

THE USE OF SIMULATION IN THE UNDERSTANDING OF PATTERNING IN
CEMETERIES: ITS POTENTIALS, PROBLEMS AND LIMITATIONS

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A great many tools of potential have become available to the archaeologist recently and simulation is one of them. Previously the archaeologist could only look at the end result of past human activity and ask, "What can we find out about this set of data?", but now with the use of simulation he can rephrase his question and ask, "Given certain assumptions about the activity we are studying would they produce these results? If not, which set of assumptions would produce the most similar results?" In order to use simulation the archaeologist is forced to appraise his own ideas about the process he is attempting to model and to analyse it into its smallest components. Perhaps he may finally decide that it is not possible to reconstruct the process successfully or that a multiplicity of causes produces the same effect, but in the course of refining his simulation he will have achieved a deeper understanding of the activity he is trying to model.

Cemetery archaeology in particular has not only benefitted from new tools applicable to archaeology in general but also from other techniques specific to the study of funerary remains. Not all these skills are new but like the anthropological contribution are being used in a new way. Formerly anthropology was used to provide rigid parallels for the observed burial customs; now it is contributing essential knowledge about the working of the human mind and the role of man in his society. Physical anthropology and demography have given us detailed information on the one hand about individuals in the community and on the other about the dynamics of population. It is now possible to attempt a better understanding of a past society than in the past when the finds were the only thing of interest from a cemetery

Introduction

Saxe (1970), Binford (1971), Tainter (1975) have demonstrated convincingly that mortuary practices reflect not only the individual but also the society. It is therefore vital for us to understand the events that lie behind the funerary remains. It is not intended here to go into any detail about their ideas, but a brief summary will be given for those not familiar with them.

The first main hypothesis is that the ritual with which a person is buried is directly related to his social persona (Saxe, 1970). His social persona is made up of his role in society and the attitude of that society to his role. This is made up of his age, his sex, his relationships, his rank and his membership of any exclusive part of the community. The next major hypothesis was Binford's (1971), extrapolating from that idea. He suggested

that the more complex the society the more range there is of social persona and therefore of burial ritual. Tainter (1975) pulled the ideas together and used them to create a model of social change. Thus if we can study the development of burial practice we should be able to examine the structure and change in the social system of an ancient people, a major step in our understanding of the past.

For the purposes of this simulation I am making a further assumption about burial practices. My assumption is that the position of the burial is dictated by the social persona of the dead, constrained by his mode of death, the present dead person's relationship to the last dead, how long the memory or evidence of the last burials survives and the limitations of space in the cemetery. I do not intend to prove this here but I will mention a site where this assumption is demonstrated to hold. The site is Westerhus in Sweden which is a medieval chapel excavated by Gejvall (1960).

Potential

The point of the simulation discussed here is to see whether, given different anthropological parameters governing the funerary rites and the role of the individual, different patterns will emerge that will be clearly recognisable. Since there is very little point in doing a simulation without trying to apply the results to an actual site, I am basing much of my simulation on the site I am working on currently. It is a Dark Age site in Somerset excavated by Rhatz. There are about 500 skeletons which are all that remain out of a total cemetery of possibly 2000. It is thought that the community buried here was in the order of 300 and that burials continued in the cemetery for about 400 years between 400 and 800 AD.

At first the simulation will use a controlled fixed population of about 300 in order to experiment with the anthropological assumptions alone. After that it should be possible to simulate the possible demographic conditions that might have prevailed in the post Roman period. Later, if the simulation is producing sensible and useful results, it may be possible to introduce further refinements into the assumptions, such as the energy expenditure on the burial, orientation and genetic relationships.

Problems

The first main problem is to break the process up into its component parts and inter-relationships between these parts. This process breaks quite logically into two parts:- that concerned with the living and that concerned with the dead. Both break down into further two sections. The part concerned with the living breaks into one part that is mainly demographical which is to do with the maintenance of a reasonable population and mortality rate, and the other is mainly anthropological and is to do with the creation of a social persona for every individual which is updated where relevant at each simulated time

gap. The first part of the section concerned with the dead population is also mainly anthropological and is to do with the attitude of the society to the dead person's social persona at death and to his mode of death. The second part is to do with a few spatial criteria that have to be fairly arbitrarily decided on.

It is crucially important to understand the relationships between the section and between those variables that emerge from inside the system and those that are input. The relationships can be of three kinds:- deterministic (either determined from outside or determined by the running of the simulation), random and probabilistic. Finding the correct balance between the three different types of relationships is possibly the most difficult part of any simulation. It probably would be impossible to recognise the balance, even if one was lucky enough to find it.

The easiest area to make the balance is in the demographic dependent variables as a great deal of work has been done on the dynamics of ancient and modern populations. Mathematical simulations have been done in the past on ancient peoples (Weiss, 1976). These simulations unfortunately are not very useful to me as I need to know about the individual rather than about how the whole population fluctuates through time. But these simulations have prepared a great deal of the general ground.

Demographers are generally agreed that dramatic increases in populations rarely occur. Weiss (1975) has suggested that, although fluctuations do occur in populations due perhaps to plague, warfare or drought, they rarely have a long term effect. Even if these conditions do persist for over five years the effect has disappeared in 50 years and the population will re-establish a zero growth equilibrium. Therefore a simulation based on a static or near static population size is reasonable. Later stochastic fluctuations will be introduced to simulate drought, prolonged warfare and a visitation of the bubonic plague that may well have happened in this period. Both immigration and emigration must be taken into account during this period as it is a time of great population movements. Unfortunately the effect of these are difficult to establish (Longacre, 1975).

It is not easy to simulate anthropological assumptions realistically. In a simulation all the choices must be quantified and no exceptions can occur unless programmed. It is very rare when we can assume such rigid laws about any human activity. However it is hoped that like tossing a coin when you have done it enough times the abnormalities will not bias the result. Tainter (1975) has attempted to show that this is the case. He has quantified and manipulated his assumptions about rank and organisation of the two cultures he was studying. Ranking is a relatively easy assumption to quantify as the name implies but there are many more that affect the burial record which are not so easily quantified. Post marital residence and inheritance customs are only two of these but they are possibly the most difficult to understand as they seem prone to individual disruption and exceptions occur frequently in anthropological accounts. Some of the anthropological assumptions directly affect the demographic qualities of the population. For instance the age

at marriage, the taboos controlling marriage within the close family units and the customs concerning remarriage after a spouse's death, affect the length of fertile life experienced by any adults in the community. However, if there was not complexity there would be little point in a simulation. The simulation allows us to vary the parameters enabling us to see which are important variables and which are insignificant. Unfortunately it is extremely likely that the most difficult of the assumptions will have the most effect.

Limitations

It is important to understand the limitations of the evidence we have in the reconstruction of the past societies. How much can we expect funerary data to tell us? Human beings are irrational at the best of times and the funerary ritual is the most irrational act he can carry out. Brothwell (1968) and Hodder (1979) have pointed this out quite clearly from anthropological examples. Hodder even demonstrated that in one case the funerary ritual may actually be misleading in the understanding of the society observed. Unfortunately this is often the only evidence there is and we must use it as best we can. The use of simulation enables the archaeologist to try to understand the complexity of anthropology and then to use it in the most sensible and constructive way.

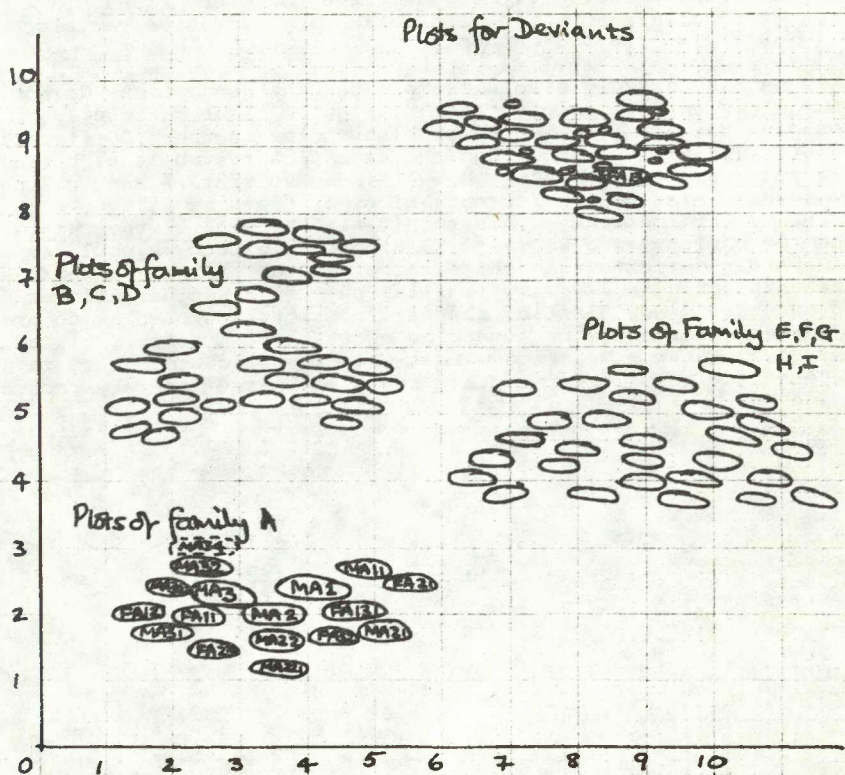


Figure 1 CEMETERY PLAN SO FAR

An Example

I have chosen an example to illustrate what I am attempting to do. The example is taken as if the simulation has been running for 50 years (i.e. the simulation has had 50 iterations). The person who has died and is to be buried has been selected. The selection has been made with the use of age specific mortality rates. Age is not the only factor that affects mortality rates, certain activity and social class also affect them under some circumstances. The final persona of the dead is shown in Table 1. The assumptions about the society's attitude to the dead are shown in Table 1. The cemetery so far is illustrated in Figure 1.

The burials are roughly in extended family plots, tending to have a linear spread chronologically. This is caused by the next burial being inserted near a close relative. The burial will tend to be closest to the most recent member of his own family (i.e. spouse and their children as opposed to his fellow syblings or parents) but if no members of his own family exist or are not buried yet, the next closest member will be selected. In this case neither his wife or his offspring are buried in the normal area for his family as they all class as deviants. The choice of the actual position is made by taking a locus around his brother's burial and after eliminating any intrusive burials a location is selected randomly

This is a relatively simple example but the assumptions do not make it an unreasonable society. A quite clear pattern is emerging but it might not be so clear after another 100 iterations. Tainter (1975) suggested that the significant symbols of burial classes are commonly repeated. This means that if one telling feature is missing other combinations of features will give us the same information. This should also be true of the cemetery and the society as a whole. To a certain extent we would expect time and genetic relationships to reveal the pattern as well as the anthropological assumptions. The simulation has allowed us to understand how time and genetic relationships combine to produce a pattern that shows us something about the community. In such ways I hope the simulation can assist other archaeologists in the reconstruction of their society revealed by the funerary record.

Table 1.

The Information necessary to decide on the Position of the Burial.

FINAL PERSONA AT DEATH

Identity: MA34

Sex: Male

Age: 36

Family: A34

Rank: 1

Sodality: Warrior

Marital Status: Wife FA13 died in childbirth four years ago
second wife FA21

Offspring: Son (MA341) 15 years
Neonatal death
Daughter (FA341) 10 years
Daughter (FA342) 7 years
Still born (causing mother's death)
Son (MA342) 1 year

Most Recent Dead: Wife 4 years ago (FA13)
burial position (8.3 N, 8.3 E)
Brother 2 years ago (MA32)
burial position (2.8 N, 2.0 E)

THE SOCIETY'S ATTITUDE TO THIS PERSONA

Three Ranks: 1) Warrior (A)
2) Farmer (B,C,D)
3) Artisan (E,F,G,H,I)

Inheritance: exclusively primogeniture

Post Marital Residence: Patrilocal

Sodality: Inherited

Strong emphasis on family relationships

Areas set aside for different classes

Prestigious nuclei

Deviants: 1) children dying before their first birthday
2) women dying in childbirth

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