ARCHAEOLOGICAL CONTEXT AND SYSTEMIC CONTEXT

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ABSTRACT

The cultural aspect of the processes responsible for forming the archaeological record is argued to be an underdeveloped branch of archaeological theory. A flow model is presented by which to view the "life history" or processes of systemic context of any material element. This model accounts for the production of a substantial portion of the archaeological record. The basic processes of this model are: procurement, manufacture, use, maintenance, and discard. Refuse labels the state of an element in archaeological context. The spatial implications of the model suggest a largely untapped source of behavioral information. Differential refuse disposal patterns are examined as they affect artifact location and association. The meaning of element relative frequencies in refuse is discussed.

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Perhaps the most important assumption made by many archaeologists is that the spatial patterning of archaeological remains reflects the spatial patterning of past activities (Binford 1962, 1964; Brose 1970; Clarke 1968; Hill 1970a, 1970b; Longacre 1970; McPherron 1967; Struever 1968; Wilmsen 1970; and many others).

> The loss, breakage, and abandonment of implements and facilities at different locations, where groups of variable structure performed different tasks, leaves a "fossil" record of the actual operation of an extinct society [Binford 1964:425].

This statement suggests that the proveniences of artifacts in a site correspond to their actual locations of use in activities. Clearly this is not always the case. But to what extent it may be so and under what conditions, would appear to be a problem worthy of some attention. In the most general terms, what I am asking is, How is the archaeological record formed by behavior in a cultural system?

I would emphasize that I am not asking the equally general and important question of why there is variability in past cultural systems. I am inquiring first, Why is there an archaeological record? Second, How does a cultural system produce archaeological remains? And third, What kinds of inter-cultural and intra-cultural variables determine the structure (as distinct from the form and content) of the archaeological record?

The branch of archaeological theory which treats these and related questions may be defined as the conceptual system that explains how the archaeological record is formed. As such, it has both cultural and non-cultural components. The latter area has received major emphasis to date; regular patterns of post-depositional changes in both artifact inventories and site morphologies have been elucidated (Hole and Heizer 1969). Explanations of variability in this non-cultural domain usually incorporate the laws of other sciences, such as chemistry, physics, and geology.

The cultural aspect of *formation process concepts* has not been appreciably developed. Archaeologists do in fact employ interpretive frameworks that include assumptions about these formation processes. These assumptions are rarely explicit, and therefore do not readily lend themselves to testing and modification. The small body of explicit concepts deals almost exclusively with chronological relationships (Dunnell 1970; Rowe 1961, 1962). While the correct chronological placement of past events is necessary for a successful reconstruction of past cultural systems, especially as they change, it can in no way be considered sufficient.

What is advocated here, and elsewhere (Binford and Binford 1968:1-3), is a concern with explaining how the archaeological record is produced in terms of explicit models, theories, and laws of how cultural systems operate. This paper will be an attempt to suggest, in the regrettable absence of such a corpus of rigorously tested concepts (Fritz and Plog 1970; Aberle 1970), some ways by which we may begin to think about the questions raised so far. Hypotheses will be presented, which, if adequately tested, can contribute to the eventual synthesis and systematization of an archaeological theory having both explanatory and predictive utility. Without this kind of a scrutinizable framework, any use of archaeological data to infer past activities or organization is highly suspect (Binford 1968a) and subject to interminable dispute. Explicit generation and use of formation process concepts, and other branches of archaeological theory, will allow genuinely intersubjective statements to be made about the past.

PRELIMINARY DEFINITIONS

Some preliminary considerations of a general nature are required at the outset. For present purposes, a culture is viewed as a behavioral system of self-regulating and interrelated subsystems which procures and processes matter, energy, and information (Miller 1965a, 1965b; Clarke 1968). A self-regulating or homeostatic system is defined as one in which at least one variable is maintained within specifiable values despite changes in the system's environment (Miller 1965a; Hagen 1961).

The values of subsystem variables are maintained within their ranges by the performance of *activities*. An activity is a transformation of energy, minimally involving an energy source, often human, acting on one or more proximate material elements. An activity may be viewed simply as a patterned energy transformation (White 1959), which serves to maintain the values of system variables. An *activity structure* is defined as the activities performed and their performance frequencies, usually with reference to a site, but not of necessity.

I define *elements* to include foods, fuels, tools, facilities, machines, human beings, and all other materials which one might list in a complete inventory of a cultural system. A provisional division of elements into the categories of *durables* and *consumables* will be made for later use. Durable elements are tools, machines and facilities–in short, transformers and preservers of energy (Wagner 1960). Consumables are foods, fuels, and other similar elements whose consumption results in the liberation of energy. Although numerous other dimensions could be used to delineate categories of elements, that is the task of an investigator attempting to solve more specific problems than those of concern here. It should be mentioned, however, that elements are often compounded into larger, more complex elements, and that complex elements may be further compounded into hierarchies of element combinations.

In order to continue activity performance, and hence maintain the values of subsystem variables, it is necessary to replace elements which become exhausted or otherwise unserviceable. The failure of an element to articulate properly with other elements is a significant bit of information to the system, which initiates the performance of other activities resulting eventually in element replacement, or activity structure change. That it also initiates the processes of discarding the replaced element is a significant bit of information to archaeologists. What it introduces is the life cycle or history of any element–the stages of its "life" within a cultural system–and how these relate to the eventual transition of elements to the archaeological record. *Systemic context* labels the condition of an element which is participating in a behavioral system. *Archaeological context* describes materials which have passed through a cultural system, and which are now the objects of investigation of archaeologists.

THE MODEL

While one may readily visualize the flow of pottery, or food, or even projectile points, through a cultural system, it is the case that all elements enter a system, are modified, broken down, or combined with other elements, used, and eventually discarded. This is so even for those elements, such as houses, which at certain points in time appear to be permanent features. This observation can provide the basis for the construction of a simple flow model with which to view the life history of any element, and account behaviorally for the production of the archaeological record. I acknowledge that the model to be presented here, and the behavioral complexities to which it calls attention, has been anticipated by Lewis R. Binford (1968a:21) and K. C. Chang (1967:106-107); a general debt is acknowledged to Walter Taylor's (1948) seminal work.

For analytical purposes, the activities in which a durable element participates during its life, or systemic context, may be broadly divided into 5 *processes: procurement, manufacture, use, maintenance,* and *discard.* A process consists of one or more *stages,* such as the stages of manufacture of a ceramic vessel. A stage consists of one or more activities, which for some analyses might be further broken down.

The model for consumable elements is parallel to and adapted from the model for durable elements. Such an adaptation is necessary to bring the model into congruence with standard terminology. One would scarcely refer, for example, to the manufacture and use of poached eggs. The terms for each process of the flow model for consumables are: *procurement, preparation, consumption,* and *discard.* Because consumption occurs but once during the systemic context of a consumable, the maintenance process has been deleted. For the sake of convenience, the discussions to follow will exclusively use the terminology of the durable element model.

In addition to the 5 basic processes of systemic context, it will be necessary for some problems to consider *storage* and *transport*. Storage and transport are activities which provide, respectively, a temporal or spatial displacement of an element. Transport and storage may take place singly or in combination between any 2 processes, stages, or activities of one stage.

Not all elements follow a unilinear path through a system. Some are rerouted at strategic points to processes or stages through which they have already passed. Archaeologists encounter items of this sort frequently; this condition is often known as *reuse*. Two varieties of reuse, *recycling* and *lateral cycling* will be defined here.

Recycling labels the routing of an element at the completion of use to the manufacture process of the same or a different element. In our system, precious metals and gems are recycled. Some systems recycle potsherds, bifaces, ground stone, and many other elements, most of which are routed to the manufacturing processes of different elements. Sometimes the use modification or maintenance activities of one element can be viewed as the manufacturing activities of another. Continued retouching of a scraper will result in an implement unsuited for further use. But in this form, the element may be adapted for reuse in some other activity.

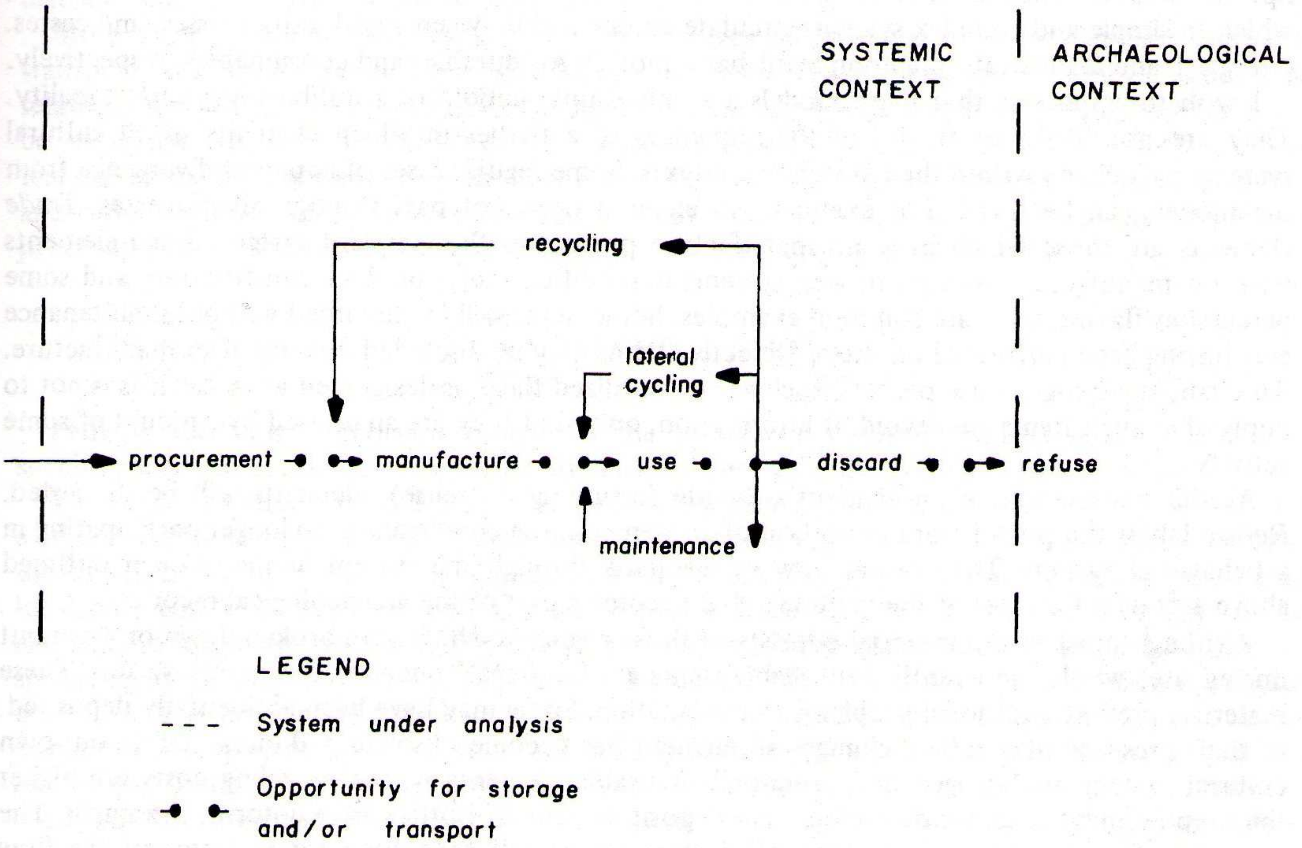

Fig. 1. A flow model for viewing the life cycle of durable elements.

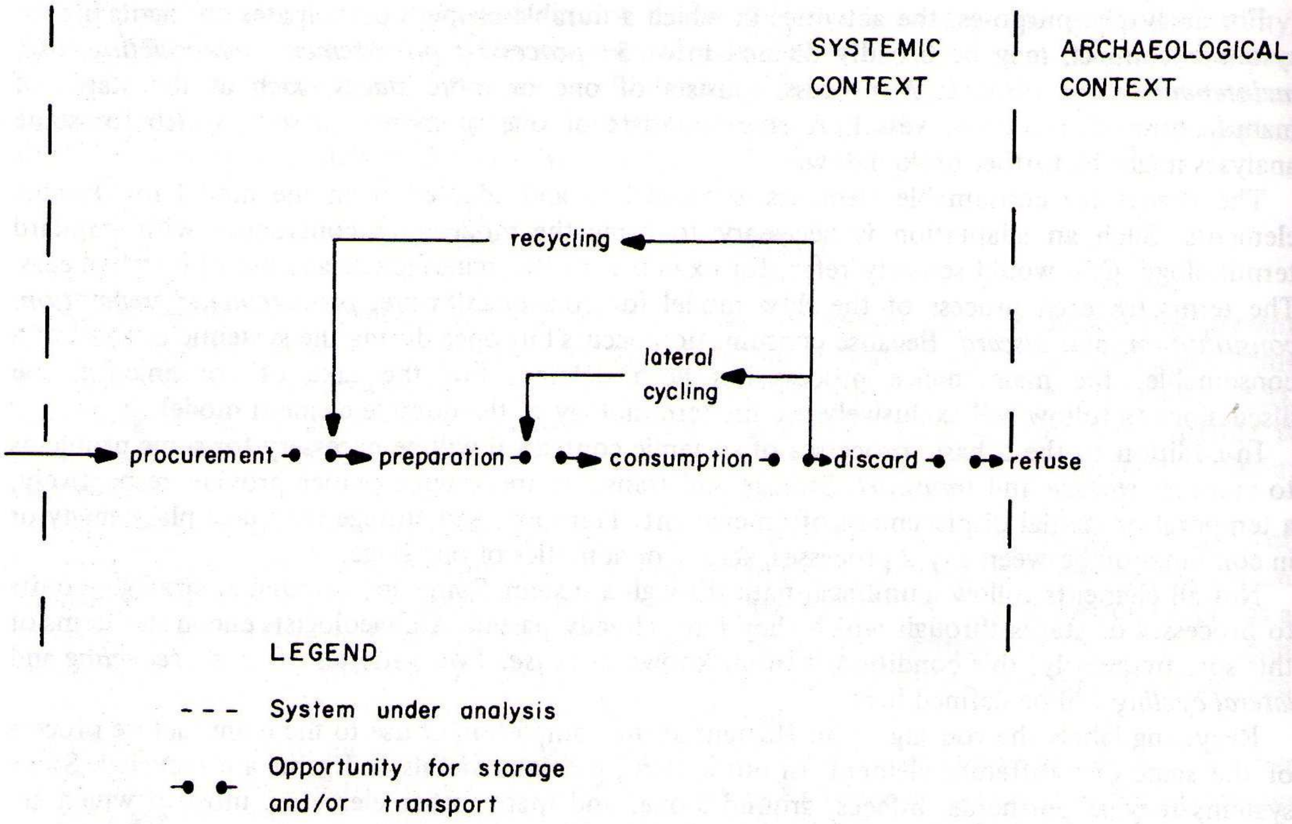

Fig. 2. A flow model for viewing the life cycle of consumable elements.

Lateral cycling describes the termination of an element's use (*use-life*) in one set of activities and its resumption in another, often with only maintenance, storage, and transport intervening. Specifically, reference is made to the movement of clothing, tools, furniture, and other elements, which in simple and complex systems circulate among and between social units, classes, and castes.

Figs. 1 and 2 illustrate the completed basic models for durables and consumables, respectively. I wish to emphasize that these models are only simplifications of a stubbornly complex reality. They are not likely to fit neatly the sequences of activities in which elements of all cultural systems participate within their systemic contexts. Some regular cases of apparent divergence from the models can be listed. For example, an element need not pass through all processes. *Trade* elements are those which have no manufacture process in the recipient system. Some elements have no manufacture process in any system; unmodified stone used in construction, and some percussion flaking tools are common examples. Some items will be discarded without maintenance ever having been performed on them. Defective items may be discarded directly after manufacture. An element having no use process, such as an unutilized flake, is designated as *waste*; this is not to imply that such items are devoid of information, only that they are an unused by-product of some activity.

At the termination of an element's use-life (assuming no reuse), elements will be discarded. *Refuse* labels the post-discard condition of an element—the condition of no longer participating in a behavioral system. The normal flow of elements through the system in the manner outlined above accounts for most of the materials that become a part of the archaeological record.

Although most refuse material consists of those elements which have broken down or worn out during use, whole, apparently serviceable items are frequently encountered in excavation. These materials present additional problems of explanation. Some may have been accidentally deposited, or their presence may reflect change—an element has become obsolete and discarded. In our own cultural system, undamaged and potentially reusable elements whose recycling costs are higher than replacement costs are discarded. "No deposit no return" bottles are a notorious example. The presence of such items in the archaeological record is still accounted for in terms of the flow model, but their formal properties must be accounted for in terms of economic principles. These various factors are important and worthy of further investigation, yet they do not account for a great deal of the remaining "anomalous" material found in archaeological context.

Elements discarded with the deceased after ceremonial use provide a significant source of intact elements in archaeological context, especially among simple systems. The subject of grave accompaniments and their relationships to other aspects of the system that discarded them, especially social organization, will not be discussed here; although a comprehensive treatment is long overdue.

The principal set of variables responsible for the presence of usable elements in the archaeological record is obviously that having to do with the abandonment of the site. Archaeological context includes all the materials found in a site, whether or not they are in specialized discard locations and whether or not they have been deliberately discarded by the past occupants of a site. It is well known, for example, that elements are found in every stage of manufacture and use. The way in which a site is abandoned–the variables operative at the time the occupants leave the site, or die without replacement–has demonstrable effects on the kinds and quantities of non-discarded elements found in archaeological context. Elements which reach archaeological context without the performance of discard activities will be termed *de facto refuse*.

Robert Ascher's provocative Seri study (1968) suggests a hypothesis, which, when generalized is relevant here: *differential abandonment of a site changes the normal ratios of elements in various processes of their systemic contexts and the normal spatial distribution of elements*. Specifically, reference is being made to activities which result in the removal of raw materials and usable elements from abandoned areas of the site and their reuse in the still-occupied portion. At the time of their abandonment, these elements were still in systemic context. We would expect to find relatively fewer elements in pre-discard processes of systemic context, that is, less de facto refuse, in sites which undergo differential abandonment. On the other hand, sites abandoned rapidly and completely as a result of some catastrophe will have relatively greater numbers of elements in manufacture, use, and maintenance processes. Pompeii comes to mind as an example of this kind of abandonment, in which no change occurred in the provenience of elements or their distributions among the various systemic processes.

More often, abandonment, even if sudden, involves the removal of some elements and their transport to another site or sites. The kinds and quantities of elements so removed should be related systematically to other variables operative at the time of abandonment. Among them might be expected: distance to the next site, season of movement, size of emigrating population, technological development of both donor and recipient sites, means of available transportation, and other variables. More complex models will have to be devised to account for the effects that processes of abandonment have on the formation of the archaeological record.

SPATIAL IMPLICATIONS

Perhaps the most important aspect of the notion of systemic context is that there is a specifiable spatial location, or locations, for each process through which an element passes.

The term "location" is used here in its broadest possible meaning. A location can be a point on a site, or it can be a set of points. It can also be an entire site if, during one process, an element has the same chance of being found at one place on the site as any other. Such a concept of spatial location might be better expressed as a set of probabilities for finding an element or class of like elements at any point on a site surface during a particular process or stage. A site or other unit of spatial analysis is divided into squares of equal area and the probability values for each square are indicated. The smaller the squares, the greater the potential accuracy (see Cole and King 1968 for numerous examples of how one might model distributions). This flexibility in depicting locations allows the frame of reference to be shifted conveniently to any variable of interest to suit the needs of the investigator; the metate of a woman, or the metates of a village. The relationships between the locations of each process or stage for an element are complex but I predict that eventually determinate relationships between these and behavioral variables will be specifiable.

The overlapping of these locations for different elements, and the activities into which they articulate, reflect a behavioral matrix of bewildering complexity, even for simple systems. While this complexity presents problems for some uses of archaeological data, it also provides a hitherto neglected source of information for generating and testing behavioral hypotheses.

Archaeologists are often able to reconstruct the manufacturing activities of elements when they are recovered in various stages of manufacture, often in association with waste materials. That the various stages and processes of an element's systemic context should be reflected spatially as well has been less frequently used as a basis for generating or testing hypotheses. A projectile point found in association with an antler flaker and tiny pressure flakes of the same material in a habitation structure is a different projectile point from one found in a midden, or another found eroding from the wall of an arroyo with no other associated cultural material. In the first case, one would be dealing with the location of some manufacturing activities, the second a location of discard activities, while in the third perhaps the location of use. The cultural inferences possible from a projectile point in each process are different, as are the potential hypotheses against which these morphologically similar elements may be brought to bear as evidence.

In another example of the relationship between systemic context and the spatial differentiation of cultural behavior, one may take the case of the simple subterranean storage pit. Because such pits occupy the same location during all processes, one is permitted to state with certainty that a pit was dug, used, and repaired by the inhabitants of the site at the same provenience where it was found in archaeological context. This is hardly a revelation, yet I suggest that such rigorous justification for a primary behavioral inference is necessary if we are to succeed in formulating and answering the kinds of questions which are now being asked about past cultural systems. The archaeological record will produce sets of information on subjects which we can scarcely contemplate at the present, when, and as, progress is made in building models to relate the production of the archaeological record to cultural behavior in the past—models which include explicit reference to the spatial dimension of cultural behavior.

REFUSE DISPOSAL PATTERNS

If this model of cultural element flow and its spatial aspect are to be of value in enabling us to gain knowledge of the past, they must illuminate some of the questions posed earlier. These questions and others will be examined and rephrased in terms more amenable to treatment by the concepts sketched out here. Additional hypotheses will be introduced as the need for them arises; they are intended, as are all hypotheses, to be suggestive and not definitive.

We shall now return to the question raised originally in the quotation from Binford; that is, to what extent can remains at a site be expected to occur at their use locations as opposed to any other, when found in archaeological context? We aim to know what some of the determinants of variability in patterns of refuse transport and disposal are. I shall distinguish between *primary refuse* and *secondary refuse*. Both refer to elements which have been discarded (compare to de facto refuse) but, in the case of secondary refuse, the location of final discard is not the same as the location of use. Primary refuse is material discarded at its location of use (Fig. 3).

I believe that the general problem of refuse disposal may be seen as the balancing of 2 major sets of variables. The particular solutions arrived at by site occupants for handling the by-products of activity performance will take into consideration the ease of moving the activity or activities versus the ease of moving the refuse.

Let us assume that there is a site at which only one activity is being conducted by a single person during brief periods of the year. In this case one might expect few pressures to favor the development of a separate location for the final discard of elements replaced during activity performance. One would obtain a general correspondence between the location of use and the location of final discard for elements used in that activity. Let us, then, increase the population of the site to a small village, and increase the intensity of occupation to year-round. In this instance, one would expect such factors as the necessity for unrestricted access between principal activity areas, sanitation, and competition for scarce activity space to place a premium upon the transport of at least some of the materials and their discard at another location. Modern cities provide the

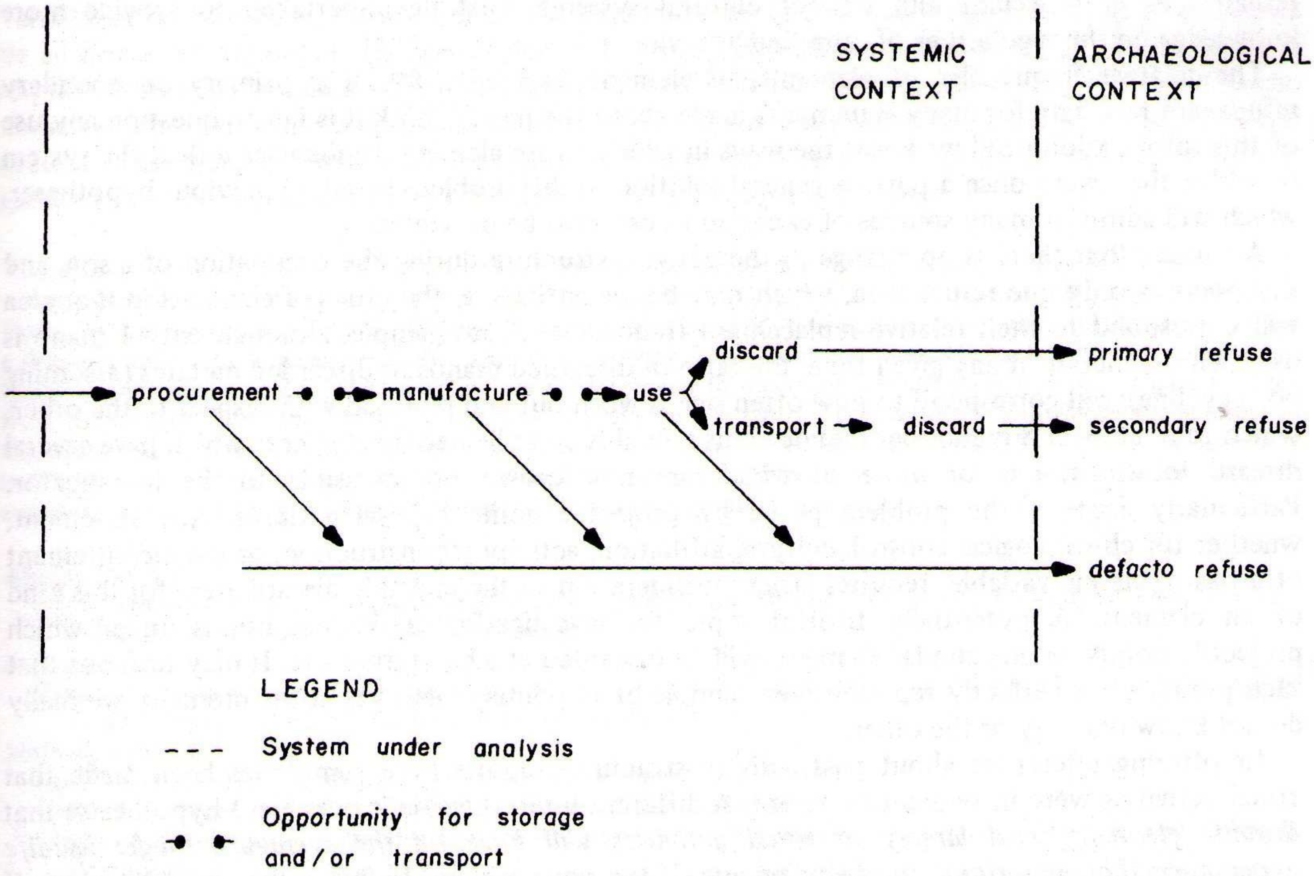

Fig. 3. Simplified flow model for explicating the differences between primary, secondary, and de facto refuse.

extreme example, as we know it today, where almost no elements are discarded at their places of use within the site; consequently, almost all archaeological context material is secondary refuse.

The general principle which these hypothetical cases illustrate is that *with increasing site population (or perhaps site size) and increasing intensity of occupation, there will be a decreasing correspondence between the use and discard locations for all elements used in activities and discarded at a site*. In addition, there will be an increasing development of specialized discard areas, occupations, and transport networks. From this principle, admittedly unpolished and untested, we can predict that limited activity locations (Wilmsen 1970) such as kill and butchering sites, quarry sites, and many seasonally occupied sites, will consist largely of primary refuse. A major characteristic of these sites will be the repeated clusterings of elements in discrete and overlapping locations.

Let it be given that many sites of many systems had at least moderately developed refuse transport and disposal activities and, as a result, elements used in many activities were removed from their locations of use. The question that would appear to be before someone interested in inferring the past activity structure of such a site is, To what extent are elements associated in use also associated as secondary refuse? No definitive answers are presently at hand, though one hypothesis may account for some element associations in secondary refuse.

If storage intervenes between the termination of an element's use-life and its final discard, there is a likelihood that one or more other elements of the same activity would have been replaced and stored along with the first element awaiting final discard. Therefore, *as there is a decrease in the ratio of final discard frequency to replacement frequency of one or more elements of an activity, there is an increasing probability that several elements, especially those with short use-life expectancies, will be discarded at the same time and in the same place within secondary refuse areas*. The optimum conditions for element association as secondary refuse occur in modern industrial societies where many storage and transport steps intervene between element replacement and final discard. Most other activities in most other cultural systems will result in secondary refuse which lies somewhere along this continuum of activity-based element association. Future research in both extant and extinct cultural systems must be undertaken to provide more knowledge on the regularities of dumping behavior.

The relative frequencies of elements, or element fragments, found as primary or secondary refuse, are raw data for many statements made about the past. I think it is fair to question any use of this information until we know the ways in which refuse element frequencies reflect the system of which they were once a part. A general solution to this problem based on previous hypotheses, which will admit of many sources of exceptions, can now be presented.

Assuming that there is no change in the activity structure during the occupation of a site, and that there is only one refuse area, which may be the entire site, the ratios of elements in that area will correspond to their relative replacement frequencies. For example, although only 1 mano is used with 1 metate at any given time, the ratio of discarded manos to discarded metates (assuming no recycling) will correspond to how often one is worn out and replaced with respect to the other, which may be 6 or 8 manos per metate. This model is complicated by elements which have several discard locations, one or more of which are not known or accessible to the investigator. Particularly acute is the problem posed by projectile point disposal patterns. Any statement, whether for chronological control, cultural affiliation, activity reconstruction, or the measurement of a past systemic variable, requires strict consideration of the multiple discard areas for this kind of an element. A potentially fruitful topic for investigation is the conditions under which projectile points, or any similar element, will be discarded at a habitation site. It may turn out that such points are a perfectly representative sample of all points in use; yet at the moment, we really do not know one way or the other.

In offering inferences about past activity structure, reports have sometimes been made that ritual activities were infrequent or absent. A different interpretation is possible. I hypothesize that *durable elements used largely in ritual activities will have on the average a longer use-life expectance than non-ritual durable elements of the same system.* If this is the case, then even if ritual activities were present and frequent, non-ritual elements would be expected to predominate disproportionately as refuse, simply as a result of differential replacement frequencies. Any statement asserting the absence or infrequent performance of any activity should be treated skeptically until the biases introduced by differential replacement frequencies and multiple discard locations have been taken into account.

CONCLUSION

Archaeologists have gone from the one extreme of viewing a site as spatially and behaviorally undifferentiated rubbish to the other extreme of viewing remains as mostly reflecting their locations of use in past activities. At this point, it appears that neither extreme is often the actual case. Clearly, though all remains in a site are refuse when uncovered in archaeological context, when viewed by the model and hypotheses presented here (and used implicitly by many investigators) they are potentially much more. In order to realize this potential, we will have to link archaeological context material to behavioral and organizational hypotheses about elements in systemic context.

I submit that this linking process is the central problem of archaeological inference (see Binford 1968b for similar statements). Once high probability statements about activity structures are possessed, hypotheses regarding the composition of task groups, their means of recruitment, and how they are structured within the total system organization, and especially how these organizations change, will be capable of precise formulation and *archaeological* test. Whether one begins at the level of archaeological context material, or with models of system organization and change, the form of the final inference or tested model will be similar: statements about past organization or other systemic properties are linked by arguments of relevance (Binford 1968b; Fritz 1968; Schiffer 1970) to the activity structure. The activity structure, in turn, is linked to the archaeological context data by formation process concepts.

The construction and use of formation process concepts along the lines sketched out above will allow the rigorous justification of our inferences. Without a base of explicit, logically related credible laws about the formation processes of the archaeological record, debates about the validity of an inference, or any use of the data from the record, can only focus on epiphenomena or ad hominem arguments (Binford 1968a). I would hope that the crude first approximations to explicit formation process concepts presented here will stimulate a round of vigorous criticism aimed at improving the conceptual tools with which we manipulate the remains of past cultural systems. As more sophisticated and comprehensive models are developed, confidence will be gained in the uses to which we put the data of the archaeological record.

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