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REFERENCES CITED

Bullard, William R., Jr.

Chase, Arlen F.

Chase, Diane Z.
1981 The Maya Postclassic at Santa Rita Corozal. Archaeology 34:1.

Cowgill, G. L.

Jones, C. D., S. R. Rice, and P. M. Rice

Pendergast, D. M.

Rice, Prudence M.

Sharer, Robert J., and Arlen F. Chase

Willey, Gordon R., T. P. Culbert, and R. E. W. Adams

BEYOND WILLOW SMOKE AND DOGS' TAILS: A COMMENT ON BINFORD'S ANALYSIS OF HUNTER-GATHERER SETTLEMENT SYSTEMS

Polly Wiessner

It is suggested that archaeologists would benefit by conceiving organizational variation in hunter-gatherer societies to be the result of both organization around resources and organization around other persons in social relations of production. This approach allows for predictions to be made about the patterning of material remains which are the products of intergroup and intragroup interaction, such as internal site structure, profiles of exchange, stylistic variation in artifacts, etc. To illustrate this point, I outline a number of social strategies for reducing risk in social and natural resources and derive hypotheses about their material

Polly Wiessner. Institut for Forhistorisk Arkeologi, Århus Universitet, Moesgaard, DK-8270, Højbjerg, Denmark
correlates. While I emphasize the importance of understanding these strategies within a framework of adaptation, I question whether it is possible to predict strategies of organization from environmental variables alone.

In his article on hunter-gatherer settlement systems and archaeological site formation, Binford (1980) raises several important considerations for archaeologists by pointing out that (1) not all hunter-gatherer societies share a similar basic organization, and (2) major differences in organization can have an important and predictable effect on the archaeological record. He describes two strategies of organization around resources: first, that of foragers, who move frequently in order to "map onto" resources, and second, that of collectors, who are more sedentary and supply themselves with specific resources through logistically organized task groups. He then relates these strategies to intersite assemblage variability. Arguing that good diagnosis is theory-dependent, he links these strategies to different environmental conditions to make them "more understandable and predictable."

Despite many points of interest in Binford's article, I find that his efforts to explain variation in hunter-gatherer societies through "a theory of adaptation," or, more accurately, through relating organization of persons to environmental variables, provides only a very limited framework for archaeologists to work with. Basic differences in hunter-gatherer organization are the products of adaptive strategies which relate persons in social relations of production. Archaeological data are also the products of both of these strategies. For example, the range of site types within a settlement system, the location of sites, the content of assemblages, etc., may be largely the consequence of direct organization around resources, but other crucial sets of data concerning internal site structure, profiles of exchange, stylistic variation in artifacts, contents of burials, etc., are the products of intragroup and intergroup interaction. In archaeology, when problems of multiple occupations, preservation, and dating make it difficult to draw any but very tentative conclusions about past organization from one set of data, it is crucial to have as many independent data sets as possible with which to examine these problems. Thus, if archaeologists are to make full use of available data, hunter-gatherer organization must be viewed in light of a theory which accounts for various forms of organization by taking the entire productive process into account, that is, both the organization around resources and the organization around other persons in social relations of production. Below I will outline a theoretical framework which has the potential to account for the range of strategies used in the second half of the productive process: strategies to reduce risk or to reduce the variance in social and natural resources. Then I will briefly illustrate how "risk theory" can be used to make predictions about a much wider range of material remains generated by different strategies of organization than do Binford's two categories which are based on organization around resources alone. Such predictions can be about internal site structure, distribution of faunal remains on a site, profiles of exchange, and stylistic variation in artifacts.

MEANS OF REDUCING RISK

In any society, economic strategies are twofold: those aimed at bringing in the mean subsistence income needed to sustain a household throughout the average year, and those aimed at reducing the variance around the mean. In hunting and gathering societies, in which direct organization around resource procurement is often minimal or short in duration (Mellaart 1973), it is often strategies for reducing risk which require the most extensive cooperation and thus have a marked influence on social organization. In view of this, many of the organizational differences in these societies stem from different strategies for reducing risk. Briefly, means of reducing risk can be seen as falling under four primary strategies, where risk is defined as probability of loss (Riegel and Miller 1959):

1. Prevention of loss: reduction of hazard or minimization of actual loss. Among hunter-gatherers this includes such preventive measures as rituals aimed at warding off misfortune; control of resources through burning; and allocation of land rights so that a group can plan a yearly round without running the risk that others will have come into the area unexpectedly and
have exhausted critical resources. Where there is pressure on land, defense of territory might be included with these measures.

[2] Transfer of risk or loss from one party to another: In the recent past this strategy appears to have been used by such groups as the Kwakwakw (Piddocke 1969; Suttles 1968), among whom a surplus was amassed during the summer and then transferred to poorer groups during winter ceremonies. A negative form of this strategy is the transfer of loss through expropriation of the land or resources of another group by force.


[4] Pooling of risk, or risk sharing: a social method of "insurance" which combines principles of risk transfer with principles of storage, and storage of obligations. In pooling, risk is distributed over a broad segment of the population, so that loss is made more predictable and shared by those in the pool. Small everyday losses—gifts of food, assistance, etc.—are thereby substituted for larger, more indefinite ones, such as weeks without hunting success, prolonged periods of sickness, etc. Pooling of risk can be locally organized through widespread sharing and through individually chosen partnerships of mutual reciprocity, or, it can be centrally organized through giving tribute to a central figure for redistribution. Many hunter-gatherer societies use a form of risk pooling described by Sahlin (1972) as generalized reciprocity, which operates under the terms that he who has gives to him who is in need, donors and recipients alternating, as the conditions of have and have not may be reversed.

Most hunter-gatherer societies used a combination of strategies for reducing risk, some simultaneously, others in different seasons. Still others for managing short-term and long-term risks. Here I will only discuss strategies for dealing with short-term variation, because these have a profound influence on organization and result in a continuum of hunter-gatherer organization which ranges from that of the Kalahari San who rely primarily on risk sharing, to that of the Nunivak who store substantial household stores, to that of groups on the Northwest (Pacific) Coast who use storage in combination with centralized pooling of risk. It should be added that all of these risk-reducing strategies can be linked to Binford's strategies for organization around resources, with individually organized pooling of risk being largely associated with a foraging strategy, and centralized pooling, transfer, and storage being most frequently associated with a collector's approach, and so on.

ARCHAEOLOGICAL IMPLICATIONS

Turning to the archaeological implications of different methods for reducing risk, I will give some brief examples of predictions which can be made about the material correlates of different strategies. I will limit these to societies which deal with short-term risks either primarily through individually organized pooling of risk or through storage, so that they can be linked to Binford's collector-forager dichotomy, making the two approaches more comparable. In future work it will be necessary to develop similar predictions for contents of burials, as well as for the material remains of societies which rely on transfer of risk or centralized pooling. Such strategies may have been much more important in the past among temperate climate hunter-gatherers who were surrounded by societies with more equivalent levels of adaptation than are hunter-gatherers today.

Internal Site Structure

Societies which rely heavily on risk sharing can be expected to have a site layout rather different from those which rely on household storage. This will be due to different intracamp relations in the two systems. Aside from the more obvious features like storage facilities, societies which practice noncommunal storage would be expected to have a more "closed" site plan, i.e., one which has either widely spaced household units or closed-in eating and storage areas, in order to avoid the jealousy and conflict which might arise from one household visibly having more than another. Among those who pool risk and share what is brought into the camp daily, one of the major means of determining who has and who is in need, is an "open" site plan which makes it possible for members of each household to see what the others have brought in and gauge their re-
quests accordingly. Published camp plans from various societies which share widely within the camp, such as those from the !Kung San (Yellen 1977a), the !Ko San (Sbrizny 1976), the Pitjandjara (Tindale 1972), the Bighorn (Williams 1968a, 1968b), the Pygmies (Turnbull 1965), and summer fishing camps of the Pea River Kutchin (Shipilnik 1962), depict an open site layout which allows members of each household to see what others around them are doing at all times of the day. When cold weather does not permit an open plan, other means of assuring visibility of food within the camp are used. Among the Ammassilik Inuit of Greenland, the entire band of 3–10 families inhabits one communal house during the winter (Thalbitzer 1914) and among the Polar Inuit, meat brought into the camp is placed on a communal rack, so that it is visible to all members of the camp (Freuchen 1962; Rasmussen 1905). Published plans from groups which rely on household storage are less common, but those available do indicate both wide spacing of household units and closed-in storage areas (Spencer 1959; Watanabe 1972). Consequently, when it is possible to determine from the archaeological record whether a site plan is “open” or “closed,” one could formulate hypotheses about the principal means of reducing risk associated with the site and test them with independent, but complementary, data.

Distribution of Faunal Remains Within a Site

As can be predicted from the social relations accompanying household storage and sharing, both butchering techniques and distribution of faunal remains appear to differ significantly between societies in which persons share all large game brought into the camp, from those in which a household supplies itself largely from its own stores. Yellen (1977b), developing a theme introduced by White (1953, 1954, 1955), argues that !Kung San butchering practices are for the most part determined by a set of cultural rules, and that differences in butchering practices thus may denote cultural differences, just as might variation in pottery designs or stone tool assemblages. My own observations on !Kung meat sharing support Yellen’s views in that certain kinsmen expect to get parcels of meat and thereby reinforce these “rules.” Close scrutiny of Yellen’s camp plans also indicate that the distribution of faunal remains partially reveals patterns of meat-sharing within the camp, although more often than not such patterns will be obscured by multiple occupations of a site and postdepositional disturbances.

In his thorough study, Binford finds the opposite to be true for both Nunamiat butchering practices and distribution of faunal remains within a site. For butchering he demonstrates that “variability is the name of the game” (1978:37), and that butchering practices hinge on such factors as current needs, future requirements, transport and preservation costs, etc. He argues that the presence and distribution of fauna on a site are the products of the utility index of various anatomical parts of an animal, with low utility parts being consumed immediately and high utility parts being stored. He goes on to suggest that apparent differences between !Kung and Nunamiat butchering practices stem from strategies of sharing, “mapping [parts of an animal] onto persons,” and storage, “mapping [parts of an animal] into different places at different times” (1978:133). Thus, in societies which rely primarily on sharing, one might expect a greater regularity of butchering practices and a distribution of faunal remains which reflects sharing; while among those which rely on household storage, the expectation is for less regular butchering practices and a distribution of faunal remains which reflects a choice of parts for immediate consumption or storage, according to current and future needs.

Intersite Variability

Since Binford’s prediction for greater intersite variability in collector systems is based largely on the premise that more types of collector sites will be visible archaeologically, as a consequence of the bulk of material processed at them, increased intersite variability should also be linked to increased reduction of risk through storage. It might be added, however, that because different settlement patterns can be the result of many variables pertaining to resources exploited and to the means of exploiting them, high intersite variability may not turn out to be a good indicator of a
collector/storage adaptation. Site variability can be produced by a number of factors which are not necessarily linked to a collector/storage system. For example, until recently, the !Kung and other San groups occasionally shot animals from blinds, which were substantial constructions (Brooks 1980; Crowell and Hitchcock 1980), and tracked them the next day, thus adding a field camp/station to their repertoire without changing their basic organization.

Exchange

From strategies for reducing risk, one might predict that among those who rely on pooling, the distribution of exchange items would not drop off directly with distance as it would among those who rely on household storage. This is because, in order to insure that their needs will be met, those who pool risk must integrate themselves into a much wider segment of the population than do those who meet their own needs through storage. Little quantitative work has been done on profiles of exchange over space among hunter-gatherers, but data from the !Kung (Wiessner 1977) indicate that exchange ties do not fall off directly with distance but are often more intense with distant groups who have complementary resources than with adjacent groups who have similar ones. Further work might reveal that among semisedentary groups who rely on storage, exchange ties drop off more directly with distance.

Stylistic Variation in Artifacts

Profiles of stylistic variation can also be expected to vary according to means of reducing risk. Among those who pool risk, an effort is made to blend the individual into the greater population rather than to emphasize household or band identity. The opposite should be the case for those who use private storage within the household or band and thus have reason to function as a unit and emphasize group boundaries. Data from analysis of stylistic variation in !Kung San projectile points (Wiessner 1980b) show that stylistic differences do not occur prior to the emergence of dialect or linguistic group boundaries. In contrast, it is interesting to note that ownership marks are most frequently reported among hunter-gatherers who rely on storage (Spencer 1953, Watanabe 1972).

Implications for Change

During a switch to agriculture, the differences in the changes required between those who rely on storage and those who pool risk are impressive. Those relying on private storage would only have to undergo gradual change in order to become more sedentary and begin food production, while storage is established, strategies for increasing mean income and decreasing the variance around the mean can be one and the same—to produce more. Among those who share widely on a daily basis, however, these two strategies can contradict one another. Because of the terms of sharing relationships, i.e., that he who has given to him who is in need, members of a family which produces more must also give away more to friends and relatives. However, doing so beyond a certain point will not necessarily increase their own security. The change required for those who pool risk to switch to food production is so great that Meillassoux (1973) has suggested that the origins of agriculture might not be found in such societies. His view may be extreme, but it does call attention to the fact that it is not just the switch to agriculture which must be accounted for, but prior to that the origins of private or semiprivate storage. It is also possible that Binford's correlation between low effective temperature and storage can be partially explained by the possibility that hunter-gatherers in more temperate environments in the past, who practiced extensive storage, gradually changed to food production, and only those in societies in which low effective temperature made food production difficult did not change.

It might be added here that in order to gain further understanding of the choice of certain options in different natural and social environments, all of these strategies for reducing risk can and should be put within a framework of adaptation. This issue is beyond the scope of this comment.
However, although Binford does demonstrate some interesting trends about the correlation of storage with low effective temperature and incongruity in resources, I do not think that this correlation between environmental variables on the one hand, and forms of organization on the other, is as straightforward as he suggests. For instance, there is no reason why spatial incongruity in resources is limited to areas of low effective temperature, nor why storage is the best method for dealing with spatial incongruity in resources. Hunters and gatherers may also solve this problem through functional equivalents, such as creating social ties which allow them to "map onto" the resources of other groups, when resources in their areas are low and those in other areas are more abundant. The !Kung, for example, are faced with the problem of incongruity in resources every year, when the most abundant resources are far from water points. However, they do not solve this problem by storing mongongo nuts, but by visiting friends and relatives in other areas, who have more ample resources in a given season, or by falling back on secondary resources (Wiesner 1977; 1980a). Binford himself recognizes these exceptions to the cold climate/storage correlation in mentioning 10 societies which do not conform to his predictions.

Environmental variables, then, can set the bounds within which certain strategies work effectively according to abundance, spatial and temporal distribution, and patterns of variation of resources, but in most environments there are a number of organizational strategies which can fill certain needs. Unless one makes the tenuous assumption that there exists an optimal solution to living in a given environment and that most societies arrive at this solution, it is dubious whether environmental variables can be used to make accurate predictions about organization in prehistoric societies. This point has been well demonstrated by Ingold (1980) who argues that hunting, pastoralism, and ranching are all based on the same animal, in the same environment, and with similar technologies and organization around work, yet with radically different relations of production. Because of problems posed by (1) the optimization assumption, (2) differences in reconstructing past environments, and (3) the impact of surrounding sociopolitical environments as well as the natural environment on organization, I suggest that ideas about the effectiveness of certain organizational forms in given environments are better employed to examine inferences about organization which are derived from patterns of material remains, rather than to predict such patterns.

CONCLUSION

Despite some discrepancies over the role of environmental data in reconstructing past social organization, Binford's approach and mine share a common goal. That is, we both try to specify a spectrum of organizational strategies which hunter-gatherers use to adapt to various environments, and to relate these strategies to regular and predictable patterns of material remains. Certainly Binford's paper provides a stimulating beginning in this direction. But, if this approach is to take us very far, it will be necessary to consider variation in hunter-gatherer organization in the light of strategies used in the entire productive process—those strategies used for organization around resources, as well as those used in organization around other persons in social relations of production. For instance, the addition of risk-reducing strategies to those for organization around resources, as outlined here, provides, for a number of reasons, a more productive framework with which the archaeologist can view hunter-gatherer organization. First, it has the potential to add many more strategies of adaptation to Binford's two categories of collector and forager. Second, the strategies for reducing risk described here differ considerably from one another. This is unlike Binford's forager and collector systems, which he describes as being a graded series from simple to complex, with "logistically organized systems having all the properties of a forager system and then some" (1980:12). Consequently, unlike Binford's hypotheses, the risk-derived hypotheses are usually dichotomous, making them in principle easier to assess with archaeological data. Finally, the consideration of strategies for reducing risk makes a much wider range of data available to the archaeologist, data which are the product of intergroup and intragroup interaction (exchange, style, internal site structure, etc.), rather than direct organization around resources. The use of such information is essential if conclusions are to be well tested with independent data.
REFERENCES CITED

Binford, Lewis R.

Brooks, Alison

Crowell, A. C. L., and Hitchcock, R. K.

Freuchen, Peter

Ingold, Tim

Mellissoulu, Claude

Fidock, Stuart

Rasmussen, Knud
Rogol, R., and I. S. Miller

Sahlins, Marshall

Schrøn, Heidi

Slothouber, Richard

Spencer, Robert F.

Stilp, Wayne

Thalbitzer, William (editor)
1914 The Ammassalik Eskimo, Middelosser om Grønland 40. Copenhagen.

Tindale, Norman B.

Turnbull, Colin M.

Watanabe, Hitoshi

White, T. E.

Weissner, Polly
1980b Stylistic variation in Kalahari San projectile points. Ms. in possession of the author.

Williams, Bobby J.
TOWARDS A RATIONAL NOMENCLATURE IN FAUNAL AND ECOLOGICAL STUDIES

Engelbert Schramm

Two new terms are recommended for the disciplines of faunal and ecological studies in historical perspective. They are congruent with terms in related sciences.

Following their precise comparison of nomenclature, S. L. Olsen and J. W. Olsen (1981) concluded that "Zoarchaeology seems to be the most appropriate term to describe the entire discipline of faunal studies in archaeology."

Nevertheless, I have two objections to the use of "zooarchaeology": (1) the definition by Olsen and Olsen as "faunal studies in archaeology" is unnecessarily restrictive because such studies need not necessarily be done under archaeological auspices; they may also occur in a zoological context. Methods and materials are the same. Some biologists cannot identify themselves with the role of an archaeological scientist and would not accept a label ending in "-archaeology" for their research into the history of animal domestication. (2) "zooarchaeology" and "archaeozoology" are formed from the same roots, and it may be possible to interchange them by mistake. Such confusion would not only be of concern to the general public but would also concern scientific colleagues from many countries where the term "zooarchaeology" is not in use at all.

I, therefore, prefer another term: "palaeo-ethnozoology", which is synthesized by analogy to "palaeo-ethnobotany" ("the study of the plants cultivated or utilized by man in ancient times, which have survived in archaeological contexts [Renfrew 1973:1]")”. The central problem of "palaeo-ethnozoology" is the study of animals which have been bred or utilized by man, or at least have been living within or near human sites in the past. "Palaeo-ethnozoology" provides the linkage between palaeozoology and ethnozoology (the science of domestic animals). This is indicated by the radical words forming the term: "Palaeo" connotes the historical dimension of the discipline, and "ethno" implicates man’s role and the epochal limitation to the Holocene (in which human influence on natural history has become manifest).

In addition, another term may be derived from the same prefixes as "palaeo-ethnozoology" and "palaeo-ethnobotany." This is "palaeo-ethnoscology." The subject of this discipline is the study of the historical interactions between man and nature, and especially of the environmental changes caused by human influence in the past. The ecological situation as modified by human labor cannot be reduced to that of earlier epochs, the regularities of which are studied by palaeoecology. The investigation of the epoch of human natural history needs a distinct disciplinary label, such

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