Systematic, Intensive Surface Collection

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Source: *American Antiquity*, Jul., 1970, Vol. 35, No. 3 (Jul., 1970), pp. 279-291

Published by: Cambridge University Press

Stable URL: http://www.jstor.com/stable/278339

# SYSTEMATIC, INTENSIVE SURFACE COLLECTION

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ABSTRACT

Archaeologists would agree that the cultural debris lying on the surface of a site in some way reflects what is buried below. However, few attempts have been made to discover just how closely one can predict from detailed knowledge of surface distributions what he will find if he digs.

In October and November, 1968, surface collections based on statistical sampling techniques were made at two mounds in Diyarbakir Vilayet, Turkey. The tabulated data were put into the form of contour maps. We find that study of these maps, singly or in combination as overlays, suggests numerous hypotheses that can be formulated much more precisely than those deriving from the usual intuitive method based on simple inspection of the site surface. Soundings were made to test some of the major hypotheses. The results of the soundings plus subsequent statistical analyses suggest that intensive, systematic surface collection is an extremely useful technique for determining where to dig. It is also highly productive of testable hypotheses relevant to the total interpretation of the site.

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May, 1969

Archaeologists assume, consciously or unconsciously, that there is some relationship between what can be found on the surface of a site and what lies below. However, there is disagreement as to the nature of this relationship: is it systematic and understandable, and thus worth establishing; or is it random and inscrutable and consequently not worth investigating? Despite such uncertainty, the surface distribution of artifacts has long been the major criterion for discovering and delineating sites and for deciding which locations to excavate within sites. This criterion and its underlying assumptions are often intuitive and impressionistic, and are seldom recorded precisely or tested formally. We believe that rigorous specification of the relationship between the surface and subsurface of an archaeological site is practically useful and theoretically significant.

A method of controlled surface collecting will yield data that can make an excavation or regional survey more efficient and productive. At the present time, when excavation expenses are increasing and research designs call for comparative information from more than one site, it is apparent that methods of sampling are necessary. It is possible to excavate a site according to some statistically valid sampling design, but this is very time consuming and often yields little immediately productive information. Further, if there is a coherent relationship between the surface and subsurface of a site – and our data support this – then sampling the site surface will provide data for determining in general outline what is underground. Areas to be excavated can then be chosen more precisely according to one's research problems and hypotheses, in the context of the entire site, with the expenditure of less time and money excavating, than other methods of choice entail. Systematic surface collection can also be used in regional surveys, without excavation, to provide comparative data about the chronological placement and functional nature of various sites. An increasing number of research designs are concerned with demographic interpretations that require the precise area of sites surveyed for each occupation period. This can be best determined by rigorous surface collection.

Hypotheses such as those we have formulated concerning the relationship between surface and subsurface of archaeological sites could enable the construction of a model useful both methodologically and interpretively. A major use of such a model would be to describe the relationship between the appearance of archaeological site surfaces today and the processes, both natural and cultural, that have resulted in that appearance. Once such a general model is constructed and its usefulness is confirmed by diverse test excavations, it can be used to predict underground distributions on the basis of surface sampling. Complete collections from selected surface areas, followed by test excavations, will allow us to determine those variables and parameters of the surface distributions which are of greatest significance for predicting subsurface conditions from surface data. From this data we can infer the prehistoric activities that resulted in the artifact patterning and associations found.

We wish to delineate groupings of material objects resulting from the prehistoric activities which took place in the various areas of the site. The primary variables determining this pattern are the depositional and erosional processes that have been operative at the site. These depend on both natural and human agencies and on the topography of the site itself. Wind and water can order, winnow, or redistribute debris. The number of culture periods, phases, or occupations represented at the site is important. Later occupations can partially or totally cover earlier ones so that only a small portion of the surface distribution represents the earlier habitations of the site. Later people or animals can dig up areas of the site exposing large quantities of artifacts from the earlier levels, thus mixing assemblages. Later cultivation can reshape the distributions. Differential deposition and erosion have a marked effect on the quantities and distributions of the artifacts on the site surface. Each of these factors must be noted and assessed at least in a general way when the surface distributions are being interpreted.

The hypothesis basic to the construction of our model is, in summary: *Surface and subsurface artifact distributions are related so that a description of the first will allow prediction of the second.*

In order to test this hypothesis, we developed a method of surface collection which is reasonably efficient, yet gives the full range of variation across the site and is statistically reliable. The general outlines of this technique follow work done by Binford in southern Illinois and Whallon in Turkey (L. Binford *et al* 1966; Whallon n. d.; Whallon and Kantman 1969).

## SITES AND SAMPLING PROCEDURES

Our study was made at two prehistoric mounds in southeastern Turkey. These sites from which we collected intensive, systematic samples are low, featureless mounds about 250 meters in maximum extent and four to five meters high. Both are located on agriculturally productive plains a short distance from seasonal streams and within view of the mountains. The generally earlier site of Çayönü was test-excavated in 1964 and appeared to be preceramic, with radiocarbon determinations of about 7000 B.C., though some pottery was known to be present on the surface. Girik-i-Haciyan, the second site, represents a village of the Halafian period and probably dates to about 5000 B.C. Both sites had been cultivated with draft animals and wooden plows for an unknown but probably lengthy period of time. The fact that the mounds are under cultivation presents a problem, but we do not feel that it seriously affected our results. These plows cut furrows only ten to twelve centimeters deep. Though there is probably some lateral displacement, we do not believe it to be very great: calculations based on a random walk simulation (Haggett 1965:308) suggested that even with three thousand plowings movement would be five meters or less. Three of the squares collected were split by field boundaries, yet statistical comparison of the collections from each half showed that they were from the same population. The results of these two tests, together with the fact that the artifact distributions did not follow the field boundaries, convinced us that plowing has not substantially changed the statistical patterns of artifact distribution.

Our immediate purpose in collecting from the surface of these mounds was not simply to discover the range of variation in cultural debris from each site, but to discover any distributional patterns present. We would then be able to formulate testable hypotheses concerning the subsurface content of the sites.

The essence of this surface collecting method is to make the collection systematically. That is, one must decide what proportion of the surface to collect; and from those areas he must pick up, or record, everything relevant to his research problem. This may be coupled with qualitative assessments of, or collections from, the remainder of the site. We feel that it would also be highly advantageous to utilize some of the various magnetometer and resistivity prospecting methods for locating structures, although we did not have access to such equipment. In any case, only systematic, intensive collection will justify quantitative comparisons of artifact frequencies between different areas within a single site. For most sites this means that a sampling procedure is necessary (Deming 1950; Berry and Baker 1968). Only if the sample is drawn properly can one extrapolate from it the pattern of surface artifact distribution over the entire site. There is a real question as to whether the additional data and reliability obtained is worth the extra effort involved in these methods. There are many different types of probability sampling designs available to the archaeologist and no one method is best for every problem. One must formulate his research design and procedures with the marginal value of his time and effort in mind. We feel that quantitative information concerning artifact distributions is of great value in solving certain problems and consequently is worth considerable time and effort.

For each site we defined a grid of squares, each square five meters on a side or 25 square meters in area, as the population of sampling units. We decided that 10 percent of the squares would be collected, each completely. Considering the size of these two sites, we concluded that a 10 percent sample of their surfaces would give us sufficient statistical reliability without requiring an excessive amount of work. Intensive collection is necessary because some of the most important information is derived from the relative proportions of artifacts, which can be calculated reliably only if each area is sampled completely. For the first site, Çayönü, we chose a 10 percent simple random

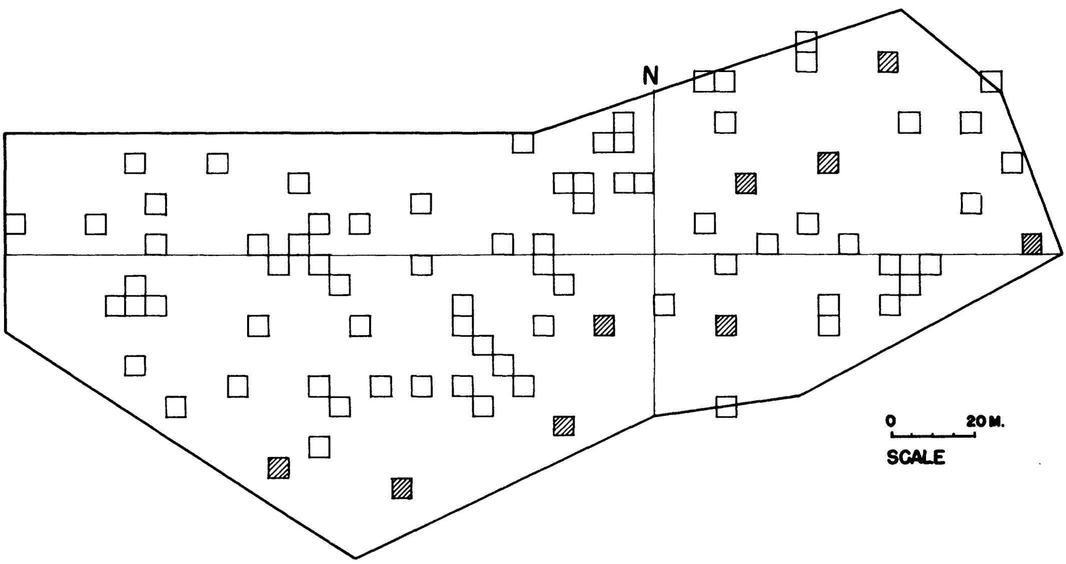


Fig. 1. Çayönü, random sample of five-meter squares collected. Hatching indicates the nine additional squares not included in the random sample.

sample of the squares (Fig. 1). A random sample has the advantage of eliminating human bias in selecting the areas to be collected; each square on the entire site has an equal chance of being chosen and collected. The random sample had one great disadvantage for us, however, because our purpose was not simply to obtain a single picture of the entire assemblage, but to trace its variation and distributional patterns across the site. In the sample we chose, as in most random samples, there are areas where the test squares cluster, and other areas with no test squares at all. Intuitively we felt that leaving large areas with no test squares would defeat our purpose of defining distributional patterns. Simple random sampling has a further disadvantage in that it forces one to define the boundaries of his site before beginning work.

In order to fill the gaps left by the random sample at Çayönü, we arbitrarily selected nine additional squares in large vacant areas. These additional squares are shaded on the map (Fig. 1). This gave us more confidence in the distributional validity of our sample, but we did not, of course, include the tabulations from these squares in the computerized statistical manipulations described below.

The sampling design used on the second site, Girik-i-Haciyan, eliminates the main disadvantages of the simple random sample, but retains its unbiased nature (Fig. 2). It is a "stratified unaligned

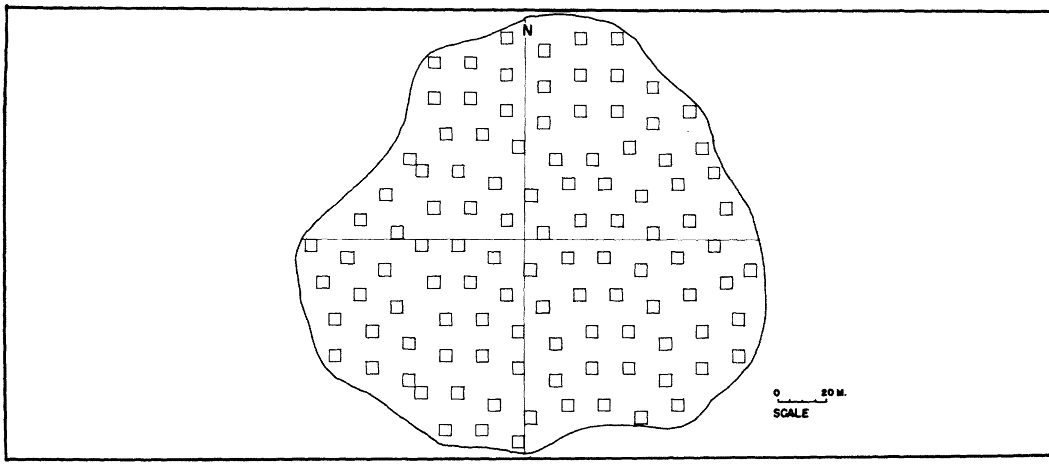


Fig. 2. Girik-i-Haciyan, stratified unaligned systematic sample of five-meter squares collected.

systematic" sample, as described by geographers Berry (1962) and Haggett (1965). We recommend its use in archaeological situations where maximally spaced areal sampling is desired. This system involves the selection of coordinates along both axes of the site grid from a random numbers table. The squares to be collected are generated by these coordinates. One square is chosen in each stratified unit of nine squares, which insures that no areas are left unsampled, that there are no blocks of squares face to face, and that the system is unaligned in any manner; moreover, one need not define the boundaries of the site before beginning work. For these reasons we felt that this was the best sampling procedure for our research problem.

The important factors in the actual collection of the artifacts are efficiency, completeness, and consistency. Effort was put into making the collecting of samples from each square as uniform as possible. Collecting teams were matched as to their capabilities, and speed was sacrificed in favor of completeness. The collections yielded over 15,000 items from each of the two sites.

## PRELIMINARY ANALYTICAL PROCEDURES

The classification of collected artifacts is also very important; each researcher must adjust his typological scheme to his research design and problems. The artifact typology is the conceptual framework through which data are viewed and leaves its imprint on any interpretation. Many variables affect the forms of artifacts, but we were basically interested in only two: those from which one can infer temporal units, and those that define patterns of cultural debris from which one can infer functionally specific activity areas. Our categories are gross divisions of cultural debris that we believe might show distinct patterning over functionally different areas. We hypothesized that temporal units can be differentiated from functional units by fossil indicators. Caution was exercised in the actual separation of artifacts to make all tabulations consistent. Eventually we found it best to have several people do preliminary sorting, but to have only one person make the final decisions.

Another crucial stage in this analysis is the representation of the data in an understandable manner. Once again, these procedures should be formulated in accordance with one's research design and problems. We used normal cartographic procedures for displaying density of variables by making a series of about 20 contour maps of artifact densities for each site. Because of the uncertainties involved in our method, which at that time was untested, we decided to compensate partially by not interpreting our data to its statistical limits, that is, by drawing fewer contours than is usually permitted. In addition to density maps of the numbers of each type of artifact in each square we drew several maps of the ratios between artifact categories. The ratios standardize differences in quantities of artifacts and deal only with their proportions. All of these maps can be looked at singly to determine distinct areas of indicative artifacts, but we found that a more useful technique is to overlay two or more distribution maps in a primitive form of cluster analysis. In this way we were able to find categories that vary together and to check what variables contribute to each distinct area.

## HYPOTHESES

We derived hypotheses from these maps and tested them with excavations. For example, the distribution map of the total cultural debris on Çayönü shows two general areas of very high artifact density (Fig. 3). The area in the northeast quadrant of the site coincides neatly with the

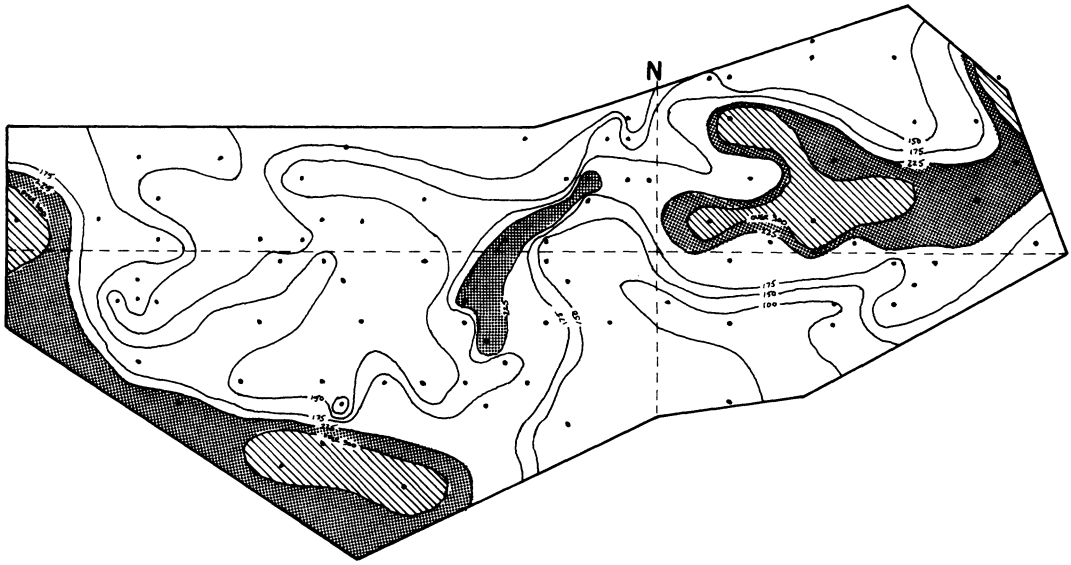


Fig. 3. Çayönü, density of total cultural debris.

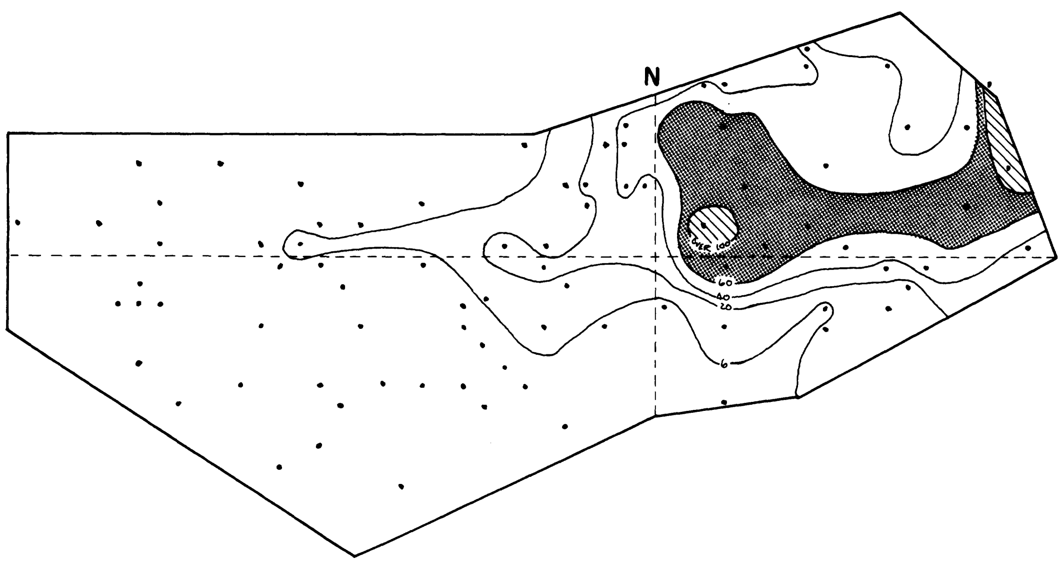


Fig. 4. Çayönü, pottery distribution.

pottery distribution on the mound (Fig. 4). We placed a five-meter test square (Test 1) on one end of this area close to the previous season's excavations. The first 50 centimeters of this square yielded no features, but about 10,000 potsherds. Below that was a stone slab coffin containing very characteristic late pottery.

The second high density area at Çayönü lies on the southwestern perimeter of the site where there is a concentration of flint, especially flint blades, and a complete absence of pottery (Fig. 5). Hoping to find an earlier level near the surface, we put two four-by-six meter trenches there (Tests 2 and 3). Large quantities of flint blades and tools were found, as well as the remains of an architectural complex only 50 centimeters below the surface. One of the structures and the accompanying assemblage are very similar to a building found nearly two meters below the surface in the center of the mound during the 1964 season. Thus, by relying on the results of the surface survey, we were able to excavate a building from the earlier period of the mound, yet had to remove less than one-third as much overburden.

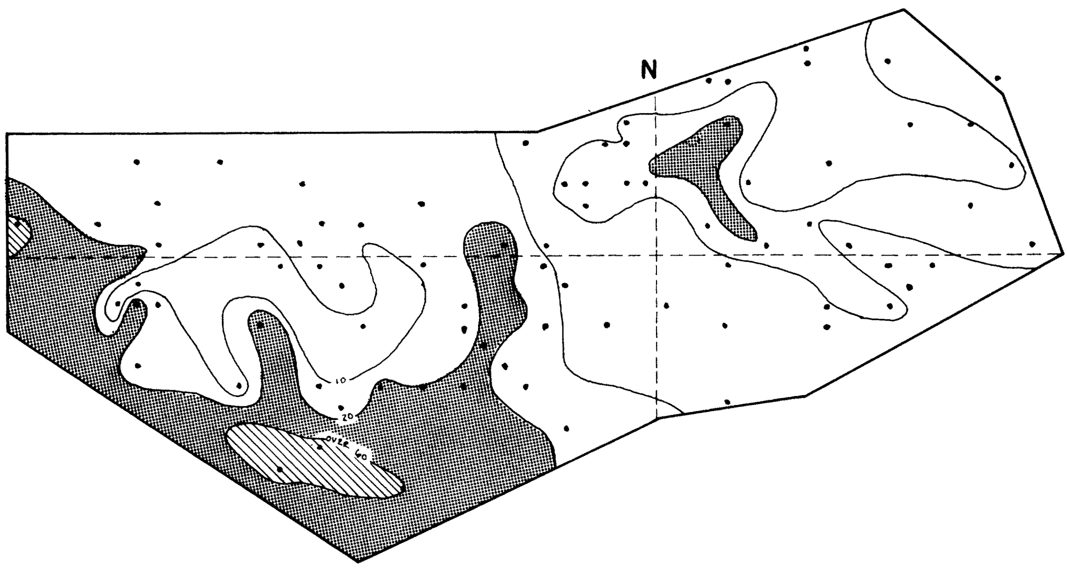


Fig. 5. Çayönü, flint blade distribution.

The artifact distribution maps of *Çayönü* suggest other interesting hypotheses that we have not yet had time to test by excavation. One association of categories that is apparent from superimposing the maps is the similarity in the distribution of bone splinters and obsidian blades. Another association shown by the density maps is the generally higher ratio of obsidian to flint in squares high up on the mound than in the area around the western base of the mound which is probably earlier in time (Fig. 11). Both of these associations suggest hypotheses concerning the functional or chronological relations of artifact types that reflect aspects of the subsistence adaptations of the prehistoric occupants.

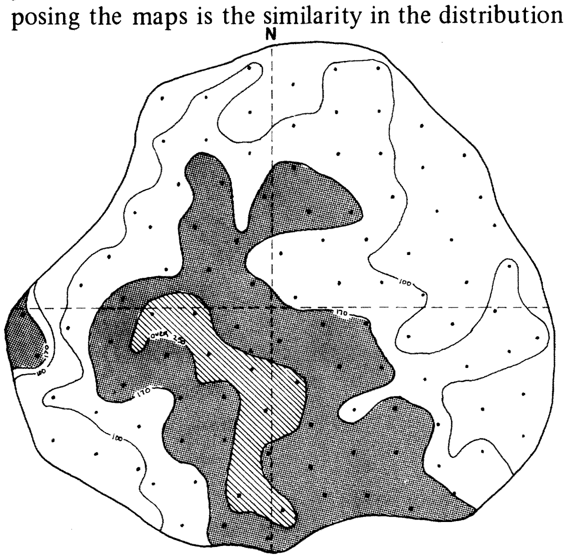


Fig. 6. Girik-i-Haciyan, density of total cultural debris.

The surface distributions on the second site, Girik-i-Haciyan, are somewhat more subtle and consequently more difficult to interpret. The immediate impression is of a unimodal locational distribution in more categories than at Çayönü (Fig. 6). For many categories, the Çayönü distributions are distinctly bimodal, a fact which probably reflects the two different occupations. These would stand out more prominently than would functionally specific areas within the same general total occupation. Hence, at Girik-i-Haciyan we relied more heavily on the ratio maps. We found that the area of very high density of total cultural debris has proportionately very little painted pottery (Fig. 7). In another area of moderate total density, we found a high proportion of painted pottery and a high ratio of total chipped stone to total pottery (Fig. 8). Study of other categories seemed to substantiate the distinctiveness of these two areas, and a five-meter square was dug into each (Tests 4 and 5). The Girik-i-Haciyan maps showed a third area, intriguing because it is high on the mound but shows low artifact density, so we placed a five-meter square in this location (Test 6, center of Fig. 6). Though there was insufficient time to complete the test excavations on this site during the 1968 season, the results from the three test squares reflect the surface distributions quite well (Table 1).

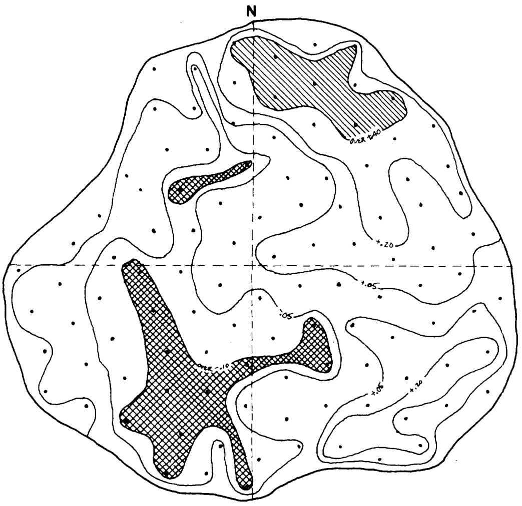


Fig. 7. Girik-i-Haciyan, ratio of painted to plain pottery. Hatching means relatively more painted ware; cross-hatching means relatively more plainware.

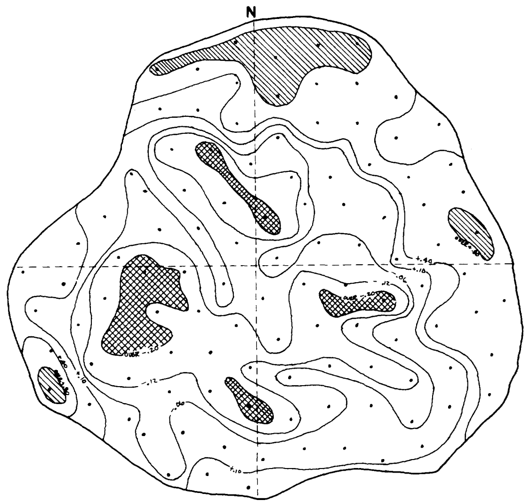


Fig. 8. Girik-i-Haciyan, ratio of chipped stone to pottery. Hatching means relatively more chipped stone; cross-hatching means relatively more pottery.

As mentioned above, the three key variables utilized for locating the three squares to be excavated on this site are the ratio of painted pottery to plain, the ratio of total chipped stone to total pottery, and the difference in absolute quantities of material. The excavated materials from each of these squares maintain the same ranking as the surface collections with respect to each of these key variables, though the percentages do not correspond exactly. It is not claimed that if a researcher makes a controlled surface collection only of the square to be excavated that he will be able to predict what will be found in that excavation. But it is asserted that the systematic sampling of a large area of a site or, preferably, of the entire site, will allow prediction of what excavations would yield in one area *vis-a-vis* what they would yield in another.

We also became interested in the possibility that areas of relatively high surface concentrations of artifacts might reflect subsurface conditions resulting from disturbance, from certain specialized activities, such as flint knapping, or from dumping. Conversely, areas situated fairly high on a site, though not on steep slopes, with relatively low surface concentrations of artifacts, might be related to undisturbed subsurface conditions likely to yield *in situ* architecture. Excavations to explore these possibilities were initiated. Of the three test excavations on each site, the square with the highest surface yield had the fewest remains of intact features, and the square with the lowest surface yield had the most remains of intact features directly below the surface. These preliminary results are confirmatory, and will permit us to define the propositions more precisely as hypotheses. We can then test them more rigorously during succeeding field seasons.

Table 1. Correlation of surface collections with excavated materials. The Çayönü materials have 13 degrees of freedom and the Girik-i-Haciyan have 20 degrees of freedom.

| Site/Square/Level | | Pearson's r | Robinson-Brainerd |
|---|---|---|---|
| Çayönü: Surface to Excavated | | | |
| Test Square 1: | 0 - 20 cm. | .9 | 174 |
| | 20 - 35 | .9 | 183 |
| Test Square 2: | 0 - 15 | .9 | 174 |
| | 15 - 45 | .7 | 156 |
| | 45 -150 | .6 | 139 |
| Test Square 3: | 0 - 15 | .9 | 177 |
| Çayönü: Surface to Surface | | | |
| Test Square 1 with 2 | | .3 | 102 |
| Test Square 1 with 3 | | .2 | 91 |
| Test Square 2 with 3 | | .9 | 167 |
| Girik-i-Haciyan: Surface to Excavated | | | |
| Test Square 4: | 0 - 15 cm. | .9 | 185 |
| | 15 - 35 | .9 | 169 |
| | 35 - 55 | .9 | 161 |
| | 55 - 75 | .9 | 159 |
| | 75 - 90 | .9 | 162 |
| | 90 -110 | .9 | 170 |
| | 110 -120 | .9 | 170 |
| | 120 -130 | .8 | 130 |
| | 130 -150 | .5 | 97 |
| Test Square 5: | 0 - 25 | .8 | 149 |
| | 25 - 45 | .7 | 139 |
| | 45 - 65 | .6 | 123 |
| | 65 - 80 | .5 | 102 |
| Test Square 6: | 0 - 20 | .9 | 159 |
| | 20 - 40 | .9 | 156 |
| | 40 - 60 | .9 | 169 |
| | 60 - 80 | .9 | 146 |
| | 80 -100 | .9 | 118 |
| | 100 -115 | .9 | 144 |
| | 115 -130 | .9 | 131 |
| Girik-i-Haciyan: Surface to Surface | | | |
| Test Square 4 with 5: | | .6 | 114 |
| Test Square 4 with 6: | | .9 | 146 |
| Test Square 5 with 6: | | .7 | 121 |

## COMPUTERIZED ANALYTICAL PROCEDURES

All the analysis described above was done in the field during a relatively short period of time, with minimal equipment. We were able to formulate hypotheses and locate our test excavations according to the results of the surface collections. Our procedures were designed to give immediate results with a minimum amount of time spent in analysis. After returning from Turkey, we continued the analysis of our data with computer aid at the University of Chicago.

The tabulated artifact frequencies from each square on both sites were standardized in a variety of ways and submitted to a Data-Text program. Separate programs were run on each site using the raw counts of artifacts, then the percentages of the artifacts in each category, and finally – for the excavated material from Girik-i-Haciyan – the frequencies were also standardized by the volume of earth moved. We found, as expected, that differing methods of standardization lead to significantly different results. We believe that the solution to this important problem is not to be found solely in mathematical complexities, but in the underlying assumptions an archaeologist makes about groups of artifacts found in a sampling unit. If one considers those groups of artifacts found geographically together as an open-ended array, that is, one which can receive additional members without changing the original relationships, then using the raw counts seems logical. On the other hand, if one views a group of artifacts as a rigidly structured closed array where the addition of more members changes the original relationships, then some sort of standardization, such as percentages, would represent the situation better. These suggestions are not meant as definitive solutions, but are included to encourage open dialogue on what is a very serious problem for those using sophisticated statistical methods in archaeological analysis (cf. Cowgill 1968a, 1968b; Freeman, Brown, and Thomas 1968).

The data were manipulated in a variety of ways, yielding basic statistics, frequency distributions, a correlation matrix, and a principal components factor analysis with at least two rotations of each of the factor solutions.

Our purpose in using the computer was three-fold. First, it would give us certain useful statistics concerning the distribution of the artifact categories. One of these – the coefficient of variation – supported our notion, in a numerical way, that there is more variation across the surface of Çayönü than at Girik-i-Haciyan. Second, we wanted to see whether the relative proportions of artifact categories covary in a meaningful manner. This would support our proposition that the surface distribution can yield culturally significant information. From the correlation matrix of Çayönü, for example, bone splinters covary with obsidian blades and pieces of shell. Flint blades covary with flint core renewal flakes and flint cores. On Girik-i-Haciyan the various types of flint are found to vary together and separately from obsidian and pottery. Plainware bowls and painted bowls vary together and independently of plainware jars and painted jars which vary together. At this stage in the investigation, we do not accept these correlations of surface distributions as confirmed relations, capable of reliable cultural interpretation. We regard them rather as hypotheses that can be tested by future excavations.

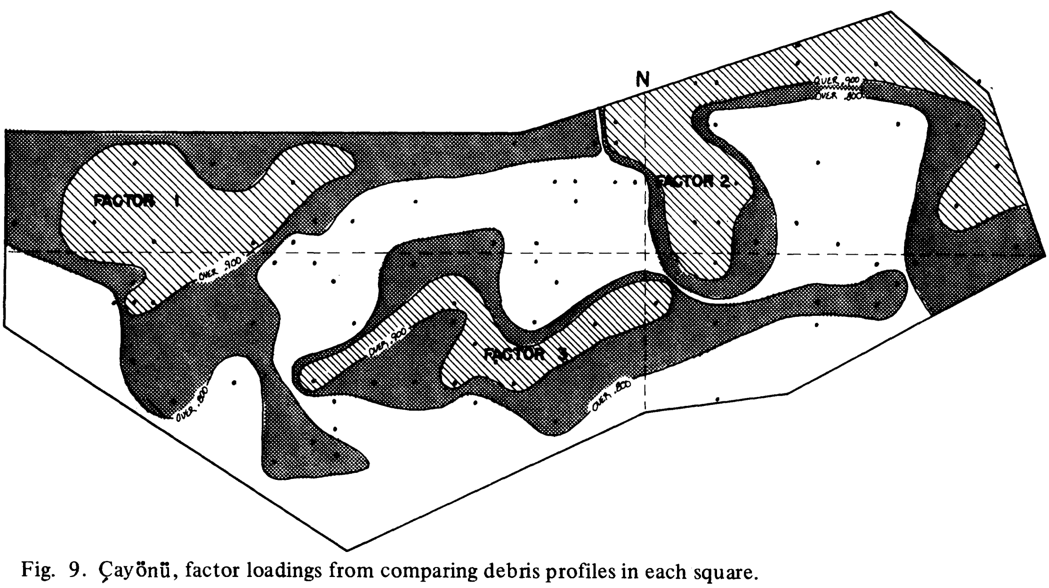


Fig. 9. Çayönü, factor loadings from comparing debris profiles in each square.

The third reason for using the computer was to see whether factor analysis yields more meaningful units for use in examining the surface distributions than does our typology of individual artifact categories. The stated purpose of factor analysis is to explain relationships among numerous variables in terms of simpler relations (Cattell 1965). This is done by creating a smaller number of hypothetical variables, or factors. By comparing the assemblages from each square at Çayönü, the varimax rotation yielded three basic factors (Fig. 9): 1) flint waste flakes, utilized flakes, and blades; 2) pottery; and 3) bone splinters and obsidian blades. The Çayönü material was reanalyzed by comparing variable categories to each other and yielded seven factors. The three most important factors are mapped on Fig. 10. The new insight this produces is the separation of what we have been referring to as the "Flint Area" into two distinct zones on the west edge of the mound (Factors 1 and 3). Factor 1 is characterized by flint waste and utilized flakes and cores, while Factor 3 represents flint blades and core renewal flakes. Factor 2 is obsidian blades and flakes. Although we have just begun to study this material, the results of these factor analyses have added confidence and further refined the hypotheses we formulated concerning the surface distributions on these two sites.

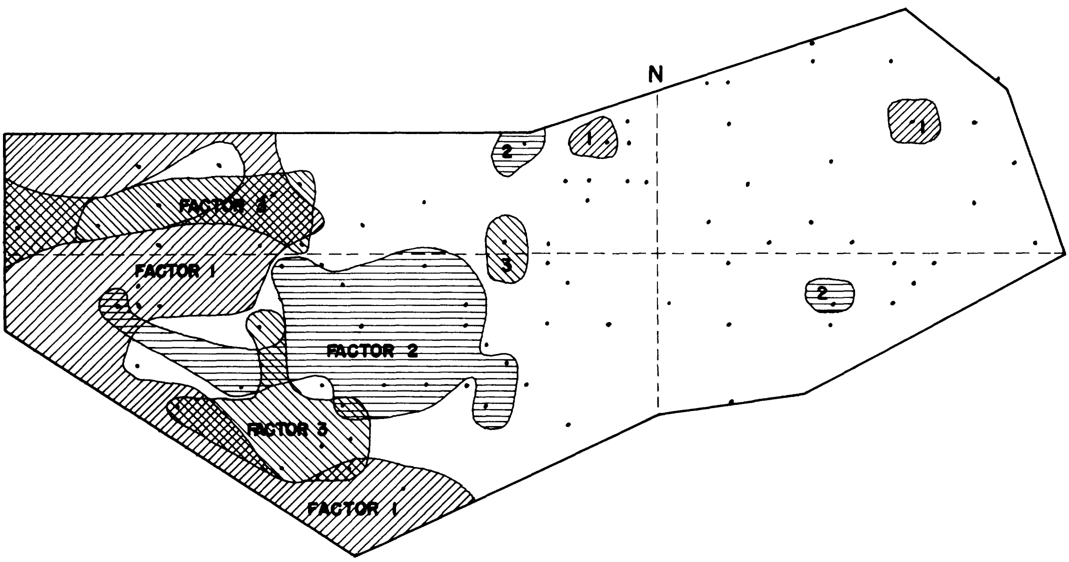


Fig. 10. Çayönü, factor scores from comparing distributions of pairs of variables.

Fig. 11. Çayönü, ratio of total obsidian to total flint, contour map. Original 52" x 30" map produced by SYMAP computer program. Darker symbols mean relatively more obsidian.

In an effort to standardize our mapping procedures and to be more rigorous in defining limits, we utilized the SYMAP computer program to draw several contour and proximal maps of the artifact distributions on Çayönü. The advantage of using a computer to print the density maps is in the versatility of the instructions it can incorporate and the more exacting procedures it uses in constructing the maps. The computer prints a darker symbol for higher values. The contour maps are based on the assumption of a continuous distribution of the value of a variable between two data points. Hence, the value of each point on the map is found by interpolating from the surrounding data points (Fig. 11). Construction of a proximal map assumes a discontinuous artifact distribution, and the value of each point on the map is given the same value as the nearest datum point (Fig. 12). Both types of maps are valuable in generating hypotheses if utilized in the appropriate situations. Though these maps are very rewarding, the expense involved in getting sufficiently detailed maps limits the use of this program to the most important distributions.

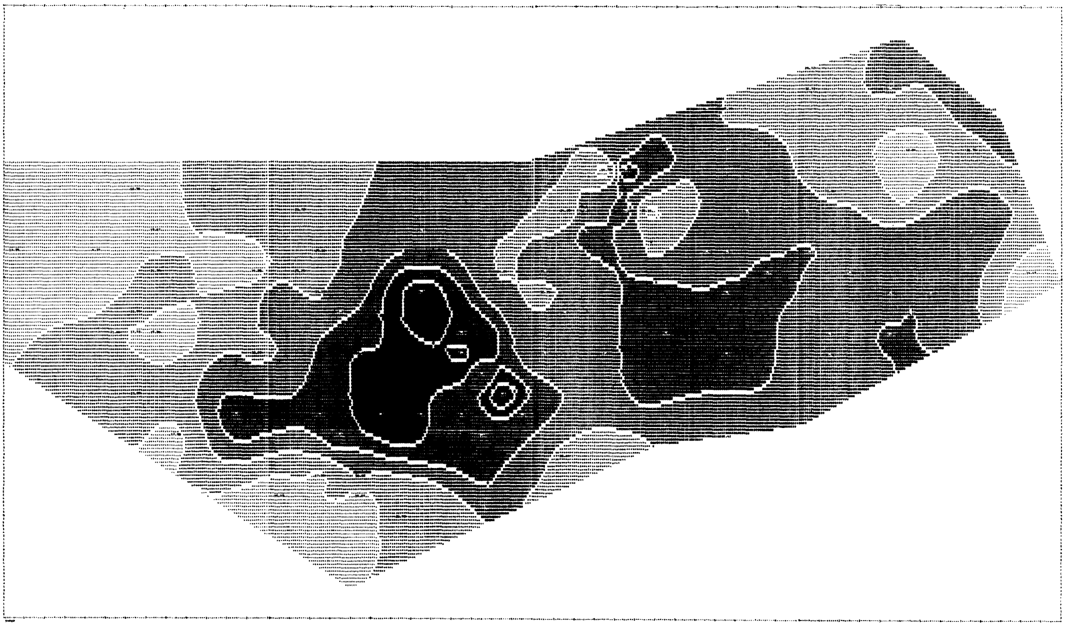

Fig. 12. Çayönü, ratio of total obsidian to total flint, proximal map. Original 52" x 30" map produced by SYMAP computer program. Darker symbols mean relatively more obsidian.

## RESULTS

Our primary general hypothesis for the two sites in question is:

I. The surface distribution of artifacts on an archaeological site is significantly related to their distribution in the subsurface matrix of that site.

We undertook formal tests of a more specific form of this hypothesis:

I.A. The proportions and kinds of different artifacts distributed on the surface are *directly* related to their distribution in the subsurface matrix in any circumscribed area.

At the same time we were interested in testing how rapidly this correlation between surface and subsurface distributions decreases with increasing depth. For the actual testing of these hypotheses we specified certain key artifact types and their ratios which we felt characterized each area and should also be found in the excavation. This involved the presence or absence of pottery, the ratio of plainware to painted ware, of chipped stone to pottery, of flint to obsidian, and other associated groups of artifact categories. The results of this season's excavations, as far as they have been analyzed, have confirmed our hypotheses for these two sites (Table 1).

In order to compare the assemblages from the surface of each square with the excavated levels both a Q-Type Pearson's Product-Moment Correlation Coefficient and a Robinson-Brainerd Agreement Coefficient were computed (Downie and Heath 1965; Robinson 1951). The results are shown in Table 1. The Pearson Coefficient is a powerful measure of linear correlation, but must be used with caution in a situation like this. To use this statistic one must make various assumptions concerning the nature and distributions of the artifact populations that are not proven before the work begins. Because of this uncertainty, we calculated the coefficient to only one decimal place. We also suggest that the strength of association displayed by the coefficient be regarded as a relative measure instead of a precise one with exact levels of significance.

Though the degree of correlation varies from square to square, in all six cases the first fifty centimeters are almost identical to the surface collection (Table 1). Below this, the degree of correlation depends largely on how rapidly the subsurface assemblages themselves change. It would be hazardous to generalize these results to other sites, but our hypotheses are confirmed here, and we believe that if the natural and human variables mentioned above are taken into account, then similar significant relationships can be found in a wide variety of situations. We believe that the particular series of events represented by each site can be subsumed under a general model. Limitations lie not in the nature of the data at any given site, but in the approach utilized and in the rigor with which it is applied. Ultimately it would be possible to develop a general, multivariate model of the relationships between the surface and subsurface distributions of artifacts that could be utilized, in some form, to locate excavations in a wide variety of situations on diverse types of ancient sites.

In conclusion, we emphasize the value of data gained from systematic, intensive surface collection as an aid to problem-oriented research designs and to the knowledgeable excavation of low, featureless mounds like Çayönü and Girik-i-Haciyan. The only alternatives are very rough criteria for deciding where to dig based on subjective evaluations of artifact distribution, site center, etc. Plotted surface distributional data reveal the most interesting and significant areas of a mound in a way that cannot be duplicated by casual, unsystematic inspection. Our surface distribution maps are immediate and continuing sources of hypotheses concerning the distribution of subsurface cultural debris and thus of hypotheses concerning the nature of the prehistoric communities responsible for the two sites. Use of this method (wherever feasible), or of some modification of it, contributes to the efficiency and effectiveness of archaeological research and broadens the scope of problems that can be investigated by archaeologists.

*Acknowledgments.* This is a revised version of a paper presented at the 34th Annual Meeting of the Society for American Archaeology, Milwaukee, Wisconsin, May 1, 1969. Our work was done under the auspices of the Joint Prehistoric Project of Istanbul University and the Oriental Institute of the University of Chicago, and was financed by a Ford Foundation student training grant and by National Science Foundation Grant GS-1986. The necessary computer time was provided by the Department of Anthropology, University of Chicago. We would like to thank the Directors, Robert J. Braidwood and Halet Çambel, and the entire staff of the Joint Prehistoric Project for their advice and assistance. We are grateful to Robert Whallon, Jr., and to Geoffrey Clark who helped in the original planning of this study, and to Richard A. Watson and Robert McC. Adams who made helpful criticisms and suggestions on an earlier version of the manuscript. However, we alone are responsible for the final result.

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