian equivalent of the *mayordomo* in today's Maya villages. The *mayordomo* is a person of relative wealth and responsibility who is chosen by his peers to shoulder the *cargo*, or politico-religious and financial burden of community leadership (*14*).

Organization of the Maya Underworld

Finally, there is the multilevel hell conceived by the Maya. Just as the four *chacs* dwelt in the "angles of heaven" and the four *bacabs* supported the sky, four *pauahtuns*, or *acantuns* (*13, 27*), apparently occupied the corners of the underworld. All of these quadrants—in heaven, on earth, and in hell—were associated with world-directions, flora, fauna, and deities of the appropriate color.

Summary and Conclusions

Thus far I have discussed ancient Maya sociopolitical structure from the upper levels of the hierarchy downward. Let me now summarize their territorial organization from the bottom upward, starting at the hamlet level (Fig. 8).

The smallest unit of settlement—one usually overlooked by archeological surveys in the lowland rain forest—was probably a cluster of thatched huts occupied by a group of related families; larger clusters may have been divided into four quadrants along the lines suggested by Coe (*26*). Because of the long fallow period (6 to 8 years) characteristic of slash-and-burn agriculture in the Petén, these small hamlets are presumed to have changed location over the years, although they probably shifted in a somewhat circular fashion around a tertiary ceremonial-civic center for whose maintenance they were partly responsible. These tertiary centers were spaced at fairly regular intervals around secondary ceremonial-civic centers with pyramids, carved monuments, and palace-like residences.

In turn, the secondary centers occurred at such regular intervals as to form hexagonal patterns around primary centers, which were still larger, with acropolises, multiple ceremonial plazas, and greater numbers of monuments. In some cases, the distance between secondary centers was roughly twice the distance between secondary and tertiary centers, creating a lattice of nested hexagonal cells. This pattern, which conforms to a Western theoretical construct, was presumably caused by factors of service function, travel, and transport. The pattern was not recognized by the Maya at all. They simply recognized that a whole series of smaller centers were dependent on a primary center and therefore mentioned its emblem glyph. Linking the centers of the various hexagons were marriage alliances between members of royal dynasties, who had no kinship ties with the farmers in the hamlets.

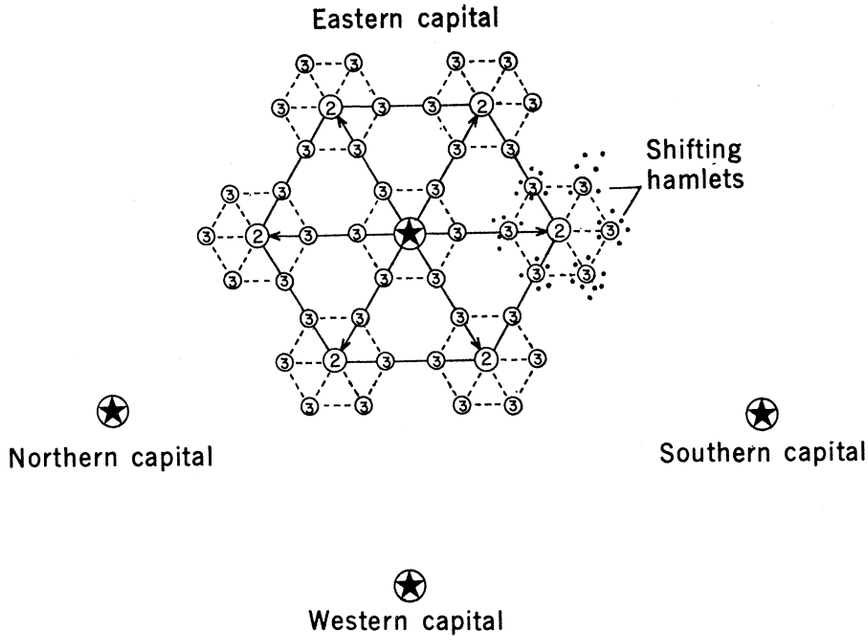


Fig. 8. Idealized diagram of the territorial organization of lowland Classic Maya, from regional capital to outlying hamlet. Circled stars indicate the four regional capitals; circled 2's, the secondary centers; circled 3's, the tertiary centers; small dots, shifting hamlets around tertiary centers. Arrows linking secondary centers to regional capitals indicate marriage alliances. (Although such organization would have characterized all four regional capitals, only the area around the eastern capital is shown in detail.)

Out of the large number of primary centers available to them, the Maya selected four as regional capitals. True to their cosmology, the Maya regarded these capitals as associated with the four quadrants of their realm, regardless of their actual location. Each was the home city for a very important dynasty whose junior members probably ruled secondary centers. Since the hexagonal lattices were probably adjusted to variations in population density, each of the four quadrants of the Maya realm probably controlled a comparable number of persons. So strong was the cognized model that, despite the rise and fall of individual centers, there seem always to have been four capitals, each associated with a direction and, presumably, with a color.

There is still a great deal to learn about the social, political, and territorial organization of the lowland Maya, and parts of the picture presented here need far more data for their confirmation. What seems likely is that the Maya had an overall quadripartite organization (rather than a core and buffer zone) and that within each quadrant there was at least a five-tiered administrative hierarchy of capital, secondary center, tertiary center, village, and hamlet. Perhaps most significant, there was no real conflict between the lattice-like network predicted by locational analysis and the cosmological four-part structure predicted by epigraphy and ethnology.

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most economical spacing of such "service centers" would be equidistant, resulting in hexagonal patterns, or "lattices." (See W. Christaller, *Die zentralen Orte in Süddeutschland* (Zeiss, Jena, 1933). Obviously, no archeological area neatly satisfies all these assumptions, and in view of the irregular topography of the Petén, with its numerous *bajos* (seasonally flooded swamps), it is amazing how nearly uniform the spacing of such centers is. This suggests the degree to which the service functions of these centers strongly override such factors influencing settlement choice as good soil, water, sheltered locale, defense, and so on.
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18. This Maya Long Count Date, 9.14.19.8.0, would be transcribed as follows:

9 baktuns (400 tuns)	=	1,296,000 days
14 katuns (20 tuns)	=	100,800 days
19 tuns (360 day-year)	=	6,840 days
8 uinals (20-day month)	=	160 days
0 kins (days)	=	0 days
		1,403,800 days

to be counted from the Maya base date of 12 August 3113 B.C. (*19*, p. 58). The above date (9.14.19.8.0) is recorded on the north side of Stela A; two dates recorded on the west side of the monument are to be reckoned from that date. The dates are 9.14.19.5.0 and 9.15.0.0.0, the Dedicatory Date of the stela (A.D. 731).
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28. I wish to thank Elizabeth P. Benson and Kent V. Flannery for criticisms and encouragement. Financial aid during the last 3 years by Harvard University; Dumbarton Oaks, Washington, D.C.; and the American Association for University Women facilitated my research. Margaret Van Bolt prepared Figs. 1, 2, 4, 5, 6, and 8.

Complete Nucleotide Sequence of a Replicating RNA Molecule

The sequence suggests how nucleic acids exhibit phenotypes for selection and can evolve to greater complexity.

D. R. Mills, F. R. Kramer, and S. Spiegelman

We report here the complete sequence of an RNA molecule capable of extracellular replication. Use was made of "fragment length mapping," a new strategem that permits the unambiguous ordering of sequence blocks by determining which of several alternatives is closest to the block being extended.

A number of unexpected implications for the rules of precellular evolution emerged from the present study and we may briefly note them. The primary sequence contains a surprising number of intrastrand antiparallel complements, a peculiarity generating the potentiality for extensive secondary and tertiary structures containing antiparallel stems and loops. This possibility would allow these molecules to go beyond their primary sequences and exploit the selective advantages of their two- and three-dimensional consequences; a distinction between genotype and phenotype could thus arise before the primary sequence was used for translational purposes.

If, as seems likely, selection operates on secondary and tertiary structures, one can begin to identify the forces that could drive these molecules to greater length and complexity, a necessary prelude to the invention of cells and their components. Further, we will see how complementary copying and antiparallelism could have served to guide the evolution of the replicating single strands toward greater structural complexity. With the appearance of the first primitive cell the structural "phenotype" of the gene would become irrelevant as a selective element, and one could afford to store translatable genetic information in the perfectly paired double helix we know today.

The possibilities for such studies came in 1965 when we isolated (*1*, *2*) a template-specific RNA replicase from *Escherichia coli* infected with Qβ, an RNA bacteriophage, and established that the enzyme preparation could mediate a virtually indefinite autocatalytic synthesis (*3*) of biologically competent and infectious RNA (*4*). We further showed (*5*) that when Qβ replicase is presented wtih either of two genetically distinct Qβ-RNA molecules, the RNA synthesized is identical to the initiating template. This proved that the RNA is the instructive agent in the synthesis, thereby satisfying the operational definition of a self-instructive duplicating entity.

These findings opened up several novel experimental pathways. Potentially, one of the most interesting was that biologists were provided for the first time with an opportunity to explore Darwinian selection with nucleic acid molecules replicating outside a living cell. This situation simulates certain aspects of precellular evolution, when environmental discrimination presumably operated directly on the replicating gene, rather than on its translated product. The comparative simplicity of the system and the accessi-

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