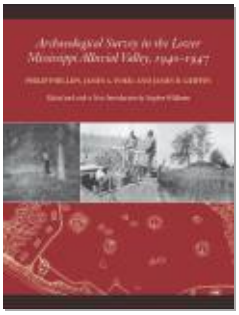
Archaeological Survey in the Lower Mississippi Alluvial Valley 1940-1947



Philip Phillips, James A. Ford, James B. Griffin, Albert Gordon, Paul Gebhard, Donna Dickerson

Published by The University of Alabama Press

Section V
SERIATION ANALYSIS OF POTTERY COLLECTIONS

SERIATION ANALYSIS OF POTTERY COLLECTIONS

Assumptions

NOW the 346,099 sherds from 383 sites, collected by the Lower Mississippi Survey and duly classified as described in Section III, could be stored away in cabinets and forgotten for the time being. The data was safely on paper and time would heal our wounded consciences and dim our suspicions that at several points our classification was less than perfect. During the winter of 1947 Phillips turned to the problems of physiography, and the identification of historic sites; Griffin began the description of pottery types; and Ford started work on analysis, assisted and checked at every point by his somewhat fearful colleagues.

The basic assumptions which served as a foundation for the analytical procedure need to be stated in some detail. They will help to explain the procedure followed and it is hoped will prevent the reader from accepting the conclusions in an any more "positive" sense than the writers intend. We consider these assumptions as a set of probabilities which lead to conclusions that are our best guesses. Not that we intend to apologize for this admission. This we think is the real method of science. We are trying to expose our limitations and are not setting out to *prove* anything beyond all doubt.

A. In the portion of the Mississippi Valley which was surveyed and for the greater part of the span of history which is being studied, the aboriginal people were presumably agriculturists. The population was rather numerous, as will be shown later, and was collected in small villages. For these reasons it seems reasonable to think that there was comparative stability of peoples. These Indians did not wander as did the historic Indians of the Plains and, from the archaeological evidence, there seems to have been little or none of the frantic shifting of tribes that marks the post-contact history of the Eastern Indians. We are assuming then until the evidence indicates the contrary that the people who carried the cultural traits we are studying were probably relatively stable geographically and that for the most part population changes were slow gradual ones.

B. While the prehistoric populations were comparatively stable in the larger geographic sense, this does not appear to have been true of the great majority of village sites. Some sites were inhabited throughout the time span which is being studied. Most, however, were occupied for a short time in proportion to the entire chronology. This assumption was based on archaeological experience in other parts of the Southeast and on a preliminary glance over the collections gathered in this Survey. The condition seems to be due to the limitations of the agricultural methods and equipment of the Indians. After a field had been cleared and used for crops for a few years, the grass and weeds probably moved in and took over. With the inefficient tools which the Southeastern Indians had, control of this vegetation very likely became so difficult after a few years that it was easier to ring and burn trees for a new field than it was to continue planting in the old one. In the course of a few decades, when all the desirable agricultural land in the vicinity of a village had been opened up to weeds in this fashion, the village would have to be moved to a new location.[1] This was the practice of the Southeastern tribes in the early Historic Period before they acquired plows, and such names as "Chickasaw Old Fields" and "Tuckabachee Old Fields" undoubtedly refer to such weed-grown abandoned land.

The securing of short time-span collections is essential if the method of seriating of surface collections is to be successfully applied. For this reason, careful attention was paid to the combinations of sherd material which were gathered from various parts of each village site. In the course of field work, where it was evident that one portion of a site yielded a different complex from that found on another part, two or more separate collections

[1] Linton, 1940, pp. 37–40.

were made. These were labeled "A," "B," etc., and were treated all through the course of analysis as though they came from different sites. A cross section of the ceramic styles in vogue at these different sites at one instant in time would have been the ideal material for seriation purposes, but that, of course, is an unattainable goal.

C. The third assumption has already been stated in the foregoing section on ceramic classification. Until the evidence suggests differently, we are assuming that in any large area cultural continuity in both time and space is to be expected as the normal state of affairs. A gradual change of feature with the passage of time and across the area, when it is viewed on any one time horizon, was our very idealized concept of the cultural history with which we are dealing. This does not mean that we did not anticipate the possibility of finding evidence of (1) the replacement of one population bearing a certain variety of culture by another population having entirely different customs; (2) the replacement of cultural features through acculturation from sources outside the region in which we are working; or (3) the specializing of cultural complexes in certain regions due to their being protected from the prevailing patterns of the area as a whole by such factors as geographical isolation, peculiarities of population distribution, linguistic barriers, or political groupings. These conditions were some of the things of which we expected to get hints from our study.

So we did not begin our analysis with any assumption that changes in ceramics, such as the shift from clay- to shell-tempering, necessarily indicate any abrupt cultural or population replacement. If the refuse deposits of the two time periods really should have a layer of clean white sand separating them after the classic model of stratigraphy, we wanted to be shown by the evidence.

D. Our fourth basic assumption has also been stated in the discussion of ceramic typology. We are assuming that each of our pottery types is a more or less sensitive instrument for measuring cultural change with the passage of time and distribution over space. We are a little complacent about this assumption and feel that we are on fairly certain grounds because we went to great pains to set up and adapt each type for exactly those purposes. Rearranging, merging, and splitting of type groups were guided by preliminary analysis and the resultant information about chronological relations.

However, as has been made clear in the type descriptions, all of the types are not equally well adapted for this purpose. Because of the practical difficulties of making distinctions, some of the types, especially the undecorated ones, include material that represents long spans of time and large amounts of area. In other examples we are aware that the original concepts have changed during the classifying so that the resultant categories are somewhat broader than would have been desired. Mazique Incised is an example of this latter kind of type weakness. Despite this, we feel that we are fairly aware of this factor and thus have it under reasonable control.

E. The next point to be considered is not a basic assumption but rather a logical derivative of the preceding discussions. It has to do with the relative popularity of types through time. If our pottery types are successful measuring units for a continuous stream of changing cultural ideas, it follows that when the relative popularity of these types is graphed through time, a more or less long, single-peak curve will usually result. Put in another way, a type will first appear in very small percentages, will gradually increase to its maximum popularity, and then, as it is replaced by its succeeding type, will gradually decrease and disappear.

This interesting phenomena can be illustrated by endless examples taken from any span of culture history. Consider the popularity curve of the "Charleston" dance fad in the United States. A specific political concept, a particular word, or any other carefully defined cultural type will show the same popularity curve that Spier found in the history of Zuñi pottery.[1a]

This is an interesting phenomenon but do not let us be misled. We have not discovered a natural law operating independently of our own humble efforts. This peculiar charac-

[1a] Spier, 1917.

teristic of type popularity distribution through time is something we have helped to bring about through our own conceptualization of the pottery types that manifest said behavior. How the curves come out is partly controlled by how the types are defined.

F. The sixth assumption is also a derivative of the foregoing discussions. If a complex of cultural materials representing a space-time continuum of culture history is classified in a consistent manner, the popularity curves of the various constituent types will form a pattern. Each portion of this pattern will be peculiar to a particular time and area. This concept may best be illustrated from contemporary culture. Lacking accurate data, as this sort of information is usually ignored by historians, let us manufacture some for purposes of illustration.[2] Let us say that in the State of Ohio in the year 1920, the following were the relative popularities of the indicated types of travel for distances over 5 miles:

	PER CENT
Walking	5
Riding horses	5
Horse and buggy	15
Gasoline-powered boats	5
Steamboats	5
Automobiles	20
Airplanes	2
Railways	43

Here is a ratio of popularity of transportation types which will never be exactly repeated in Ohio or anywhere else.

Now let us take a look at a supposed history of the relative popularity of transportation types in Ohio for a period extending sometime before and after 1920. This we have graphed in figure 15.[3] Not only is the pattern different for each ten-year interval, but the quantitative picture of this stretch of culture history is a unique thing. The pattern of the popularity peaks of the different transportation types have never been repeated. A similar graph for Texas would doubtless show larger popularity of horse-riding. There wouldn't have been any steamboat travel at all in Utah. Indiana would show the same type as Ohio but in differing quantities and temporal relations.

So long as we maintain our classifications strictly as they are, we may review any number of representative samples of Ohio transportation history, and the same frequency pattern will result. The only way in which the pattern might be changed would be to change the classification. This can be done in a number of different ways. Let us show a few:

1. Travel without vehicles
   Vehicles that travel on land
   Vehicles that travel on water
   Vehicles that travel in air

2. Man-powered travel
   Animal-powered travel
   Steam-powered travel
   Gasoline-powered travel
   Electric-powered travel

3. Travel 0–5 miles an hour
   Travel 5–10 miles on hour
   etc.

Note that in each case where the classification is rearranged, the quantitative-historical picture would be completely different. This is not to say that it would be any more true or false than the scheme which we have illustrated in figure 15. All of these classifications will measure time change in a cultural feature. The point of interest to the classifier is that the first scheme with the finer type divisions will do the job a little more accurately than the others. Still finer divisions which will do even better jobs will occur to the reader.

While this fanciful illustration is set up, let us go a little farther and show how the dating and seriation techniques that will be discussed later will work. Suppose that we

[2] Historical statistical data about manufacturing, trade, etc., will give this kind of information. However, it is easier to make up our illustration than to dig it out of the census

[3] Here we have used the type of diagram which will often reoccur in this study, so we might as well explain it now. The passage of time is always represented by proceeding from the bottom to the top of the figure. Each cultural type is assigned a vertical "axis," or imaginary line, which is indicated at both top and bottom of the figure. The relative popularity of the type is shown by the length of the horizontal bars that center on the type axis. This may be measured by means of the percentage scale given in the figure. Try it for the year 1920 and see if the graph agrees with the tabulation given above.

have a sample of the transportation habits of the Ohioans for an unknown date which showed the following percentages of popularity:

	PER CENT
Walking	5
Riding horses	12
Horse and buggy	28
Paddling and rowing boats	1
Steamboats	12
Automobiles	0
Airplanes	0
Railway	40

with frequency data on the transportation customs of Ohio for a number of years. We do not know the dates of these samples and have no idea as to their chronological sequence. We can't get a complete history out of this data but we can do something. By rearranging our samples, we can find the type frequency pattern and the relative order of the samples. We will not know the calendrical dates of the samples, the relative lengths of time occupied by the various sections of the chronology, or even which end of the chronology is the most recent in time, but we can develop the quan-

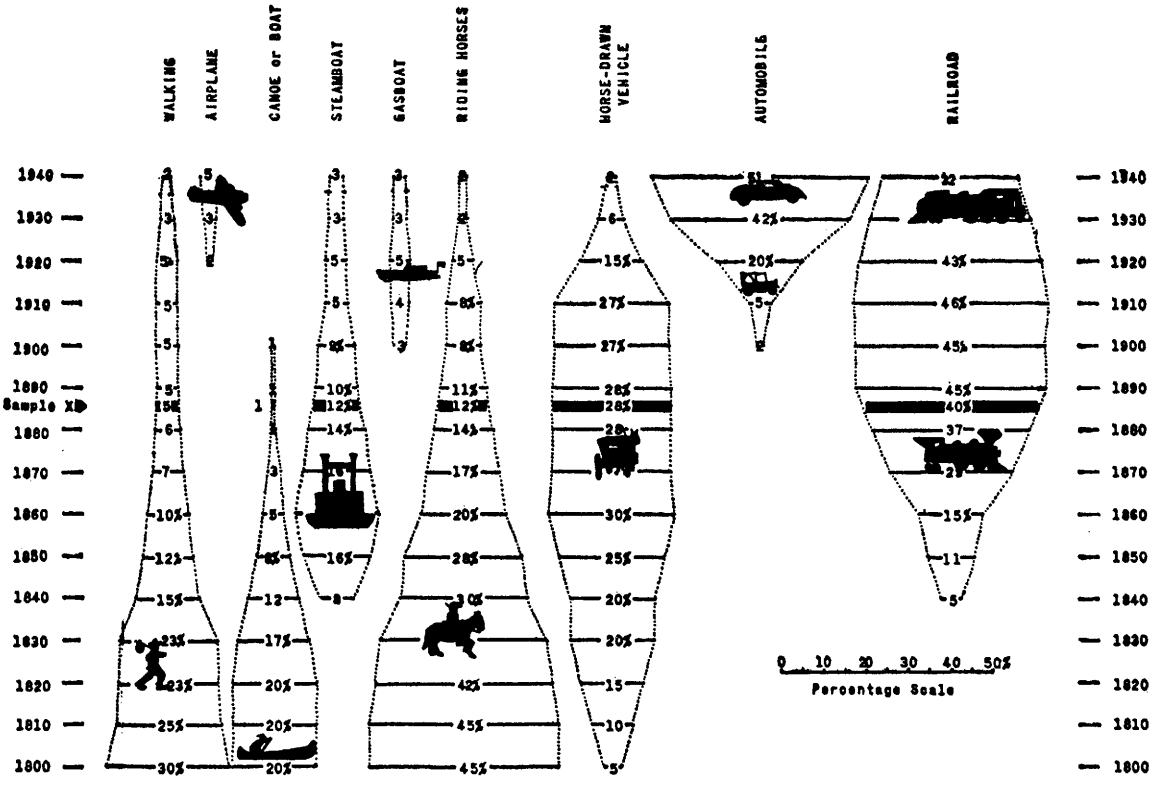


FIG. 15. Theoretical percentage frequency graph of transportation types in Ohio from A.D. 1800 to 1940.

titative-historical pattern. This, in effect, is the seriation technique we have used.

When this information is graphed after the fashion used in figure 15, and the graph is placed on this chronology, it will be seen that the type frequencies of this sample, which we may as well call "X," will fit the chronology at only one point. As our figure shows, it dates about 1885.

Let us suppose again that we are faced with a situation in which we are merely provided

This rather far-fetched bit of imaginary analysis is only worth-while if it brings out the point that systematic classification of cultural data representing a particular range of time creates in each case a characteristic quantitative pattern. We had this in mind as our sherds from the Mississippi Valley area were classified,

and the analytical procedure that will be described were the steps which were taken in search of these patterns.

G. Two more assumptions which we have made may be grouped together. We have assumed that our sampling of sites in each part of our Survey Area has been sufficiently thorough. We think that we have secured a sample of the pottery which was made during each stage of the chronologies which we will present so that no large time gaps remain unrepresented.

We are also guessing that a random sample of over fifty sherds is sufficient to indicate the proportionate type frequencies existing in the refuse from which the material was collected. A total of fifty is considered to be usable, but not particularly reliable. One hundred is much better and every sherd above one hundred is all to the good.[4] It will be noted that some of our collections are quite large.

The foregoing assumptions which we made at the start of the analytical work, and which we intended to act upon until the evidence indicated that they were wrong, may be summarized as follows:

A. The distribution of prehistoric populations of the Survey Area was relatively stable.

B. The majority of the village sites were probably inhabited for a short time as compared to the entire time with which we are dealing.

C. The culture of the area in the main probably changed gradually rather than by means of mass migration from other areas.

D. If propositions A and C were true, the pottery types which we had defined would each show a single-peak popularity curve when measured through time, but the duration of such peaks, and the resulting curves, would vary from one type to another.

E. If D is true, then all the pottery-type frequency curves would be different in each part of the area on each time horizon, and a distinct pattern will appear when each part of the area is viewed through time.

F. Our sampling technique has been successful in getting samples representing continuous segments of time in all parts of the area and also in securing enough material from the sites which we will treat to give a more or less reliable picture of the material available on the surface.

[4] For a brief discussion of quantitative reliability of collections, see Ford, 1936, pp. 13–14.

Analytical Procedure

The first step in our ceramic analysis was a simple and tedious one. On the sheets which recorded the classification of the material from each collection, the totals of these collections were run up on an adding machine, and the percentages of each type calculated by slide rule. The "Unclassified" sherds were included in these totals. This was done for all surface collections which contained more than fifty sherds, as well as for each level in the stratigraphic excavations.

Then a roll of graph paper marked with a centimeter-millimeter grid was secured. On a piece of this paper a "key" was prepared very carefully. This key indicated the position of the axis of each type from which bars showing the relative frequency of the types were to be drawn. The best spacing of the types along the key was something that had to be developed in the course of the analysis to prevent overlapping of the frequency bars. The arrangement was changed several times, and its final form is as given at the tops and bottoms of figures 17–21.

After the first key was worked out, the type frequency data for each collection was placed on a 5-centimeter-wide strip graph. This second step was also a routine mechanical matter and took some time to accomplish, particularly as this work several times pointed out defects in the positions of the types on the key. When the key was changed, all strip graphs made with the old key had to be discarded. Finally, however, all of the classification data was in this graphic form.

While this work was underway, the classification data was being analysed in another way by several student assistants[5] at the American Museum. This was a distributional study of type frequencies. For each type a sheet of tracing cloth was placed over a map showing all site locations. Then, the percentage frequency of the type at each site, say

[5] Miss Margaret Rose, Miss Eileen Boecklen, and Mr. Gary Vesalius.

Mulberry Creek Cord-marked for example, was recorded in its proper geographical position on the traced map. Now, if the above-discussed assumptions are correct, that the average village site was inhabited for a relatively short period (see assumption B, above), and that our Survey work has gathered a sample of the material from sites representing each time period in all parts of the area (F, above), then in each part of the Survey Area there should be sites which show Mulberry Creek Cord-marked near or at its popularity peak. Other sites, which cover time ranges before or after the maximum popularity of the type, will, of course, show their occurrence in smaller percentages. With all of this in mind, the completed distribution maps of Mulberry Creek Cord-marked were inspected with particular attention to maximum occurrences. It was seen that it would be possible to draw lines which would enclose maximums in descending order, after the fashion of contour lines (see figs. 6–14). If we wished to coin a new word and help our science to become more profound, we might call these "Iso-ceramic Lines" — but let's not.

These distributional studies made plain something which we knew already from classifying the material: there would be both quantitative and qualitative variation at all time periods in the different parts of the Survey Area. They also showed something else which we had suspected would be true. Regional specialization tended to increase with the passage of time so that late complexes from the northern and southern ends of our Survey were more unlike than were the early. This is a common phenomenon for cultures at this stage of development and seems to be owing to factors such as decreased population mobility due to an increased dependence on agriculture; the establishment of more stable centers, such as ceremonial mound groups and towns; and an increase in the cohesion of political groupings made possible and necessitated by the improved food supply and consequent population increase; to which was added the increased availability of cultural ideas which could be combined to form "new" varieties.

With this data in hand, it was decided that the practical way in which to treat the chronology of the Survey Area would be to divide it up into sub-areas based on the differences that could be observed in the material of the latest time horizons. A chronological column could then be worked out for each sub-area and comparisons between the areas could be made at the different time levels. We realized that the procedure which we were adopting was fully as arbitrary, and indeed was of the same kind of high-handed ruthlessness as were our decisions in regard to ceramic classification. We are again preparing to set up artificial boundaries, which this time are geographically defined, and draw the borderline cases back toward the selected concepts.

From the beginning, the Lower St. Francis River area in Arkansas looked like a "natural" for a "Focal Grouping." Here are a number of highly similar sites, already known in archaeological literature (Parkin, Rose Mound, etc.), that seemed to stand off by themselves. This happy condition was improved by the fact that Survey work was not extended very far up the St. Francis River above these sites, so we were ignorant of any gradual transition toward any different-appearing complex in that direction. All the arbitrary decisions which would trouble us lay to the south and east. Ignorance and a classical tradition; it couldn't be better. We immediately set up a Lower St. Francis area and accepted the sites in quadrangles 11–N and 12–N as appropriate for starting chronological analysis.

The second area also looked good. Its literary background is provided by Calvin Brown's description of the material from the Walls Site [6] near Memphis. The material from this and a number of closely related sites differed in a number of respects from the typical St. Francis area complex, as we have abundantly shown in Section IV. That this distinction proved to be partly due to difference in time does not lessen the initial lure of the situation. A *Memphis area* was definied and the sites included in quadrangles 13–O, 13–P, 14–O, and 14–P were taken as nuclear for starting the analysis.

We had a little more difficulty about the other three areas which were eventually set up. The literary background did not focus our attention so effectively, and we knew a

[6] Brown, 1926, pp. 288–319.

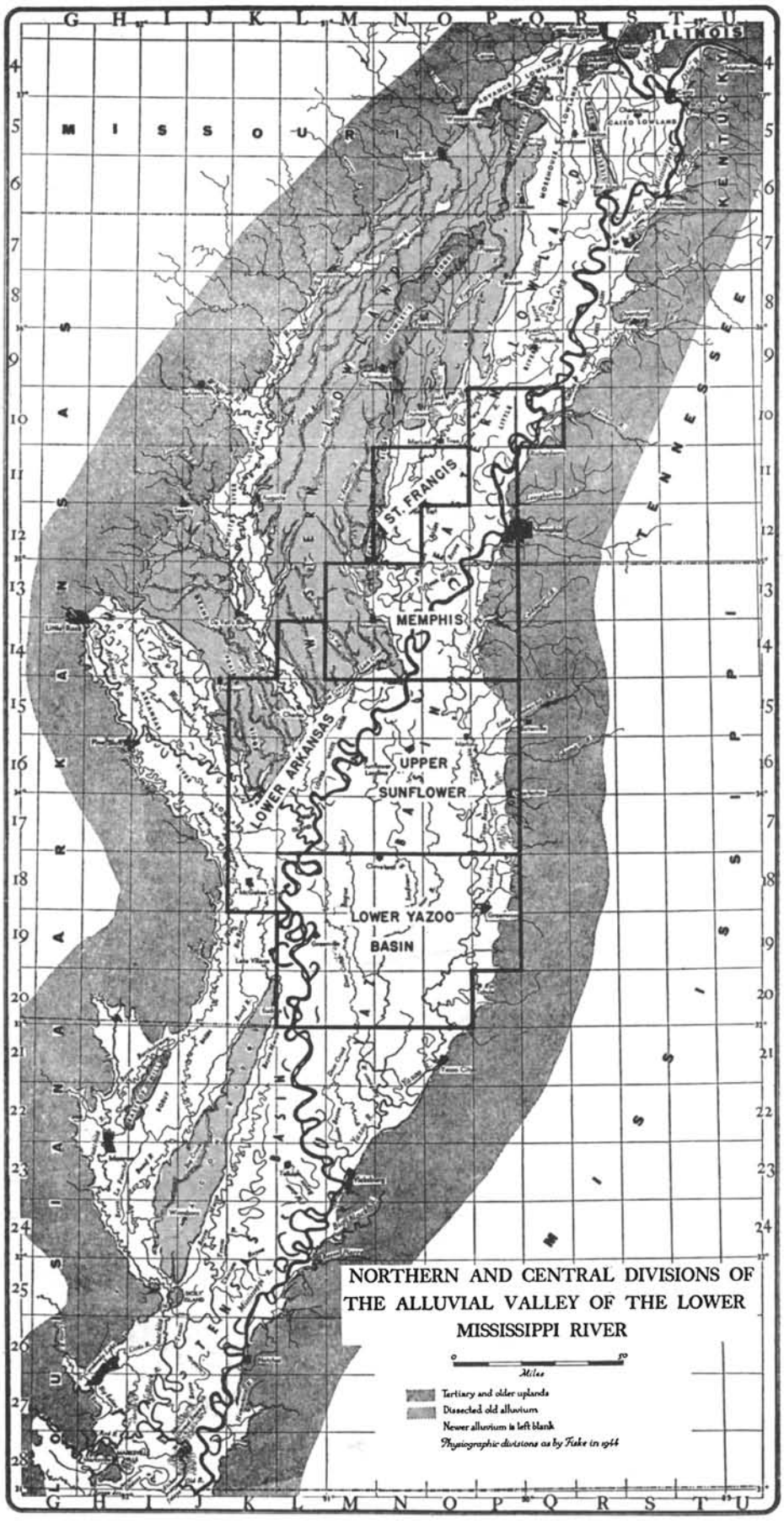


FIG. 16. Subdivision of Survey Area into analysis units for purposes of seriation.

little too much about "transitional" sites and material. After several false starts the following areas and beginning quadrangles were selected (fig. 16):

St. Francis Basin	11–N, 12–N
Memphis area	13–O, 13–P, 14–O, 14–P
Sunflower area	16–N, 16–O, 17–N, 17–O
Lower Yazoo Basin area	19–M, 19–N, 20–M, 20–N
Lower Arkansas River area	16–K, 16–L, 17–K, 17–L

It must be emphasized again that these areas have been set up solely for purposes of seriation and are therefore not to be confused with "foci" in the Midwestern taxonomic sense, or any other sort of cultural grouping.

It will be seen that the starting quadrangles for each area are geographically separated from the starting quadrangles of the other areas. This was intentional and was for the purpose of emphasizing the differences. The borderline cases were dealt with later as will be described.

By the time the study had reached this stage, we already had at hand considerable information as to the outlines of the ceramic chronologies in the region. One source of information was the sequences which had been worked out in the adjoining regions by Webb and his associates in northern Alabama;[7] Jennings along the Natchez Trace Parkway in north-central Mississippi;[8] Ford and his co-workers around the mouth of the Red River in Louisiana. A second very essential source of information were the stratigraphic excavations made by Phillips and Griffin, described in detail in a later section of this report. These revealed portions of the ceramic histories which could be used as partial backbone for the area chronologies. Our third source of information was the preliminary seriation analyses which we had made while classifying the site collections. So we had a rather good idea as to the relative time positions and distributions of many of the ceramic types. Despite this, the analytical procedures described here were followed out in detail, so far as possible, as though we had been completely innocent of such fore-knowledge.

Five sheets of heavy paper about 48 inches long and 20 inches wide were laid out on a large table side by side. The 20-inch width of these sheets corresponded to the length of the strip graphs which recorded the type frequencies of each collection. Each of these sheets was headed with the name of one of the seriation areas, and they were placed on the table in the geographical relation of the areas from north to south. Then all of the strip graphs that represented collections from sites included in the quadrangles that served as the nucleus, or starting point, were separated out and placed on the appropriate sheet. The strips were laid horizontally across the sheets and were held in place at the edges by paper clips. As they were arranged and rearranged, particular care was taken to see that the type axes coincided.

We were now ready to begin the search for the quantitative patterning of pottery types, which for reasons that have been discussed in the foregoing, should exist in the area chronologies. This work was started with site collections of the Lower Yazoo Basin area (see fig. 17). These were relatively easy to seriate as two stratigraphic excavations were available to serve as guides for part of the history. The deepest of these excavations, Jaketown (20–O–1) Cut A, had fourteen levels and seemed to cover the greatest range of time. Accordingly, the strip graphs representing these levels were arranged on the sheet in the order in which they had come from the ground and immediately showed the frequency patterning for the time covered by the cut. The strips representing the second strata excavation, Shell Bluff (19–O–2) Cut A, were next put in place. The graph of the top level of this cut was slid along the sheet of paper until a point was found at which all its type frequencies best fitted the corresponding frequencies of the Jaketown cut. It was clear that the second level at Shell Bluff was older than the top level, but we could not know how much older it was in relation to the picture given by the Jaketown cut. Consequently, the second-level graph was placed below the first and slid downward until the best fit was secured.

Vertical arrangement of the material in the ground gave some control over the collections from the stratigraphic pits, and we knew that the collections from the lower levels had to

[7] Webb and DeJarnette, 1942.

[8] Jennings, 1941.

be older than those from the upper. However, for the surface collections we had no such guide. All we had was our assumption that the majority of these surface collections represented relatively short spans of time (see B, above) and the logic which led us to think that a quantitative patterning must be there.

The surface-collection graphs were taken one at a time and compared to the beginning that had been made with the stratigraphic material. If they fitted somewhere along the time represented by the excavations, the graph was fastened down to the backing sheet with paper clips. If percentages of such late types as Neeley's Ferry Plain and Bell Plain were too large, and proportions of such older types as Baytown Plain, Larto Red Filmed, and Mulberry Creek Cord-marked were too small, the collection was obviously later and the graph was placed above the excavations. These surface-collection graphs were shifted about in vertical relation to one another until patterning was developed as is shown in the upper part of figure 17.

The data from the starting quadrangles of the other four seriation areas were dealt with in a similar fashion, figures 17–21. Where stratigraphic information was available, it was used as a guide. Where there was none, the surface-collection graphs were shifted about to develop the best patterning that could be secured. In this way the five chronological columns were developed side by side.

The next phase of the analysis was to assign the sites in the intervening quadrangles to one or another of the five areas which had been set up. All of the site-collection graphs for each of these remaining quadrangles were seriated and then compared to the five area graphs. For example, the chronological patterning of quadrangle 18–M looked more like the chronology begun for the Lower Yazoo area than any of the other sub-areas, so the collections from this quadrangle were fed into the Yazoo graph at the points where they fitted best.

Now, the area chronological graphs were virtually complete and good patterning of types could be seen. Apparently, our assumption that most of the surface collections represented relatively short lengths of time was correct. But while the majority did, some obviously did not. In a number of collections, early and late types were associated together in a fashion that showed either that the sites had been occupied for a long time, or there had been reoccupation. In order to clear up the patterning, the strips representing these collections were taken out. The numbers of these long time-span collections as compared to the shorter-lived sites that are used in the final graph are as follows:

AREA	NUMBER OF SHORT-TIME-SPAN SURFACE COLLS. USED IN FINISHED GRAPH	NUMBER OF LONG-TIME-SPAN COLLS. TAKEN OUT TO CLARIFY GRAPH
Lower Yazoo Basin	48	1
Lower Arkansas River	19	1
Sunflower	81	9
Memphis	66	7
St. Francis	37	0
Colls. used in graphs	251	Discarded 18[9]

Although eighteen surface collections with respectable sherd totals have been eliminated from the graphs because of the special requirements of this kind of analysis, this does not mean that the effort devoted to these sites has been lost. It may be expected that these are places where rather long spans of history may be examined in stratigraphic relation, if there is any depth to the deposits. So far,

[9] The full list of site collections excluded from the seriation graphs is as follows:

	SHERD TOTAL
Lower Yazoo	
20–O–1 (Jaketown)	4226
Lower Arkansas	
16–L–3 (Stovall)	218
Sunflower	
17–N–16 (Wilnot)	244
16–P–7 (Mitchell)	418
16–P–5 (Crosslyn)	127
16–P–1 (Charleston)	646
16–O–14 (Stover)	110
16–O–17 (Longstreet)	160
17–O–11 (Cassidy)	249
16–O–1 (Dunn)	94
16–P–6 (Cox)	144
Memphis	
10–P–3 (Nettle Ridge)	477
10–Q–3 (Turnage)	328
14–N–6 (Helena Crossing)	80
13–P–4 (Dogwood Ridge)	354
13–P–10 (Irby)	1381
11–P–3 (Golightly Place)	241

tests have been made in one of these sites, 20–O–1 (Jaketown), the results of which are discussed in the section on Stratigraphy (VI). It was quite evident why surface collections from this site were useless for seriation purposes; the occupation covered practically the full range of ceramic history in the area.

Handling of the Data from Stratigraphic Excavations

The incorporation of the data from the stratigraphic excavations into this analysis was done in a purely arbitrary fashion. Each level was treated as though it were a separate surface collection from a distinct site, except for the fact that care was taken to keep the levels in proper vertical order. The relation of stratigraphic levels to the soil profiles revealed by the walls of the excavations, which is discussed in detail in the next section of this report, was not worked out at the time this analysis was made, but had it been available would not have received consideration in this phase of the work. The seriation of the data in these five sub-areas was an attempt to discover the chronological patterning of the pottery types in each region and to reveal the consistency with which the types followed that pattern. In this handling of the data it was expected that such anomalies as the reoccupation of sites after they had been abandoned for any considerable length of time would be revealed by comparison with the evidence given by neighboring sites as to the chronological pattern of each sub-area.

There are some discrepancies between the interpretation given to the stratigraphic data in this section, written mainly by Ford, and the section on Stratigraphy which follows, written by Phillips. These disagreements are not basic differences as to the gross outlines of the chronology; there are no differences as to this. They have to do principally with the problem of whether the evidence indicates that there was a break in the deposition between the Baytown refuse characterized by clay-tempered pottery and the shell-tempered Mississippian deposits. In most cases this involves a question as to whether late Baytown (period D–C) or the early Mississippian Phase (period C–B) is missing in the stratigraphic sequence. With the evidence which we have at present it does not seem possible to resolve these discrepancies to everyone's satisfaction, so we will allow them to stand. However, they can be explained by the fact that Phillips' judgments have been based on detailed examination of the internal evidence supplied by each strata cut while the guesses of Ford have attempted to reconcile the evidence given by both surface and excavated collections.

Co-ordinating the Area Chronologies

We are now in possession of five quantitative graphs representing the ceramic history of the five selected areas. However, these are relative histories. There is no absolute chronological scale by which the appropriate amounts of vertical spacing, which represents time that should be given to the early, middle, or late portions of each can be measured. The best that can be done is to try to correlate them one with another. This was done in the following fashion. Six strings, spaced and running parallel, were stretched from end to end of the table on which the graphs lay. Then portions of the graphs were adjusted up or down until the same types showed comparable relative quantities under the appropriate string. Thus, the third string down from the top, which has become line C on the time scale used in the finished drawings (figs. 17–21), was made to mark the point in each graph where Baytown Plain and Neeley's Ferry Plain were about equal, Mulberry Creek Cord-marked had practically disappeared, Bell Plain was just getting a start, and Larto Red Filmed was almost gone. In each case this procedure was a compromise. If the upper portion of the Lower Arkansas graph had been slid downward until all the percentages of Bell Plain were equal to those in the Sunflower and Memphis areas along the C horizon line, then the Baytown-Neeley's Ferry relationship would have been all out of adjustment. All the type patterns were considered in this correlating process and the A to G time-scale arrangement given in the five final graphs is the end result of many compromises. So this scale is presented as a time framework for the chronologies. Time F in the Yazoo area, for

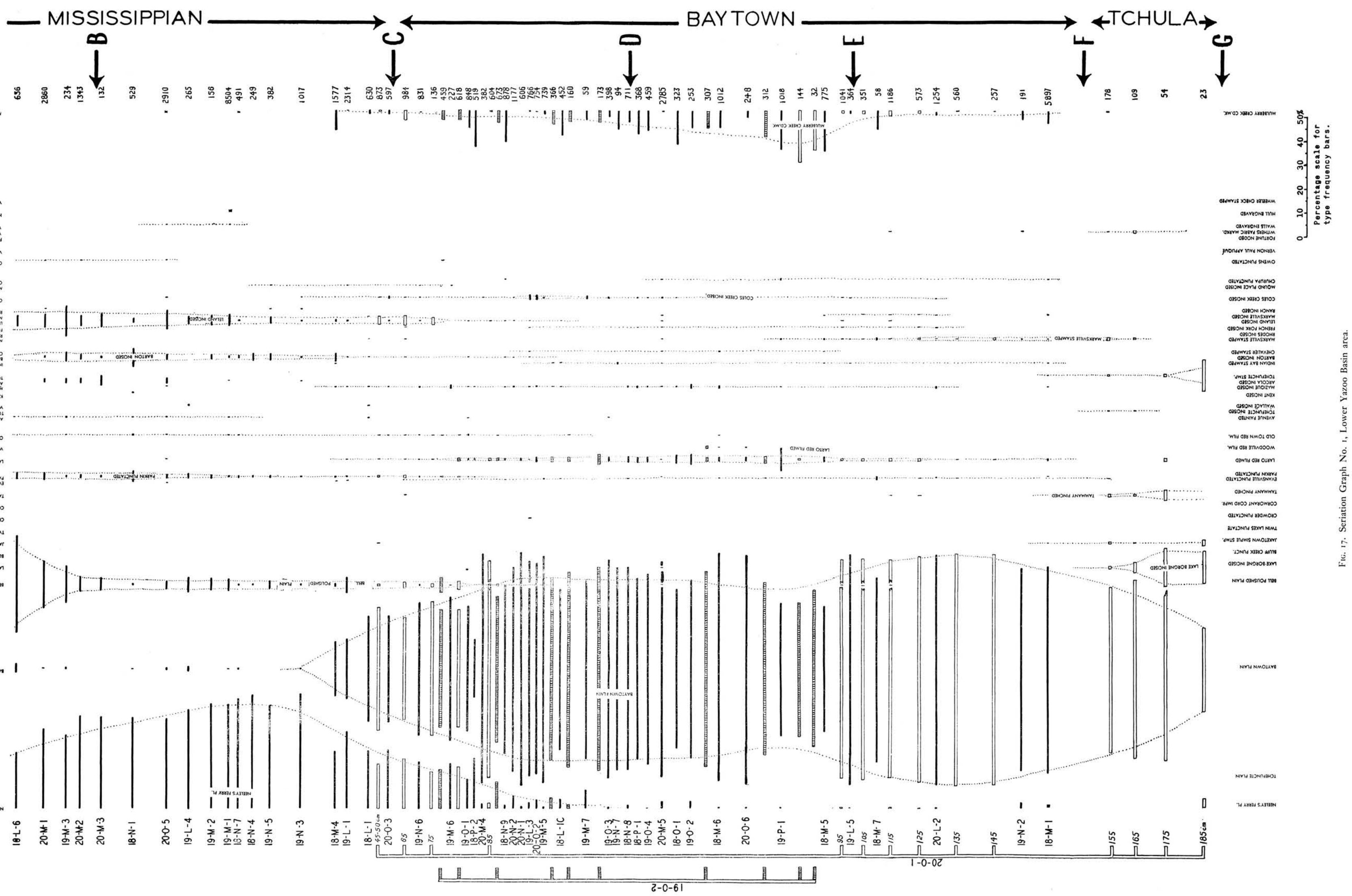


Fig. 17. Seriation Graph No. 4, Lower Yazoo Basin area.

example, is supposed to be the same as F in the Lower St. Francis.

The necessity for compromises of this kind was not unexpected. As a matter of fact, they are an inherent part of this kind of cultural analysis. The groups of ideas to whose products have been tagged such names as Mazique Incised did not spring up simultaneously all over the area. They moved from one part to another, and that took time. For example, the ideas of red slipping on clay-tempered vessels (Larto Red Filmed) apparently was moving from south to north through the region, while cord-marking on clay-tempered pots (Mulberry Creek Cord-marked) was moving from northeast to south. Naturally, the former is earlier to the south and the latter to the north.

The student who is particularly interested in the history of this area, or of the procedure by which this balancing was done, may check it — if he has the time and patience — by placing the five area graphs (figs. 17–21) side by side and following across the relative time position of each type. This process has been a subjective weighing of the evidence provided by each type position and of course is always open to question. As a matter of fact, there has been considerable question as to certain aspects of this arrangement which should receive attention at this point. Griffin and Phillips are of the opinion that the late materials in the Arkansas area actually date somewhat later than they are represented in the graph of that area (fig. 18). They think that the pottery type Wallace Incised probably extends up to the time when the Quapaw were discovered by the French. This opinion is somewhat reinforced by the fact that the type is practically confined to the region in which the Quapaw were described and occurred in appreciable amount in the top levels of two cuts in the Menard Site (17–K–1), and on the surface of the near-by Wallace Site (17–K–3) which there is reason to believe may have been the site of the Quapaw village of Osotouy (Uzutiuhi), first visited by the French in 1686 (see p. 414). As additional evidence, Clarence B. Moore excavated burials in the fields near the Menard Site that were accompanied by European material. Admitting that the cemetery excavated by Moore almost certainly is of Quapaw origin, Ford has hesitated to raise the upper part of the Arkansas graph for several reasons. First, to do so would also bring the types which accompany Wallace Incised up to a later date where their proportions would not be consistent with those of the same types in the neighboring areas. Second, Moore's illustrated material does not show any examples of the types Wallace Incised. However, this does not mean that he may not have found such vessels. The third and most convincing point (to Ford) is the fact that Moore does illustrate three vessels of the type Fatherland Incised, the pottery which the Natchez tribe farther down the Mississippi were making about A.D. 1700.[10] In addition, he found "teapot vessels," another trait shared with the Natchez. Neither Fatherland Incised nor any of the late "Caddo" types with which it is normally associated appeared in the Survey collections from the Menard and near-by sites. While far from denying that this vicinity is the likely site of a historic Quapaw village from which Moore sampled the burials, it does not appear likely to Ford that the site collections and uppermost strata levels in our Arkansas area graph represent this historic occupation.[11]

Comparison of the area graphs will show that the late collections in the Memphis area have been allowed to come up to the most recent times. This was practically forced by the large percentage of Bell Plain found on the surfaces of the late sites in that area. In contrast the other areas show much smaller percentages of this type as a very late feature. It is possible, as discussed in the next section, that a part of this Bell Plain is pot-hunter refuse or is burial ware which has been ripped

[10] Moore, 1908a, figs. 8, 10, 19. Compare with Quimby, 1942.

[11] Griffin's reposte to this is simple. He thinks that the Yazoo and Sunflower columns also have their latest portions placed too early. More of the sites in those areas should fall after time B.

Phillips thinks that this is an instance where the assumption of continuous distribution of a pottery type has played us false. Bell Plain, which carried the weight of identification of the late time, seems to have a discontinuous distribution in space. Therefore, according to this view, the near lack of Bell Plain in the top portions of the Lower Arkansas graph is not chronologically significant.

from graves by cultivation. However, the trends in accompanying types: decrease of Barton Incised, increase of Parkin Punctated, and the appearance of Rhodes Incised and Vernon Paul Appliqué, suggests that there is a certain consistency to this situation that makes the increase of Bell a significant marker of the passage of time in this area — whatever may be the factors involved.

It is thought that probably none of these columns extend to the beginning of reliable historic documentation about A.D. 1700. This is consistent with the fact that the French explorers of that period indicate that the population of the Mississippi flood-plain area between the mouth of the Yazoo River, where villages of Yazoo and Tunica were found, and the northern limits to which our Survey has extended was very scanty indeed. About the mouth of the Arkansas River were found the Quapaw or Arkansea, and those are the only people who can be placed with any certainty. In the upper drainage of the Yazoo were the Tiou,[12] Chakchiuma,[13] and Ibitoupa.[14] Swanton estimates that the total of this Upper Yazoo population was less than 1000 people.[15]

This is far from enough people to account for the number of sites which we have dated as occupied during the later Mississippian period, and, in fact, is markedly in contrast to the population picture given by the De Soto narratives for the year 1542 as will be shown in a later section.

Clarence B. Moore found burials accompanied by glass beads and other European material at several sites through the area we have surveyed.[16] The pottery which he illustrates from the Rhodes and Bradley Places is clearly of late Memphis area types but, as Moore's report does not associate the illustrated materials with the burials that are described, it is impossible to state definitely that the European material was found with this complex. Even if it is associated with it, it should be noted that the possibilities for the aborigines acquiring glass beads probably go back somewhat before 1700 in this area, if not back to the period of De Soto's exploration in 1542.

There is some reason to expect that the ceramic complex which prevailed at least as far north as the Sunflower area in 1700 had a small percentage of incised pottery resembling in both decoration and shape the historic Natchez-type Fatherland Incised.[17] It has already been pointed out that Moore found a small proportion of this type associated with European material near the Menard Site. Charles Peabody's excavations in the Oliver Site in our Sunflower area produced at least one vessel of this type.[18] Again, the association with the European material which was found in some quantity cannot be determined from the report. However, the type did not appear in any of our late collections. Clearly, further search needs to be made for rare contact sites in the Survey Area with a view to determining the exact forms of the late ceramic complexes in the different parts of the region. Until this is done, it cannot be stated with certainty exactly when these columns end.

The finished area graphs are given as figures 17, 18, 19, 20, and 21. The collections are listed by site designations, 12–N–7, etc., down the left side of each graph. Collections which were made from restricted areas in certain sites are indicated as A, B, etc. (12–N–3A). The stratigraphic cuts made in certain sites are shown by staffs on the left side of the diagrams, and each level of such excavations is indicated with depth in centimeters. Each staff is shaded to aid in relating it to the corresponding type frequency bars given in the body of the charts.

The pottery types are represented by vertical "axes" which are labeled at both top and bottom of the diagrams. Equally spaced on either side of the appropriate axes are horizontal bars the length of which represents type percentages according to the scale given in the lower right-hand corner of the graph. It will be noted that only one-half of the full length of the frequency bars for the relatively

[12] Swanton, 1946, p. 194.
[13] Swanton, 1946, p. 105.
[14] Swanton, 1946, p. 140.
[15] Swanton, 1946, p. 107.
[16] See Moore, 1911, pp. 406, ff., Kent Place (our 13–N–4); pp. 413, ff., Rhodes Place; and pp. 427, ff., Bradley Place.
[17] Quimby, 1942, pp. 263–64.
[18] Peabody, 1904, pl. 14, line 4.

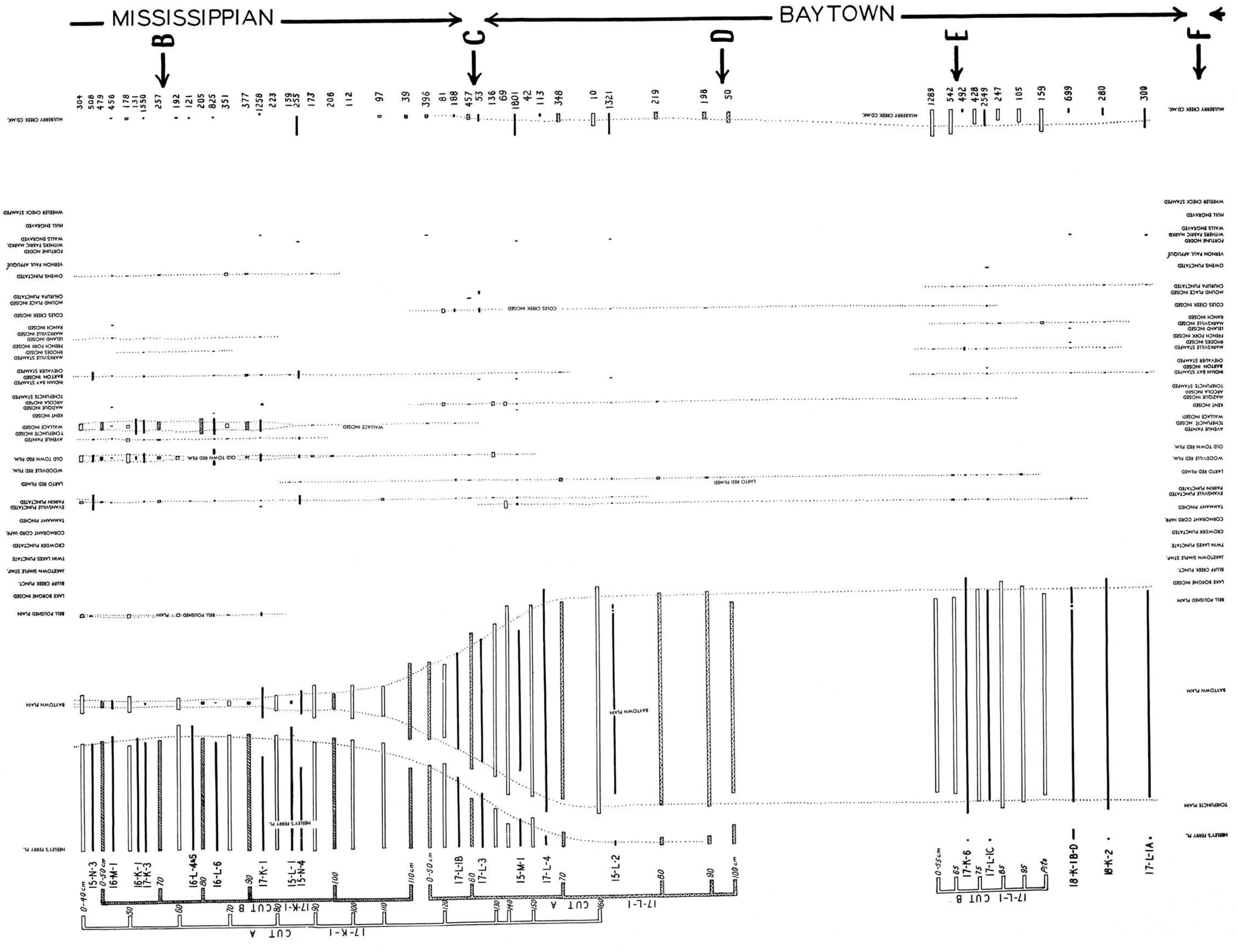


FIG. 18. Seriation Graph No. 2, Lower Arkansas River area.

abundant types Neeley's Ferry Plain and Mulberry Creek Cord-marked has been shown. These types are arranged at the left and right-hand sides of the graphs, respectively, and this device has enabled us to decrease the over-all width of the illustrations.

On the right-hand side of each graph are listed the collection totals. These will indicate the amount of reliance that may be placed upon the samples. The time scale, A, B, C, etc., which relate the graphs to one another in the manner which has been described above, is on the right-hand side of each. These are the smallest time divisions which we have felt justified in making in the chronologies. The more comprehensive names which we are using Tchula, Baytown, and Mississippian are also given with the time range of each period indicated.

Explanations of complicated diagrams are tedious reading and frequently serve mainly to hide the essential simplicity of the scheme. The reader who is still confused at this point may be less so after comparing the following tabulation of types at Site 19–L–6 (Refuge) with the collection as graphed at the very top of the Lower Yazoo Basin area diagram (fig. 17).

19–L–6 (Refuge)

TYPE NAME	NO. SHERDS	PERCENTAGE
Neeley's Ferry Plain	304	.463 *
Baytown Plain	31	.047
Bell Plain	263	.400
Parkin Punctated	21	.032
Leland Incised	28	.043
Unclassified	9	.014 †

* Half of percentage shown in graph.
† Not graphed.

Discussion of the Seriation Technique

Such, then, was the analytical procedure followed in developing the area graphs, and some of the reasons why it was done so. The seriation of surface collections might have carried the full weight of the evidence for developing the chronological type patterning, but as some stratigraphic excavations were available in each area it did not have to. There is a tendency among some archaeologists to affect an attitude of suspicion and doubt in regard to the seriation technique, and it has often been asserted that the results of such "juggling" cannot be accepted unless supported by vertical stratigraphy. It seems likely that such an attitude may arise from one or both of two sources: either a misconception of the phenomena of cultural change and the part that typology plays in measuring that change, or a lack of understanding of the seriation technique. As a matter of fact, both seriation and the vertical stratigraphic technique have certain advantages and defects under different conditions and must be applied to chronological problems with a careful regard for their limitations.

The chief limitation of seriation is the fact that it must work with degrees of probability which are often quite difficult to measure or even estimate. Usually, the measure has to be the pragmatic one of the results obtained. In our area, for example, any one or all of the probabilities stated at the beginning of this section may not have been true. The population may not have been relatively stable. There might have been sudden and frequent movements of populations so that the cultural change in any one locality would have had little semblance of order. Had this been true, we might expect either that the development of a sequence by this means would have been impossible, or that cultural periods would have been developed which were clearly delimited, one from the other.

It is also possible that a majority of the villages might have been inhabited for very long periods of time. If this had been true, it would have been impossible to separate early and late pottery features by surface collecting and seriation techniques. There is, of course, a degree of this kind of error in all of the samples which we have handled, and this is probably the principal defect of the technique. None of the collections are the instant cross section of the ceramic content of the culture at each site which would be the ideal situation. The fact that each of the surface collections does represent a time span of a certain length must, in theory, result in a certain "fogging" of the quantitative history. For example, if we assume that we have done a perfect job of sampling and classifying and have placed one of our strip graphs so that its vertical position cor-

rectly represents the mean date of the site occupation, then it is plain that this graph will represent the early types which were fading or perhaps disappeared soon after the site was first occupied, too high in the chronological scale. Conversely, the late types which belong to the latter part of the occupation are also pulled back to the mean position and show as too early.

Again, the occasional reoccupation of sites after a lapse of time might be a disruptive factor. It is even possible that there might have been at some periods the general custom of utilizing older sites. This also would result in our securing a mixture of old and new cultural materials and would invalidate our assumption for continuous occupation. Had this happened in a majority of cases, the odds are very much against there having been any consistent pattern to the selection of the earlier sites which would be utilized. Only in the event that a region had been cleared of a previous population by conquest, and the conquerors had moved in and begun to utilize the settlements and fields of the people whom they replaced, could there be any probability of a consistent sequence of types. In such a case the seriation technique would reveal the cultural chronology, but interpretations as to cultural and population continuity might be led astray. It is very probable, however, that there would be "pure" deposits of the late phase of the earlier occupation, and the early phase of the later, which would illustrate the break in cultural continuity.

We can also be certain that none of the collections show type frequencies to the exact percentage that would be found if every sherd at a site had been gathered and classified. For these reasons, we would like to say again that success in this type of work demands numerous collections, and the imperfections of the technique are such that the majority of the indications must be taken as evidence. Two or three sherds of a type that seems to be quite late in a surface collection from a site that by all other indications is rather early do not worry the seriator at all. There are too many ways in which such a chance mixture could have occurred. He is more concerned by the fact that the overwhelming majority of the sherds of this type take a late position, and that the preponderance of the material from the site fits into the early ceramic pattern. Add to all this the uncertainties of classification which we have outlined in a foregoing section, and it is easy to see why we would like to stress the fact that success in this type of work demands a number of fairly sizable collections, and that only indications given by the majority of the situations must be accepted as evidence.

The Use of Stratigraphic Data in Seriation

The analysis of stratigraphic data as such will be discussed at length in the following section. Here we are concerned principally with the use of stratigraphic along with surface collections in the seriation technique and their limitations from this point of view.

Phillips and Griffin in the 1941, 1946, and 1947 field seasons made a total of seventeen stratigraphic excavations at nine different sites. All of these gave the anticipated results and showed evidence of change in type frequencies with the passage of time. Of these, fourteen were clear-cut enough to be incorporated in the area graphs and three could not be used for reasons that are explained below. This high degree of success in the effort to obtain this type of evidence was directly due to a careful selection of sites to excavate. Before beginning, each excavator had a fairly clear notion as to at least a part of the chronological patterning which the site would reveal.

The principal defect, from the point of view of seriation, in the information provided by stratigraphic excavations is a result of what might be termed migration, particularly upward migration of material in midden deposits. This is most pronounced in middens in which refuse and soil was accumulated very slowly. Apparently, the activities of the Indians who lived on such sites, the digging of post-holes and pits, and overturning the soil in other ways, has tended to bring old pottery and other refuse to higher levels in the growing deposit. This is particularly true of the later Mississippian horizons. Analysis of stratigraphic studies in such deposits make the older type appear to have lasted much longer than really was the case. This factor is doubtless always present in the analysis of all midden deposits. Usually, how-

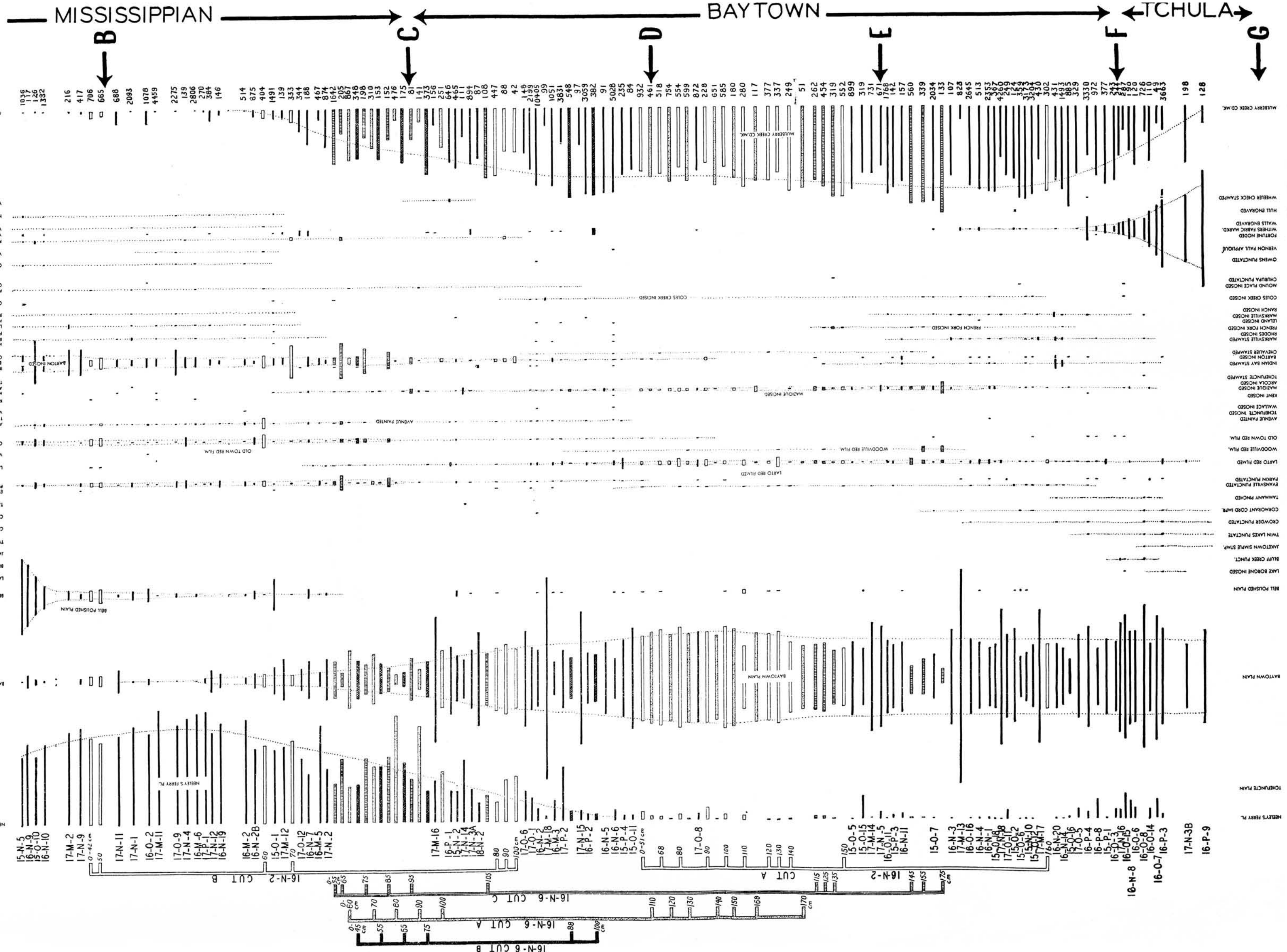


FIG. 19. Seriation Graph No. 3, Upper Sunflower area.

ever, the distortion of the graphs is so small that it falls well within the limits of the variations that have to be allowed in this kind of analysis.

The control which we have over this accidental upward weighting of midden-deposit evidence is the comparison of such unusually slow-growing cuts with the results of other excavations in the same area. A still better check is the comparison of these cuts with seriated short time-span surface collections.

The most pronounced example of upward migration which we have encountered in this study are the two strata cuts that were made at Lake Cormorant (13–P–8). These are described on pages 249–52. The site is located in the Memphis area and the excavations revealed about 120 cm. of refuse deposit, the material from which, when analyzed, proved to represent the entire ceramic chronology for the area from time G to A. All of the types found in the area are well represented, for the collections from each level were substantial. The popularity peaks of the types form a pattern which is in perfect agreement with the seriation graph of the Memphis area as a whole as can be seen by comparing the stratigraphic and seriation graphs (figs. 25 and 27 with fig. 20). However, if we were to accept the evidence offered by the Lake Cormorant Site we would have to believe that the types Withers Fabric-impressed and Baytown Plain were still being made in time B to A. All the other sites collected from the Memphis area by both the surface and stratigraphic techniques show that this was not so. We conclude then that these older types in the Lake Cormorant Site have been brought up to the surface of the midden by overturning of the soil. For this reason, it has not been possible to incorporate the Lake Cormorant data in the Memphis area graph.

The second phenomenon found in strata-cut tests is that at times they misrepresent the history of the site being studied by completely skipping or being deficient in the material that represents certain spans of time. The reason for this is not difficult to find. While a village was occupied, the midden material accumulated at any one spot only so long as it was being actively deposited at that place. In the Southwest, where intentional dumps were utilized or in Peru where substantial buildings of stone and adobe were occupied uninterruptedly, there was little reason to change the locales of garbage disposal. However, in the eastern United States the houses were impermanent structures of wood, and from the excavation of numerous sites it is clear that considerable shifting of house locations was done in rebuilding. Thus, it may happen that one of our strata pits was put down at a spot where a house stood for the first third of the time the village lasted; was rather far from any dwellings during the second third; and was again near a house during the last third. A graph of the type frequencies will — if it is clear enough — show a definite shift in percentage frequencies at the level where deposition paused. The same thing will result if the pit chanced to pass through a house floor or a courtyard which was intentionally kept clean of debris.

The Question of Population and Cultural Continuity

One of the most interesting questions raised in the interpretation of the data which we have to present is whether there are indications of cultural and, by inference, population discontinuity between the Baytown and Mississippian periods. This has an important bearing on the matter of how and where did the Mississippian cultures develop, the major current mystery of Eastern archaeology. Did the Mississippian culture come into the Survey Area from outside, carried by a new population in such a way that there was a distinct break in the cultural sequence, or was there a period of gradual but possibly rapid cultural change at the beginning of this period when new cultural ideas (carried perhaps by some intruding people) came into the area and merged with the Baytown. We cannot pretend to settle this question, for our data are confined to ceramics. However, the ceramic histories and the villages that have been investigated give enough evidence to permit some discussion. This discussion centers about the more specific question of whether reoccupation has occurred on these sites where the shell-tempered Mississippian pottery complex is mixed with the clay-tempered Baytown ware. A glance at the five area

graphs will show that there are a substantial number of such sites in each sub-area, most of them represented by surface collections and a few by stratigraphic excavations. Do all of these sites represent reoccupation?

There can be little doubt that reoccupation is represented by some of these collections. These sites where an early Baytown complex is mixed with shell-tempered pottery, such as 14–O–1 and 14–O–2 near the bottom of the Memphis area graph (fig. 20), seem to have a thin Mississippian occupation mixed with early Baytown, with material of the intervening periods missing. Some of the surface collections excluded from seriation may also be interpreted in this way. Also, there may be some examples of reoccupation where the time during which the site was unoccupied was so short that it is impossible to measure it in cultural terms. The real question is whether the *majority* of mixed sites represent reoccupation. If site reoccupation were the explanation for this mixture, it might be expected that late Mississippian material would be mixed with early Baytown pottery about as often as occupations of the early part of the Mississippian chanced to be placed over late Baytown refuse. The early Baytown sites are in just as favored geographical locations as the late, and there is little reason why these spots should have been avoided by the later invaders. In this event, little or no patterning would appear in either the attempts at seriation or in the strata excavations. However, there is also the possibility that the later people conquered the territory and settled down to use the cleared fields and villages of those whom they had displaced. The techniques applied here would not be able to clearly detect such an event. Even if this somewhat unlikely kind of population replacement had occurred, it is probable that there would be some early Mississippian villages which were established in new, unoccupied spots which would not have the late Baytown mixture, and conversely some of the conquered late Baytown villages which were not reoccupied, and thus did not show the early Mississippian mixture. There are several sites which may be interpreted in this way such as Collins (13–O–9), of the late Baytown in the Memphis area graph (fig. 20), but the number is small. The patterning revealed by the majority of the site collections indicates to one of the present writers at least (Ford) that there was essential continuity of the ceramic complex and, by inference, of the majority of the population.

Another and parallel approach to this question of continuity lies in an examination of the possibility of certain ceramic decorations which are found on clay-tempered pottery being directly ancestral to similar decorations on the shell-tempered wares. This will be treated elsewhere, and it is sufficient to say here that this evidence does not suggest that there has been a cultural break.

Relative Dating of Village Sites

The foregoing was the analytical procedure which was directed toward the development of the five area chronological columns (figs. 17–21). Now, we call attention to the fact that in the analysis process we have also provided relative dates for the collections studied. The vertical positions in which the collection graphs have been arranged in the five chronological columns show the relative mean dating of these collections. However, it must be emphasized that this is a *mean* or *average* date. As has been mentioned above, each of these collections represents refuse which was in the process of deposition for a shorter or longer period of time — 10, 25, 50, or 100 years, we do not know. There is no external evidence which can be used to resolve this uncertainty. We are aware that what has been done is to "flatten out" the cultural evidence which accumulated during the occupation span that each collection represents and treat the collection as though it were a cross section of the cultural content at one moment in time. If our analytical operations were perfect, we might expect that the time at which the collection best fitted in the chronology would be about the mid-point of the period through which the refuse was accumulating. This is the reason for the term "Mean Date" which will be applied to the graphed time position of the collections.

Frequently, there is in the collections some evidence on which a judgment of the relative time span represented may be based. The presence of types which are chronologically

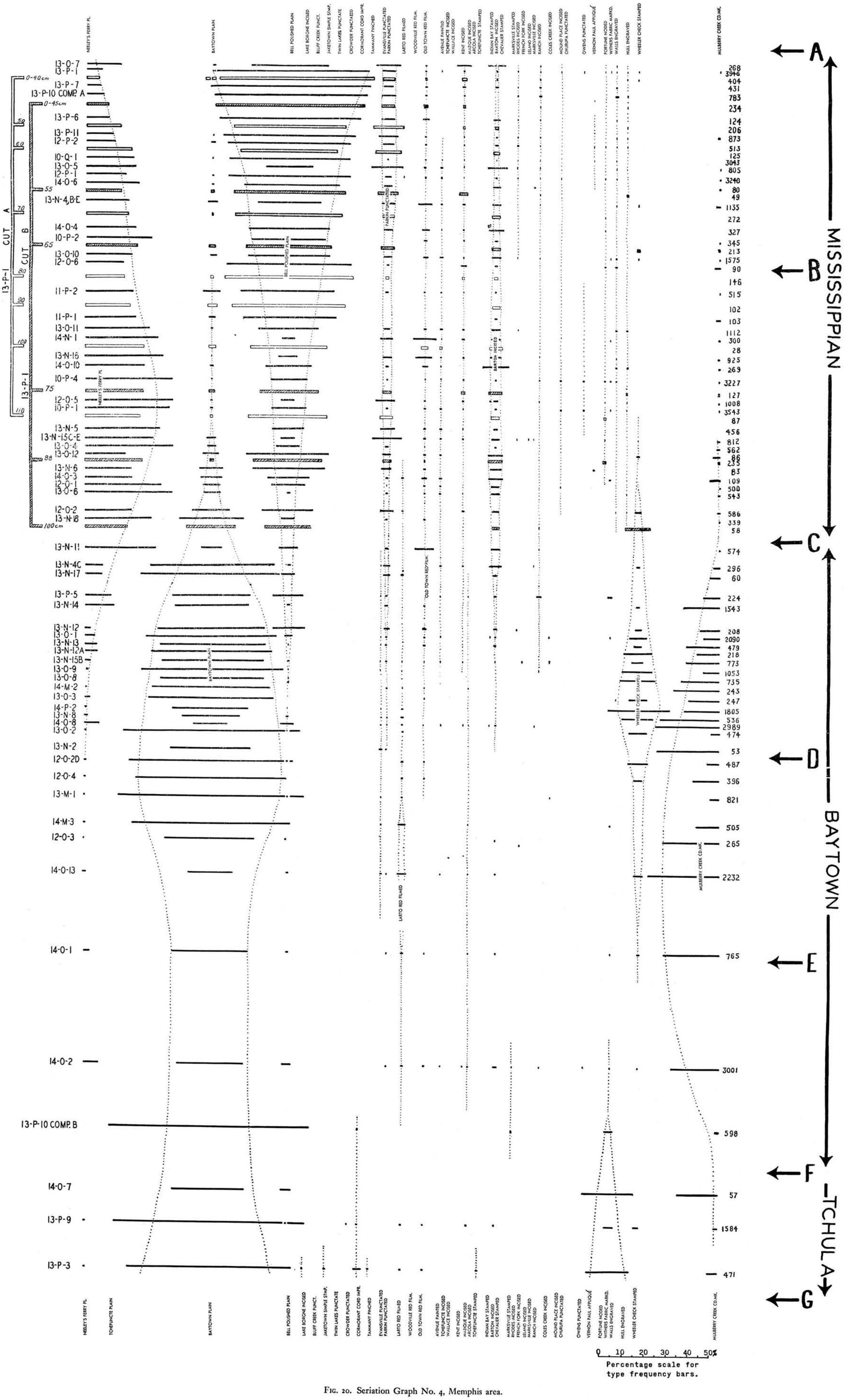


FIG. 20. Seriation Graph No. 4, Memphis area.

earlier or later than the mean date may indicate approximately how far the time span of a site extended from its mean date. This evidence has served as a basis for the judgments of the time spans of site collections listed under the heading "Range" in table 1. The majority of collections, it will be noted, are listed as falling within one of our lettered subdivisions. These are collections which show no evidence of any long period of occupation and which seem to be about as homogeneous in content as is the usual 10-centimeter level of a stratigraphic cut in this part of the Mississippi Valley.

The above discussion has reference, it will be noted, to the dating of collections. The question as to whether a collection completely and fully dates a site is another matter. There is always the possibility that either (1) only the top and latest refuse is on the surface of the site, or (2) earlier refuse is on the surface but at some point which was not investigated. There can be little doubt that we have made this error in the dating of some sites, but we suspect that the proportion will be quite small. The principal reason for thinking so is that refuse deposits that extend below the plow zone are not common. Numerically, there are more of these deposits than has generally been supposed in the Mississippi Valley, but the proportion of deep to superficial sites is undoubtedly small. The second reason is that this possibility was kept in mind during the course of the field work, and as far as possible all sites were examined to see if areal differentiation of material could be detected. In these cases localized collections were made. Thus, while we cannot say with complete confidence that site "X" is fully dated by its surface collection, we are fairly well satisfied that the great majority of the mean dates do not suffer from serious error of this kind.

An interesting comparison can be made between the graphed positions of surface collections from certain sites and the later stratigraphic excavations in these same sites. Although Ford insists that at the time these collections were being seriated he paid not the slightest attention to site designations but concentrated on type frequencies, the reader had best judge the appropriateness of each position for himself.

On the area graphs, we make the following comparisons:

19–O–2, general surface collection with 19–O–2 strata cut (fig. 17);

17–K–1, a general surface collection with the two strata cuts made on the site, A and B (fig. 18);

17–L–1B, a localized surface collection with strata Cut A, made in same part of the site (fig. 18);

17–L–1C, a localized surface collection with strata Cut B, made in the same part of the site (fig. 18);

16–N–2,[19] a general surface collection with the two strata Cuts A and B made in old and younger parts of the site (fig. 19);

16–N–2B, a localized surface collection with strata Cut B, made in the same part of the site (fig. 19);

16–N–6,[19] a general surface collection with the three strata cuts made in this site, A, B, and C (fig. 19).

The Walls Site (13–P–1) and the Rose Site (12–N–3) are the only cases where such collections fit in the graphs at the upper end of the time span indicated by excavations in the same sites (cf. figs. 20, 21). When the fact is recalled that the sites enumerated were selected for excavation partly on the basis of their showing a depth of midden deposit, and that these depths ranging from 75 to 240 cm. are exceptional rather than the rule on sites in this region, it can be seen that the chances are rather good that we have secured samples representing the full time range of most sites. The problem of buried strata can virtually be ignored so long as we are considering the *majority* situation.

However, this slight degree of doubt which

[19] Note that the graphs of these two surface collections show mixture of both early and late types, a condition that is clearly explained by the length of time represented in the deposits as shown by the stratigraphic excavations. Their lessened value for giving a clear seriation is obvious, and possibly they should have been excluded from the graphs as were the 18 long time-span surface collections described above. However, they are included here both to illustrate this effect and to point out the tendency of these surface collections to take a position intermediate of the time range of the site. The surface collection from site 20–O–1 (fig. 17), another long time-range site, would have illustrated the same condition, but was not included, as explained above.

must be admitted for the fullness of the site-dating shown by any particular surface collection has no bearing at all on the validity of the quantitative-chronological patterning which derives from the seriation of these collections. The probabilities are still in favor of each collection representing a continuous segment of time, whether this segment be only the latter portion of the length of time any one site has been occupied or not.

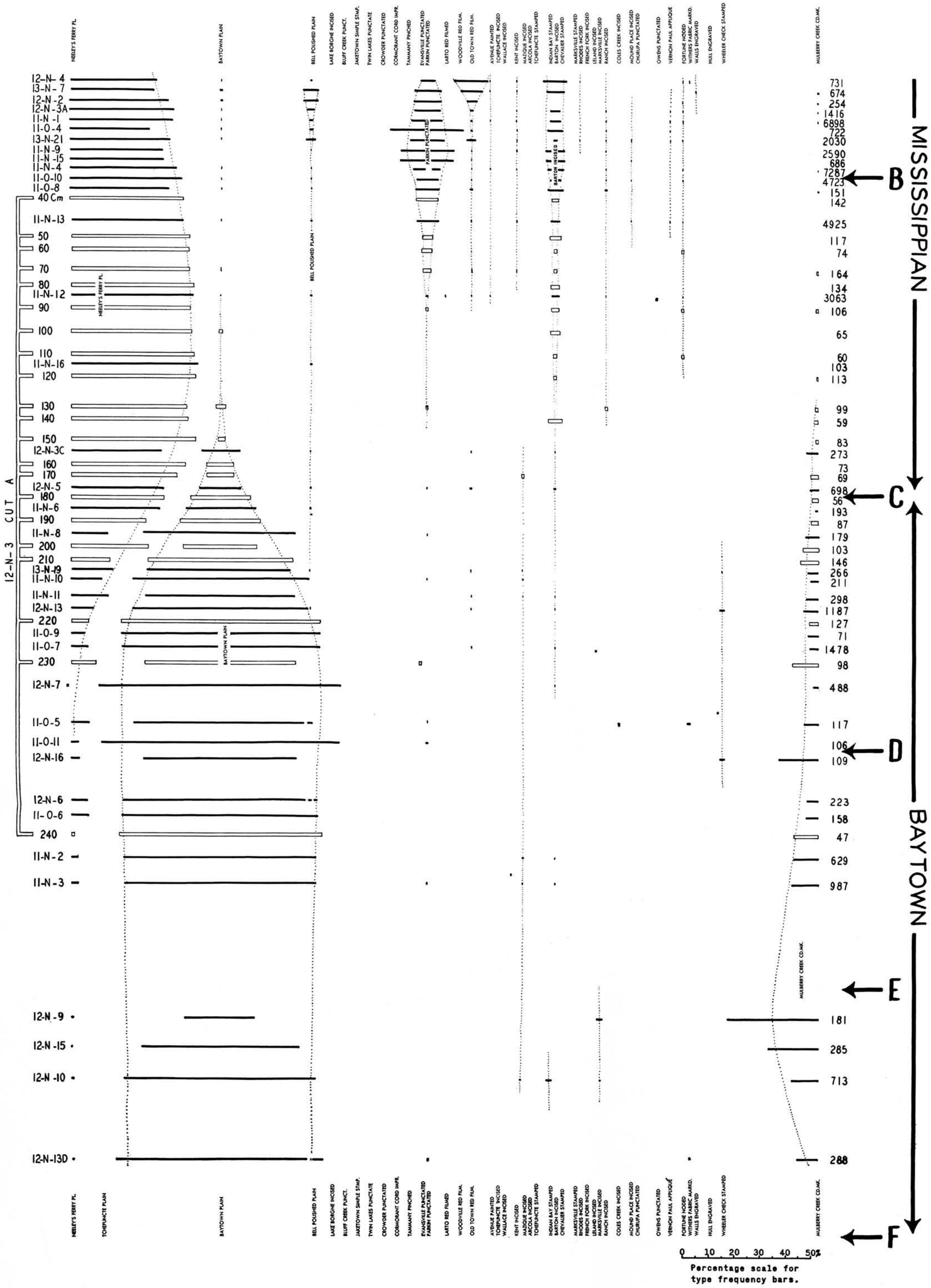


FIG. 21. Seriation Graph No. 5, St. Francis area.