PROFILE ANALYSIS OF EARLY ANGLO-SAXON POTTERY

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ABSTRACT

The study of early Anglo-Saxon funerary pottery forms has hitherto been fraught with subjective difficulties. This paper outlines how digitising urn profiles and applying principal components analysis has led to a more rigorous approach. On the basis of correlations between pottery forms and other attributes of the cremations, such as pot decoration and gravegoods, it is argued that the classification system produced is more than an archaeological device, for it has meaning in terms of the Anglo-Saxon's conception as well.

THE PROBLEM

Hand-made cremation urns of the Anglo-Saxon period appear to represent a continuous gradation of size and shape. In attempting to order this material, researchers have previously applied ill-defined categories derived from J.N.L.Myres (1978), such as globular, biconical, and hollow-necked, according to their own conceptions of what such descriptive terms imply. Consequently, no two researchers have used the terms in the same manner. Nor does it appear that any individual researcher has used the terms consistently over time.

Therefore it was apparent that an alternative classification system was desirable. It was hoped that this should be an improvement in three ways:

(i) Firstly, an alternative system should be easier to apply. It should only be necessary for the archaeologist to take a limited number of measurements from each pot in order to group them.

(ii) Secondly, it should be more rigorous. Any urn should fall definitely into one class or another, rather than lying in between. The criteria by which an urn was placed in a particular group should be stated at the outset. Hence the process should be repeatable, and anyone applying the criteria would produce the same groups.

(iii) Lastly, the criteria chosen should match as closely as possible the criteria used by the Anglo-Saxons to distinguish between pottery forms. The groups produced should not only be a useful archaeological device for sorting material, but should also have a conscious or unconscious spatial, temporal, or socio-cultural significance in Anglo-Saxon society.

The work described is based on a sample of 482 urns from Spong Hill, Norfolk and a smaller group of 80 urns from Mucking, Essex. Further work will include other sites although it is anticipated that they will exhibit the same range of variability.

THE FIRST APPROACH

The first approach was to measure the major dimensions of each urn and to enter them at the keyboard of an RML380Z micro-computer in the course of an inter-active data capture program. Five measurements were recorded: height, maximum diameter, height of maximum diameter, base diameter, and rim diameter.

The micro-computer then produced frequency distributions for each dimension. Maximum diameter, base diameter, and height of maximum diameter all displayed perfect normal distributions. The height distribution was skewed towards the upper end, suggesting there was a maximum pot size above which few were made. The distribution of rim diameters was skewed towards the lower end and appeared to show most pots were narrow-necked, apart from a group of wide-mouthed urns.

However, all the distributions were essentially continuous with no obvious breaks representing distinct pot forms. They provided a useful "fingerprint" for the range of variablility of dimensions on each site, and standard descriptive statistics could be extracted. However, they were little help in classifying the material.

One way forward was to follow the traditional approach to pottery classification and calculate ratios of measurements. However this involves several problems. Firstly, there are numerous possible measurements and ratios of measurements for each urn. How does one decide which are the significant ones? There are two difficulties in producing a meaningful classification, i.e. one that has meaning in terms of the conception of the people who made and used the artefacts. One must find the particular measurement or ratio of measurments that were significant to the makers and users, i.e. the ratio or measurement that they used, probably unconsciously, to distinguish between and describe forms. Once the significant measurements have been found one must then discover the points on the scale at which the division between types occurs. For example, if it is likely that Anglo-Saxons discriminated between pots on the basis of their widths (height/maximum diameter ratio) then one must discover which ratio values conform to their mental template of a wide pot, and which to a narrow pot.

The second problem in using ratios of measurements to discover Anglo-Saxon pottery forms is that Anglo-Saxon pots vary within a very limited range. Hardy-Smith (1974) plots height against width for post-medieval material to distinguish between plates, bowls, cups, jugs, and so forth. However, if the same procedure is followed for Anglo-Saxon pottery all fall within one tightly clustered group, corresponding to her bowl form. Most universal systems of pottery classification place all Anglo-Saxon pottery in one class. Thus according to Shepard (1957) all would be restricted inflected vessels.

Therefore it was decided that a more sophisticated approach was necessary.

THE SECOND APPROACH

The second approach was to apply the "sliced" method of profile comparison, as described by Wilcock (Wilcock & Shennan 1975) by which artefact profiles are treated as multi-variate data. One hundred urns from Spong Hill and sixty-eight from Mucking were digitised using a Summagraphics BITPAD ONE linked to a RML380Z micro-computer. Each profile was recorded as a series of x-y co-ordinates. For ease of storage and processing the raw data files were transferred to an ICL2960 mainframe computer, although the following operations, by a package of PASCAL programs, could have been performed on the micro.

It was decided to treat size as an independent variable. Therefore each urn was normalised to a standard height, and the widths multiplied by the same scaling factor. Being hand-made, many Anglo-Saxon urns tend to be assymmetrical. To determine the central axis of each pot in the two-dimensional profile drawing the least squares method was used. Left and right radii were then averaged to produce mean radii.

In order to discover what was responsible for the variability between urns principal components analysis was employed. Initially 101 variables, or "slices", were used, although it was later found that identical results were produced when only one point in five, or 20 "slices" were analysed. Separate analyses were performed for the Spong Hill and the Mucking data. Each site produced virtually identical results. For Spong Hill the first three components were interpretable and together accounted for 93% of the variability between all the urns. The first component alone accounted for 79% of the variability and could simply be interpreted as representing the width of each urn. The second component represented the height of the maximum diameter, or how shouldered each urn was. It accounted for 9% of the variability. The third component, responsible for 5% of the variability, represented how sharply in-turned the neck of each urn was. The Mucking sample produced identical components, accounting for 74%, 11% and 5% of the variability.

In case the large scores for the first component were distorting the subsequent smaller components it was decided to re-run the analyses with width removed. This was achieved by calculating the mean radius for each urn, and using the difference from the mean for each radius, rather than the raw value. However the nature and relative proportions of the remaining components were the same as before, confirming the original results.

THE CLASSIFICATION

The first three components, accounting for over 90% of the variability between urns, can simply be expressed as ratios of just four measurements (Fig.1) : height, maximum diameter, height of maximum diameter, and rim diameter. Their interpretation was confirmed by plotting them against the values of the ratios. A straight line was produced in each case. Independent support was provided when it was discovered that Fennell (1964), in an early

attempt to quantify urn classification using material from Loveden Hill, had arrived intuitively at the first two ratios, and had used a similar value (rim diameter / maximum diameter) for his third criterion.

Therefore, having found three ratios which accounted for the significant variation between urns, it remained to discover the points along the values for these ratios at which the divisions between pot forms occured. Returning to the full sample of around five hundred urns whose major dimensions were stored on the micro-computer, frequency distributions were now plotted for each of the three ratios. Since these exhibited no obvious breaks the choice of dividing points had to be fairly arbitrary, although where possible natural kinks in the distribution were exploited. Independent corroboration for these points was provided later. Three groups were distinguished for each of the three ratios, giving twenty-seven possible forms in all. The resultant system, with size restored as an initial criterion, is shown in Figure 2. Over 90% of the variability between urns can now be described in a few words. Having shown the system's statistical validity in accounting for physical variation between urns, it was still necessary to investigate if it had any significance in terms of the Anglo-Saxon conception.

SIGNIFICANCE OF THE SYSTEM

To test what significance, if any, the forms had to the Anglo-Saxons, it was necessary to use my research data base, containing full information about decoration and associated gravegoods for 482 Spong Hill urns. Various subsets of attributes were extracted from the data base and correlated with the form groups using the SPSS routine CROSSTABS. Each form was cross-tabulated with twelve possible types of incised decoration; eight types of applied or plastic decoration; the number of different stamp motifs; thirty-three possible gravegoods; and many other attributes. The results, a selection of which are summarised in Figure 3, revealed many statistically significant positive correlations between forms and other attributes.

For example, it can be seen that vertical lines, curvilinear decoration, and bosses, are positively associated with wide urns; whilst diagonal lines are less common on these forms than one would expect under a random distribution. It could be argued that this is a purely technological relationship and that certain pot shapes are physically more appropriate to certain decorative motifs. However, this is unlikely to apply to attributes such as the variety of stamped decoration encountered on the urn. Elaborate stamped decoration occurs more frequently on narrow than wide urns. Here an alternative explanation must be found. A chronological hypothesis is one possibility. Myres (1978) has suggested that elaborate stamped decoration is a late development. Perhaps narrow urns are also late. Furthermore, certain artefacts placed in the urn are also associated with certain pot forms. For example, the miniature tweezers, shears, and razors, which are believed to be non-functional funerary objects, are most commonly found in full, baggy, and closed urns. They occur less frequently than expected under a random

distribution in both wide, narrow and open urns. In this case a social explanation may be the most likely one. If it is assumed that the purpose-made gravegoods represent the wealthier sections of society then perhaps the urns in which their cremated remains were placed were also specially made, according to a limited range of forms, for their funerary role. In contrast the open-mouthed urns which contain few specially made gravegoods may repesent common domestic cooking pots re-used for the burial of the poorer elements in society.

By examining which attributes of the cremations are correlated with pot forms it may be possible to identify which are significant. For example, it was found that brooches were not significantly correlated with any particular form, but were randomly distributed throughout pots of all shapes. This may confirm the hypothesis that brooches are not gravegoods as such, but are items of personal dress worn by the corpse at cremation. On the other hand, worked flints were found in several of the urns. It has often been assumed that these are post-depositional and have fallen into the urn from the surrounding matrix. However, like the miniatures, they are positively correlated with closed urns, suggesting that they may be deliberate depositions.

It is likely that there are a number of interlocking factors at work in the relationship between pot forms and other attributes. The full explanation must await further research, proceeding at present. Nevertheless, the fact that the forms exhibit these correlations must give extra weight to the classification.

A further test was made to discover if a classification on the basis of Myres' criteria would also reveal significant correlations. Quantitative definitions of types had to be assumed in order to classify the urns, as these were not given by Myres. For example, globular urns were assumed to be those with a maximum diameter within two centimetres either way of the height; bowls were defined as those with a height less than the rim diameter, and so forth. Some significant correlations were revealed. This was to be expected as there was a degree of overlap between Myres' criteria and those used in this paper. However, the number of such correlations was drastically reduced to about one third as many. Therefore it seems that the previous classification was not describing variability between urns in the same way that Anglo-Saxons understood it, and in the way in which this paper has attempted to do.

ACKNOWLEDGEMENTS

I am grateful to Dr. Catherine Hills of the Department of Archaeology, University of Cambridge, for assisting me in using material from her excavations at Spong Hill; and to Mrs. Margaret Jones and Mucking Post-Excavation for permission to use unpublished material from Mucking.

I would also like to thank my colleagues in the Research Centre for Computer Archaeology, especially Nick Ryan, the author of the BITPAD driver program, and Dan Smith, who spent many hours de-bugging the Centre's principal components program.

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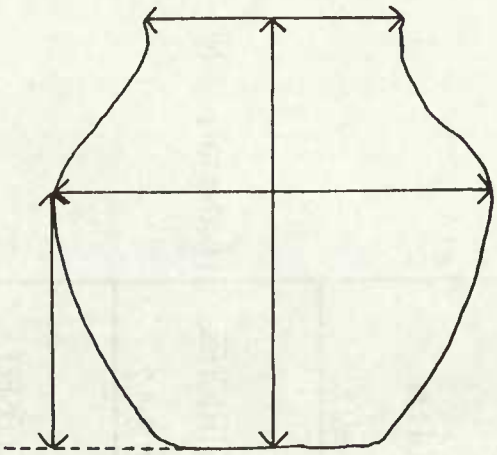
Figure 1



1. $\frac{\text{MAXIMUM DIAMETER}}{\text{HEIGHT}}$

2. $\frac{\text{HEIGHT OF MAXIMUM DIAMETER}}{\text{HEIGHT}}$

3. $\frac{\text{MAXIMUM DIAMETER - RIM DIAMETER}}{\text{HEIGHT - HEIGHT OF MAXIMUM DIAM.}}$

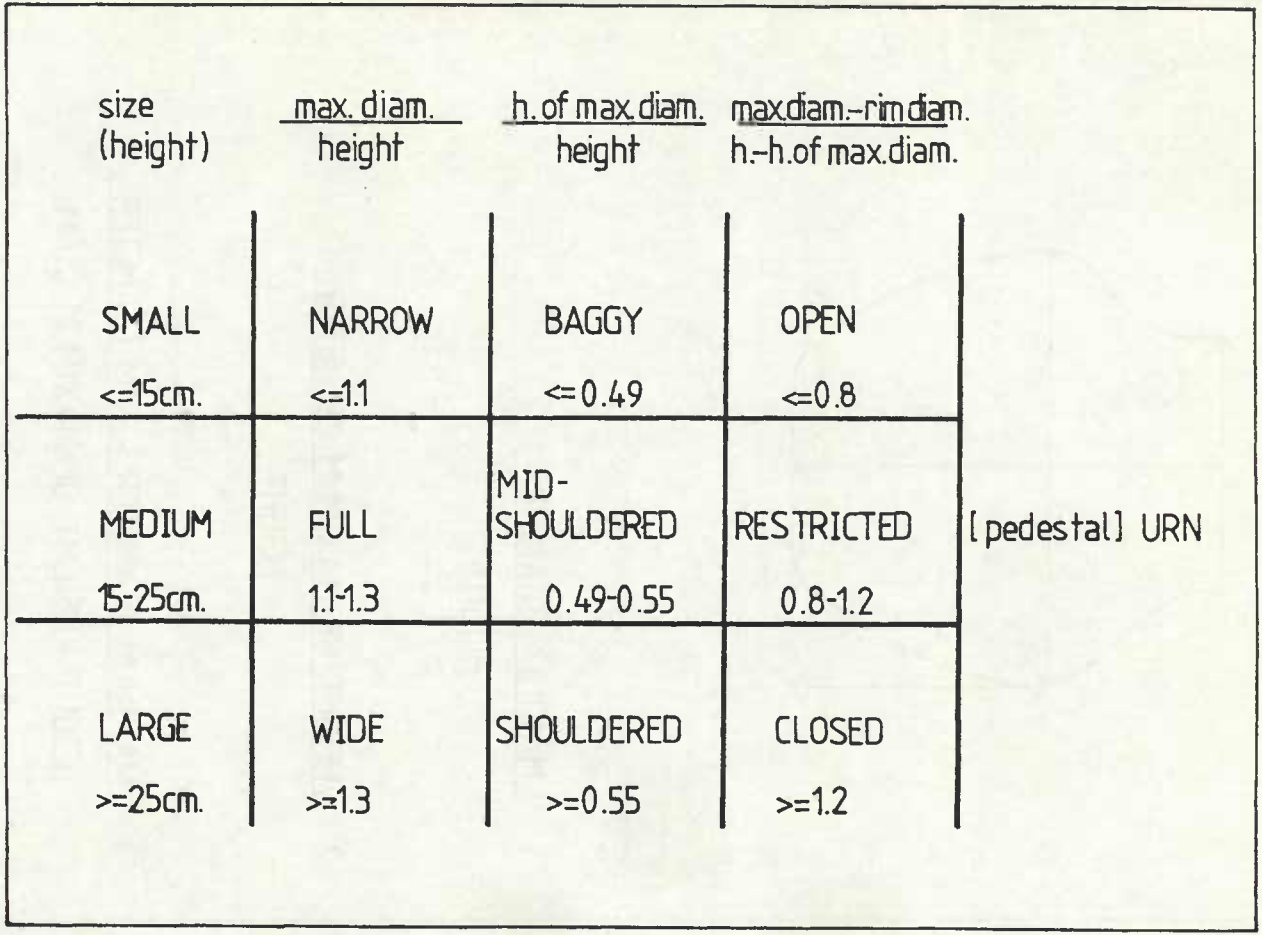


Figure 2 THE CLASSIFICATION SYSTEM - The full urn description is read from left to right.

Figure 3

	DECORATION				GRAVEGOODS			
	A	B	C	D	E	F	G	H
1 MAX.D./HEIGHT								
NARROW	0	-	-	+	0	-	0	0
FULL	0	+	0	+	0	+	+	-
WIDE	0	+	+	-	0	-	-	+
SIGNIFCE. LEVEL	.6114	.0114	.0378	.0816	.6750	.0509	.0820	.0405
2 H.MAX.D./HEIGHT								
BAGGY	+	+	0	+	0	+	+	0
MID-SHOULDERED	0	0	0	0	0	-	-	0
SHOULDERED	-	-	0	-	0	0	0	0
SIGNIFCE. LEVEL	.0000	.0686	.8037	.0245	.4907	.1082	.0977	.5103
3 NECK RATIO								
OPEN	-	-	-	0	0	-	-	0
RESTRICTED	+	0	0	0	0	0	0	0
CLOSED	+	+	+	0	0	+	+	0
SIGNIFCE. LEVEL	.0000	.0000	.0000	.6847	.6179	.0001	.0011	.7536

The table shows a selection of significant and non-significant correlations between pot form criteria (vertical axis) and other attributes of the cremations (horizontal axis).

KEY:
A Horizontal incised lines
B Vertical incised lines
C Bossed decoration
D More than two different stamp motifs
E Brooch
F Miniature tweezers
G Miniature shears
H Glass beads
+ Positive correlation - more than expected under random distrib.
0 No correlation
- Negative correlation - less than expected under random distrib.

The Chi-square test significance level indicates the probability of the association occuring by chance. For example, a significance level of 0.0001 indicates that the association would occur by chance in only 1 sample out of 10000; whilst a 0.6 level indicates that the association would occur 6 times in 10 and is therefore not significant.