Chapter 4

One-dimensional archaeology and multi-dimensional people: spatial organisation and mortuary analysis

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Introduction

Spatial analysis has become very popular in archaeology today, but most of this work has centred on habitation sites and settlement patterning. As Clarke (1977, p. 9) has pointed out, however, sites selected for study should *not* be confined to settlements. Human activity, wherever represented, tends to be non-random, and spatial structure can be seen as the output of non-random human choice processes (Clarke 1977, p. 10). This paper addresses a somewhat neglected area of spatial analysis – the mortuary site.

Mortuary customs, mortuary sites and even isolated human burials have concerned archaeologists for many years. Until recently, however, there has been little attempt to deal with burials 'as a distinct class of variable phenomena' (Binford 1971, p. 6). Early trait-list approaches to burial customs assumed an intra-cultural uniformity that inhibited investigation of mortuary variation within and between societies. These approaches also implicitly assumed that formally similar objects and customs have fixed significance from one culture to the next. However, the same object may have different symbolic significance in different cultures, and in any given culture there may be many ways of symbolising the same concept (cf. Ucko 1969).

Recently, archaeologists have returned to the study of mortuary practices as a critical method for the determination of prehistoric social organisation. The validity of this approach

is amply documented in the ethnographic literature (cf. Bendann 1930; Douglass 1969; Gluckmann 1937; Miles 1965; van Gennep 1960). 'Not only does death serve to activate the various levels of social organisation, but on each level it occasions the widest expression of such relationships . . . To a significant degree . . . it is through death that the social relationships of the living are defined and expressed' (Douglass 1969, p. 219). Archaeologists are now aware that in order to explain similarities and differences within and between sociocultural systems it is necessary to seek 'regularities in the *processes* that result in a set of mortuary practices rather than in the formal attributes of the practices themselves, each of which is necessarily unique' (Saxe 1970, p. 1). Past mortuary studies failed because they focussed on formal rather than processual regularities.

The ethnographic literature has been the source of several studies attempting to relate aspects of mortuary behaviour to the organisation of society (e.g. Binford 1971; Saxe 1970; Tainter 1975*a*; Goldstein 1976, 1980). Among other things, these studies have resulted in confirmation of two basic assumptions of current archaeological mortuary analysis: (1) the variables within a mortuary site cluster so that they partition the universe of mortuary practices, and these partitions represent different social statuses or classes; and (2) the principles which organise the sets of statuses are the same as the organising social relations in the general society (cf. Saxe 1970). To put it simply, a person treated differentially in death was probably also so treated in life; this differential treatment reflects the social structure of the society.

One of the basic concepts inherent in the study of mortuary practices is that of status and social identities. Indeed, most current mortuary analysis focusses on the identification and differentiation of social statuses. The concept of status is crucial, since burials afford archaeologists one of the best means of examining social interaction. The particular social relationships involving the deceased account for the specific disposal treatment. However, because different types of social organisation allow for different sets of social relationships, different organisations will also exhibit different disposal treatments. Mortuary analysis must link social relationships, social structure, and disposal treatment.

A review of current mortuary analyses

Recent mortuary analyses have taken several different paths. One of these can be termed the 'evolutionary classification' approach. Different levels of social organisational complexity should be reflected by different sets of disposal treatment. Fried (1960, 1967) and Service (1962) are frequently quoted in mortuary analyses because, as a part of their general evolutionary models, they have specifically defined several levels of socio-organisational complexity. These levels of complexity are differentiated primarily on the basis of form of organisation.

Binford (1962) first discussed the possibility of distinguishing archaeologically between Fried's egalitarian and ranked types of societies, offering predictions of the artefact assemblages which would be associated with each type of society. Specifically within the context of mortuary studies, Saxe (1968, 1970) has made similar observations. In his sample of ethnographic societies, burial mode was controlled by age, sex, and normal/deviant distinctions in egalitarian societies, while culturally defined social role and kinship positions controlled burial mode in ranked societies.

Focussing only on the artefactual dimension, King (1970) summarised archaeological definitions of egalitarian as opposed to ranked societies for mortuary sites. King's definitions or list of attributes deal exclusively with artefactual dimensions and resemble an updated trait-list approach for classification of societies. The definitions do not really examine interrelationships between dimensions.

The major problem with the evolutionary classification approach is that both Fried's and Service's schemes are relative, and translating the scheme into artefact dimensions results in an elaborate trait list. The analysis then becomes a process of pigeon-holing the particular culture as egalitarian, tribal, ranked, or a chiefdom. While useful in terms of partly standardising levels of sociocultural complexity and giving some idea of the general organisation of prehistoric societies, this procedure is not necessarily instructive as to the society's specific organisation and structure.

Renfrew (1972) has carried out perhaps the most elaborate application of evolutionary classification. Using Service (1962) and Sahlins (1968), Renfrew extracted twenty characterising features of a chiefdom and then compared his data with these features. The closeness of fit suggested that the data most resembled a chiefdom model. While this kind of scheme has the advantage of being easily reproducible, it is very rigid and only serves the function of identification or labelling, rather than explanation or interpretation (cf. Brown, this volume).

Saxe (1970), Peebles (1972), Tainter (1975*a*, 1975*b*) and others have attempted to circumvent some of these problems by stressing the advantages of information theory in the analysis of mortuary sites. Social organisation, burial organisation, and the relationships between them, have been examined from the standpoint of information and entropy (cf. Buchler and Selby 1968, pp. 279–317; Saxe 1970, pp. 102–18). It has been suggested that the information content of burial attributes and their combinations provides a measure and criterion for splitting a burial population into meaningful subpopulations.

Entropy has been suggested by Saxe (1970) and Tainter (1975*a*) as a measure of organisational complexity. Entropy is a measure of disorder within a system: high entropy has been interpreted to mean lack of organisation, and vice versa. Increasing organisation relates to increasing interaction between system components, and increasing entropy is related to decreasing interaction. Increasing entropy is also related to decreasing predictability of messages and decreasing constraints on behaviour.

Both Saxe and Tainter have applied entropy measures as an inverse measure of organisation. Saxe (1970, pp. 69–75) has hypothesised that the number of components in a disposal domain, the kinds of components, and the organisational complexity, are interrelated. The 'relative entropy and redundancy not only measures the degree of organisation among elements, but . . . also the number of different kinds of elements present in the domain' (Saxe 1970, p. 110). In other words, a decrease in entropy implies not only differences in the relationship between elements, but also the addition of more and more different kinds of elements.

A point which has been overlooked by Saxe and Tainter, but which needs clarification, is the problem of using entropy as a measure of organisation. Entropy may be less a measure of organisation *per se* than of differential classification. For example, if one has a ranked society which limits access to specific ranks, the ranking might be demonstrated as:

Rank A = 2 individuals
Rank B = 4 individuals
Rank C = 6 individuals

The measure of entropy for this system would be low. However, let us say there is another system in which there are also three distinctions, but organised as follows:

A = 4 individuals
B = 4 individuals
C = 4 individuals

The entropy measure for this system would be very high. Rather than implying *lack* of organisation, the measure implies *lack of differential access* to the classes within the system. Thus, entropy measures may measure organisational complexity, following the theory of Fried, Service and Sahlins, but there is no lack of organisation in a mortuary domain with a high entropy measure.

When one has a classification scheme based on a variety of types of data (nominal, ordinal, interval), entropy measures allow one to ask 'how differential is the classificatory scheme' and 'does this measure reflect what we know from other data'. This is the key advantage to the entropy approach.

In examining the degree of differentiation within a classificatory scheme, the measure of entropy used is not the actual entropy, since actual entropy reflects only the classification scheme itself, but rather *relative* entropy – the ratio between the actual entropy for the classification and the maximum entropy for that classification system. A measure of relative entropy approaching 1.0 suggests a lack of differentiation in the classificatory scheme of disposal types. A relative entropy measure approaching 0 would suggest much differentiation in the classificatory scheme.

This measure can also test how good a classificatory scheme is. A measure of 0.9, for example, for a disposal system which is believed to be ranked, could mean that the disposal types merely reflect a variety of acceptable disposal practices to which access is not restricted. However, 0.9 could also mean that the sample used is not representative. By re-examination of the data, one might be able to determine which is the case. Examination of the classificatory scheme itself was implied in our earlier statement that entropy measures allow one to ask 'how differential is the classificatory scheme' and *'does this measure reflect what we know from other data'.*

Assuming that the measure of relative entropy or the differences in the measure of relative entropy between two systems is not a result of some form of sampling error, the extent to which the differences are the artefacts of the classificatory scheme must be examined. Simple numerical comparisons will not suffice, because, as stated earlier, a decrease in entropy also implies the addition of more and more different kinds of elements. For example, if one divides the same disposal system into two or four disposal types the relative entropy measures will be different. The four-division scheme will have a lower entropy measure. This lower measure is the result of addition of more elements, that is, a finer classification. Whether or not it is a *better* classification can only be determined by examination of the elements and their possible cultural significance.

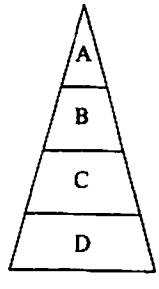
In sum, the application of entropy measures in analysis of mortuary practices can be useful for examination of how differential a classificatory scheme is: is there limited access to certain disposal types? The problems of the approach, however, must also be accommodated.

In a similar context, Saxe (1970) and Tainter (1975*a*, 1975*b*) have discussed the usefulness of energy measures in the interpretation of mortuary practices. Tainter (1975*a*, 1975*b*) has suggested that the measure of energy expended on a burial be used as a means of ranking burials. Specifically, the amount of energy expended in inhumation will increase with the social status of the deceased. Thus, an alternative measure of social stratification might be the measure of the extent of 'unequal privilege' of energy expended.

As a test of the energy expenditure hypothesis, Tainter (1975*a*) has examined some of the ethnographic literature on mortuary practices. In 93 societies the energy expended bears a direct relationship to the social status of the deceased. Significantly, Tainter has found no societies which specifically contradicted the hypothesis. Theoretically, the amount of energy expended is not a culture-specific measure.

Unfortunately, there are some definite problems in the application and quantification of energy expenditure as a measure of social stratification.

The application of the energy hypothesis to a ranked society is based on a pyramidal model:



Highest rank – fewest people per rank

Lowest rank – most people per rank

The higher the rank, the more duty–status relationships owed, and conversely, the lower the rank, the fewer duty–status relationships owed by other ranks (cf. Goodenough 1965; Binford 1971).

While the notion of differential energy expenditure is certainly logical, one problem is the amount of noise generated by parallel status relationships. How much is owed to the people of a rank by others of the same rank? Is this reflected in the amount of energy expended? Further, how much noise does any within-rank ranking (however slight) contribute to the amount of energy expended? A less simplistic model is probably necessary. The noise created by status relationships of parallel-ranked individuals may increase the within-rank variance such that between-rank differences are less clear. Although the problem will probably not have a serious effect on rank differentiation, the extent of potential noise generated by parallel-ranked relationships (as these affect overall between-rank differences) should be examined.

Tainter (personal communication) has suggested that, to remove biases, measurable variables of energy expenditure be used, such as size of burial pit, volume of pit etc. How does one differentiate or measure energy when such data classes do not exist? How much energy does a secondary burial require, and more importantly, is it a consistent amount of energy? If measurable, how does the volume of rock on a grave compare with the volume of dirt taken from a pit? Relative measures of energy expenditure may be discussed, and a system of weights devised, but this too may inject biases into the sample. When different modes of energy expenditure are employed by the same society, the problems are greatest. Nonetheless, the use of energy expenditure, even as the basis for subjective divisions, does have advantages over some other schemes.

Measures of energy expenditure can provide a more objective method for the examination of variability in mortuary practices. The degree of quantification of energy-related variables, however, will vary with the type of data at each site. As Saxe (1970, p. 111) has noted, measures of energy may allow the archaeologist to determine not only forms of organisation, but also the degree of organisation of a society.

What is perhaps most critical in mortuary studies is not to limit the analysis to one dimension. Tainter (1975*a*) and Saxe (1970) have stressed energy expenditure because it is multidimensional and does not have the bias inherent in studies which, for example, stress artefacts alone (cf. Hatch 1974; Peebles 1974; Larson 1971). Because of the nature of archaeological data, it is imperative for the archaeologist to employ all available information. Ucko (1969) has quite clearly demonstrated the problems of narrow or ethnocentric interpretations of funerary remains.

While more recent mortuary analyses have begun to stress the multidimensionality of mortuary practices, a severe problem remains. This problem can perhaps best be termed 'classification without context' (see Brown 1976 for a discussion of this problem in a different situation). Archaeologists have, in general, moved away from some of the problems which were characteristic of past mortuary studies (see above). Unfortunately, rather than moving toward a system of study which helps elucidate the underlying social structure, we have created a more complex version of an old problem.

The focus of most mortuary studies in the last ten years has been the identification of status types or social groupings. Once the groupings have been determined, they are frequently placed within an evolutionary classification scheme or the information theory structure discussed earlier. While this type of analysis is useful, it is not complete. The result is a new classification or pigeon-holing. Burials are classified by internal differentiation, but the *context* of the classes is not taken into account. What does each group or status type mean? How do the groups relate to each other? What are the functions of each group, and what are the functional relationships between groups? While many of these questions may not be easily or reliably answered, current mortuary analysis does not even approach or attempt to *ask* these questions. Can we really say, particularly given the problems cited earlier, that a culture in which we have determined seven social groupings is more complex than one in which we find six groupings? Our current approach not only fails to examine function and relationships between groups; it ignores the possibility of sampling biases.

The term 'sampling bias' is used in this paper to refer to several possible conditions. Bias, in general, means something which sways or unduly influences a measurement or observation. In the archaeological analysis of mortuary sites, there are several sources of bias. First, there is the manner in which sites are selected for study. The tendency has been to focus on all mortuary sites either of a given type or in a given region or, because of the very complex nature of mortuary site analysis, to focus on the site or sites just excavated. Secondly, bias is introduced by the familiar problems of selective recovery and differential preservation. In working with mortuary site materials excavated, however carefully, by others, biases may be introduced by the historically different recovery objectives. Further, were this not enough, a subtle bias is introduced by the prehistoric funerary customs employed. Archaeologists must be very cautious in interpreting even the mortuary practices displayed over a series of sites. In the absence of other evidence, there is no reason to believe that one or another segment of the prehistoric population has not been systematically excluded from the sites examined. This is not to say that mortuary analysis *per se* is hopeless, merely that the investigator who deduces six social ranks should not be surprised to discover that other ranks exist and have been disposed of elsewhere. Likewise, if one culture has six ranks and another has five, the first is not necessarily more complex than the second – you may have missed the 'extra' rank in the second.

As any archaeologist is well aware, a mortuary site frequently represents considerable time depth. Further, the time depth must be regarded with respect to the rate of social change in the prehistoric society. What we may interpret as different ranks may in fact represent changes in funerary

behaviour through time. This problem can also introduce a sampling bias. It is for this reason that context is crucial.

Quite simply, what does the presence of eight disposal types tell us about culture or social structure?

It is clear that one must look beyond grave associations to understand the structure of a mortuary site and the society which produced it. The archaeologist now knows that the treatment of the body, preparation of the disposal facility, burial context within the grave, and the population profile and biological dimensions must all be examined. In other words, *the mortuary system is a multidimensional system.*

The key to resolving the 'classification without context' problem is the recognition of all components of this multidimensional system. There must be a way to organise the various components so that co-variations and interrelationships become clear. It is argued here that the best way to examine these relationships is to use the spatial component of the mortuary system as the organisational framework.

Examination of the spatial component of the mortuary system

As Binford, *et al.* (1970, p. 1) have noted, 'the archaeological site should exhibit a complex formal-spatial structure in direct correspondence to the degree of differentiation of activities and social units performing the various activities'. Mortuary sites reflect both a differentiation of activities and a differentiation of the social units performing the activities; mortuary sites should thus also exhibit a complex formal-spatial structure.

Within anthropology, it has long been recognised that the spatial organisation of behaviour is culturally significant. For example, Eisenstadt (1949, p. 63) noted: 'The spatial and temporal orientation of social activities, their definite ordering and continuity are focused on the ultimate values of a given social structure.' Similarly, statements identifying the significance of space in funerary practices are common in the ethnographic literature (see especially Douglass 1969).

Because mortuary practices are reflections of interpersonal and inter- and intragroup relationships, as well as a reflection of the organisation of the society as a whole, examination of the spatial component can yield information on at least two broad levels: (1) the degree of structure and spatial separation and ordering of the disposal area itself may reflect organisational principles of the society as a whole; and (2) the spatial relationship to each other of the individuals within a disposal area can represent status differentiation, family groups, descent groups, or special classes, dependent upon the correlation of these spatial relationships with other dimensions of study.

Curiously, with one notable exception, archaeologists have ignored the spatial component. Frequently, in fact, a detailed map of the site showing the placement of burials is not even included in reports. The one important exception to this omission of spatial organisation is the mound or barrow. For mounds, one often refers to central features or tombs, ramps, peripheral burials, and so on. Most researchers accept that some social significance is associated with the placement of a particular burial in a particular place within the mound. Further, archaeologists will make broad spatial distinctions, such as placement in a mound or in a village area. But within a village or within a cemetery or other non-mounded disposal area the same sorts of distinctions are not made. Yet it is clear that societies have sets of rules for disposal, including rules for which body goes where in a formal disposal area (i.e. mound, barrow, cemetery etc.). In other words, mortuary space in these situations has also been partitioned, and patterning should be discernible; the processes reflected are certainly not random.

In mortuary analysis, archaeologists (either explicitly or implicitly) accept that particular cultural elements of the social organisation form the basis for rules governing various material representations (e.g. grave furniture, disposition, etc.). Given this, these same cultural elements should form the basis for rules governing spatial organisation. Coincidence of spatial organisation and grave associations must imply coincidence of cultural elements. The lack of acknowledgement of this simple point is another way of saying 'classification without context'. The same cultural elements may be expressed redundantly, along many dimensions, and to understand those elements fully all dimensions must be examined. On habitation sites, we examine materials and make interpretations based on spatial positioning (e.g. activity areas), and it is logical to do the same for mortuary sites.

The task in mortuary analysis is to identify the rules a society used and the cultural elements (e.g. kinship, wealth, etc.) represented. The rules can be seen as functions which are used to map the domain of cultural elements on to the set of appropriate funerary behaviour. The appropriate funerary behaviour is only partially represented in an archaeological context. Because not all aspects of funerary behaviour are represented, it is critical to examine as many representations of behaviour as possible (and the co-variations among and between them) in order to increase the probability of proper inference of both the rules and the cultural elements.

While utilisation of space is clearly a component of the mortuary system, within the disposal domain space can be used in many ways and at different levels simultaneously. For example, space utilisation can refer to placement of grave associations in relation to an individual, placement of the individual in relation to others, placement of groups of individuals, and placement of the disposal area itself. Therefore, *the spatial component is also multidimensional.* The different dimensions may represent different cultural elements, and thus should be carefully sorted out and analysed.

The necessary distinctions to be made in a mortuary study which incorporates the spatial component are analogous to the geographer's problem in differentiating spatial languages. A spatial language provides a set of rules for the use of co-ordinate systems. One obvious example of a spatial language is longitude and latitude. Harvey (1969, pp. 215–16) discusses

two basic types of spatial languages. The location of an object or event in space and time can be described by the four-dimensional co-ordinate system (x, y, z, t); this is a *space–time* language. The non-spatial co-ordinate system, which describes an object or event by measures on a set of properties or attributes ($p_1, p_2, \ldots p_n$), is called a *substance* language. If two things are the same in a substance language, then they both have the same properties. If two things are the same in a space–time language, the implication is that they occupy the same physical position. The point being made here is that archaeologists have analysed mortuary sites almost exclusively in terms of substance languages, but should in fact be examining those sites within space–time languages as well. Further, it is necessary to examine the results of both in relation to each other. As Harvey (1969, p. 386) points out for geographers: 'Each simple language (space–time or substance) can have several dimensions, but in this case we are forming a complex language by bringing together two different languages into *one information system*' (emphasis added). Given this background, it is necessary to examine methods for investigating the spatial component in a mortuary site.

Clarke (1977) has outlined the various spatial models used by archaeologists, and has also noted many of their limitations. Archaeologists have, in particular, been drawn to geographic, economic, and ecological models. The problems noted by Clarke are applicable to mortuary sites, but mortuary sites create other problems as well. A key problem, for example, is that mortuary sites represent a large amount of information condensed into a relatively small space. Some of the major problems of applying models from other disciplines can be outlined as follows:

1. Many techniques and models are regionally orientated and assume regular interaction or interactive networks (e.g. central-place theory, gravity models, etc.).

2. The models, especially in geography, often tend to be deterministic and/or descriptive, having little explanatory power. This is really a limitation rather than a specific problem but these techniques do not allow the flexibility one would like for mortuary analysis.

3. Some techniques and measures can accommodate only one variable or set of variables at a time. Given the multi-dimensional nature of the mortuary system, restrictions of this type do not allow examination of the interrelationships among and between components.

4. Some methods used are difficult to apply to mortuary sites, simply because the techniques were designed for twentieth-century civilisation, or for plant distributions. The number of assumptions which one would have to violate for application to a mortuary site is frequently great.

5. Pattern tests frequently are designed to examine whether or not a distribution is random, but will not isolate the nature of the non-random distribution represented. Because a mortuary site, almost by definition, is non-random, these tests do not really tell us anything we do not already know.

6. Techniques such as nearest-neighbour analysis have severe problems near boundaries. The amount of space (border) left around the area being tested will in part determine whether or not the result is significant. A wide border will result in a 'clustered' pattern; if there is no border clustering may or may not be picked up, depending upon the number of points and their density. Since mortuary sites are frequently densely packed, the nearest-neighbour analysis will be either significant or confusing; it will seldom give us the information we need.

In sum, mortuary sites rarely meet the assumptions of most spatial-analytic techniques, and the techniques are rarely designed to ask the necessary questions of mortuary-site analysis.

At the risk of appearing blasphemous, I suggest that within a mortuary site, the spatial dimension is uniquely amenable to simple visual inspection for locational organising principles. It is reasonable to assume that the spatial principles used by a society will be fairly distinct and apparent. It is probable that rules for placement of individuals will have been followed consciously by the members of a society (especially in a cemetery, barrow or mound), and it is unlikely that these people had computers or random-number tables to assist them in developing a visually incomprehensible pattern. A modern example of obvious spatial structuring would be Arlington National Cemetery (the official armed services cemetery) in Washington, D.C., where burial is in a distinct grid-like system. Even early pioneer cemeteries were clearly organised in rows and/or family groupings or plots.

Given that many spatial-analytic models are not usually applicable to mortuary sites, although we would expect apparent ordering of space, simple visual inspection of the mortuary site is a logical first step of analysis. This idea is similar to Thomas's (1978) recent point about abuses of statistics: one need not prove with statistics that which is apparent. More appropriately, we are merely following Tukey's dictum: a thing that is not worth doing is not worth doing right.

The spatial pattern of a mortuary site may not always be completely clear or obvious. However, even when this is the case, visual examination should be undertaken as a means of hypothesis generation.

The spatial patterns themselves may not necessarily be complex, but because the spatial component itself is multi-dimensional, different kinds of spatial relationships (or societal relationships) should be represented. The archaeologist should analyse the different dimensions of space represented, e.g. grave goods around the body, the burial in relation to other burials, groups of burials, and the placement and structure of the entire disposal area. These studies using space–time languages must then be compared with those resulting from substance language studies, and the relationships between the two kinds of studies should give clues to the cultural elements represented. The archaeologist should then be able to identify the various rules of placement and the cultural elements.

Dimensions of study

It is apparent (as mentioned earlier) that the domain of

mortuary practices consists of a set of dimensions that are reflected in more than the archaeological expressions of the disposal of the dead. However, for the purposes of archaeology, the domain is limited by archaeological knowledge and by assumptions drawn from ethnographic sources. Binford (1971) summarised some of the dimensions of study, and these dimensions can be expanded by inserting those which specifically address the spatial component.

1. Treatment of the body itself
   a. degree of articulation of the skeleton
   b. disposition of the burial
   c. number of individuals per burial
   d. mutilations and anatomical modifications
2. Preparation of the disposal facility
   a. form of the facility (e.g. grave, tomb)
   b. orientation of the facility and the body within the facility
   c. location of the facility in relation to the community (e.g. within village, adjacent to village, in spatially differentiated location)
   d. location of the facility within the disposal area itself
   e. form of the disposal area (e.g. cemetery, mound, house-floor)
3. Burial context within grave
   a. arrangement within grave of specific bones with relation to grave furniture and grave facility
   b. form of the furniture
   c. quantity of goods
4. Population profile and biological dimensions
   a. age
   b. sex
   c. disease states and/or circumstances of death
   d. nutritional evidence and environmental stress
   e. genetic relationships.

Although the dimensions of population and biology are not part of the disposal domain in a formal sense, in that they are given and cannot be changed by funerary behaviour, the treatment of the categories included may be differential, and thus the culture at least controls the differential treatment of these categories.

Hypothesis generation using the spatial component

A set of examples should prove useful in clarifying these concepts. Recently I (Goldstein 1976, 1980) examined Mississippian social organisation by utilising information from two cemeteries in the lower Illinois River valley in West-central Illinois (fig. 4.1). Both sites date from around A.D. 1100–50. Schild is a large Mississippian cemetery of about 300 individuals and was excavated by Perino in 1962–3 for the Thomas Gilcrease Institute of American History and Art, Tulsa, Oklahoma (Perino 1971). Moss is a small cemetery of about fifty individuals which I excavated in 1971–2 under the sponsorship of the Northwestern University Archeological Program, Evanston, Illinois.

The first set of analyses concerned the nature and placement of the disposal area itself, i.e. it was done in terms of substance language. Both Moss and Schild were bounded disposal areas used exclusively for burial. Given this, an hypothesis proposed by Saxe (1970) seemed especially pertinent.

Saxe (1970) has made an important study using the ethnographic literature; he concentrated specifically on the archaeological analysis of mortuary practices. He attempted to construct a body of theory designed to bring the study of mortuary practices and their sociocultural determinants under the realm of scientific determination; i.e. his goal was 'to build and test models of how treatment of the dead is related to other elements of sociocultural systems' (Saxe 1970, p. 12). He accomplished this by formulating a set of eight hypotheses generated by anthropological models. These hypotheses were tested by using a very small, but diverse, ethnographic sample.

Saxe's Hypothesis 8 is of critical importance in analysing the spatial dimension of mortuary sites, if the hypothesis is supported. Because of its implications, this hypothesis was examined in detail and tested on a sample of ethnographic data (Goldstein 1976). Hypothesis 8 states: 'To the degree that corporate group rights to use and/or control crucial but restricted resources are attained and/or legitimised by means of lineal descent from the dead (i.e. lineal ties to ancestors), such groups will maintain formal disposal areas for the exclusive disposal of their dead, and conversely' (Saxe 1970, p. 119). By formal disposal area, Saxe means a permanent, specialised, bounded area such as a 'cemetery'. As any of the variables involved decreases, the formality of the disposal area should also decrease; i.e. the disposal area should be less restricted to burials.

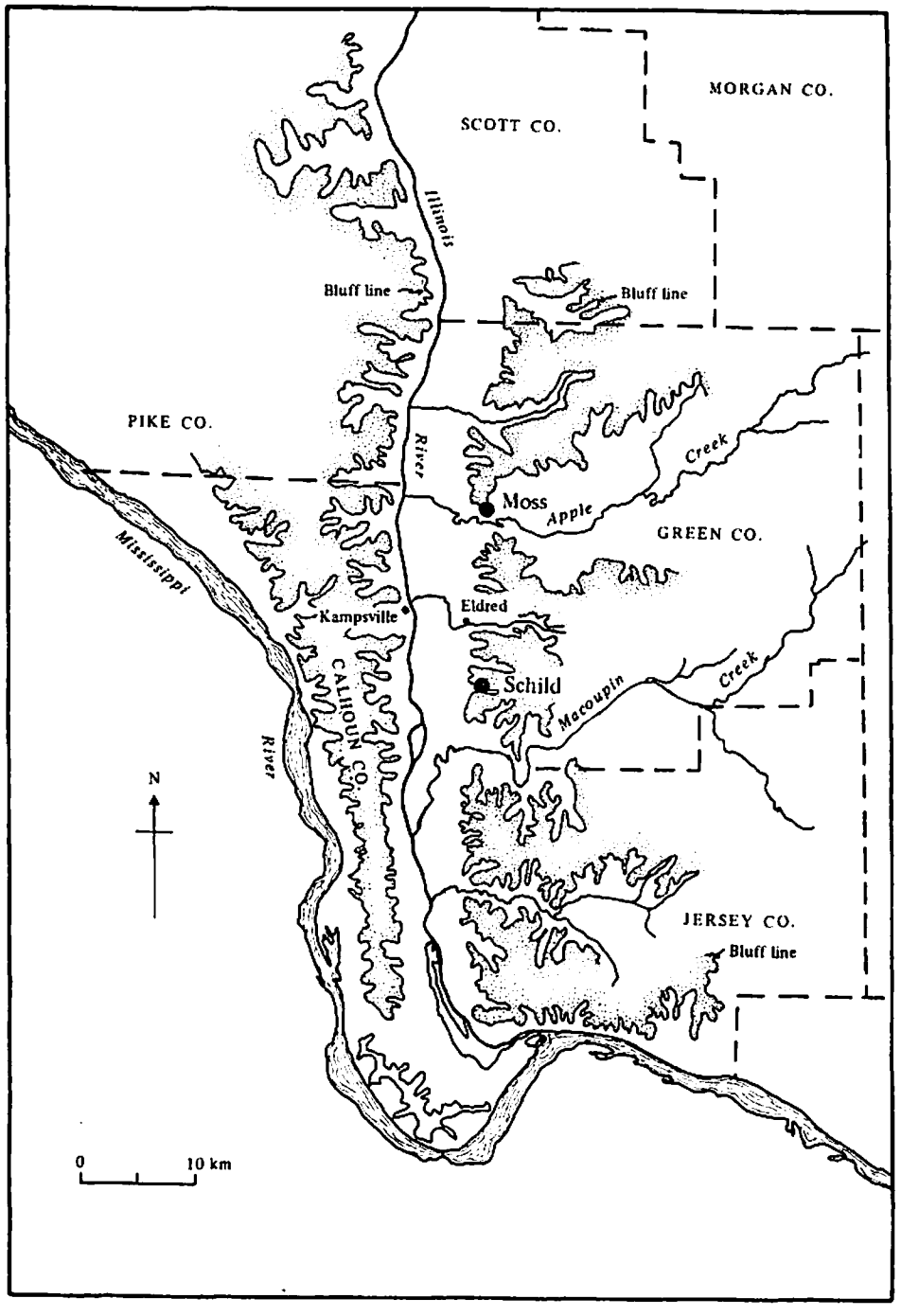
Hypothesis 8 is based on another hypothesis and argument set forth by Meggitt (1965*a*). In working with the Mae-Enga, a New Guinea Highland society, Meggitt discovered that among horticulturalists increased pressure on available land resources is likely to result in a group which is structured in terms of agnatic descent and patrilocality; i.e. if land is both important and scarce, the group will be patrilineal and patrilocal. Specifically, the hypothesis states that, 'where the members of a homogeneous society of horticulturalists distinguish in any consistent fashion between agnates and other relatives, the degree to which social groups are structured in terms of agnatic descent and patrilocality varies with the pressure on available land resources' (Meggitt 1965*a*, p. 279). In another article, Meggitt expanded upon this hypothesis and explained the subsequent effect on ritual and religion: 'the people emphasise the importance of the continuity of solidary descent groups which can assert clear titles to the highly valued land. The popular religion is well designed to support these ends . . . rituals regularly reaffirm the . . . patrilineal group . . . the dogma in itself implies a title to land by relating living members of the group to a founding ancestor' (Meggitt 1965*b*, p. 131). Meggitt's hypothesis is specific in terms of land, patrilineality, patrilocality and horticulture. He developed and showed (1965*a*) the value of agnatic descent and patrilocality in terms of controlling scarce land. The force of his argument lay in the fact that, in order to cope with the scarce land resources, groups had to have patrilineality and patrilocality.

Meggitt cited examples of other horticultural groups with scarce land, and found the situation was the same. Essentially, Meggitt's hypothesis is based on a type of environmental stress.

Saxe (1970, p. 121) has carried Meggitt's formulation one more step. Since effective agnation is a response to an ecological variable, and since ancestor-centred dogma reinforces agnation, Saxe postulates a connection between ecosystem factors and treatment of the dead (i.e. ancestors) as reflected by cultural variables such as inheritance rules. In an attempt to make the hypothesis cross-culturally applicable, Saxe changed 'land' to 'vital resources' and 'agnation' to 'lineal descent'. Also, he added 'and conversely' to the hypothesis, which of course is more useful to the archaeologist.

I reviewed the ethnographic data employed by Saxe in formulating the hypothesis and subjected the hypothesis to further testing with a world-wide sample of societies (Goldstein 1976). The test demonstrated that the hypothesis did not work in both directions: not all corporate groups that control

Fig. 4.1. Location of the Moss and Schild cemeteries.



crucial and restricted resources through lineal descent will maintain formal, bounded disposal areas exclusively for their dead.

Hypothesis 8 can perhaps best be restated in three separate but related sub-hypotheses.

A. To the degree that corporate group rights to use and/or control crucial but restricted resources are attained and/or legitimised by lineal descent from the dead (i.e. lineal ties to ancestors), such groups will, by the popular religion and its ritualisation, regularly reaffirm the lineal corporate group and its rights. *One* means of ritualisation is the maintenance of a permanent, specialised, bounded area for the exclusive disposal of their dead.

B. If a permanent, specialised bounded area for the exclusive disposal of the group's dead exists, then it is likely that this represents a corporate group that has rights over the use and/or control of crucial but restricted resources. This corporate control is most likely to be attained and/or legitimised by means of lineal descent from the dead, either in terms of an actual lineage or in the form of a strong, established tradition of the critical resource passing from parent to offspring.

C. The more structured and formal the disposal area, the fewer alternative explanations of social organisation apply, and conversely.

The major problem found in the application of Hypothesis 8 was the unintentional implication that cultures will ritualise a particular aspect of their social organisation in the same form, i.e. by maintaining formal specialised disposal areas when corporate group rights to restricted resources are legitimised by lineal descent. Considering the wide range of variability in cultures, there is a low probability that certain groups, even when in similar economic and environmental conditions, will symbolise and ritualise aspects of their organisation in precisely the same way.

The implications of the revised hypothesis for examination of the spatial dimensions of mortuary practices are most significant. It appears that if a particular situation is discovered archaeologically, then statements can be made about social structure as well as the nature of the resource utilised by the society.

The evidence supporting the hypothesis suggests that if there is a formal bounded disposal area, used *exclusively* for the dead, then the culture is probably one which has a corporate group structure in the form of a lineal descent system. The more organised and formal the disposal area is, the more conclusive this interpretation.

When an archaeologist excavates a mortuary site, the work is seldom done in a cultural void: usually the site is assignable to a particular cultural period. Often, habitation sites of this same period have been excavated and there is already some idea of the subsistence base of the society and its organisation *vis-à-vis* settlement pattern and type. Thus, using this hypothesis in conjunction with what is already known, the culture's organisation can be discussed with a greater degree of certainty, and the critical resources can perhaps be determined in the case of a formal disposal system.

The re-analysis of Hypothesis 8, as well as the original formulation of Hypothesis 8, is an example of substance language as specifically applied to the spatial component. The unit of study is the mortuary disposal area, and the property examined is the degree to which and the circumstances under which a disposal area is formal and bounded.

An example of mortuary site analysis using the spatial component

Before proceeding with the example, a short introduction to the cultural context is in order.

The term 'Mississippian' refers to cultural systems in the eastern United States which date, roughly, A.D. 900–1400 (see also Brown, this volume). Attributes of Mississippian society are generally considered to include shell-tempered pottery, ceremonial centres, pyramidal mounds, palisaded towns, various 'ceremonial' artefacts and symbolic motifs, and agriculture.

Site location is usually along major rivers and streams. Large ceremonial structures on many sites and thick village middens suggest long and continuous occupations. Sites which have been termed Mississippian have been found from Wisconsin to the Gulf Coastal Plain, and from Texas to the Atlantic Coast, although the original centre of Mississippian development is believed to have been the central Mississippi valley area. Population density was high, and Mississippian sites were often quite large. The presence of domesticated plants on Mississippian sites, the occurrence of these sites on fertile, easily worked soils, and the discovery of ridged agricultural fields (cf. Fowler 1969; Morrell 1965; Kelly 1938), suggest that agriculture was an important aspect of Mississippian subsistence. Maize, beans, squash, pumpkins, sunflowers, and other minor crops were cultivated, although hunting and fishing were still major components in the subsistence economy. Griffin (1967) hypothesises that increased dependence on agriculture resulted in population increase, specialisation of labour, markets, and elaborate religious ceremonies.

As one might expect in a complex society, Mississippian settlements were organised in a graded or hierarchical manner: there may have been a large urban centre with the characteristic truncated temple mounds arranged around a plaza; around this centre were several smaller towns, with perhaps one or two temple mounds and a plaza; and surrounding these towns were smaller villages, hamlets, and farmsteads which had much smaller populations and no elaborate structures.

In sum, Mississippian can be seen as a cultural system which is represented by increased complexity in the technological, social and organisational realms from the preceding late Woodland period. Mississippian people had not only agriculture, but specialisation of labour, trade, and social ranking

– it was a cultural system in which it was necessary to proliferate a diversity of material forms and social positions.

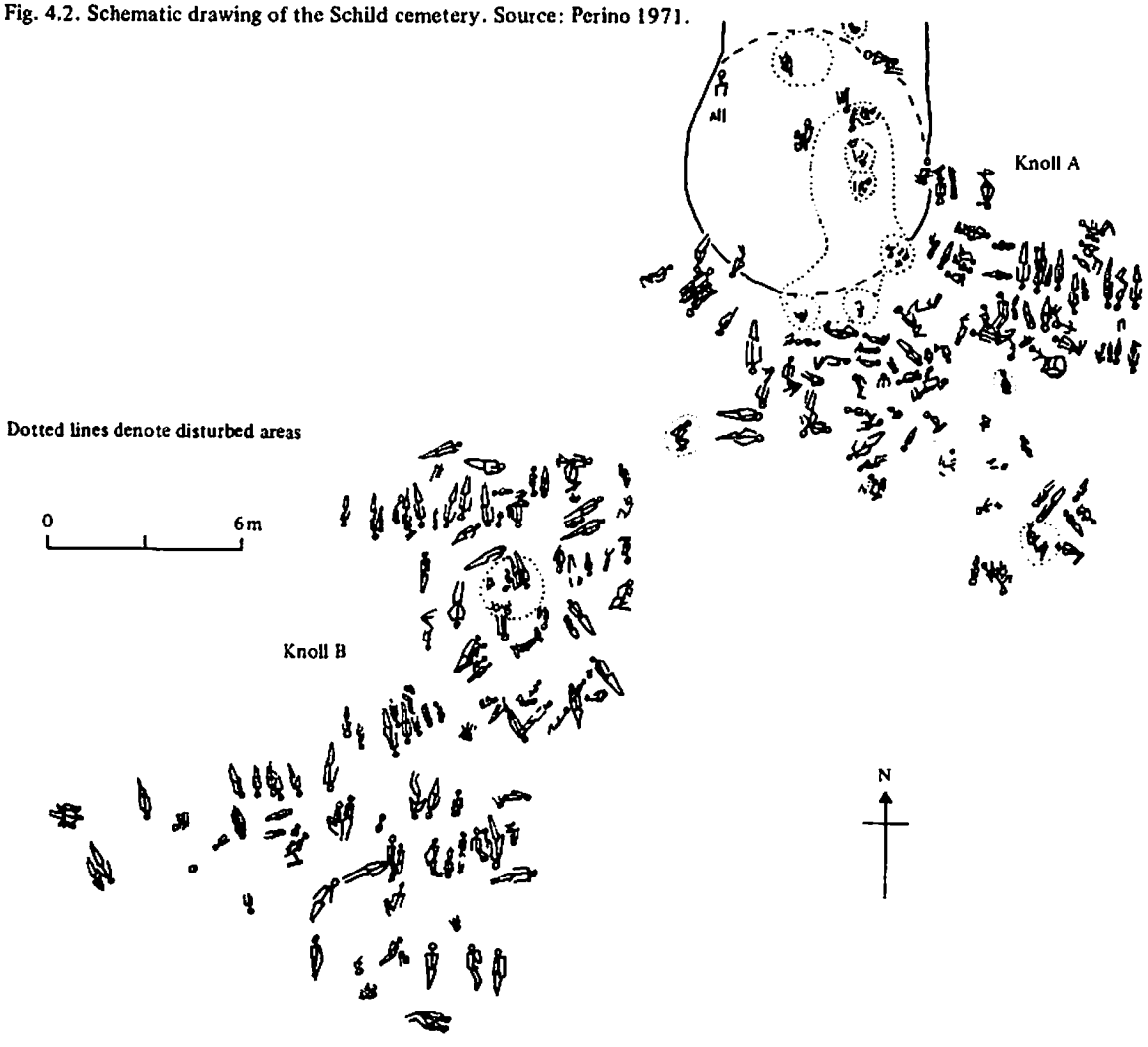
As mentioned earlier, Moss and Schild cemeteries are two Mississippian sites located in the lower Illinois River valley (fig. 4.1). The sites are approximately fifty miles north of Cahokia, the large Mississippian centre in the central Mississippi valley. Both Schild and Moss are located on South-facing slopes of secondary valleys adjacent to the eastern edge of the Illinois valley floodplain. Both sites are located within one mile of Mississippian habitation sites. Schild (Perino 1971) is divided into two parts: Knoll A is a natural knoll which abuts against the late Woodland Mound 9 (fig. 4.2) and is located at the highest point at the end of the bluff. Knoll B (fig. 4.2) is a terrace extending from the lower part of Knoll A. Knoll A is slightly earlier than Knoll B.

It was clear that both Moss and Schild cemeteries fit the pattern of formal, organised disposal areas. This would mean that some form of corporate group was probably operating to control access to limited resources. Given this, the next step was to analyse the structure present and identify the various groups represented.

A substance-type multidimensional approach was used to isolate disposal types within each site. The approach was similar to that employed by Peebles (1972, 1974) for the Mississippian Moundville phase, although variables in addition to grave associations were included in this analysis. A monothetic-divisive cluster analysis using the information statistic was the initial technique employed for division of burials, but the resultant groupings were then examined and, where necessary, recast into groupings which made better archaeological sense. The groups were then ordered according to: (1) general knowledge of Mississippian; (2) information gained from the preliminary data analysis (univariate listings and two-way tabulations); and (3) the application of Saxe's Hypothesis 3 (1970, pp. 69–71), which states that personae of lesser social importance or significance will be defined by fewer positive components (in binary distinctions), and conversely.

Peebles (1972, 1974) and Tainter (1975*a*, 1975*b*) have discussed the value of the monothetic-divisive clustering procedure using the information statistic. The information statistic is seen as being particularly useful since it is not

Fig. 4.2. Schematic drawing of the Schild cemetery. Source: Perino 1971.



sensitive to skewness, and since (as discussed earlier) social organisation and mortuary practices can be seen from the perspective of information and entropy (cf. Peebles 1972, p. 4). Further, this kind of classification was particularly suited to this data set because of the results obtained by Peebles for the Moundville data.

Before continuing with this example, it is necessary to make a point about cluster analysis. Cluster analysis can be seen as a 'number cruncher', or an inductive search routine. As Hodson (1970) has noted, multivariate techniques are an 'arbitrary summary of data'. The researcher must determine whether or not the results have cultural significance. The results of a cluster analysis should not be an end, but a means to an end.

Formal analysis (cf. Saxe 1970, Brown 1971*a*), however, is a deductive technique, one of whose problems is cumbersome calculation and juggling of variables. One might think that the results of a cluster analysis, particularly the monothetic-divisive procedure, might be used to set up the necessary information for a formal analysis of burials. Unfortunately, this is not necessarily possible. The required ordering in a formal analysis key (from most to least restrictive type) may not be possible with a cluster-analysis dendrogram. The reordering may not preserve the dendrogram structure. Also, reordering is based on burial *attributes* rather than on burial *treatments*. Further, the reordered key is one for *clusters* rather than for *individuals*. For these reasons, a formal analysis was not done, although clusters were reordered into disposal types, then interpreted.

The structure of the disposal domain, as seen from a formal-analysis key diagram, can range from a perfect paradigm to a perfect tree (Saxe 1970). The structure of a cluster-analysis dendrogram can be similarly viewed (cf. Tainter 1975*a*; Peebles 1972, 1974). A perfect paradigm is characteristic of an egalitarian society; a perfect tree is characteristic of a highly structured stratified society. Saxe has discussed the differences in detail, and while the concept is briefly summarised here, the reader is referred to his original discussion (Saxe 1970, pp. 38–63, 75–9).

The structure of the disposal domain is a perfect paradigm if the definition of each and every disposal type contains one positive component from each and every dimension. In a key diagram, each column would contain only one dimension and a dimension occurs in only one column. Perfect paradigms are maximally non-redundant; dimensions are independent. A change in a single component changes the type into a definition of another disposal type. The organisation is more random with more alternative dimensions.

A perfect tree is a maximally redundant structure. In the key diagram, except for the root feature and the first column, all other columns contain more than one dimension which can occur only in that column. Trees are examples of complete non-randomness. Many more dimensions are required to define a given number of disposal types.

Peebles (1972) found two primary dimensions of variability in his Moundville data. The clusters on the basis of vessel form suggested an egalitarian-type distribution, with no indication of ascription of status. Conversely, clusters generated on items of dress and office cross-cut age and sex and were independent of vessel form, suggesting status ascription. Peebles postulated a situation analogous, perhaps, to the Ashanti as analysed by Saxe (1970). The two major social strata within the Ashanti showed qualitative differences in burial dimensions; the 'royals' exhibited ascribed dimensions, and the 'non-royals' exhibited achieved dimensions, as in an egalitarian society.

When cluster analysis and consequent reordering were done on the artefact associations at Moss and Schild, burials were differentiated first on the basis of presence of vessels, next on vessel form, and finally on additional artefact associations. The key diagrams for the cluster analysis were clearly paradigmatic, thus analogous to Peebles's results. This does *not* mean that there is no differentiation of treatment, nor does it mean that Mississippian society is egalitarian, or that there are only chiefs and indians. Formally, it does mean that a change in any single component changes the disposal type. Also suggested is that the differences between the 'elite' and 'non-elite' are far greater than the variability within either group. Although Moss and Schild can be seen as representing the 'non-elite' in Mississippian society, many disposal types are represented, and several definitely appear to have restricted access. Some groups were differentiated on the basis of age and sex.

Another set of cluster analyses was done for Schild Knoll A, Knoll B, and Moss. This set incorporated burial positioning, fragments of individuals buried with other individuals, and orientation as well as artefact associations. The key diagrams were once again paradigmatic, but the disposal types were defined on the basis of different dimensions. The types differed not only in definition, but also in number of burials per type, and in individual composition of each type. This second variety of analyses divided the population first on the basis of arm positioning, then on vessel form and orientation.

In both sets of analyses, burials of the most restrictive group were the same; these individuals probably represented the 'high status' groups within each cemetery area. Beyond these groups, however, many variations were evident. The subsequent space–time studies described below revealed that the two sets of analyses reflected, in part, two different aspects of social organisation.

The next stage of work involved a space–time approach to determine cemetery structure. The resultant structure allows a framework for close examination of the disposal types and their interrelationships.

At Moss (fig. 4.3) a row structure was delineated. Four rows running south-west to north-east were discernible. Plotting the disposal types on the map revealed that a series of kin units was probably represented. All four groups or rows were probably linked in terms of some overall corporate group structure, because the disposal types were differentially dis-

tributed with the most restrictive types occurring in the northernmost row.

Initially, rows were also noted in both knolls at Schild. With the exception of a semi-circular row around Mound 9 in Knoll A (see fig. 4.4), the rows seemed to run roughly west-south-west to east-north-east, especially in Knoll B (fig. 4.5). A set of definitions for what constituted a 'row' was compiled. The basic definition used was: the set of all burials which lie between an arbitrary pair of parallel lines set one and a half body lengths apart; this set must include complete burials, at least five in number, arranged so that five have parallel axes. Specific conventions used in connection with the definition addressed proximity, orientation, and position of the body in relation to its neighbour.

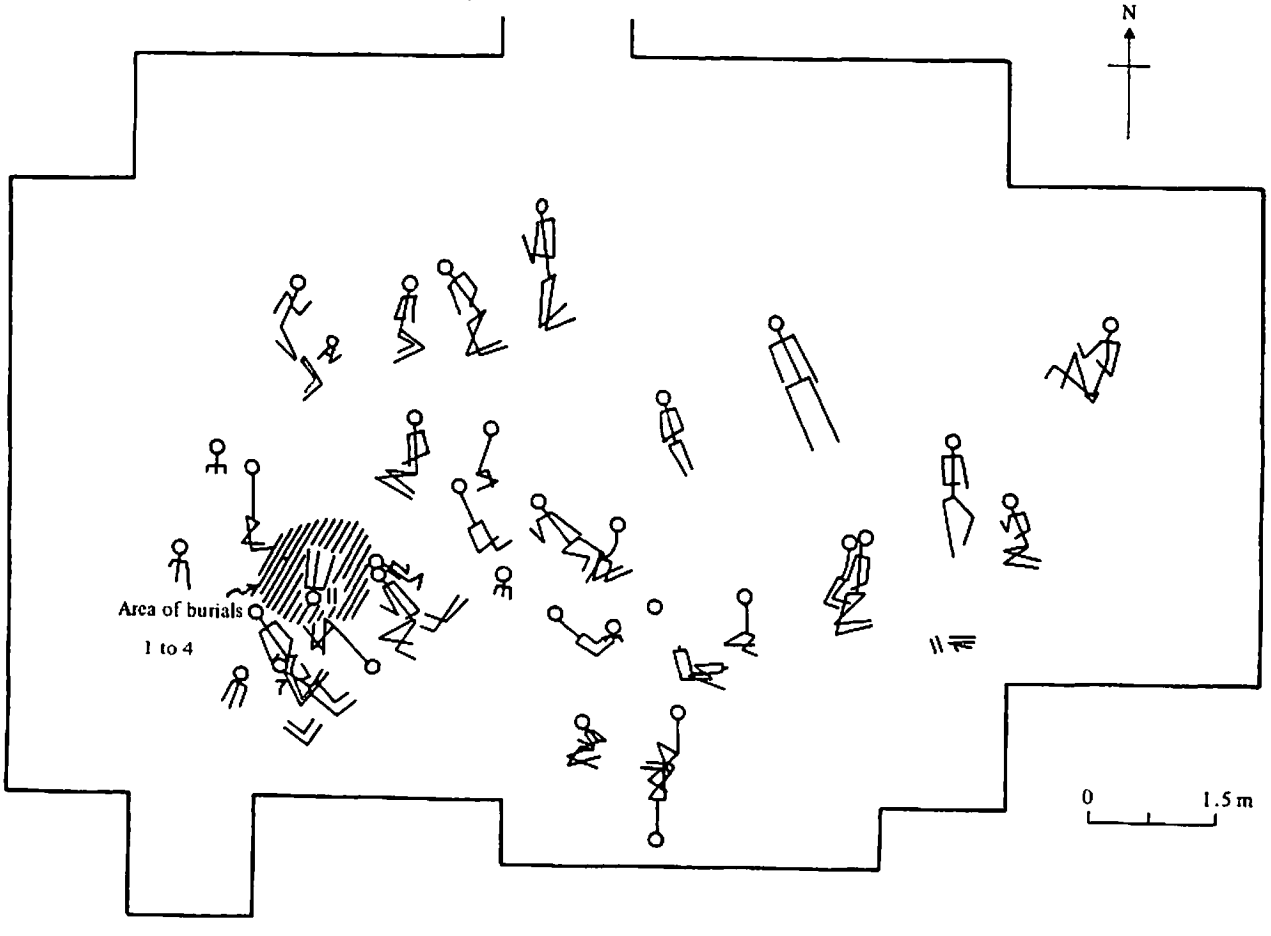
Using the definitions, these 'rows' were outlined, then tested by employing a regression model. Each burial was assigned an X and Y co-ordinate, which was the map location of the pelvis or, roughly, the body midpoint. A simple bivariate regression was done for each hypothesised row. Of course, while the regressions on the individual rows were statistically significant, such significance is meaningless. Rather, the important question is how effective is a model of rows for a cemetery? To test the model of row structuring or effectiveness an analysis of co-variance model was used. At a better than 0.01 significance level, there was a preference for a row model over a random placement model. More significantly, another analysis of co-variance model, using the slopes of the regression lines, showed that the rows within the cemetery areas were generally parallel.

Although the row model fitted nicely at Moss, there seemed to be a patterning in the residuals of the Schild Knoll A and Knoll B analyses. The residual burials tended to occur in pairs generally orientated East–West, or perpendicular, to the rows; this was especially true in Knoll B.

An attempt was made to test whether the distribution of East–West burials at Schild was dependent or independent of the individuals orientated North–South in rows. Were the densities dependent, or did they fit a Poisson distribution, as one might otherwise expect? The problem fits the form of a discrete-time Markov chain model or density-independent cell count model. The East–West burials in the test were treated separately; i.e. rather than each state of the model representing time, each state represents orientation (East–West v. North–South). If an individual is added to a distribution without regard to who is already there, one has a density independent situation, of the Poisson variety. If the opposite is true, the process is more likely to be density dependent.

While this analysis supported the density dependent

Fig. 4.3. Schematic drawing of the Moss cemetery.



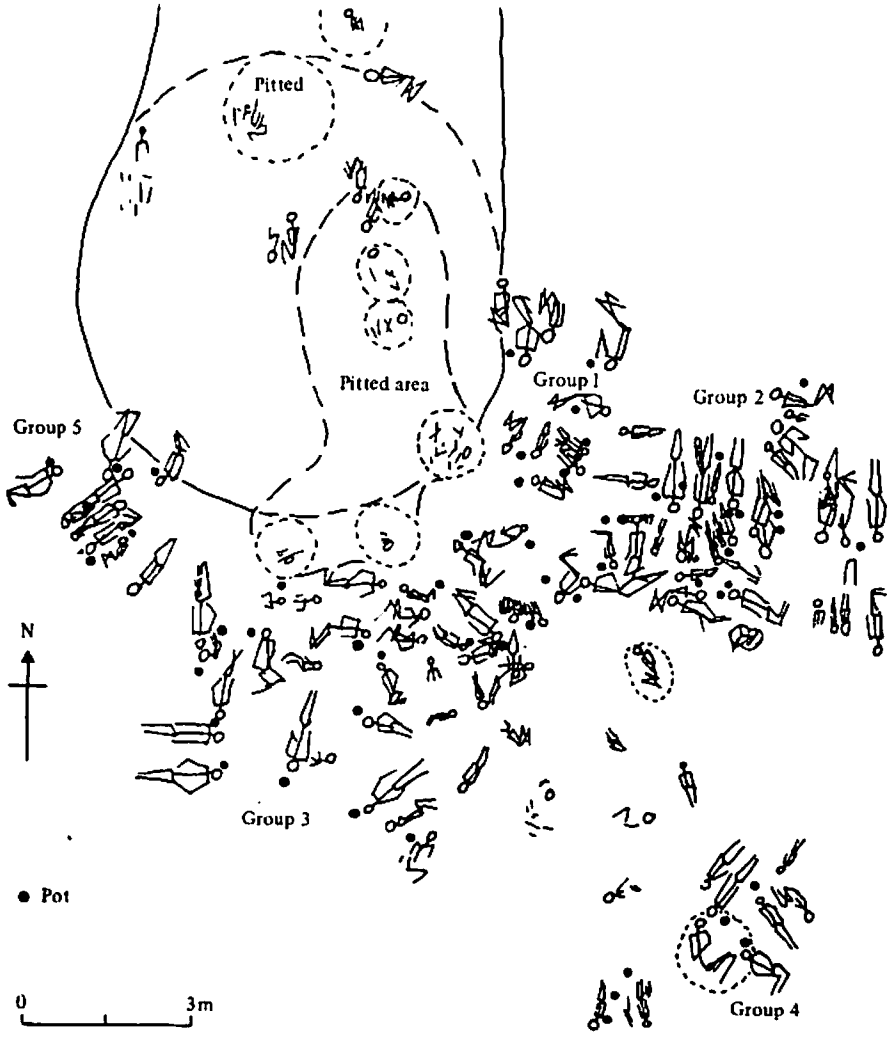
model, confirmed the semi-circular row in Knoll B, and further confirmed that rows were a reasonable model for the Schild structure, the results were still insufficient for the explanation of the structure. There seemed to be a lot of noise, or unexplained variance. Clearly, rows worked for Moss and parts of Schild, but something else also appeared to be operating at Schild. The analytic approaches taken were all variants on a row structure – perhaps rows were important, but examining only variants of them would not address the question of what else was happening.

The easiest way to approach the problem appeared to be through a series of distribution maps for each of the two knolls. Each map was a simple plot of all burials possessing particular variables or attributes of variables. Maps of the distribution of each disposal type for both sets of disposal-type analyses (artefacts only and artefacts and positioning) were also prepared. As a result, the distributions of charred bone, fragmentary remains, large pieces of limestone and fully extended burials defined what can be termed an empty space in the east-south-east portion of Knoll A and in the northern portion of Knoll B. In both cases, this area is roughly rectangular and contains some disarticulated and incomplete burials (figs. 4.6 and 4.7). At the northern end of each area was a row or set of extended burials representing the most restrictive disposal types.

On both knolls, there apparently existed at one time a charnel structure which was later burned. On Knoll A, there is evidence that this area was capped by a low mound or thin earth cover (fig. 4.8). On Knoll B, there seem to have been two groups operating (see fig. 4.7), one related to the charnel sequence and one apparently independent of it. The groups are discernible only from a spatial perspective; the row orientations vary slightly, and in each group the most restrictive disposal types occur in the northernmost row. This illustrates the power of simple visual techniques. The existence of the key structures of the sites was deduced solely by visual examination.

The differences between the two different sets of cluster analyses become clear at this point. The artefact-only analysis

Fig. 4.4. Schild Knoll A burials. Source: Perino 1971.



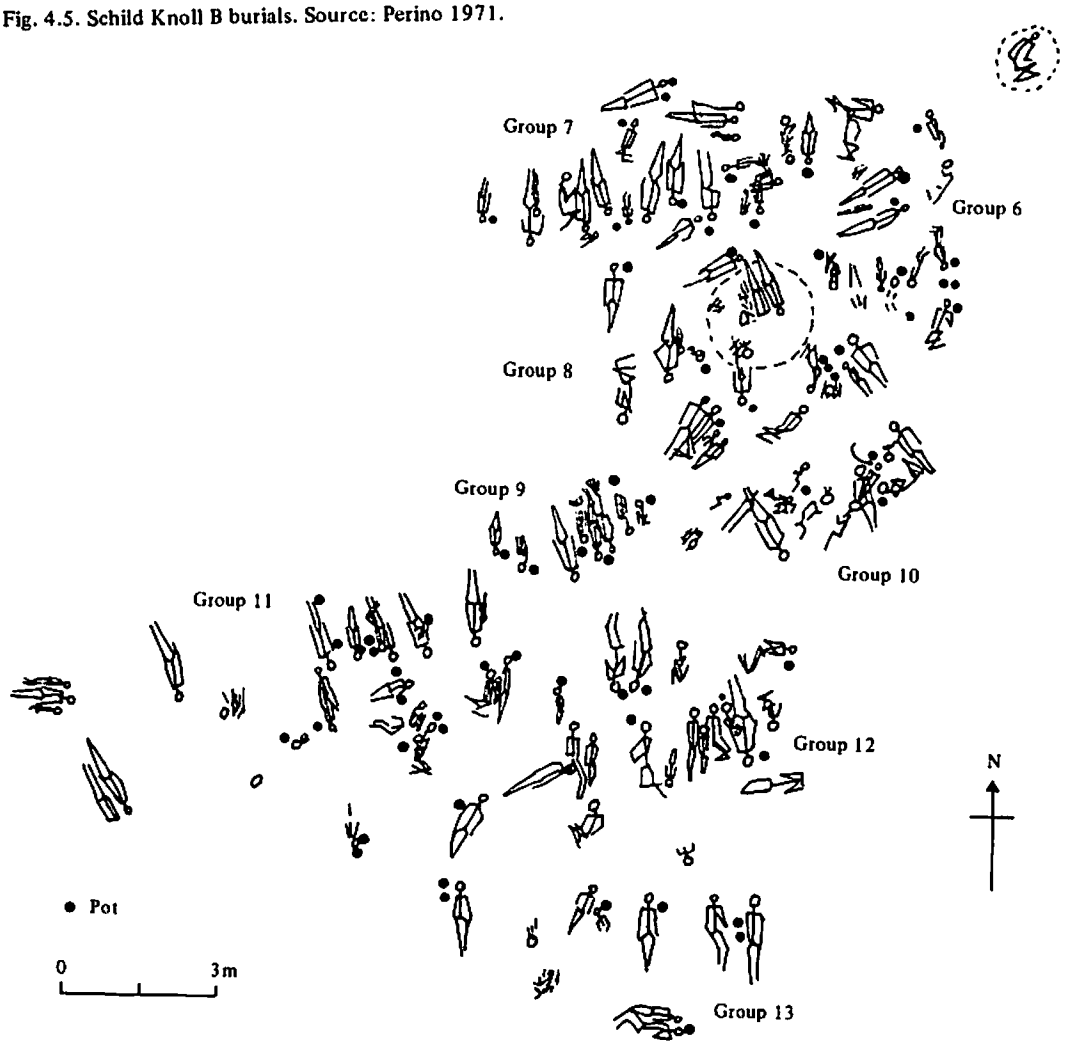
isolated individualised treatments, often divided on the basis of age and sex. The artefact-and-positioning groupings isolated the same most highly restrictive groupings, but the remaining types in fact delineated the charnel areas, and reflected group membership over and above individualised treatments. These types are larger and less restrictive; they are not differentiated by age and sex, but represent group or perhaps kin affiliation.

Perino, the original investigator of the Schild cemetery, noted some evidence which suggested the structure (e.g. the additional topsoil over part of Knoll A; differential distributions of fragmentary, burned and broken artefacts and bones) and he looked for evidence of postmolds in both knolls (Perino 1971). He did not, however, pool his information and examine the data spatially; because of this, he failed to see the structures present.

In summary, there were two knolls with burials at Schild, and these probably represented differences in time. The row structure was present in each knoll, as at Moss, but had been elaborated upon by the addition of the charnel unit. Schild clearly represented a greater number of individuals included in the burial programme. The most restrictive disposal types in each knoll were at the northern end of the charnel structures, with 'lesser' family or kin units represented by other rows or groups. Knoll B had two simultaneous groups operating, one related to the charnel structure sequence and one independent of it. The Knoll B situation suggests that the organisation increased in size and scope and perhaps incorporated outlying groups who qualified for burial, but not for the charnel sequence.

The spatial and social group patterns were tested on a number of other Mississippian mortuary sites, and confirmed the basic pattern of increased elaboration on the row and charnel principles. Putting the information together, it is suggested that Mississippian society is organised on the basis of corporate or lineal descent groups which control access to critical resources (quite possibly agricultural land). The hierarchy of Mississippian mortuary sites may well reflect the progressive elaboration and incorporation of small corporate groups. The degree of communal emphasis increased with site size and the number of groups represented. Larger and more

Fig. 4.5. Schild Knoll B burials. Source: Perino 1971.



complex disposal areas reflect this higher degree of pooled resource utilisation.

This set of examples demonstrates the value of simple visual inspection and the importance of linking substance and space–time approaches. It has also shown some of the dangers in accepting too quickly results which are statistically significant. One must examine the residuals and noise in the model. Further, the statistical models used in spatial analyses should test for the presence of a specific type of pattern, and not fall into the problematic categories addressed in the earlier discussion of spatial-analytic techniques.

Conclusions

Although the examples used are necessarily brief and sketchy, it should be clear that a multidimensional approach which includes the spatial component is critical in mortuary studies. Specifically:

1. The mortuary system is a multidimensional system which includes the spatial component.

2. The spatial component is also multidimensional, and may reflect different levels of relationships and interactions.

3. The most profitable way to begin an analysis of the spatial component is to employ simple visual techniques.

4. The spatial component, when used as a *framework* for examining the results of 'substance language' approaches, can yield an understanding of the meaning and interrelationships of the groups or statuses represented.

5. It is the *interplay* between the 'substance' and spatial components which provides the maximum information about the cultural elements represented in a mortuary site.

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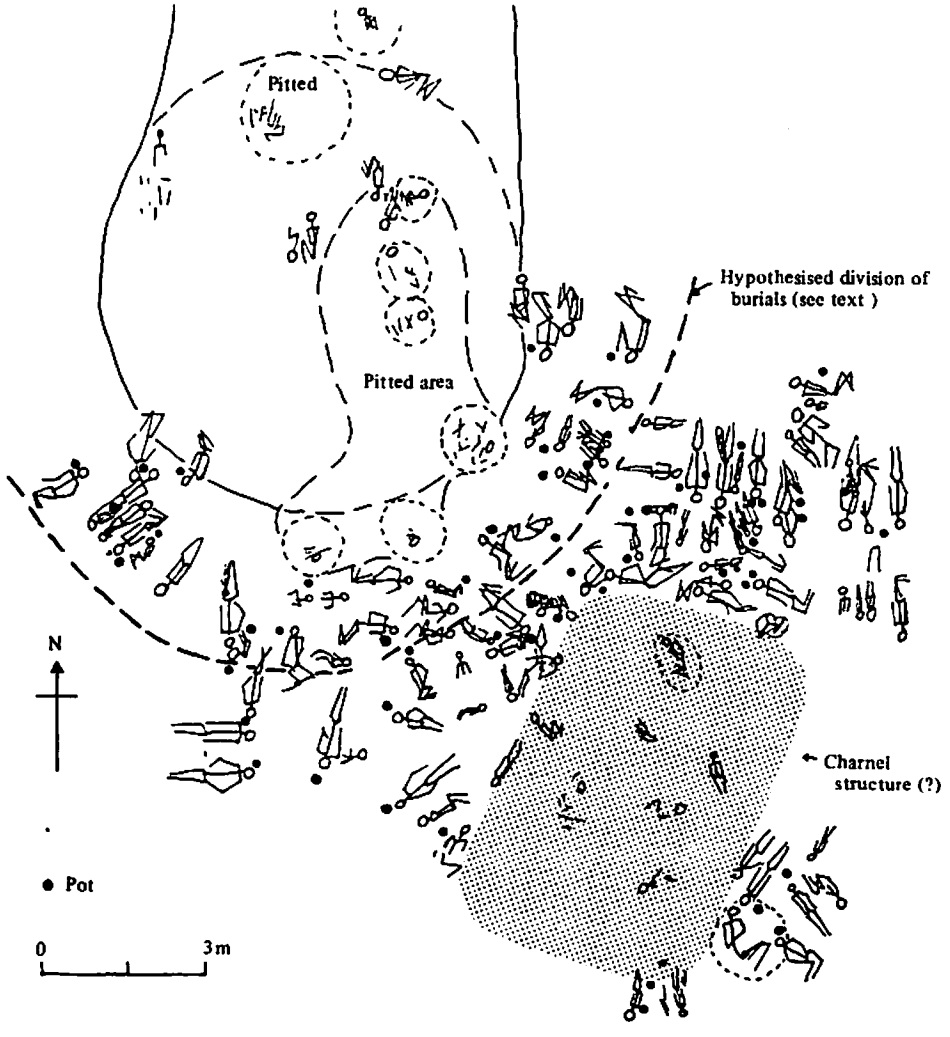
Fig. 4.6. Schild Knoll A burials showing semi-circular row and charnel structure.



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Finally, I would like to state my gratitude to the late Donald Moss, on whose land Moss cemetery was located. Without his co-operation and assistance, Moss could not have been excavated and this project could not have been completed.

Fig. 4.7. Schild Knoll B burials showing charnel structure and hypothesised group division.

Fig. 4.8. Schild Knoll A burials showing charnel structure and probable location of mound.