NOTE ON THE ANALYSIS OF LITHIC ASSEMBLAGES

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This note describes a study of flakes and scrapers from some twenty six British sites dated from early Neolithic to the end of the Bronze Age. The sites were listed in as near to chronological order as possible, using all available data. Only eight of the sites were common to both kinds of artifact, i.e. 9 sites provided flakes only,
9 sites provided scrapers only,
8 sites provided both flakes and scrapers.

Ten sets of data from seven sites are unpublished.

The Data

a) Flakes. There were ten length classes, each class covering the same increment of length and six breadth/length classes, each covering the same increment in that ratio. For each site the number of flints in each length class was recorded and also the number in each breadth/length class. It is unfortunate that the two dimensions were not recorded together for any one flint, but for the present purposes this is not important. This gives us a 17 x 16 matrix of numbers, i.e. 10 + 6 numbers for each of 17 sites. The data are given in Table 1.

b) Scrapers. There were nine length classes, eight classes of angle of retouch, and twelve thickness classes, all defined by equal increments in the variable. Also there were eleven shape classes as defined by Clark, giving a 17 x 40 matrix. The data are given in Table 2.

Procedure

We started with the flakes, multiplying together pairs of rows of the data matrix A to form a 17 x 17 site similarity matrix.

$$G = A.A^T$$

and normalised this by replacing each element g_{ij} by

$$g_{ij} / \sqrt{g_{ii}\ g_{jj}}$$

giving unity all down the leading diagonal and all other elements between 0 and 1. This gave 50 values of g_{ij} greater than 0.9 and one greater than 0.99. Study of the data revealed the startling fact that on most sites most people preferred to make middling sized flakes! Clearly a more subtle criterion was needed, so we replaced A by A - E where e_{ij} is the expected value of a_{ij} calculated on the assumption that the percentage of any class present was the same for all sites. We then formed the similarity matrix

$$G = (A-E).\ (A-E)^T$$

and normalised this as before. Since we had four types of measurement for scrapers as compared with two for flakes, one might expect the former to yield more reliable results, but there was a snag. We see that we have complete data for only seven sites while for five sites we had only one kind of data. We did our best to overcome this defect by filling the gaps with expected values i.e. making $a_{ij}-e_{ij}$ zero in our modified matrix.

Method of Analysis

Tests showed that simple seriation was not possible and we proceeded with a simple graphical method based on that used by Renfrew and Sterud (Amer.Antiq. 34,265,1969). Since all the off-diagonal elements of G lie between +1 and -1, we chose as a convenient unit of length

$$l_{ij} = 1.20 - g_{ij}$$

so that all l_{ij} lay between 0.2 and 2.2 . Following Renfrew and Sterud, we chose the two largest values of g_{ij} from each column of G, so giving two values of l, say l_{ij} and l_{kj}. Taking these two lengths to give the distance of point J from I and K, we can start to build up a figure by triangulation. However, the same term $g_{ij}=g_{ji}$ was often one of the two highest in both column i and column j so we needed more data. We obtained this by taking the next largest value of g in the appropriate column.

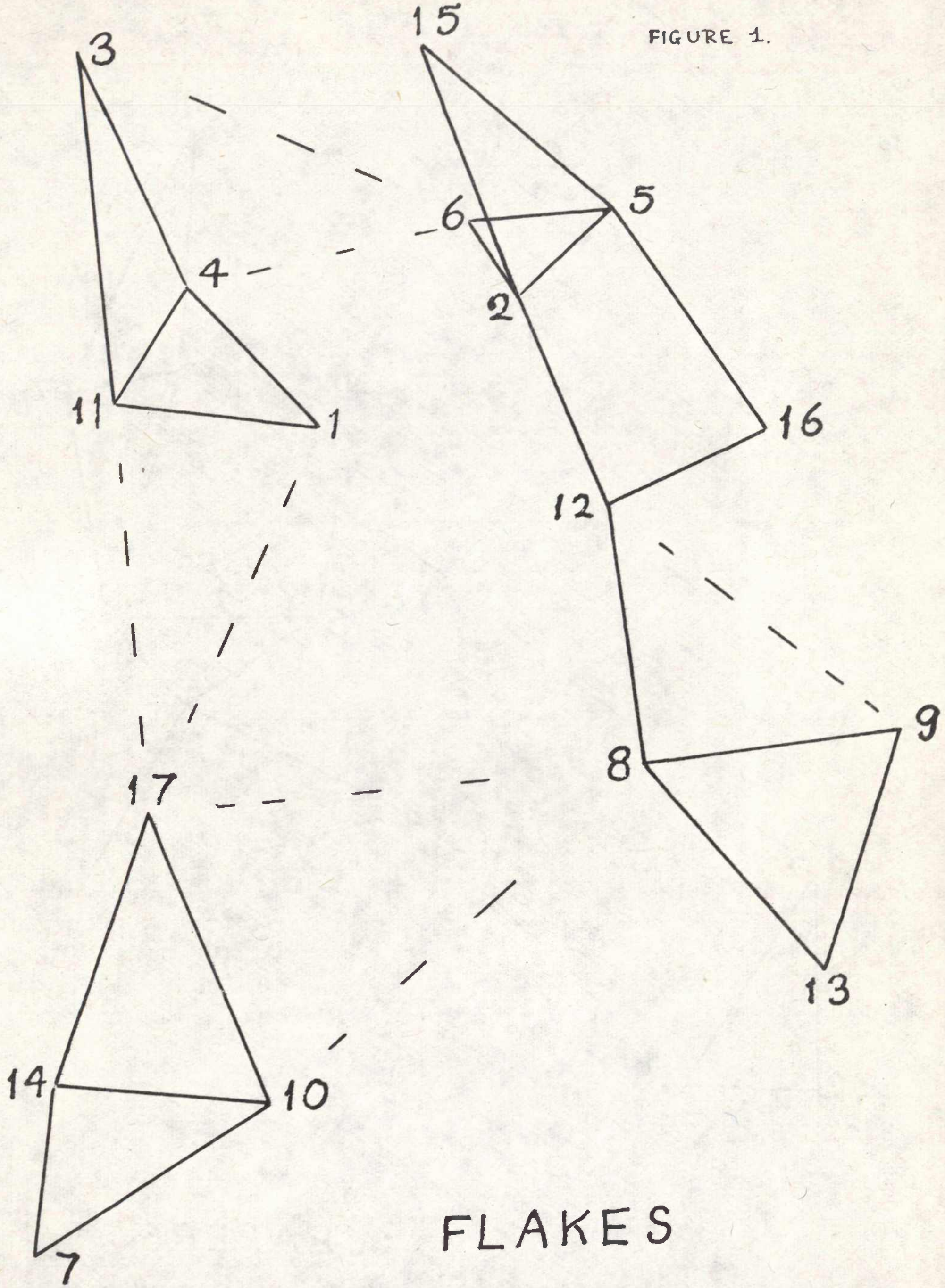
Of course, when one constructs a figure by repeated triangulation there are usually two possible positions for the next point. The one chosen was that which gave the next 2 or 3 smallest values of l, as measured to existing points on the diagram, closest to those derived from the matrix.

The above procedure encountered only two hitches. Once the smallest value of l had to be rejected because the two circles used in the triangulation process failed to intersect and once it was rejected because it gave very poor measured values for the next three smallest values of l.

Results for Flakes

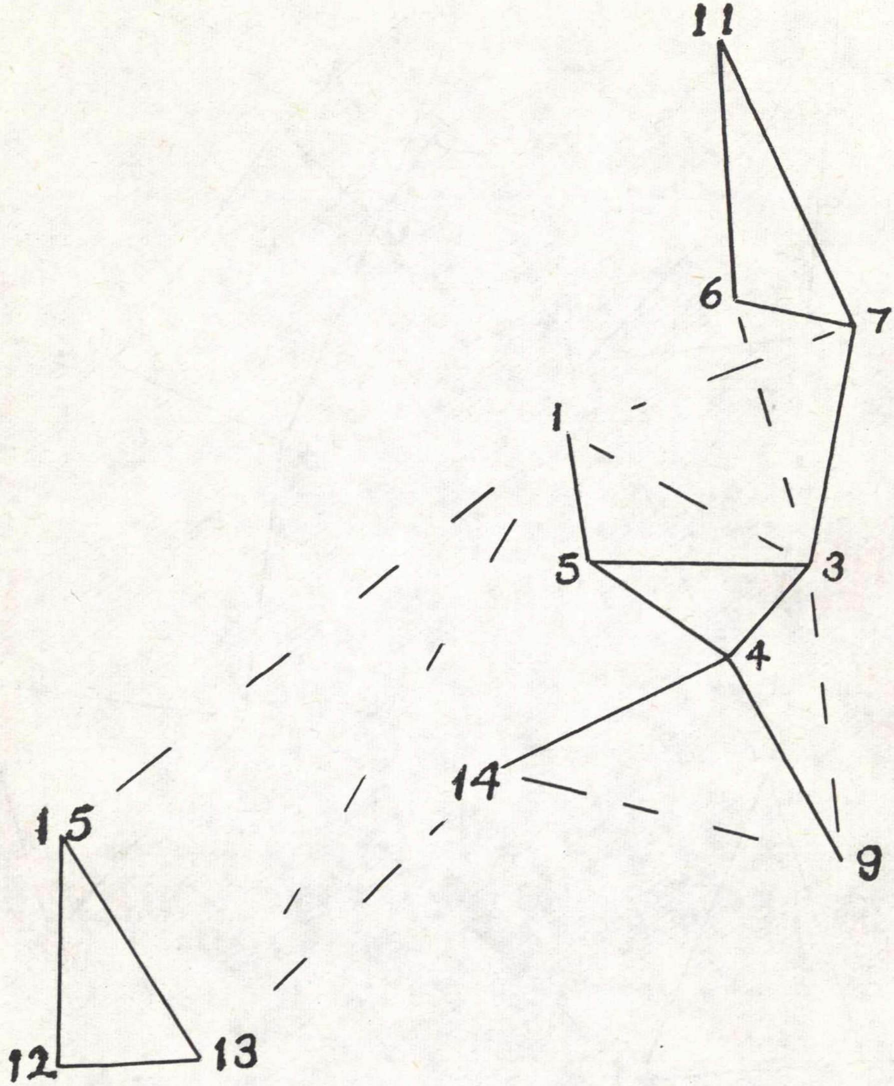
These are shown in Fig. 1. The solid lines are derived from the two largest values of g in each column while the dashed lines show what additional values were used in the construction. Clearly we have four distinct groups and if we forced a seriation using Renfrew and Sterud's procedure of using only the shortest links, we should still be left with a number of side chains and still at least three distinct groups. Consider the group in the bottom left-hand corner. We have here a close association between a lateish Neolithic, a late Neolithic grooved-ware, a Beaker and an Iron-Age site! Again sites 13 and 14 were only 5 metres apart, and there was no a priori reason to expect any difference. However, the data table shows that the flakes from 14 tend to be smaller and narrower than those from 13. Since they must be contemporary, this can only mean different activities at different parts of the same site. In fact it appears that one area was used for core preparation and one for making and sharpening tools. Site 11 is a Neolithic

FIGURE 1.



FLAKES

FIGURE 2.



SCRAPERS

grooved ware site, but correlates well with the very early Neolithic sites. Site 3 is Windmill Hill, the type site for the early Neolithic, but this diagram shows it out on a limb and therefore atypical. Sites 8, 9 and 13 form a little group on their own, but have quite different pottery types, late Neolithic, grooved ware and Beaker respectively.

Maybe flakes are not a very reliable guide, so let us turn to scrapers.

Results for Scrapers

Omitting the five sites with only one type of measurement, we get Fig. 2. This shows one compact group and one rather diffuse group, which could be separated into two. In the compact group, numbers 12 and 13 are those two sites 5 metres apart which yielded different flakes, so the scraper results look a lot better.

Sites 12 to 17 are all Beaker sites but number 14, which is the Windmill Hill type site, still looks the odd one out. The fact is that the others are all small sites where only one activity went on and scrapers formed large percentages of the total numbers of tools found. Because of this, Bradley has suggested in World Archaeology, that they belong to a special class of late Neolithic site.

Numbers 1 and 5 are type sites for early and late Neolithic respectively, but their scrapers are closely correlated. In fact we have three pairs of neighbouring sites which have closely correlated scrapers but quite distinct pottery. This suggests that a given style of tool making may persist for a long time in a small region. Examples of pottery styles persisting in this way are known, for example Neolithic at Broome Heath (Nos. 2 and 6 on Fig. 1).

Number 11 is Belle Tout, with pure Beaker pottery, but the excavation report pointed out that the flint industry was odd; it looks like mid-Neolithic on this diagram. In fact the scrapers are larger than on other Beaker sites and there are very few of the G and H shapes that one expects to find in quantity on Beaker sites.

We should of course be looking for sites with different kinds of activity-tool kits - and all the Beaker sites on Fig. 2 were temporary or seasonal except Belle Tout. Finally I should mention that the analysis was first done with a different formula for 1, namely 1/g instead of 1.2 - g. This produced the same little group but quite differently oriented with respect to each other. Any other method of analysis must also produce the same groups.

Conclusion

We have shown by simple graphical analysis that the data presented cannot be explained by time seriation alone. The application of more powerful computer programs to separate temporal and spatial variations is hardly justified for such limited data.

TABLE 1 LIST OF SITES USED IN ANALYSIS OF FLAKES.

NUMBER	NAME	PERIOD.
1	Pamphill.	Early Neolithic.
2	Broome Heath(old land surface).	Early Neolithic.
3	Windmill Hill.	Early Neolithic.
4	Knap Hill.	Early Neolithic.
5	Durrington Walls A.	Mid Neolithic.
6	Broome Heath pits.	Mid Neolithic.
7	Kennet Avenue.	Late Neolithic.
8	Arreton Down.	Late Neolithic.
9	Durrington Walls B.	Grooved Ware.
10	Puddlehill.	Grooved Ware.
11	Wilsham Road, Abingdon.	Grooved Ware.
12	Belle Tout.	Beaker.
13	Rackham Area A.	Beaker.
14	Rackham Area B.	Beaker.
15	Oakley Down.	Beaker.
16	Itford Hill.	Beaker.
17	Handey Barrow.	Iron Age.

DIMENSIONS USED:-

Ten Length classes with boundaries at 0,1,2,3,4,5,6,7, 8,9 & 10 cm.

Six breadth/length classes, with boundaries at 0,0·2, 0·4,0·6,0·8 & 1·0.

TABLE 2 LIST OF SITES USED IN ANALYSIS OF SCRAPERS.

NUMBER	NAME	PERIOD.
1	Windmill Hill.	Early Neolithic.
2	Abingdon.	Early/Mid Neolithic.
3	Hurst Farm.	Early/Mid Neolithic.
4	Broome Heath.	Mid Neolithic (bulked).
5	Kennet Avenue.	Late Neolithic.
6	Long Island 3.	Late Neolithic.
7	Portsea 2.	Late Neolithic.
8	Arreton Down.	Late Neolithic.
9	Durrington Walls.	Grooved Ware.
10	Clacton.	Grooved Ware.
11	Belle Tout.	Beaker.
12	Rackham Area A.	Beaker.
13	Rackham Area B.	Beaker.
14	Windmill Hill.	Beaker.
15	Broome Heath.	Beaker (bulked).
16	Peacocks Farm.	Beaker.
17	Plantation Farm.	Beaker.

DIMENSIONS USED : - Nine length classes with boundaries at 1,2,3,4,5,6,7,8,9 &10 cm. Eleven shape classes A(i),A(ii),B(i),B(ii),C,D(i),D(ii),E,F,G & H. Eight angle-of-retouch classes with boundaries at 20,30, 40,50,60,70,80,90 & 100 degrees. Twelve thickness classes with boundaries at 3,5,7,9,11,13,15,17,19,21,23,25 &27mm.