Archeology as Anthropology: A Case Study

Abstract. *Anthropological inferences, made possible by advances in techniques for collecting data in archeological field work and the processing of data with a computer, permit a comparison to be made between the modern western Pueblos and their prehistoric background. One point in the development of Pueblo social organization (approximately A.D. 1200) is examined and compared with the present.*

Recently, certain archeologists have expressed concern over the few contributions that archeology has made to the general field of anthropology (*1*). A combination of advances in methodology and the adoption of cultural models which focus on cultural processes has resulted in contributions that go beyond mere taxonomy and inventories of stylistic traits. Many aspects of extinct cultural systems (for example, social organization) are not directly reflected in material objects and are therefore difficult for the prehistorian to interpret. This paper indicates one way in which archeology can elucidate some of the features of social life.

Selected data obtained during the excavation of one prehistoric community in eastern Arizona were used to answer questions concerning aspects of its social system. The purposes of this study were: (i) to augment the cultural history of the upper Little Colorado area and to provide a clearer understanding of the role of the region in the prehistoric Southwest, (ii) to demonstrate the value of combining systematic sampling procedures with traditional as well as new methods of data processing (for example, computer processing), and (iii) to make specific contributions to the growing body of anthropological knowledge and theory (for example, to demonstrate the presence of localized matrilineages in the Southwest by A.D. 1200).

In this report I describe the analysis of one community, the Carter Ranch Site, located in eastern Arizona and occupied approximately from A.D. 1100 to 1250. This area today is semiarid with most of its precipitation occurring during the summer months as torrential storms. Palynological studies, which permit inferences concerning the past climate, indicate that there have been no great climatic changes in the past 3500 years. There is evidence that a minor shift in the rainfall pattern, from one of roughly equal winter-summer precipitation to the present pattern (*2*), took place by about A.D. 1000. It was after this shift became pronounced that the Carter Ranch Pueblo was occupied.

By A.D. 1000, the area was covered by a network of small villages (pueblos) consisting of one or two multi-room buildings. By 1250, most of the region was abandoned; very large Pueblo villages were located on two permanent streams in the area. The area was totally abandoned by 1500.

The Carter Ranch Site consisted of 39 dwelling rooms built as a main block with two wings surrounding a plaza which contained two kivas (underground ceremonial structures). A detached Great Kiva (a large ceremonial building built partly aboveground) was situated about 10 meters northwest of the room block. The site was located in a valley containing about 60 sites roughly contemporary with it.

During the course of the occupation of the Carter Ranch Site, ecological pressures became more acute as the shift in rainfall became more pronounced. The cultivation of corn probably became difficult and mutual economic assistance in the form of cooperation between villages would seem to have been advantageous under conditions of such economic stress. The appearance of Great Kivas suggests the development of multi-community patterns of solidarity with a religious mechanism to "cement the ties." In the area's settlement system, the Carter Ranch Site functioned as a ceremonial center and united a number of communities into one sociopolitical sphere.

A series of analyses were undertaken to determine the social system of the community itself. One was a detailed design element analysis of the ceramics from the site. The smallest elements of design, which were defined from more than 6000 sherds, were considered important because they might not have been "in focus" to the potter who might therefore have selected them in an unconscious manner. If there were a system of localized matrilineal descent groups in the village, then ceramic manufacture and decoration would be learned and passed down within the lineage frame, it being assumed that the potters were female as they are today among the western Pueblos. Nonrandom preference for design attributes would reflect this social pattern (*3*).

The distribution of 175 design elements was plotted for the site and was found to be nonrandom, certain designs being associated with distinct blocks of rooms. This suggested the presence of localized matrilineal groups. To test this phenomenon further, the frequencies of the design elements were subjected to a multiple regression analysis on the I.B.M. 7094 computer. This analysis showed that there were three groupings of rooms and kivas on the basis of similarities and differences of occurrence of elements of design on the pottery from the floors. Each group of rooms was associated with a kiva. There were two main groups, one each in the southern and northern parts of the village. A small cluster of rooms in the northeastern portion of the village with an associated kiva was similar to the main block of rooms localized in the southern part of the Pueblo. I interpret this as a group which segmented from the lineage in the southern part and began a separate localized lineage in the northeastern portion of the community.

The various kinds of pottery excavated during 1961 were subjected to a regression analysis (*4*). Nonrandom groups of ceramics appeared to be correlated with certain rooms, suggesting that specific tasks were carried out in particular types of rooms. Rooms of several different types were repeated in each room block. This probably reflects household units housing an extended family or lineage segment. Nonceramic artifacts obtained during the 1961 and 1962 excavations, and ceramic types from the 1962 season were subjected to a multiple regression analysis on the I.B.M. 7094. The pottery types were associated with particular types of rooms, exactly as in the previous analysis. Other artifacts were much less confined in distribution. Each dwelling was used for several functions, with an activity or set of related activities prevalent in each room. This is precisely the pattern of room utilization in the modern western Pueblo household.

One group of ceramics was associated with ceremonial units, such as kivas, indicating that a set of stylisti-

cally distinct vessels were associated with ritual activities. Vessels of these types were also associated with the burials, suggesting grave-side ritual.

A cemetery of three separate areas was excavated in the midden east of the site. In the northern midden were interments that were oriented east-west, whereas the southern midden had burials oriented north-south. An analysis of design elements on the ceramics in the graves indicated that the burials in the northern section of the midden were associated with the localized descent group in the northern part of the village, and that the southern burial area was associated with the descent group localized in the southern portion of the site. The burials in the center of the midden were mixed, both in terms of their orientation and the occurrence of design elements. Almost all of the ornaments and unusual items that probably reflect differences in status, included as grave goods from the entire sample of burials, were from this central area. Likewise, the burials in the central portion of the midden had twice as many vessels per burial as the burials in other areas of the midden. This central cluster of burials probably represents individuals of relatively high status from all localized social groups in the community, buried in a separate section of the cemetery. The importance of the site as a ceremonial focal point suggests that high status would have been earned by individuals through participation in ritual activities rather than acquired through inheritance.

The regression analyses of artifacts reflect a rigid division of labor at the site. For example, weaving implements were found with a male burial indicating that weaving was a male activity, and these items were strongly correlated with artifacts used in ritual activities associated with the kivas. This suggests that weaving was a masculine task and was carried out in the kiva, just as it is today in the western Pueblos. The distribution of tools associated with female activities was quite different from that of items associated with male activities. Most tasks were evidently performed by groups organized according to sex.

These analyses permit comparisons to be made between the modern western Pueblos and one portion of their prehistoric background. The presence of localized matrilineages and lineage segments at the Carter Ranch Site demonstrates continuity for this western Pueblo trait for more than 700 years. A similar pattern for the household as the basic local unit can now be documented. Other stable processes are now demonstrable. These include the basic form of the rigid division of labor and particular activities associated with each of the sexes.

Significant differences can be shown as well. One of the most striking is the change in inter-community integration and a related change in the intra-community pattern itself. Communities made up of from one to three localized matrilineages (probably corresponding to single clans as well) were united through the mechanism of centralized ritual. Strong mechanisms for multi-community integration are not present among the modern western Pueblos.

Related to these changes was a change in the nature of the organization of the community itself. Villages up to A.D. 1300 probably were more commonly composed of single localized lineages. The economic advantages accruing to larger aggregates of people in the face of environmental pressures resulted in the establishment of communities of more than a single lineage after 1300. Strong localized lineages are not conducive to a strong village integration when a village consists of several lineages. I would expect the development of integrative ties that crosscut social groups to develop within the village under these circumstances. These would be such things as the development of societies with strong ritual functions, the breakdown of the association of kiva with clan, and the assumption by the kivas of more village-wide significance (for example, by association with societies). Cross-cutting integrative mechanisms such as these would promote community solidarity at the expense of the disruptive lineage strength, and this is the pattern today among the western Pueblos.

These examples serve to document my case for the potential use of this approach in investigations of prehistoric communities. The method and theory incorporated in this study can be used to advantage in testing hypotheses of reconstruction, as well as for providing background to aid in understanding the development of certain sociological phenomena.

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References and Notes

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2. Palynological studies by Schoenwetter and Hevly under the direction of P. S. Martin, University of Arizona, have yielded data concerning past climatological conditions in eastern Arizona: P. S. Martin, J. B. Rinaldo, W. A. Longacre, C. Cronin, L. G. Freeman, J. Schoenwetter, *Fieldiana: Anthropology* **53** (1962); P. S. Martin, J. B. Rinaldo, W. A. Longacre, L. G. Freeman, J. A. Brown, R. H. Hevly, M. E. Cooley, *Fieldiana: Anthropology*, in press.
3. The first demonstration of a correlation between changes in social organization or residence and the distribution of design attributes used in ceramic manufacture, or both, was made by J. D. F. Deetz (thesis, Harvard Univ., 1960), by utilizing data from the historic period in the Plains. The usefulness of the distribution of design elements as a tool for sociological interpretation in prehistory was first realized by C. Cronin, *Fieldiana: Anthropology* **53**, 105 (1962).
4. This was undertaken, with the aid of Univac, by L. G. Freeman and J. A. Brown, University of Chicago, *Fieldiana: Anthropology*, in press.
5. This study is a result of a series of investigations in eastern Arizona conducted by the Chicago Natural History Museum, directed by Paul S. Martin, chief curator, Department of Anthropology. The full report of the work (W. A. Longacre, thesis, Univ. of Chicago, 1963) contains details of the evidence and methodology which supported the conclusions reported. A great many people aided in this project; I express special gratitude to: L. R. Binford and Fred Eggan, University of Chicago; Paul S. Martin, Chicago Natural History Museum; and John B. Rinaldo, Amerind Foundation, Dragoon, Ariz. Various phases of the project were supported by the NSF and the Wenner-Gren Foundation for Anthropological Research. Martin made a preliminary report of the results [*Science* **138**, 825 (1962)].

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Coenzyme Q: Intracellular Distribution in Rhodospirillum rubrum

Abstract. *Whole cells and cell membranes of* Rhodospirillum rubrum *prepared by lysozyme treatment and osmotic lysis of cells were analyzed for coenzyme Q. All the coenzyme Q was localized in the cell membranes.*

In photosynthetic bacteria, coenzyme Q appears to participate in photophosphorylation (*1*). The cell membranes or ghosts of *Rhodospirillum rubrum* derived from lysozyme treated and osmotically ruptured cells contain the functional photochemical apparatus which catalyzes photophosphorylation of adenosine diphosphate (*2*). Accordingly, such membranes should contain coenzyme Q. The coenzyme has been detected in chromatophores obtained from photosynthetic bacteria (*3*). Its presence in chromatophores, however, does not necessarily mean that it is