

A. BOHMERS

STATISTICS AND GRAPHS IN THE STUDY OF FLINT ASSEMBLAGES

II. *A Preliminary Report on the Statistical Analysis of the Younger Palaeolithic in Northwestern Europe*

(pl. I; figs. 2-5)

THE TYPES

The types given in the main graph (pl. 1) are listed below, each with its graph number (1-27) and a brief description which is not intended as a full definition of the type but merely as a statement of the most important criteria used to distinguish it. We also give for each type a description of the measurements which are diagrammed in the supplementary graphs.

Shouldered points (1)¹ (Dutch: *kerfspitsen*; Ger.: *Kerbspitzen*; Fr.: *pointes à cran atypiques*; 1-4)²

The retouch of the upper part of the point may or may not meet the retouch of the shoulder (1, 2). There may be retouch at or near the base of the blade opposite the shoulder (4). In addition to the shoulder there may be one or more "hafting notches" (4). The notching and the shoulder may appear on the bulbar face or on the reverse face (4). The retouch of the point and of the notch may appear either on the left or on the right edge; usually they are on the same edge but occasionally on opposite edges. The implement is made on a blade.

The main graph gives the number of shouldered points (1). The supplementary graph (34) gives the lengths of all types of points in the site in groups of 20-30 mm, 30-40 mm, 40-50 mm, 50-60 mm, 60-70 mm, and sizes > 70 mm.

Havelte points (2) (Dutch: *Havelter spitsen* 5-7)³

For brevity we refer to the long narrow tanged points of Havelte type as Havelte points.

The retouch of the upper part of the point is always on the non-bulbar face, either on the left or the right edge. The two notches which form the tang may both be made from the bulbar face or both from the reverse face, or one from each face. They are often of unequal depth and length.

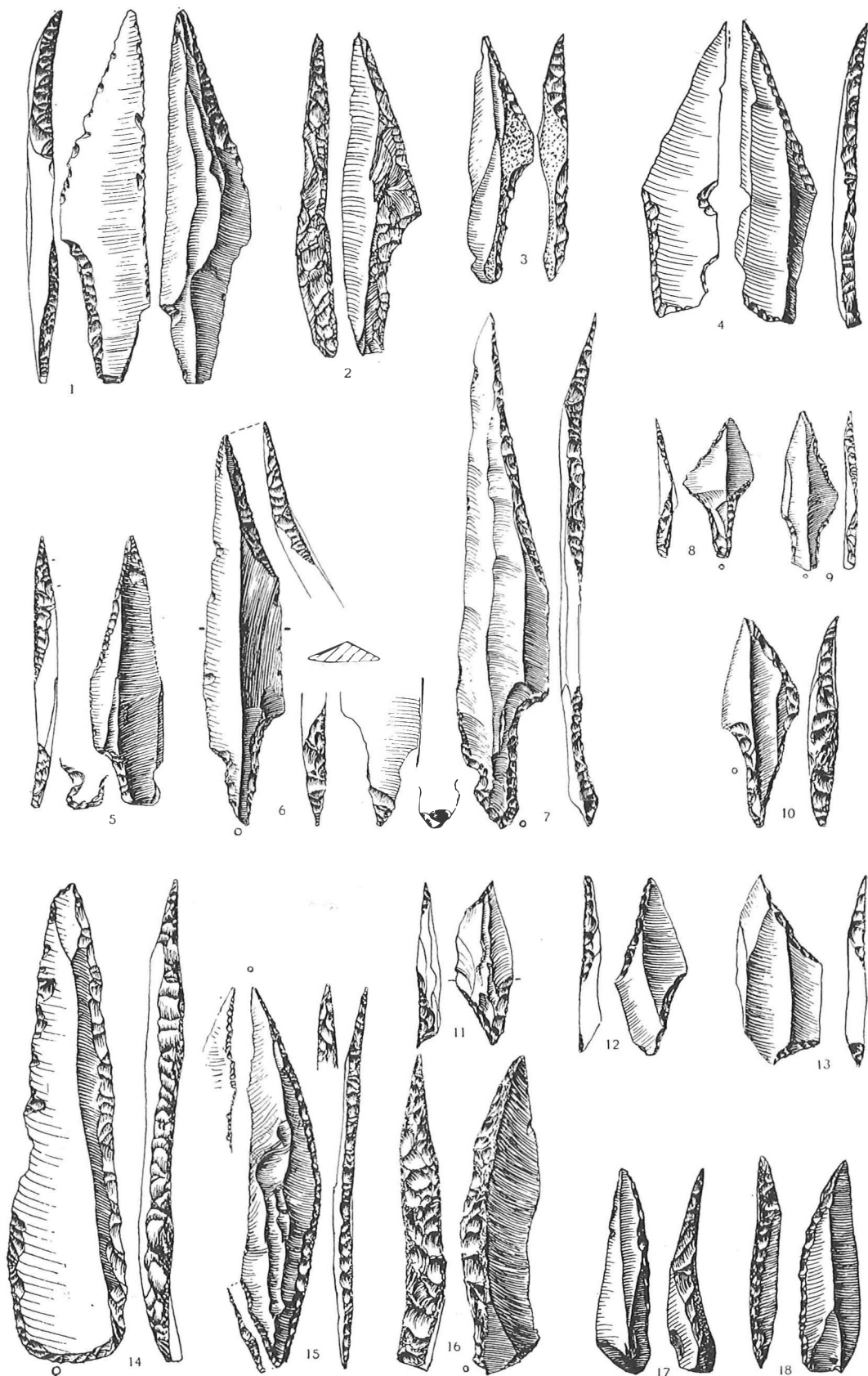


Fig. 2

It is possible to distinguish the largest of the tanged points of Ahrensburg type (length 40 to 50 cm) from the smallest of the Havelte points. On the largest of the Ahrensburg points the tang-notches are comparatively large and deep, and can be distinguished from the smaller tang-notches of the Havelte points.

Ahrensburg points (3) (Dutch: *Ahrensburg-spitsen*; Ger.: *Ahrensburger Spitzen* or *Stielspitzen Typ Ahrensburg*; 8–10)

As we have already noted in discussing the Havelte points, Ahrensburg points are distinguished from Havelte points not only by their smaller size but by the form of the tang. The points may be retouched on the left edge (8), the right edge (9, 10) or on both edges. The tang notches are made on the bulbar face, the reverse face, or with one on each face. The lower end is often worked so as to remove the bulb.

Points type B (4) (p. 28, fig. 6) See description p. 29

Trapezoids (5) (Dutch: *vierhoeken*; Ger.: *Vierecke*; Fr.: *trapèzes*; 11–13) See description p. 30

Gravette points (6) (14)

I formerly (Bohmers, 1947) grouped all points made from blades with one straight, curved or angular steeply retouched side under the heading of Gravette points. I now believe that they can profitably be subdivided.

These implements are, in my opinion, points rather than knives.⁴ It appears best to employ the term Gravette point, first introduced by Breuil, for the long, slender, more or less symmetrical examples, with a straight or nearly straight back. On these the point is normally situated near or on the long axis.

Chatelperron points are broader, and have a strongly curved back. Since this name has always been used for the larger implements of this type, I would suggest that Chatelperron points less than 50 mm in length be designated as micro-Chatelperron points or Tjonger points (7) (16–18). This seems necessary because one finds in various cultures many examples which are so small (*e.g.*, between 30 and 40 mm) that the name Chatelperron point would hardly be applied to them; and yet they correspond exactly to Chatelperron points in form. Indeed, many of these were found at the type-site of Chatelperron itself.

Mr. J. Verheyeweghen called my attention to this after the graphs had been prepared and printed, and it was too late to apply the term Chatelperron point to some of the larger Tjonger or micro-Chatelperron points in the graph. On all these points the base of the edge opposite the back is often steeply retouched, probably to remove the bulb of percussion or its remains.

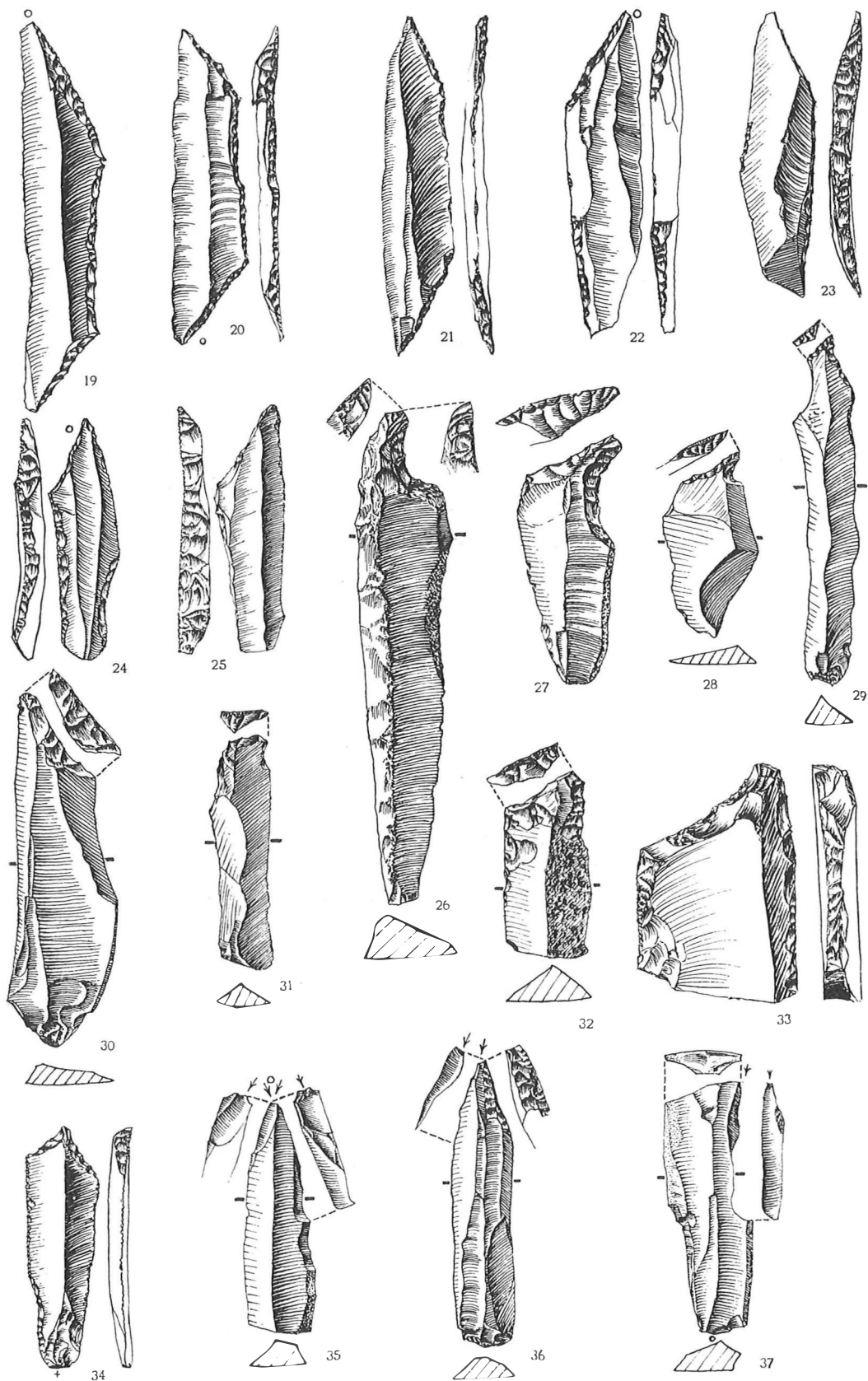


Fig. 3

I would also suggest that points of Chatelperron or Tjonger type of crescentic form, that is, with a more regularly curved back and two distinctly pointed ends, be termed Azilian points. This distinction suggested itself only after the counting had been completed, and could not be utilized in the graphs (16).

Creswell points (8) (22–25)

In the Creswellian, as we shall show later in this paper, and at the related sites in the Netherlands, such as Neer II, we find points similar to Tjonger points but with a single angle on the back. For these I propose the name Creswell points, after the sites at Creswell Crags. These points are rare in the Tjonger group.

Cheddar points (9) (19–21)

Implements similar to Tjonger points, but with two angles on the back, were found especially at the site of Zeyen in the Netherlands. A site with an industry corresponding to it in many respects was found at Gough's Cave near Cheddar in the west of England. Since the main concentration of sites yielding such points appear to be in that region, I propose the name Cheddar points.

Borers (12)

True borers, with straight boring points, usually slightly (but sometimes heavily) retouched on the reverse face, are very rare on our sites. Here are also included the reamers (Dutch: *ruimers*; Fr: *alésours*).

Zinken (13) (14) (15)

As A. Rust demonstrated, these are not borers but implements for working antler and bone. The beak-like projection is appropriately large and thick, with a triangular or planoconvex cross-section. On typical *Zinken* (15) (Dutch: *krombekstekers*) the beak is rather long and distinctly curved; on atypical examples (Dutch: *bekstekers*) (14) it may be more or less straight, and is sometimes so worn down by use that no curvature remains. Typical examples are illustrated in 26–29, atypical examples in 30–33. There are some examples which are transitional forms between borers and *Zinken*.

Gravers (16) (17) (18) (19)

Gravers are here classified primarily according to the form of the worked end rather than according to the position of the cutting-edge in relation to the long axis.

On most gravers the worked end is either blunted by retouch or simply broken. This appears to me to be more important (at least for our material) than whether the cutting-edge is found on or near the long axis (median graver; *Mittelstichel*) or eccentrically (*burin d'angle*; *Eckstichel*). An initial classification according to

the form of the worked end can be carried out easily and objectively while the distinction between median gravers and angle gravers is often somewhat subjective because of the frequent occurrence of intermediate forms which are not easily assignable to one or the other category. The median graver – angle graver classification is however retained as a secondary division (in the Table, but not in the graph), if only because it is almost universally used in the literature.

Thus we have the following types:

1. Gravers with a broken (or flaked-off) worked end, in short: removed-end or AA-gravers (16) (Dutch: *tweevlakstekker*; Fr. *burin dièdre*; 35, 37 and 38).

2. Gravers with a blunted or retouched upper end, in short: blunted-end or RA-gravers (17) (Dutch: *afgeknotte middenstekker*; Fr.: *burin sur troncature retouchée*; 36, 39).

3. Gravers with a graver facet which does not descend from a previously prepared, broken or retouched end, but from an ordinary, unworked, blade or flake edge (or, rarely, from the striking platform). In this type of graver the graver-facet sometimes runs along the length of one edge of the flake, and not, as in most other graver types, at an angle to the edge. The name plane graver, single blow graver, Ger. *Seitenstichel*, has accordingly come into use. We should like to call this type A-graver (18) (40, 41).

The gravers in Group 2 are often also called single blow gravers (Dutch: *een-slagstekers*; Ger.: *Einschlagstichel*); those in Group 1, double blow gravers (Ger.: *Zweischlagstichel*; Dutch: *tweeslagstekers*). I prefer to discontinue the use of these terms, since the classification into single and double blow gravers is not really correct. Gravers are most often made by striking off a series of flakes to form the cutting-edge.

The cutting-edge is often re-sharpened by fresh graver-blows. The so-called double blow gravers are thus not produced by two graver-blows, but rather by first breaking the original blade and then striking off a single graver facet from the broken edge. They are therefore single blow gravers. The single blow-double blow nomenclature gives rise to much confusion. Some observers use the term single blow gravers because they show only one graver blow, while others prefer to reserve the same term for gravers with a retouched upper end. Others understand by the term single blow graver the type which we call A-gravers, without an upper end that is broken off, retouched or blunted.

No special treatment is given to polyhedral and/or prismatic gravers, which are in any case rare in our material. In our region most of these are merely core-gravers with a number of graver blows coming off the cutting-edge, but essentially belonging in Group 1. A separate classification of these gravers would be difficult because of the many forms transitional between these and other types. One would have to specify, for example, how many graver blows descend from the cutting-

edge. In many cases it is merely a question of resharpened or massive gravers. It seems preferable to specify the nature of the resharpening or polyhedry in each individual case. We give therefore in the Table the number of graver facets descending from the cutting-edge, and also the number of earlier graver facets (no longer connected with the cutting-edge) which are to be observed.

Gravers with a retouched upper end can also be resharpened by fresh retouch. This is easily seen on the graver facet, which will have lost its negative bulb of percussion.

Core gravers are often difficult to recognize, since there is every degree of transition between gravers deliberately made on a core and ordinary cores which have been utilized as cutting or graving implements.

They are not given in the graph, so as to avoid introducing too great a subjective element which would have an undue influence on the proportions of the more exactly definable types. They are given, however, in the Table, in the main work.

Multiple gravers (19) (40) have more than one working edge on a single implement. These working edges can belong to gravers of the same or of different types.

Multiple-purpose implements (23) (Dutch: *combinatiewerktuigen*; 39, 46)

Gravers with scrapers, with *Zinken*, with notches, or with a blunted or retouched end opposite the graver working edge, are counted as multiple-purpose implements.

Gravers of Noailles Type are rather short and wide retouched little angle gravers with a graving angle of 80° – 90° . They are often found on multiple purpose implements.

It would be useful to establish the typical dimensions of this type to aid in its definition; but the large amount of comparative material necessary for this is not at present available in our sites.

For gravers of all types, the following dimensions are recorded in the graph:

1. The width of the working edge; given in groups of 0–1, 1–2, 2–3, 3–4, 4–5, 5–6, 6–7, 7–8 or more mm (see 38, 39 and 35 in the graph).
2. The graving angle; given in groups of 30° – 40° , 40° – 50° , 50° – 60° , 60° – 70° , 70° – 80° and 80° – 90° (see 38–40 and 36 in the graph)
3. The maximum length along the long axis; in groups of 20–30, 30–40, 40–50, 50–60, 60–70 and 70–80 mm (37).

The dimensions are graphed. The graph also shows the proportion of flake or blade semi-finished implements in relation to the gravers and scrapers. For this purpose only clearly recognizable unfinished implements are counted (32, 33).

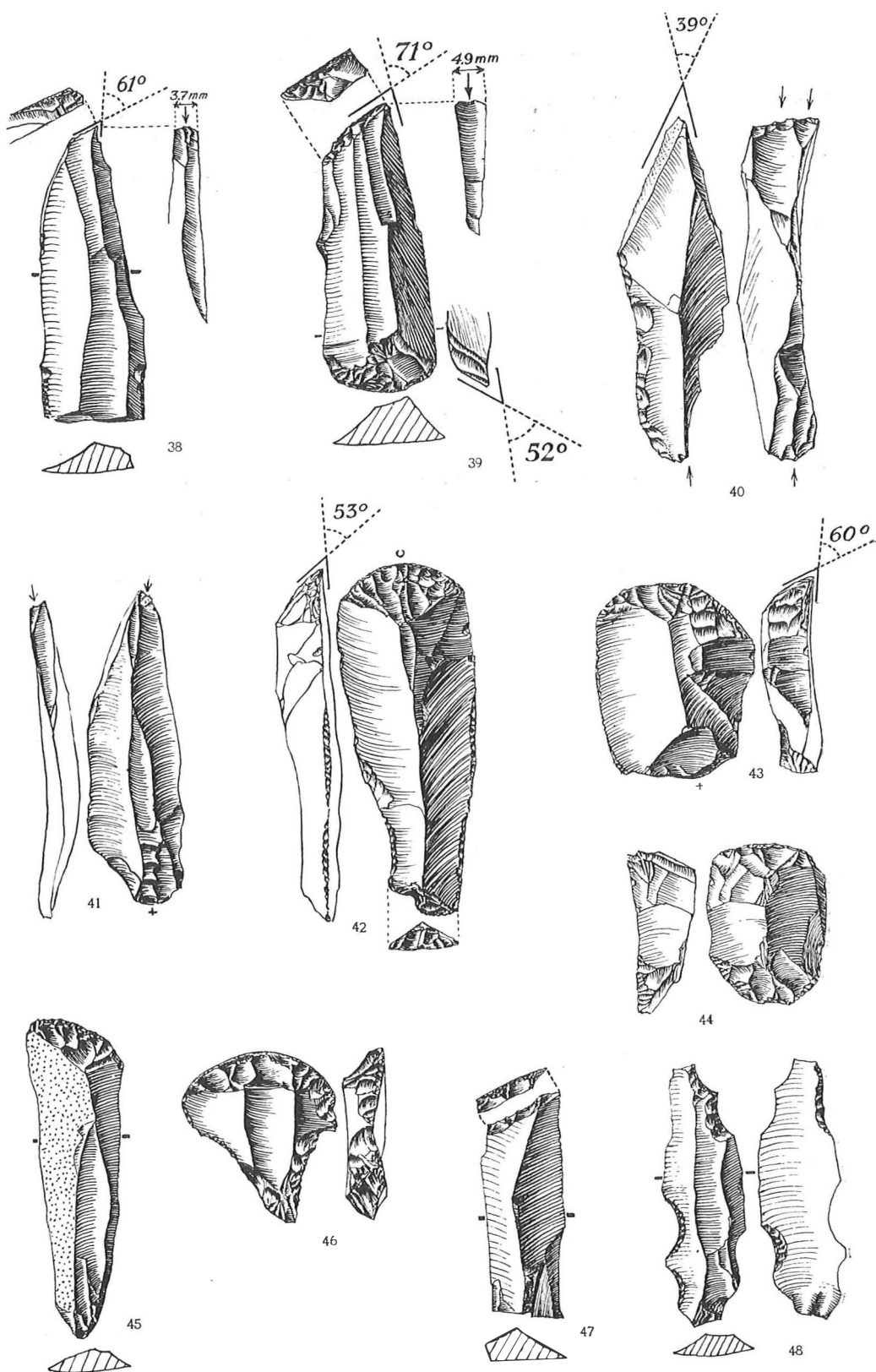


Fig. 4

The Table also gives the absolute length, breadth and thickness of the gravers, the number of graver facets descending from the working edge, the number of earlier graver facets, and the retouch of the graver edges.

Backed blades (24) (25)

Fragments of backed blades or blunted-back blades without points occurring on our sites are often merely broken points of the three last-mentioned types. Some, however, have been intentionally produced without points.

The count of the latter given in the graph and table includes only examples which are definitely complete implements. Some have straight or obliquely trimmed ends. Microlithic blunted-back blades (for description see p. 31, fig. 7) have a thickness of less than 4 mm.

Scrapers (20) (21) (22)

Scrapers are divided into long scrapers (20) (42, 45), with a length greater than twice the width, and short scrapers (21) (43), with a length-width ratio of less than 2:1. Double scrapers (22) (44), are also counted. Scrapers with gravers or *Zinken* (46) or with notches, or with the end opposite the scraping edge blunted, are counted as multiple-purpose tools and measured by the scrapers.

For all the scrapers, the angle of the scraper-edges is measured, (see 39, 42, 43) as well as the length along the long axis, the width at right angles to it, and the thickness, given in groups as indicated on the graph (39-42). On double scrapers the angles of both scraping edges are given. The graph also shows the percentage of retouched scraper edges. For microscrapers, see p. 32.

The Table gives the number of examples with oblique scraper-edge (45) and the number of examples with polished or glossy working edge (46).

Retouched blades (26) (27)

The number of retouched blades including those with distinct worked notches (48) and those with straight or diagonal blunted or retouched upper end (47), are counted and shown in the main graph.

The Table gives the length, breadth and thickness of all the blades and the proportions of the various blade types.

Type A is unbroken, Type B lacks the lower (non-bulbar) end, Type D lacks the bulbar end, type E has both ends missing. The number of blades with retouched edges is also given. The length of the unbroken blades (Type A) may provide a useful indication of the quality of the flint raw materials available. This length is therefore given in the graph.

The table also records the number of cores, core gravers, core scrapers, hammer-stones, polishing stones, and, where applicable, the number of pieces of red ochre and pieces of amber.

NOTES ON THE INTERPRETATION OF THE GRAPHS

1. The percentages shown for points (1-11) are on the basis of the number of points compared with the total number of implements of all kinds, including points. The actual number of points measured is given in figures on the graph.

2. The percentages shown for other implements (12-27) are based on the number of implements of each type compared with the total of all implements except points. The actual count of each type will be given on the Table.

3. In the graphs of the percentages of implement types (1-27), each square represents 5%. In all other graph bars (28-43), each square represents 10%.

4. In computing the ratio of gravers and scrapers made on flakes to those made on blades (32-33), we count only examples where the distinction between blade and flake is obvious. The number of pieces counted is given in figures.

5. The indices of *Zinken* (29), gravers (30) and scrapers (31) are calculated as follows:

$$\text{Zinken index} = \frac{\text{number of Zinken} \times 100}{\text{total number of implements except points}}$$

$$\text{graver index} = \frac{\text{number of gravers} \times 100}{\text{total number of implements except points}}$$

$$\text{scraper index} = \frac{\text{number of scrapers}}{\text{total number of implements except points}}$$

The percentage of points (28) is calculated as follows:

$$\text{percentage of points} = \frac{\text{number of points} \times 100}{\text{total number of implements}}$$

6. For the scraper-angle (36), all scrapers, including those forming part of multiple-purpose tools, are counted. The actual number of scraper-edges measured is given in figures.

7. For the width of the graver working-edge and the graver-angle, all gravers, including those forming part of multiple-purpose implements, are counted. The actual number of graver working-edges measured is given in figures.

8. The retouch of the scraper-edges (1 × and 2 ×) (38) is calculated on the basis of the number of scrapers.

9. For the length of blades (43), only unbroken blades are measured, *i.e.* blades with striking platform and lower end preserved (Blade type A).

10. The actual counts of implements upon which the graphs are constructed

will be given in the form of a table so that exact figures will be available. This will enable any one to rearrange or reconstruct the graphs for special purposes. The table will appear in the forthcoming publication, but is not given in this preliminary report.

11. A supplementary table will also be provided, in which various counts and dimensions may be recorded which, though not of sufficient significance to be used for the graphs of the Palaeolithic material of the Netherlands, may prove useful in other respects. It will include such data as the width and thickness of gravers; the number of graver-facets descending from the working-edge of the gravers; the number of older graver facets; details of side-retouch on gravers; position of the graver working edge in relation to the long axis of the implements (right, centre or left); the form of scraper-edges; the frequency of gloss on scrapers, and flakes. Such data will also be given for the smaller sites which are not graphed.

SOME EXAMPLES ILLUSTRATING THE METHOD

The graphs can be correctly interpreted only with the aid of the illustrations. In the forthcoming work over 1000 illustrations will be provided. In this preliminary account, we confine ourselves to a few characteristic examples to illustrate the method and the results obtained from its use.

The graphs are arranged according to cultures: the Hamburgian, the Tjongerian, the newly proposed Cheddarian, the Creswellian, and the Ahrensburgian.

As a test of the method, we have counted and graphed separately two groups of implements from the same homogeneous Tjongerian site, 'de Banen' (North Brabant), excavated in 1954 and 1955, under the headings 'de Banen I, 1954' and 'de Banen II, 1955' respectively. The counts themselves were made with a year's interval between. This gives us an insight into the magnitude of differences to be expected in the graphs which may be considered to be insignificant.

The results obtained from the count of 373 implements from the first year's excavation differ very little from those obtained in the counting of 161 implements from the second year. The agreement between the two graphs is striking. Among the gravers the differences are at the most 6%. The indices and unfinished-implement values differ at most by 7%.

The graphs of the dimensions of the various types are, viewed as a whole, very similar in form. In de Banen II there were too few points to enable their dimensions to be graphed. The largest difference, of c. 10%, is found in the width of the graver working edge. This tends in any case to vary considerably.

This kind of agreement between two graphs may be termed agreement of the first order.

Almost as close an agreement is shown in the graphs of two different sites of the Tjongerian, Drunen III and Eindhoven, although the two sites are 35 miles apart.

Most of the implements from these two sites were counted and measured by Brother Aquilas Wouters for the forthcoming publication. The percentages of the types agree almost exactly; only for the points, which tend to be variable, is there a difference of as much as 6%. The indices are almost the same and the dimensions differ at most by 5%. There is a striking similarity in the form of the graphs of the points, the graver working-edge, the graver-angle, the length of gravers, the scraper-angle, the length of scrapers, the width of scrapers, the thickness of scrapers, and the edge-retouch of the scrapers. The material comes from surface sites, systematically collected by experienced workers.

The agreement between these two sites is almost exactly as great as between the two parts of the single find-concentration at de Banen. Since the forms of the artefacts, with the typical Tjonger points and small narrow scrapers, are the same, this may also be called agreement of the first order. These are only two sites chosen at random; there are others in the same region which show agreement of the first order with either de Banen or with Drunen and Eindhoven.⁶

The graphs for the sites of Donkerbroek I and II provide a third example for the Tjongerian. The assemblage from Donkerbroek I comes from an excavation and from a surface collection made by H. J. Popping in the 1930's. The finds from Donkerbroek II were excavated by the present writer in 1956. The counts and measurements were made five years apart.

Although the implements come from the same site, rather large differences appear, e.g. in the counts of gravers and scrapers. Donkerbroek I has too few gravers (which is also reflected in the graver indices) and too many scrapers. This suggests that in the surface collecting in the 1930's, not all the gravers were recognized, while scrapers were particularly looked for. (This is of course not intended as a criticism of the work of M_r. Popping, who indeed has the distinction of being the first, as early as about 1930 and in opposition to the then official view, to recognize the Palaeolithic in the northern Netherlands). Similarly, there are discrepancies in the graphs of the dimensions, especially in the length of the gravers, resulting from the smaller gravers being overlooked in the earlier collecting, and in the sideretouch and length of the scrapers, since the smaller and more poorly worked examples would tend to be overlooked.

Other sites from the Tjonger River showing agreement of the first order with Donkerbroek occur in the northern provinces of the Netherlands and will be discussed in detail in the forthcoming work.

Another site of the same culture excavated by the writer, at Makkinga, shows some deviation, e.g. in the very important scraper-angle, which at Makkinga is

somewhat steeper. The peak in the graph occurs between 60° and 80° , in contrast to Donkerbroek where the peak is between 50° and 70° – 80° . But the proportions of the various types are almost identical. This kind of agreement may be called agreement of the second order⁵.

In all we present here seven graphs of sites belonging to the Tjongerian. These seven sites belong to three different variants of the Tjonger culture. In comparing these with one another, we may first examine the differences between the Brabant variant, as represented here by de Banen, and the variant from the northern part of the Netherlands, as represented by Donkerbroek. It may be observed that in both variants there is the constant presence of a small number of Creswell points and atypical *Zinken*. But in the de Banen variant there are many more gravers and many fewer scrapers than in the North (cf also the graver and scraper indices). The ratio of gravers and scrapers made on flakes to those made on blades is approximately the same in both groups.

The points, scrapers and gravers are somewhat larger at de Banen than at Donkerbroek. The graver-angle is larger at Donkerbroek; the scraper-angle, a particularly significant dimension, is the same in both.

It appears that all implements tend to be larger in the de Banen variant than in the Northern provinces. One might attribute this to the availability of better flint in the South; but this is not an inescapable conclusion, since the third variant of the Tjongerian, that of Eindhoven and Drunen, occurs in almost the same area as de Banen, and had access to the same raw material, but its implements are much smaller than those of de Banen, and in part smaller even than those of the Donkerbroek variant. This applies particularly to the gravers. In this connection it may be noted that in the Eindhoven-Drunen variant the graver working edges are narrower than in the other two variants.

The points of the Eindhoven-Drunen variant are smaller than those of the de Banen variant, and of approximately the same size as those of Donkerbroek. In all sites of the Eindhoven-Drunen variant, the scraper-angle is much more homogeneously concentrated between 60° and 70° than in the other two variants, where it lies between 50° and 80° .

Differences also occur in the proportions of the types. The sites of the Eindhoven-Drunen variant have no atypical *Zinken* and more points; their ratio of gravers and scrapers made on flakes to those made on blades differs from de Banen, but agrees with the Donkerbroek variant. Among the unfinished implements there are a significantly larger number of blades at Eindhoven-Drunen than in the other variants.

It is apparent that with the help of this method a large number of resemblances and differences can be observed which previously, or with other statistical methods would be overlooked, and enables the maximum possible amount of information to be extracted from the material.

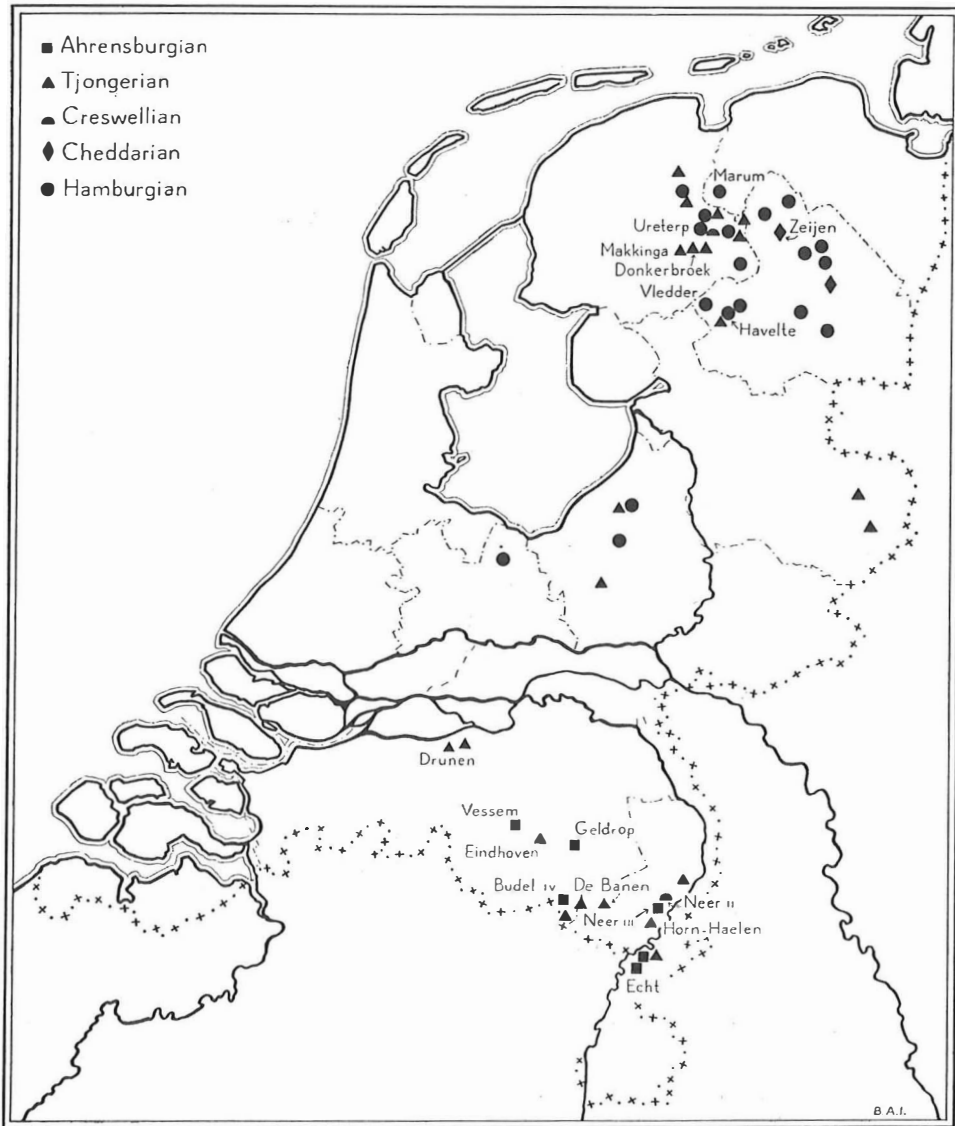


Fig. 5

The sort of agreement occurring among the three variants of the Tjongerian group may be characterised as agreement of the third order.

To illustrate the occurrence of still other variants, we give the graphs for the sites of Horn-Haelen (Limburg), Wehlen (south of Hamburg), Westerbeck IV (east of Hanover) and Rissen 18 (west of Hamburg). The detailed discussion of these sites will appear in the forthcoming work; here we mention only a few striking points.

The easternmost of these sites, Wehlen and Westerbeck IV, have, as Schwabedissen has several times pointed out, no Creswell points. Horn-Haelen has typical *Zinken* and, like Wehlen, many atypical *Zinken* and many scrapers with edge-retouch.

Westerbeck IV and Rissen 18 have a graver-scraper ratio agreeing closely with the sites in the northern provinces of the Netherlands, such as Donkerbroek; and the proportions of other types are not very different. But their ratio of gravers and scrapers made on flakes to those made on blades shows a higher proportion of blades; and in this respect they are closer to the Brabant sites like de Banen. The graver working edges are larger than those of the Donkerbroek variant; the graver-angle is smaller.

The scrapers from Rissen 18 agree on the whole with Donkerbroek; but the scraper-angle at Westerbeck IV is much sharper.

Wehlen and Horn-Haelen are unlike the sites mentioned above but agree generally in the graver and scraper dimensions. In order to work out the variants in this region as has been done in Brabant and Friesland one will need a larger number of sites with extensive material.

A second example of the diagnostic utility of the method is offered by the graphs of the sites of the Ahrensburgian at Vessel, Geldrop, Budel IV and Neer; Vessel was excavated by Wouters and the present writer; Geldrop is partly a surface collection and partly an excavation by Wouters. The finds occur in occupation layer slightly higher than the Alleröd level. The age of the occupation layers has been determined by the C 14 method as 10720 ± 85 (Gro 1059).

Budel IV and Neer III are surface sites, mainly collected by Wouters. The counts for these four sites were made partly by Wouters, and the remainder by the present writer, for the forthcoming joint work.

It was already known that the two sites, Vessel and Geldrop, were distinguished from the others by the absence of triangles and trapezoids. The graphs show that Vessel and Geldrop on the one hand, and Neer III and Budel IV on the other, are nearly identical, *i.e.* display agreement of the first order. In each case the graphs show a very similar form and agreement in almost all details. Other sites of the Ahrensburgian with agreement of the first order with Vessel and Geldrop will be discussed in the forthcoming work.

It is equally evident from the graphs that Vessel and Geldrop differ from Budel IV and Neer III at almost every point. These two variants of the Ahrensburgian differ from each other not merely in the absence or presence of triangles and trapezoids, but in the following particulars as well.

Budel IV and Neer III have:

- 1) fewer trapezoids;
- 2) fewer Ahrensburg points;

- 3) fewer short scrapers;
- 4) fewer blades with diagonally retouched end, and more blades with a straight retouched end;
- 5) fewer gravers (cf. graver index);
- 6) somewhat more blades and somewhat fewer flakes among the unfinished implements;
- 7) gravers with significantly narrower working edge;
- 8) gravers with much larger graver-angle;
- 9) smaller gravers;
- 10) steeper scraper angle;
- 11) shorter scrapers;
- 12) narrower scrapers;
- 13) thinner scrapers;
- 14) more scrapers with retouched sides;
- 15) longer blades.

Along with a number of important distinctions such as scraper angle, graver angle, graver working edge and scraper side retouch, it can be said in summary that the gravers and scrapers from Budel IV and Neer III are smaller and narrower than those of Vessem and Geldrop. This cannot be attributed to poorer raw material, since both variants of the Ahrensburgian occur in the same region, and since the blades from Budel IV and Neer III are in fact larger than those from Vessem and Geldrop. Since poorer flint material would obviously result in a reduction in the size of all implements, and certainly of the blades from which most of the implements are made, the difference must in this case be attributed to deliberate human choice.

These variants within the Tjongerian and Ahrensburgian all occur within a comparatively limited area. The Donkerbroek variant is found in the province of Friesland; the de Banen variant in the province of North Brabant and adjacent parts of Belgium; the Drunen–Eindhoven variant in North Brabant; the Vessem–Geldrop variant in North Brabant and Limburg; and the Budel IV–Neer III variant also in North Brabant and Limburg. Wouters has also measured sites of the Ahrensburgian in the Belgian Ardennes which are very similar to the Vessem–Geldrop variant, but with agreement of the second rather than of the first order.

In the Hamburgian, a number of large settlement sites have been excavated and studied; but among these no two sites have yet been discovered with agreement of the first or second order. There are agreements more or less of the third order, which will be discussed in the forthcoming work, but at present one can show no higher degree of agreement even among sites lying close together within a small area.

Graphs are given here for the large excavated sites northeast of Hamburg: Meiendorf, Hasewisch and Poggenwisch, for the site of Ureterp in Friesland,

excavated by the present writer, and for larger surface sites in the Northern part of the Netherlands: Havelte and Marum.

The graphs show obvious and essential differences from the Ahrensburgian and the Tjongerian; as in the appearance of tanged points, Havelte points, *Zinken* and many long blades with retouched sides. They display quite different indices and proportions of graters and scrapers made on blades to those made on flakes; the graphs of dimensions are likewise completely different. Thus the scraper-angle graph shows that in the Hamburgian the scrapers have a sharp angle, of about 30° to 60° , in contrast to the other groups with an angle between 50° and 80° .

If comparing the sites one with another, the graphs show that the people of this culture, unlike those of the Tjongerian, were very responsive to the quality, or rather the size, of the flint nodules found in their area. The sites near Hamburg, where especially large flint nodules were available in quantity, contain many more larger graters, *Zinken* and scrapers than those from the Netherlands in districts where large nodules are rare. This of course affects their comparability to a degree, although not in all respects, since some dimensions show little change; nor does it affect the comparability of sites within each particular region.

As we have already noted above, the inventory of implements from sites of the Tjongerian in the 'good' flint area, such as Rissen near Hamburg, is not significantly larger than that from 'poor' flint areas, such as Donkerbroek, and Makkinga in the northern part of the Netherlands or de Banen in Brabant.

There are a number of sites in the Netherlands which cannot be classified with any of the cultures mentioned above, but have affinities with British sites. The graphs of a number of British sites with finds belonging to a single period and culture, compared with certain sites in the Netherlands, are helpful for the understanding of the British as well as of the Continental material. To bring out some of the problems we compare the graphs for the sites of Zeyen and Neer II in the Netherlands (Zeyen is an excavated site, Neer II a surface site, where an excavation is planned) with assemblages from Gough's Cave in the Cheddar Gorge near Bristol, and Mother Grundy's Parlour, Creswell Crags, Derbyshire. The following observations may be made:

- 1) Mother Grundy's Parlour and Neer II have rather many shouldered points, often of a form found very rarely in the Hamburgian. These shouldered points have their principal basal indentation on the side opposite that with the steep retouch at the point. This will be illustrated in the larger work. Gough's Cave and Zeyen have hardly any tanged points.
- 2) Mother Grundy's Parlour and Neer II have many Creswell points; Gough's Cave and Zeyen have many Cheddar points.
- 3) Mother Grundy's Parlour and Neer II have many short scrapers, Gough's Cave and Zeyen have many long narrow scrapers.

- 4) Gough's Cave and Zeyen have more gravers.
- 5) Among the unfinished implements, Gough's Cave and Zeyen have blades almost exclusively, and very few flakes; at Mother Grundy's Parlour and Neer II blades and flakes are almost equally numerous.
- 6) The working edges of the gravers at Gough's Cave and Zeyen are much narrower than those at Mother Grundy's Parlour and Neer II.
- 7) The graver-angle is sharper at Gough's Cave and Zeyen than at Mother Grundy's Parlour and Neer II.
- 8) The gravers at Gough's Cave and Zeyen are smaller than those at Mother Grundy's Parlour and Neer II.
- 9) At Gough's Cave and Zeyen the scraper-angle is much sharper than at Mother Grundy's Parlour and Neer II.
- 10) At Gough's Cave and Zeyen the scrapers are much longer and thinner than at Mother Grundy's Parlour and Neer II.

In comparing these two groups of sites, the types and dimensions are so different in many respects that they cannot belong to different variations of a single culture. In the full work this will be examined in greater detail, with the help of a larger number of sites and many illustrations. Here we may anticipate this study by mentioning that we have adopted the English name *Creswellian* for Continental sites such as Neer II and English sites like Mother Grundy's Parlour; and recommend a new name for the dissimilar sites such as Gough's Cave and Zeyen. Because of the concentration of the most typical sites in the region of the Cheddar Gorge, the name *Cheddarian* is proposed.

The method presented here is the product of a long period of study, with frequent revisions and recalculations, with the aim of attaining a method of presentation which would combine the maximum of useful information with the minimum of difficulty and the greatest possible simplicity in obtaining and utilizing the results, and which is applicable not only to the Upper Palaeolithic but also, with suitable adjustments, to the Lower Palaeolithic, the Mesolithic, and the lithic content of the Neolithic. Although at first sight the measuring procedure may seem rather complicated, it is in fact not so when one has acquired some experience with it. After some practice, and with an assistant to note down the data so that the measurer may work without having to lay aside his measuring instruments, a site such as Meiendorf, with c. 500 implements, can be counted and measured and the results calculated in a day; sites of medium size can be done in half a day.

Since a number of investigators have already adopted or signified their willingness to adopt this method, it has already become possible to provide this summary of its useful features.

In the main work, I will have more suitable opportunity to express my gratitude to the various museum directors and owners of collections who have made the material available to me.

FIGURES 2-5

Fig. 2

- 1- 4 Shouldered points (1 Eelde; 2, 3 Ureterp; 4 Rolde).
- 5- 7 Havelte points (5, 6 Havelte; 7 Wijnjeterp).
- 8-11 Ahrensburg points (Vessem).
- 12-13 Trapezoids (Vessem).
- 14 Gravette point (Unterwisternitz).
- 15 Azilian point (de Banen).
- 16-18 Tjonger points (16 de Banen; 17 Prandinge; 18 Donkerbroek).

Fig. 3

- 19-21 Cheddar points (Zeijen).
- 22-25 Creswell points (22 Wijster; 23 de Banen; 24, 25 Neer II).
- 26-29 Zinken (Ureterp).
- 30-34 atypical Zinken (Ureterp).
- 35 and 37 AA gravers (Ureterp).
- 36 RA graver (Ureterp).

Fig. 4

- 38 AA graver (Ureterp); showing method of measuring graver-angle and width of graver working-edge.
- 39 RA graver with scraper (Ureterp); showing method of measuring graver-angle, width of graver working-edge, and scraper-angle.
- 40 Two A gravers on one blade (de Banen).
- 41 A graver (Zeijen).
- 42 Long scraper with measurement of scraper-angle (de Banen).
- 43 Short scraper (de Banen).
- 44 Double scraper (de Banen).
- 45 Long scraper with oblique scraper-end (Ureterp).
- 46 Multiple-purpose implement; above, scraper; below, atypical Zinke (de Banen).
- 47 Truncated blade (Ureterp).
- 48 Blade with notches (Ureterp).

Fig. 5

Map showing location of sites.

NOTES

¹ (I) corresponds with the number following the type name in the graph.

² The numbers refer to artefacts drawn on figs. 2-4; for the names of the sites see p. 25; for the location see fig. 5.

³ Schwabedissen (1954) calls them *Kerbspitzen* but indicates that they are a transitional form between shouldered points (*Kerbspitzen*) and tanged points (*Stielspitzen*), and adds the designation "*vom Typ Havelte*".

⁴ H. Schwabedissen calls these *Federmesser*. Since they are not knives but rather points, I prefer not to use this name. Aq. Wouters found near Roermond a mandible of *Megaceros* with a fragment of a Tjonger or Gravette point deeply embedded in it.

⁵ The definition of the different orders of agreement will be discussed more fully in the forthcoming work.

⁶ The C 14 date of one of the Sites, Budel II, is 11200 ± 120 (Gro 1675).