AN ARCHAEOLOGICAL CORRELATE OF WAR

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ABSTRACT

War is a critical variable in a large number of theoretical models used in archaeology, yet there has been little research to date on archaeological correlates of war. An archaeological correlate of war based on patterns of community organization is developed and tested using ethnographic data. This correlate is applied to the archaeological record of Mississippian societies in eastern North America, and the presence of warfare during the Mississippian period is confirmed. In addition, it is suggested that the pattern of warfare made evident through Mississippian community organization appears to be one focused solely on riverine centers and not affecting more rural Mississippian communities.

Although war plays a major role in many theories of cultural evolution (for example Haas, 1990; Carniero, 1990), little research has been done on archaeological correlates of war. It has been assumed that the presence of defensive works, mass graves of individuals with obvious traumas, military weapons, and the like, are reliable predictors of war, but few of these seemingly obvious correlates have been adequately tested (a notable exception is Milner, Anderson, and Smith, 1991). In addition, there are many cases in which the archaeological record for a given site or region is not adequate to use one of these predictors.

In a previous *North American Archaeologist* article, I demonstrated that household and community patterns reflect socio-political organization, and can be effectively used to infer social and political systems in archaeological contexts (Peregrine, 1992a). I suggest that in addition to socio-political organization, household and community patterns should also reflect warfare if it is present. As I will argue below, community patterns do appear to be a reliable predictor of the presence of warfare in non-pastoralist societies.

COMMUNITY PERMEABILITY AND WAR

The Theory

This article begins with the basic assumption that community patterns should reflect the presence or absence of warfare in the same way that they reflect other aspects of socio-political organization (for example, Flannery, 1972; Wilk and Rathje, 1982). In situations where warfare is present, I hypothesize that communities should be structured in such a way that households are relatively inaccessible from outside the community; that is, that households should be deeply embedded in the community. Embedding households in a community makes it more difficult for invaders to access houses and their inhabitants, thereby offering a greater potential for defense than communities where households are less deeply embedded.

Constructing a defensive palisade would be one way to embed households in a community, but courtyards, cul-de-sacs, and other forms of enclosures could also be used to create deeper levels of embeddedness and inaccessibility. An example is the medieval Japanese *masugata*-plan fortress. These fortresses were constructed with a maze-like ground plan so that an invader, having breached the defensive walls, would still be unable to navigate the streets without prior knowledge of the fortress's layout (Duffy, 1979:245). Creating this kind of inaccessibility was also a primary consideration to the architects of Renaissance fortress cities in Europe. Renaissance military architects, who developed an extensive body of theory for fortification and defense of cities, "disregarded the needs of civilian populations that were to inhabit [their] projected fortress cities. On many theoretical designs the citizen was not even accorded the right of easy access to his town" (de la Croix, 1972:50). Streets in these fortress cities were organized radially with the city center as a hub, allowing a garrison rapid access to any part of the defensive walls. However, the streets were often offset from city gates or screened by a ring of houses, making access to inner parts of the city from outside the walls very difficult (de la Croix, 1972:51-52). In both these examples, the city architects appear to have been purposely incorporating high levels of household embeddedness into their defensive plans. Based on these examples, it seems reasonable to hypothesize that high average levels of household embeddedness should be correlated with high frequencies of warfare.

The average embeddedness of households in a given community can be operationalized through the graph theoretic concept of permeability (Hillier and Hansen, 1984:14-15). Graph theory is a branch of applied mathematics which provides numerous techniques to operationalize and quantify the properties of graphs (Hage and Harary, 1983). Since trade networks, settlement patterns, and even social systems can be represented graphically, graph theory provides a powerful set of tools for archaeologists to operationalize variables that would otherwise be difficult to utilize (Peregrine, 1991a; Rothman, 1987).

A graph is simply a set of points (nodes) connected by lines (links). A community can be transformed into a graph by representing each household as a secondary node and each transitional space as a primary node, and then linking the nodes by following paths necessary to access each house from outside the community (Hillier and Hansen, 1984 employ a somewhat more complex method). Figure 1 provides a simple example. Node 1 represents the world outside the community, node 2 the area inside the community wall, nodes 3, 4, and 5 the residential compounds, and nodes 6, 7, and 8 the individual households. To access each household, one must enter the area inside the community wall, creating a link between nodes 1 and 2. From here one must enter one of the three residential compounds, creating three links between node 2 and nodes 3, 4, and 5. Since it is possible to move directly between residential compounds 3 and 4, there is also a link between them. Finally, there are links between the residential compounds and each household, nodes 6, 7, and 8.

I define permeability as the average embeddedness of each household in a community, and I define embeddedness as the number of primary nodes that must be crossed to access a given household (this might also be called the structural depth of each household). Permeability, therefore, is simply:

$$\Sigma\, (h * d)/n$$

where h is the number of houses at structural depth d (again, defined as the number of primary nodes that have to be crossed to access the house), divided by the total number of houses in the community (see Hillier and Hansen, 1984 for alternative methods of permeability analysis). For the community presented in Figure 1, each household is at a structural depth of three. The outside node counts as one, and two
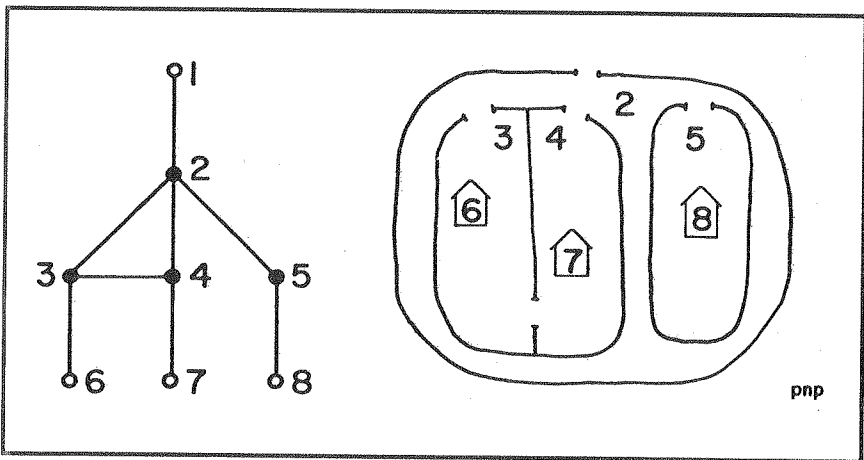

Figure 1. An example of a community and its associated permeability graph.

additional primary nodes are crossed to access each household. Since every house in the community has a depth of three, the community's permeability is also three.

The Sample

The sample I used to conduct a preliminary evaluation of the hypothesis that higher levels of community permeability are correlated with higher frequencies of warfare consisted of sixteen societies selected from the Standard Cross-Cultural Sample (Murdock and White, 1969) based on the frequency of war each society experienced as coded by Ember and Ember (1992). Eight of the sixteen were those societies in the Standard Cross-Cultural Sample in which warfare was absent (coded 1 by Ember and Ember), but not due to pacification (in other words, non-pacified peaceful societies). I randomly selected the other eight from the thirty-eight societies in which warfare was constant (coded 5 by Ember and Ember). I restricted my selections, however, to those societies that were represented in the Human Relations Area Files.

I assigned a permeability value to each society based on community plans I located in the Human Relations Area Files using *Outline of Cultural Materials* (Murdock et al., 1982) category 361 (Settlement Patterns), and plans of any defenses I located using category 712 (Military Installations). If there was more than one community diagrammed in the Files, I chose a single plan that seemed to be the most representative or "average" of the plans presented. Several of the societies had no plans at all, and for these I used ethnographic descriptions to reconstruct a community plan. If there were incomplete or conflicting data for the society, I dropped that society from the sample and chose another at random. In some cases the plans or descriptions used were not from the focal time period for the society (see Murdock and White, 1969), but I attempted to make sure the data I used were consistent with the focal time period. I checked the reliability of my coding by having an independent coder determine permeability values for five of the societies chosen at random, and all five matched my coded values.

The Analyses

In my initial analyses, I found that societies with high frequencies of warfare had significantly higher community permeability values than societies with low frequencies of warfare (Mann-Whitney $U = 5.0$, $n1 = 6$, $n2 = 5$, $p < .05$), but this difference was only significant among non-pastoralist societies (with pastoralists included, Mann-Whitney $U = 19.5$, $n1 = 8$, $n2 = 8$, $p < .15$). Pastoralists seemed to be following a different strategy for defense; one in which groups split into household compounds arrayed across the landscape, offering none a very strong defensive position, but allowing each the potential for rapid escape if one's neighbors were attacked. Because of this, I eliminated the seven pastoralist societies in the original sample from further analyses.

To examine whether this significant difference in community permeability formed a linear relationship with frequency of warfare (which could provide an accurate prediction of warfare frequency as well as its presence or absence), I selected four additional societies at random (all of which were, again, represented in the Human Relations Area Files) from each of the other three categories of warfare frequency coded by Ember and Ember (1992), and determined permeability values for each of the twelve societies as described above. This addition created the final sample of twenty-two societies that I used in the remainder of the analyses. The names of the societies and their associated permeability and frequency of warfare values are presented in Table 1.

Figure 2 shows the plot of permeability by frequency of war. While the regression coefficient is 0.617 ($p < .002$), the plot itself suggests that the relationship is slightly nonlinear. Permeability appears to increase rapidly until warfare frequency reaches three, and then levels off. To test if this is an accurate model of the relationship between permeability and the frequency of war, I dichotomized warfare frequency by collapsing frequency values 1 and 2 into a single category, and frequency values 3, 4, and 5 into a separate category. I then conducted a second regression analysis, and found that the regression coefficient for the dichotomized frequency variable rose to 0.699 ($p < .001$), suggesting that there is some leveling of permeability when warfare rises above three.

Permeability appears to be a reliable predictor of warfare in non-pastoralist societies. It is obvious from Figure 2 that if one finds a community with a permeability value greater than three, one can be almost certain that warfare is present. Conversely, if one finds a community with a permeability value of one or two, one can assume that little or no warfare is present. Unfortunately, this relationship does not appear to be linear, so warfare frequency cannot be reliably predicted from permeability.

Permeability also appears to be a particularly useful measure for archaeological research. While other potential correlates of war require specific information about technology, a large number of well-preserved burials, or the like, permeability can be estimated with a single trench cutting across a community. Indeed, random test pits sampling an entire community and defining its edges should provide enough evidence to estimate permeability. An example should serve to illustrate permeability's utility as an archaeological indictor of war.

A MISSISSIPPIAN EXAMPLE

Mississippian refers to a group of culturally distinct, sedentary, horticultural, and politically centralized societies that evolved in the southeastern United States and adjacent parts of the Mississippi River Valley around A.D. 900. The idea that warfare played an important role in Mississippian evolution has been put forward by a number of scholars (for example, Larson, 1972; Green, 1977; Gramly, 1988; and Milner, 1990). Most authors cite the presence of defensive palisades

Table 1. Societies Used to Test the Relationship between
Permeability and Frequency of Warfare

Society Name	SCCS[a]	HRAF[b]	P[c]	WF[d]
Andamans	79	AZ2	2	4
Bambara	22	FA8	3	3
Cayapa	168	SD6	1	1
Gros Ventre	140	NQ13	2	3
Hausa	26	MS12	3	4
Island Carib	161	ST13	2	5
Kikuyu	11	FL10	2	2
Kwoma	95	OJ13	2	2
Lepcha	68	AK5	1	1
Maori	104	OZ4	4	4
Omaha	143	NQ12	2	4
Pomo	135	NS18	1	2
Rif	42	MX3	2	5
Saramacca	175	SR8	2	2
Semang	77	AN7	2	1
Shilluk	31	FJ23	3	3
Siriono	173	SF21	1	1
Tanala	81	FY8	4	3
Tupinamba	177	SO9	4	5
Turks	47	MB1	2	1
Vietnamese	73	AM11	3	5
Warao	162	SS18	1	1

Note: The frequency of warfare values in Ember and Ember's (1992) original data set were coded to two decimal places. I rounded these to whole numbers by giving any coded value with a decimal of .5 or greater the higher whole number value, and any coded value with a decimal of less than .5 the lower whole number value. Thus, a society with frequency of war coded as 4.25 would have been recoded as 4, while one with frequency of war coded as 4.5 would have been recoded as 5.
[a]Standard cross-cultural sample number
[b]HRAF number
[c]Permeability
[d]Warfare frequency

surrounding Mississippian centers as evidence that warfare was present. An analysis of the permeability of these sites should allow for a more objective determination of the presence or absence of warfare during the Mississippian period.

Figure 3 presents the graphs of five Mississippian centers: 1) Angel Mounds in southern Indiana (Black, 1967:490); 2) the Aztalan site in southeastern Wisconsin
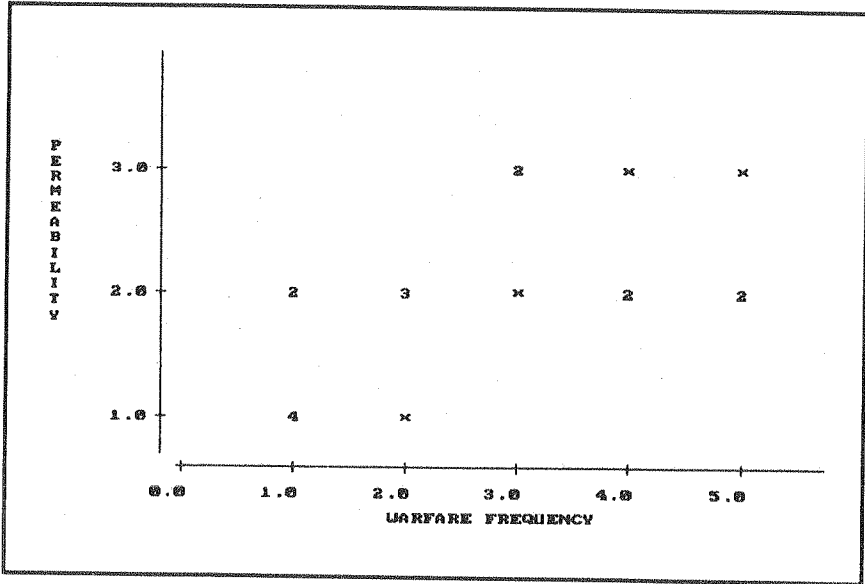
Figure 2. The relationship between permeability and frequency of warfare.

(Goldstein and Richards, 1991:195); 3) the Toqua site in eastern Tennessee (Chapman, 1987:78); 4) the Lake George site in Mississippi (Brain, 1978:346); and 5) the Etowah site in Georgia (Larson, 1972). All five of these Mississippian centers have a permeability value greater than three, suggesting that warfare was present at all of them.

There is a problem here, however, in that these sites were major centers, and are not representative of the entire range of Mississippian community types. Indeed, many rural Mississippian communities, even ones located quite near these large centers, are radically different in form. In the American Bottom, for example, sites such as Julien (Milner, 1984) and BBB Motor (Emerson and Jackson, 1984) show a linear pattern of community organization, while sites like Carbon Dioxide (Finney, 1985) and Robert Schneider (Fortier, 1985) suggest small, independent household compounds (Peregrine, 1992a). In both cases, the average permeability of houses is one, suggesting no warfare.

One way to account for these differences is to suggest that Mississippian centers functioned in a way similar to the fortress cities discussed earlier, as locations where individuals living in surrounding areas could find safety in time of war (Green, 1977:177-178). I argue that this would require a much more complex political situation than is commonly thought to have existed in the Mississippian period (indeed, to me it suggests a political situation bordering on feudalism). While some researchers do argue that Mississippian societies were tightly
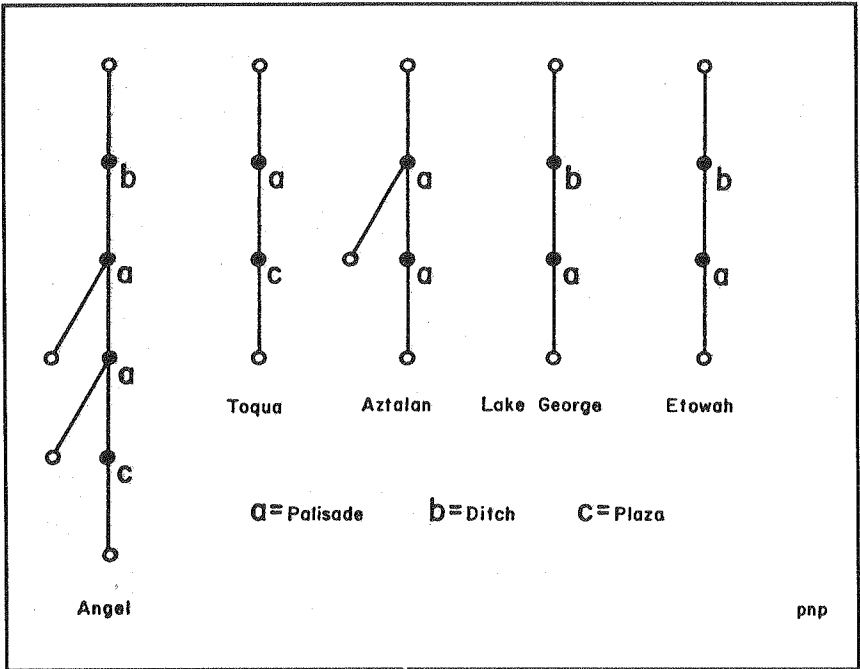
Figure 3. The permeability graphs of five Mississippian centers.

integrated (for example, O'Brien, 1989) many others argue conversely that Mississippian communities were largely independent, with little coordination between them (for example, Milner, 1990). Certainly the ethnographic and ethno-historical record suggest a looser political organization than is proposed by a model that makes Mississippian centers into fortresses. As Hudson explains (1976:205-206):

> If powerful chiefdoms or small primitive states did exist in the Southeast in Mississippian times, they were probably not very stable, as is the case in such societies elsewhere in the world, the reason being that their local communities remained almost completely self-sufficient. Thus if a village, town, or affili-ated chiefdom were cut off from the seat of power, it probably made little difference in the day-to-day lives of people.

An alternative way to view the differences in Mississippian community patterns is to consider the idea that warfare among Mississippian societies was more complicated than generally is thought. The community patterns suggest that war was not a concern for rural populations, but that it was for more urban ones. This may, in turn, suggest that war was focused on these urban centers and did not

affect rural populations in the same way. The question then remains, why would this have been? I posit that one possible reason was to defend nodal locations on trade routes.

A theoretical perspective has recently emerged that views Mississippian societies as participants in some form of a prestige-goods system (Brown et al., 1990; Peebles, 1987; Peregrine, 1991b; 1992b; Steponaitis, 1991; Welch, 1991). In prestige-goods systems, exotic personal ornaments, often traded inter-regionally, are used to pay social debts such as bride price, initiation and funerary fees, and punitive fines (Meillassoux, 1978). Since exotic personal ornaments are needed by all members of the society to socially reproduce themselves and their kin groups, but are controlled at the highest level of the political hierarchy, the control of prestige-goods forms a potent foundation for political authority (Ekholm, 1972). By selectively distributing these goods, political leaders are able to control their followers' access to them, and hence, to effectively control their followers' abilities to socially reproduce (Friedman and Rowlands, 1977).

A key facet of political power in prestige-goods systems is, therefore, the ability to control access to prestige goods. If Mississippian societies were participants in a prestige-goods system, a key element of the power of Mississippian elites would have been their ability to control trade in prestige-goods (Peregrine, 1991b). Since trade for the Mississippians was most likely conducted along the major rivers (Lafferty, 1977; Little, 1987), controlling nodal river locations would have provided the potential to control trade. I recently demonstrated that the Cahokia site was located on the most central location in the Mississippi River system (Peregrine, 1991a), and elsewhere I have argued that other Mississippian centers occupied similar locations (Peregrine, 1992b).

For Mississippian elites, the defense of these locations may have been equivalent to defending their access to prestige-goods, and hence, equivalent to defending their political authority. If there was competition over access to these goods, as would be predicted in a prestige-goods system (Peregrine, 1992b), it makes sense that Mississippian centers would have been under the constant threat of attack and would thus have community patterns that reflect war, while rural areas would not have been threatened and would thus have community patterns that reflect peace. This seems to be consistent with the permeability analysis presented above.

If warfare during the Mississippian period was indeed focused on urban centers, then the pattern of Mississippian warfare is quite different from that envisioned by Larson (1972), Green (1977), and others. They suggest war was a means by which powerful Mississippian groups expanded territorially, obtaining new and productive land for growing maize (DePratter, 1983). The pattern suggested by the permeability analysis presented here is that conquest of territory was not a significant aspect of Mississippian war, because territory itself was not defended. Urban centers that appear to have occupied nodal locations on trade routes were defended.

CONCLUSIONS

Given the large number of theoretical models concerning migration, social and economic change, and cultural evolution in general that contain warfare as a critical variable, the ability to reliably predict the presence or absence of warfare in a given case makes permeability a useful index for archaeological research. In addition, the case study from Mississippian archaeology demonstrates that permeability analyses may not only lead to an objective confirmation of the presence of war, but may also lead to new interpretations of the nature of war in particular archaeological situations. As I have tried to show in this brief discussion, permeability does not require extensive or highly specific information to objectively confirm the presence or absence of war, and can, in some cases, provide new information concerning the nature, extent, or importance of war. Because of these useful features, I hope permeability will become a widely-employed index in archaeological analysis.

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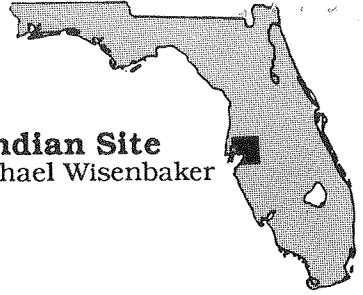
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