CERAMIC WARES IN THE MAYA AREA: A CLARIFICATION OF AN ASPECT OF THE TYPE-VARIETY SYSTEM AND PRESENTATION OF A FORMAL MODEL FOR COMPARATIVE USE

By Sabloff, Jeremy A. and Robert E. Smith
Peabody Museum, Harvard University

Introduction

The concept of ware has often been neglected in ceramic studies within the Maya area.[1] Even when it has been used, this ceramic concept, which is an important part of the taxonomic hierarchy of the type-variety system (see Smith, Willey, and Gifford 1960), has been employed in a vaguely defined manner "to make inferences about economic features such as manufacturing centers and trade" (Culbert, 1967, p. 92). In relation to ware, the majority of the members of the Conference on the Prehistoric Ceramics of the Maya Lowlands felt "that the primary use of the ware concept should be at the level of integration and functional analysis, with wares abstracted from completed type definitions" (*Ibid.*; also see Willey, Culbert, and Adams 1967). However, it is our belief that the ware concept should be used as an integral part of any taxonomic analysis of Maya ceramics. While our attention in this paper will focus on ware in its hierarchical role as part of the type-variety system of ceramic analysis (see figure 1), it should be stressed that we recognize the importance and necessity of combining typological with modal studies in any full description of Maya pottery (see Sabloff and Smith in press).

It is our intent to show that *ware* can be a useful tool in the mechanics of ceramic analysis and in intersite comparison. In relation to the latter use, we will introduce a new methodology which we feel

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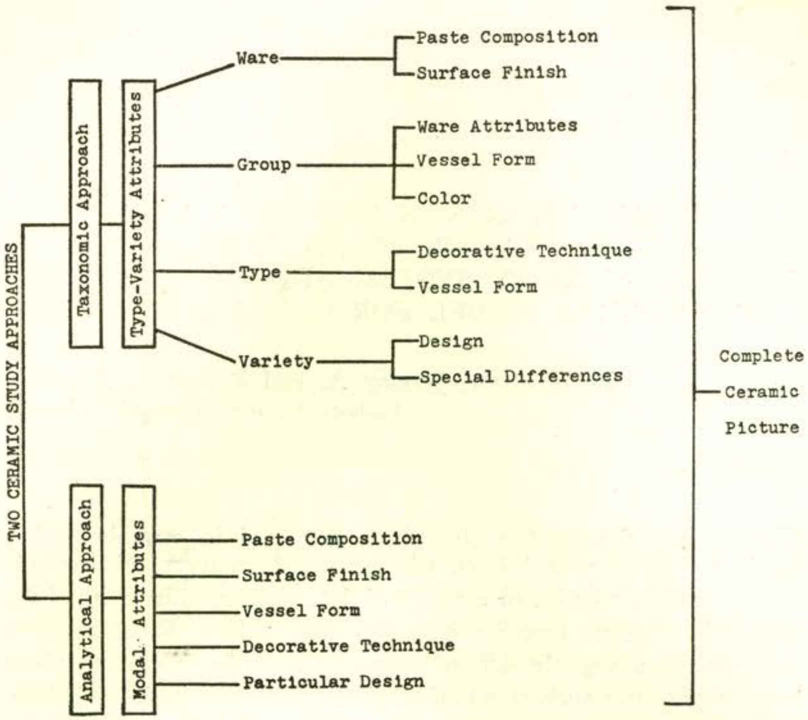

Figure 1. Attributes can serve two complementary approaches to the study of pottery.

will enhance the utility of the ware concept and perhaps help broaden the contributions of ceramic analyses to our knowledge of the culture of the ancient Maya.

Definition of Ware

Ware as used in the type-variety system is the conceptual unit which in concerned with paste composition and surface finish. Under paste composition, the attributes considered are texture, temper (which strongly influences texture), hardness, thickness, and color. The attributes associated with surface finish include slip (which may be present or absent), smoothing, lustre (which may be the result of burnishing, polishing, or the colloidal nature of the slip), and color. All other attributes may be useful in determining ware, especially when the material is fragmentary and weathered, but none are essential — not even form.

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A New Emphasis on Using Ware as a Tool is Needed

Ware is rarely used as a tool in ceramic studies even though it offers many advantages. It is clear that in the more recent ceramic reports, which admittedly employ the type-variety system, the ware concept has been omitted, slighted, or misused. These reports include excellent ceramic studies of such areas or sites as the Central Highlands of Chiapas by Culbert (1965), the Isthmus of Tehuantepec by Wallrath (1967), Bilbao, Guatemala, by Parsons (1967), and Altar de Sacrificios, Guatemala, by Adams (In press). Culbert is inclined to use ware or group attributes in the naming of types thus obscuring the value of the decorative technique as the prime type factor. Wallrath also often makes the type the ware, and thereby obscures the abundantly represented decorative techniques in the descriptions instead of marking them stand out in the names of the established types. Parsons has followed the type-variety system very closely and has justifiably emphasized group because of the weathered and fragmentary condition of his material (see Sabloff and Smith In press). Although he has correctly named wares, Adams fails to use ware as a tool. In fact, in not one of the above reports has ware been used as an aid to the mechanics of ceramic analysis or have full ware definitions been given.

Actually, ware as defined here appears to have been set aside because of the inability of many researchers to recognize the clear-cut differences between wares of the same color (red, orange, brown, black, cream, buff, etc.), although they clearly recognize and are willing to accept such visually distinctive wares as fine orange, fine gray, fine black, thin orange, and plumbate. However, if all the attributes associated with ware are carefully considered, then one particular red, black, or cream ware stands apart from any other like color as clearly as do the more obvious wares mentioned above. A clear example of the procedure which makes such recognition possible is given later.

In this paper, the ware aspect of the type-variety system is being emphasized. However, it is important to recognize that each of the hierarchical units (ware, group, type, variety) of the system must be kept conceptually independent and used as a separate research tool, even though they are interdependent in many respects. It is vital to the understanding and development of a ceramic study, and the underlying theme of this paper, that ware can be used as a tool. The advantages in so doing are manifold.

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First, ware can simplify sorting, especially second sorting (presuming that we might sort by color first and then separate into different wares of the same color). This original sorting by ware and color reduces a large collection to a relatively few piles which can then be worked individually, thus reducing the space needed for adequate handling. Furthermore, it will immediately bring to light any unusual or unidentifiable pottery which in certain instances may result in the discovery of a new ware.

One brief example of how ware may aid the archaeologist in sorting pottery can be illustrated with reference to the analysis of the ceramics of Seibal, Petén, Guatemala, which is now in the process of being completed (Sabloff and Willey In prep.). Early Classic pottery has rarely been found in any pure stratigraphic deposits at Seibal. It is almost always found in mixed architectural fill, and its total quantity at Seibal is quite small. In addition, the Early Classic sherds are often very fragmentary and eroded. In one important collection which spanned the Late Preclassic through Early Classic Periods, it was possible to make an initial separation of the Early Classic material on the basis of certain horizon modes (such as basal flanges, z-angles, abstract polychrome designs, etc.). The Late Preclassic types and varieties, which had previously been defined, were also sorted out. But the bulk of the collection defied sorting on the basis of known types or individual decorative or form modes. However, careful study of the paste composition and surface finish of the identifiable Early Classic and the Late Preclassic sherds permitted the further sorting of the collection into Early Classic (Peten Gloss) and Late Preclassic (Paso Caballo Waxy) wares. It was also found that the remaining unsorted sherds shared a special paste and surface finish which defined a third ware, Playa Dull Ware.

Second, wares may be either of very short duration or may span hundreds of years. In the former case, they can act as excellent time and probably space markers and in the latter they indicate a long term survival which may be extremely useful in the determination of ceramic spheres and of traditions continuing through several chronological periods.

Finally, ware offers a means of comparison both on a ware to ware basis and on the changing ware characteristics from era to era, for it is so much a part of its cultural setting in that it reflects the materials used in making pottery, the methods of manufacture including shaping, surfacing, and firing, and style. In order to enhance the role of ware as a comparative tool, we now turn to the explanation of a

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model which we feel can provide the archaeologist with a useful procedure for comparing wares through time or through space.

A Cognitive Model for Discussing Technological Tasks (pottery making)

In a recent study, A. F. C. Wallace (1965) introduced a model of cognition in order to describe a system of 'cognitive maps' which are used in the everyday task of driving to work. Wallace (1965, p. 291) notes that the model may be "useful in formulating psychologically real, cultural descriptions of technological tasks". It seems to us that Wallace's model might also be profitably used by the archaeologist as a formal means for illuminating various aspects of his ceramic analyses. In the discussion below, an attempt is made to translate Wallace's model into archaeological terms and to explain how it might be used as an aid to studies of ware.

Wallace's cognitive model consists of five basic categories: action plan (route plan); action rules (driving rules); control operations; monitored information; and organization. In relation to the task of driving an automobile to work, Wallace (1965, p. 291) describes these five categories as follows:

> Route Plan (the specification of the origin state, destination state, and the intervening transitional states at which instrumental choices must be made); Driving Rules (the specification of general rules for marking choices among alternative actions); Control Operations (the specification of the minimal behavioral responses available to the actor); Monitored Information (the specification of the types of data relevant to choice of response); and Organization (the pattern of interpretation employed in relating data to action).

These categories, when taken together, can be used to define that part of an individual's mazeway (total system of cognitive maps) concerned with some specific cultural activity.

Theoretically, Wallace's model should be applicable to any technological task. However, our interest lies in pottery and the available archaeological data concerning Maya ceramics and their manufacture is particularly well suited for use in the application of the model to archaeological problems. In addition, there is a small but excellent literature on modern pottery manufacture (see Thompson 1958;

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also Guthe 1925; Van de Velde ande Van de Velde 1939; Foster 1955; Fontana, Robinson, Cormack, and Leavitt 1962; and Bowen and Moser 1968, among others) which can be used for general ethnographic analogies.

Wallace's model can be rewardingly applied to archaeological situations in the Maya area (and other areas as well), because the ancient Maya potters made only a limited number of vessel types with various shapes, decorations, tempers, pastes, etc. The limited number of combinations of ceramic attributes in a culture makes possible both intersite and intrasite comparisons through time, for if all combinations were used and the pottery of every site unique, then comparisons would be virtually impossible (as Whiting [In press] has pointed out in relation to other domains of culture).

Translation of the Model into Archaeological Terms

By the very nature of the archaeological data, Wallace's cognitive model cannot be directly applied to ceramic problems in its original form. Therefore, we have had to modify the model in order to make it useful. To begin, it might be best to explain and illustrate the various aspects of the revised model. In this way, the translation from Wallace's driving situation to the manufacture of pottery should become clear. Then we will attempt to show how the archaeologist can recover the type of information that other anthropologists can collect ethnographically.

Perhaps the clearest way for the archaeologist to visualize the model as a whole is in chart form (figure 2). In pottery manufacture, the

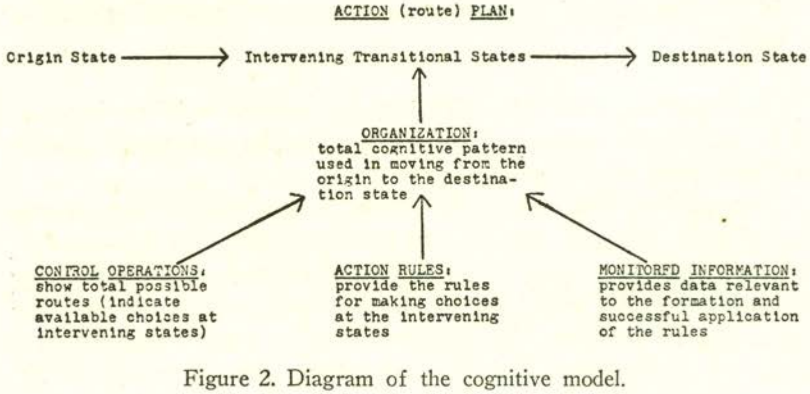

Figure 2. Diagram of the cognitive model.

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origin state would be the desire to make a pot, while the destination state would be the finished pot. The intervening transitional states would be those points in the manufacture of the pot at which the potter has a choice to make (figure 3). For example, one intervening transitional state would be the addition of temper (various kinds or none could be added) to the clay. Obviously, the model, or total number of choices, would encompass the whole manufacturing process including shape and decoration, whereas the ware concept is concer-

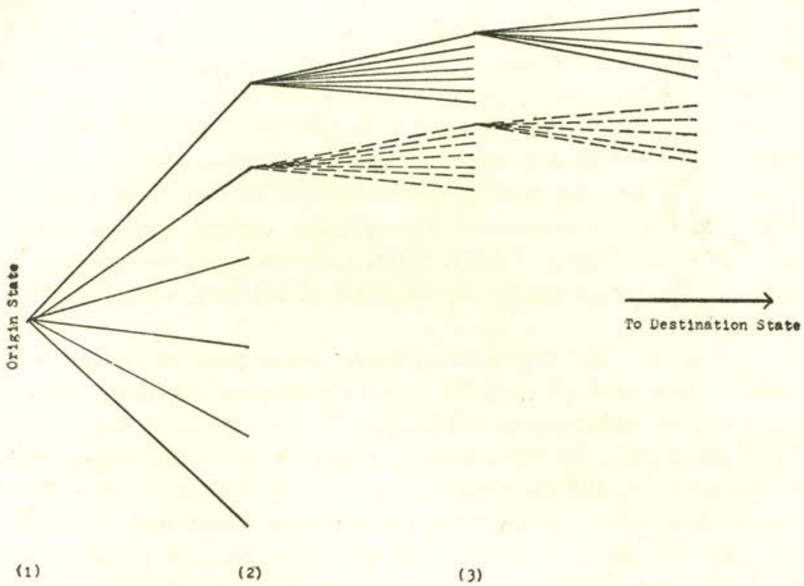

Figure 3. Diagram of an action (route) plan. Each branching fork represents and intervening transitional state at which instrumental choices are made. (Note that for reasons of clarity, only part of diagram has been drawn.)

ned with paste composition and surface finish only. But form or decoration may be related to paste or surface finish and we feel it best to initially apply the model to the total manufacturing process (although one can examine some parts more closely than others).

The control operations would indicate which of the possible choices the potter could make, while the monitored information would provide the data relevant to the application of the action rules. As Deetz (1967, p. 10) has pointed out:

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The structural aspect of the bowl tells us something of the cultural norms which led to production. In comparison with other bowls, this one might be seen as 'typical' in that it and similar ones resulted from the expression in clay of a set of ideas which were joined by certain 'rules' of combination.

The action rules in making a water storage jar, for instance, might specify that coarse sand temper must be used. The monitored information relevant to this rule might be that coarse tempered jars allow greater evaporation than usual wich results in cooler water. It must be realized, however, that many of the rules may have been unconscious. In addition, much of the monitored information may have functional implication, although it may have been learned in earlier generations and passed on to later ones. In fact, the reasoning (monitored information) behind a particular action rule might be totally unknown to a potter ('we do that because that is the way it is done'). In other words, information which may once have had functional significance could later become custom without known functional importance. Finally, a few non-functional choices may be made by the potter purely on the basis of his idiosyncracies or his personal taste.

To conclude, the organization would encompass the total action (route) plan with all its paths, the rules concerning which path to take, and the information relevant to the application of these rules. More specifically, the organizational pattern would be the probabilities of taking any of the alternative routes; that is, the pattern consists of the possible routes and indications of those most heavily (repeatedly) traveled. It should be pointed out that the resultant model of the total cognitive pattern (organization) is only an approximation of this pattern. In addition, there are other factors which probably complicate the picture we have presented, but which have not been discussed here. The process of feedback is one example of such a factor. Moreover, it should be pointed out that we do not hold that all potters in a given culture at a given time have identical cognitive maps vis a vis pottery making, nor do we hold that the Wallace model exactly reproduces any one of the potters' cognitive maps. Rather, we hope that the model approximates the general features of all of the potters' cognitive maps.

Turning to the archaeological situation, the principal question is, of course, how can the archaeologist obtain the data, which is essential for the use of Wallace's cognitive model, from his archaeological material. He cannot watch the potter manufacturing a pot or ask an

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informant how such and such a step is done or what follows what. Even though the archaeologist's informants are mute, he can still utilize his associational data to great advantage. In relation to action plan, the inferential method as outlined by R. H. Thompson (1958, pp. 51-64) would be relevant. If the archaeologist is attempting to apply Wallace's model to a ceramic collection from a single period at some archaeological site, he would begin by looking for indicative data (for example, the clay contains calcite inclusions). After availing himself of applicable probative data, he would then try to reach some probable inference. To give a very simple example, Thompson (1958, p. 51) is able to go from the indicative datum of calcite inclusions to the probable inference:

> The clay was prepared for pottery making by the intentional admixture of a large proportion of pulverized limestone, that is, particles of calcite.

If Thompson's method were rigorously applied to a collection of pottery, then the archaeologist would be in a position to demarcate the major steps in the manufacture of the pottery and would know at what intervening points in the manufacturing process instrumental choices could have been made by the ancient potter.

In addition, actual experimentation by the archaeologist might be required in order to elucidate the action plan. In the case, say, of the choices involved in the preparation of a slip, a particular choice which the ancient potter made might not have a very obvious effect at the time the pot was made. But it might have an effect which is visible to the archaeologist such as making the slip amenable to rootlet-marking after it had been discarded and buried. Experimental procedures might be able to show that choices a, b, c, d would result in a hard, dark, glossy (and so on) slip, while choices a b, c, e would result in a soft, dark glossy (and so on) slip which would be more liable to rootlet or liquid-marking.

The delineation of the control operations is a relatively simple procedure and consists solely of counting all the varieties of features which are associated with each choice point in the action plan. That is to say the archaeologist would note all possible pastes, surface finishes, forms, types of decoration, etc. The total number of possible choices would go to make up the control operations.

The definition of action rules, on the other hand, is a much more complex and time-consuming procedure. Essentially, the ceramic

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action rules can be looked upon as an illustration of the mathematical concept of the stochastic process. As Wallace (1961, pp. 139-140) notes:

> A stochastic process is a set of events so related that the probability of any one event occurring next in series is conditional upon the identity of the preceding event or events.

The only way for the archeologist to get an approximate idea of prehistoric ceramic action rules is to study the actual combinations of choices (attributes) visible on sherds and whole pots. The first step would be to look for recurring combinations of two attributes (coarse paste with calcite temper, sand temper with widemouth jars, etc.). The next step would be the counting of recurring combinations of three attributes, and so on. After his study of the various combinations of choices, the archaeologist would be in a position to state that if step A is taken, then this step is usually followed by B, C, D, etc. If the ceramic collection is fairly large, a computer would surely be of great aid to the archaeologist in discovering action rules. From the discussion above, it should be obvious that the archaeologist can only achieve an approximate idea of what the prehistoric ceramic action rules were.

The discovery of monitored information is perhaps the most difficult task which the archaeologist faces and is, perhaps, on a less secure level of inference than the discovery of action rules. There may be several ways to retrieve data about monitored information. One way would be to use the inferred action rules as a base. Hopefully, the study of action rules will have isolated most of the significant attribute clusters. These clusters could be looked at in terms of function. Hypotheses could then be formed in order to explain the various combinations of attributes. These hypotheses could be formulated by recourse to the Mayan ethnohistoric and ethnographic literature (or tested in the same manner if they have been formulated by other means). Fortunately, the Maya area is well suited for studies of ethnohistoric and ethnographic ceramic continuities. Through studies of this kind, it should be possible to infer the monitored information which certainly had much to do in the formation of ceramic action rules.

Finally, the organization, due to the nature of the archaeological data, must be seen simply as the combination of the data which has been inferred about the action plan, control operations, action rules,

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and monitored information. That is to say, the organizational aspect of the archaeologically translated model would be an approximation, hopefully not too gross, of the total cognitive pattern of a prehistoric pottery making process.

Use of the Model for Comparing Wares

More than any other conceptual unit of analysis now in use in the Maya area, ware is the ceramic concept which is most concerned with the process of ancient pottery manufacture in that it is concerned primarily with paste composition and surface finish. The cognitive model presented in this paper also can be applied to the process of pottery making as we have shown above. Although this model has a number of possible archaeological applications, we are specifically concerned here with its use in relation to wares. It is our belief that the model's main merit in this regard is that it provides a formal means for comparing wares through time or space.

Ceramic research in the Maya Lowlands has shown, to date, that there were changes in ware through time, although these changes appear to have been slower than changes in types. There is much less data, however, on the differences or similarities among wares through space in specific time periods. Even though there is some general evidence that great similarities do exist among wares from different sites in the Southern Lowlands during certain periods, little has been written about the closeness and nature of these similarities. It would be of great interest, for example, to know if there is an identity in ware within a 'ceramic sphere' (see Willey, Culbert, and Adams 1967; Culbert 1967) and if there are ware differences between two spheres on the same time horizon. That is to say, it certainly would be significant if we could define the geographical limits of ceramic manufacturing techniques and compare them to limits of decorative style or form or even non-ceramic techniques or traits. It would further be of interest to discover if the apparent ware differences between two sites are just a matter of different mineralogical resources at those sites or the manufacturing centers supplying them or if the dissimilarities are due to differences in the basic manufacturing process. Another area of interest which warrants investigation is the nature of ware changes through time at a single site. In what specific area of ceramic manufacture does change occur through time? Do the culturally defined alternatives involved in

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creating a vessel become more or less numerous through time, and, if these changes do occur, how are they related to other changing aspects of culture (such as an increase in craft specialization)? In order to answer these kinds of questions, there must be a greater emphasis on ceramic wares in studies of Maya pottery. Nevertheless, even with such a new emphasis, it will simply not be sufficient for the archaeologist to say that there are close 'resemblances' between the pottery of two sites of that all the sherds from several periods look and feel similar.

It is our belief, rather, that the model outlined above can provide the proper framework for investigating a variety of questions relating to ware. In setting up a flow chart, such as the one shown in figure 3, for the study of ware in the Maya area, we found that by using our own analyses of the pottery of Uaxactun (Smith, 1956), Mayapan (Smith, 1971), and Seibal (Sabloff and Willey, 1971) as sources for ceramic data, we could set up a preliminary chart with more than twenty-five major points (exclusive of design style) at which the archaeologists could investigate the instrumental choices (conscious or unconscious) which the ancient Maya potter made during the process of ceramic manufacture. These points are concerned with the total manufacturing process which encompasses not only what we have defined as ware but also form and decoration. But, as noted above, it is our feeling that, in relation to the cognitive model, ware can best be looked at in this total context of pottery making, since steps in the pottery making process involving ware may be separated by non-ware steps. The specific points of choice are concerned with paste composition (texture, color, temper, hardness, thickness), form (basic shape, side, rim, lip, base, thickness, and others), decoration (alteration of surfaces, slipping, painting, applique), surface finish (smoothing, thickness, and color; plus lustre and feel, if slipped), firing (crazing, flaking, fire-clouding), and postfire decoration.

Although we cannot give a complete example here of an aplication of the cognitive model, since that would require the presentation of detailed ceramic information and step-by-step inferences about action rules, control operations, and monitored information, we can offer a very brief idea of how the model could be used in analyzing Maya ceramic wares. In comparing just the red groups of the Flores Waxy Ware (Mamom) and the Peten Gloss Ware (Tepeu 3 group only) (Smith, 1955), we found that on the basis of the points of choice noted above, there were approximately seventy thousand

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possible combinations of traits open to the Mamon potter of Uaxactun, while there were over sixteen million open to the Tepeu 3 potter. However, the difference in possible choices occurred mostly in the realms of form and decoration. In relation to paste composition, surface finish, and firing, the possible trait combinations numbered about fifty for both groups, and the main differences were in slip (especially lustre, feel, and color; also rootlet-marking and liquid-marking) and temper, and also in firing (crazing and fire-clouding).

Looking back at figure 3, one could imagine the many combinations of ceramic traits which could lead to the numerous possible manufacturing 'routes'. For example, at point one, the texture could be very fine, fine, medium, coarse, or very coarse. At point two, the paste color could be gray, buff, pink, orange, red, brown, or cream. Then at point three, the ancient Maya potter could use calcite, ash, quartz, or sherd temper or no temper at all. It should be kept in mind, of course, that these and other points may not have been temporally spaced in the potter's thinking. If one continued on with the more than twenty-five points of choice, the complete model of the making of pottery at Uaxactun could then be constructed. In studying only the red group of Flores Waxy Ware, however, one finds that the diagram becomes much simpler. For instance, figure 4 shows a diagram of the same three points of pottery manufacture which we have just discussed.

For quick comparative reference, the archaeologist may also wish to construct a chart such as the one shown in figure 5. Although it does not compare combinations of attributes, it immediately points out the differences in individual attributes between two wares. In fact, it may be easier for the archaeologist to construct this kind of diagram and then follow the procedure outlined above in the section on translating the cognitive model. He can then think of the manufacturing process in terms of the diagrams shown in figure 3 and figure 4 and perhaps draw part of it, but he can probably do without drawing the whole flow diagram of the total manufacturing process.

In the example concerning us here, comparing the red group of the Flores Waxy Ware in the Mamom Ceramic Complex with the red group of the Peten Gloss Ware in the Tepeu 3 Ceramic Complex, a look at figure 5 shows that many attributes are shared, as noted above, but it also shows that several differ strongly. These latter include temper which may be calcite, ash, or sherd for the Flores Waxy Ware but only calcite for the Tepeu 3 Peten Gloss Ware.

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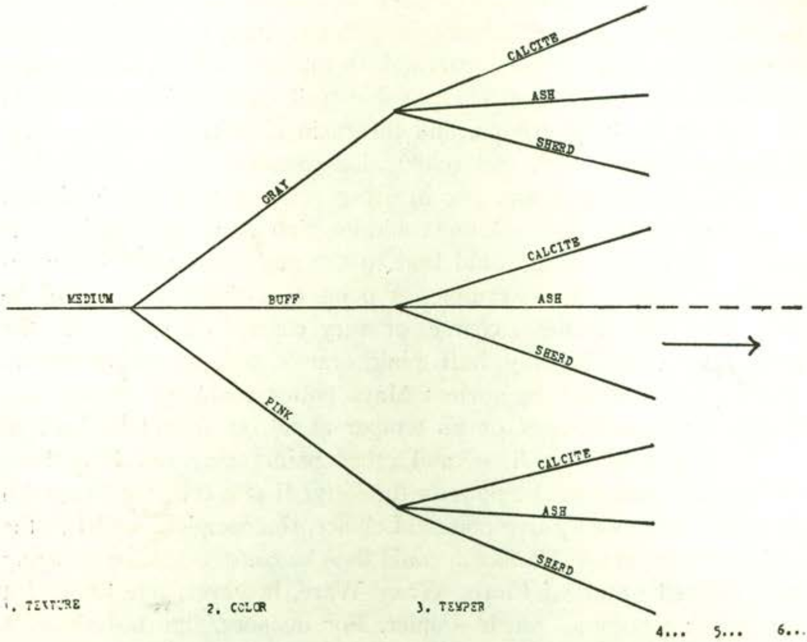

Figure 4. Diagram of the action plan (first three steps only) of the Mamon red group at Uaxactun. Compare with Fig. 3 where all the possible choices at the first three points of choice are diagramed.

Under surface finish, three marked differences prevail: 1) lustre is obtained by one through polishing the slip and by the other as a result of using a colloidal slip; 2) one favors a lighter red color than the other, and 3) the feel of one is waxy and the other glossy (some glossy slips may be polished).

Turning from the action (route) plan to the other aspects of the cognitive model, we found that although there apparently had not been any basic *change* of action plan in the manufacture of the two monochrome groups outside of the availability to the Late Classic potter of more choices of form and surface decoration, there were two major changes in action rules. First of all, as previously pointed out, there was a restriction of temper in Tepeu 3 times. The second principal change was in the action rules related to the preparation of the slip and the post-slip surface (change from a non-colloidal slip solution to a colloidal slip solution). Obviously, this latter change implies a corresponding change in control operations, but the most

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important change is in monitored information. The importance of this change does not really become clear if one is looking only at the red monochrome group. But if one looks at the other ceramic groups in the Flores Waxy Ware and the Peten Gloss Ware, the significance of the change in slip can be seen the potters could fire polychrome designs with the colloidal slip, which they apparently could not do before the change (Shepard 1964, pp. 252-53). The origin of the new monitored information is another question, though

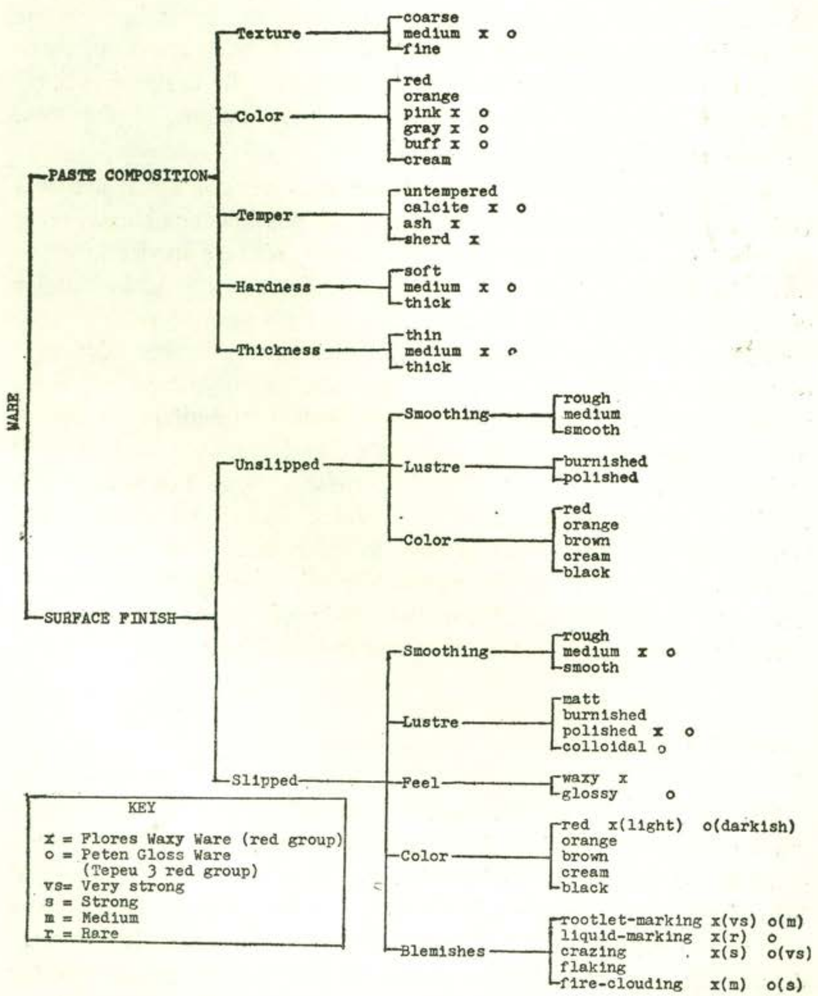

Figure 5. Attribute study of two wares: Flores Waxy Ware (red group only) and Peten Gloss Ware (Tepeu 3 red group only).

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we might note that some archaeologists believe that it may have been introduced into the Maya Lowlands at the end of Late Preclassic times (see Willey and Gifford 1961), while others believe that it was developed there (Smith in Smith and Gifford 1965, p. 155).

It can be seen from this very brief example and the discussion above that the use of the model can formalize the comparisons of wares by readily pointing out differences or similarities in traits and quantitative and qualitative differences in kind and number of instrumental choices in pottery manufacture open to the Maya potter. Moreover, the model can help the archaeologist move beyond the stage of simply noting that Ware X differs from Ware Y in three traits, by allowing him to make comparisons on the basis of cultural (ceramic) rules and potters' cognitive organizations of the total ceramic manufacturing process.

In addition, we should note that the idea of looking at artifacts (and, specifically, ceramics) in terms of possible combinations of traits is certainly not new. But use of the Wallace model helps to formalize the procedure and, in the case of ware, can make studies of pottery samples from different sites or time periods readily comparable to each other. Moreover, the model has the further advantage of perhaps opening the road to future studies of ancient cognitive maps and their change through time. Recent ambitious studies of pottery have used ceramic associations and contexts and stylistic traits as the basis for testing hypotheses about function, trade, residence patterns, and cultural dynamics. Individual technological traits have also been used to lead to inferences about chronology, trade, economy, and site functions. We might suggest that further development of the model for the study of ceramic manufacture presented here could lead to new cultural insights.

Conclusion

The analysis of ware has been a neglected area in Mayan ceramic studies. It is our feeling that discussions and definitions of wares could be profitably included in all ceramic studies, since they would help clarify many of the criteria which archaeologists in the Maya area use to identify and sort ceramic types and groups. In addition, detailed descriptions of ware could provide the necessary data for tight intrasite and intersite comparisons of wares. These comparisons might have many significant implications for studies of regional

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ceramic spheres and technological development in the Maya area, among others. We have discussed one method, based on a psychological model, which we feel could be used to formalize these comparisons and provide a solid basis for numerous archaeological inferences. To conclude, the concept of ware can be an important analytic tool in the study of Maya ceramics, as well as a great aid to the archaeologist in broader studies of ancient Maya culture.

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