

THE EARLY UPPER PALAEOLITHIC IN CENTRAL EUROPE;
A CLUSTER ANALYSIS OF SOME AURIGNACIAN AND SOME
SZELETIAN ASSEMBLAGES.

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Since the second World War a good deal of work has been carried out in Moravia with the object of investigating the earliest upper palaeolithic industries, the Aurignacian and the Szeletian. The term 'Aurignacian' is understood in its current Western European sense, and Czech authors in their definition of 'Szeletian' usually follow the formula devised by Prošek (1953), i.e. a leafpoint industry with both Aurignacian and Mousterian component parts. This definition immediately raises the question of overlap between the two entities, particularly since it is also suggested that the Aurignacian may on occasion have 'borrowed' Szeletian elements. This difficulty has been emphasised by Klima (1959, p.152), and illustrated by his own experience when he first published Křepice as a "pure Aurignacian industry" but later found some leafpoints as well (Klima, 1968/69). Suggestions for the internal division and projected evolution of each entity have been made by Valoch, whereby most variation is interpreted in a chronological sense (e.g. Valoch 1969, 1973), although not all his typological definitions have been universally accepted (J. K. Kozłowski, 1965).

In short, there is a classification problem here, and one that seemed amenable to treatment by considering the variously categorised sites together on a common basis and subjecting them to multivariate analysis such as is available in the CLUSTAN program. The material from all the sites in the numbered key has been examined by the author, and I would like to express my thanks to all those persons and institutions in Moravia who facilitated my study, particularly of unpublished material; thanks go first and foremost to Dr. Valoch of the Moravian Museum, Brno, and also to colleagues in the museums at Prostějov, Olomouc, Mohelnice, Kroměříž, Holešov and Gottwaldov.

Valoch (1966) has proposed the use of a special type list for early upper palaeolithic industries of the area, combining elements from the well-known type lists of Prof. and Mme. Bordes for the Middle and Upper Palaeolithic respectively, and adding certain new elements to make up a total of 81 types. In the author's opinion there are great advantages in having a single list adapted to particular circumstances, although not all Valoch's categories (particularly his so-called core tools) can be accepted. A simplified and further revised list of 55 classes was used for this work. The list includes 12 categories for endscrapers, 12 for burins, and 11 for sidescrapers. Allowance is made for both carinate and busked burins, which, although rare, do occur in this area (cf. Hahn 1970, de Sonneville-Bordes, 1971). Bifacial and unifacial leafpoints are included, plus retouched pointed blades which in some cases are difficult to distinguish from the latter. Unretouched and retouched Levallois flakes, blades and points feature as recognised classes. As with all such lists, this one relies on an intuitive sorting procedure, and no particular merit is claimed for it other than that it

was sufficiently comprehensive and flexible for the task in hand.

The data has been analysed using the CLUSTAN package on the Cambridge University IBM computer. The analysis was carried out on the author's behalf by Mr. Philip Lerman, Department of Applied Biology, Cambridge University; and Mr. Lerman also advised on those statistical procedures which seemed to be most appropriate to the data. It is obvious that some form of standardisation is required, since the total numbers of tools at the various sites differ widely, and whereas some tool classes occur almost always in fairly large numbers others do so more rarely. For each site the raw data were first transformed into percentages. The mean percentage for each tool class was then obtained. If we denote by " \bar{p}_i " the mean of p_{ij} in the i 'th row (where p_{ij} is the percentage of tool class i in site j), then the standard deviation of the p 's in any row between sites is

$$s_i = \sqrt{\frac{\sum_{j=1}^n (p_{ij} - \bar{p}_i)^2}{(n-1)}}$$

and the p_{ij} are standardised to have unit standard deviation within a row by the formula

$$p'_{ij} = p_{ij} / s_i$$

The distance between sites k and l is then calculated on these standardised p'_{ij} as

$$D_{kl}^2 = \sum_{j=1}^n (p'_{kj} - p'_{lj})^2$$

This Euclidean distance is worked out by CLUSTAN as one of its standard procedures, and is simply an attempt to ensure, as desired in the given case, that each variable is given equal weight. The resulting dissimilarity matrix forms the raw material for the cluster analysis, and two methods were used: average link and Ward's method. Ward's method, locating minimum variance spherical clusters, appears to have distinct advantages and the tendency of average link towards more of a "nesting effect" can be seen by comparing the two dendrograms at figs 4 and 5.

In the discussion here the results of both are considered together. There is space to indicate only some of the trends emerging from the analysis.

Among the numbered sites, certain geographical concentrations can be recognised, which may reflect in part the intensity of local fieldwork. Many are in the area of Brno and to the south-west (nos. 6-13, 18-21); others are concentrated on or near the easterly fringes of the Drahaný Uplands

(nos. 1-5, 14, 15); others again along the middle reaches of the Morava (nos 16, 17, 22, 23). Almost all are surface sites; there are some indications of a former stratigraphy at Ondratice, Neslovice and perhaps Křepice; and excavations have revealed some in situ material at Rozdrojovice (Valoch 1955, Musil, 1955).

A particularly difficult site in this respect is Ondratice, and, to a lesser extent, Otaslavice. Both sites contain a quartzite and a non-quartzite industry, and at Ondratice there are a number of different localities. There are conflicting indications at Ondratice as to whether the quartzite and non-quartzite industries originally constituted separate entities (see summary in Valoch 1967). Both sites have been analysed in two ways, keeping the raw material components separate, and combining them. Figs 1 and 2 show the results for the analysis ("no.2") with raw materials combined. Ondratice I-Holcasy is the major site, with 3529 tools included in the analysis here; by contrast Otaslavice (with which it is often carelessly bracketted in the literature) has only 410 all told. Listed here separately are the new localities of Ondratice III-VII and Zadni Hony (Valoch 1967), together with Určice-Golštyn (Skutil 1925). It can be seen that the results for Ward's method and average link are quite similar, and the plot according to principal components 1 and 2 gives a fair picture since these account for 75% of the total variability. The results provide a striking quantitative demonstration of the correctness of Valoch's view (1973) that the "Drahany palaeolithic" can on no account be regarded as a unitary phenomenon. There is a wide disparity between the main Ondratice localities on the one hand, and Otaslavice on the other; whereas Zadni Hony and Určice (very alike indeed to each other) are also separate from the rest.

Figs 4 and 5 show the results for the analysis ("no.4") by Ward's method and average link for the full 23 sites. The sites according to their positions in terms of principal components 1 and 2 are mapped out at fig 3, but a word of warning should be given about this, in that the first two principal components account for only 33.23% of the cumulative variance (compare the results of the principal components analysis for Hahn's 29 Central European Aurignacian sites, where the first two components accounted for only 24.5% of the total variance; Hahn 1972). Any analysis of the results therefore must be based on the dendrograms. The salient features upon which both agree appear to be as follows:

(1) Both analyses clearly separate out as a distinct group nos 2, 3 and 12: Zadni Hony, Určice and Kohoutovice. The range of the four main 'type group' indices within this set is as follows: endscrapers 11 - 20, burins 51 - 61, sidescrapers 2- 5, leafpoints 2- 4. Clearly burins are overwhelmingly predominant but, no doubt because of the presence of a few leafpoints, Valoch (1968) has referred

to Kohoutovice for example as a "late Szeleto-Aurignacian". In fact, excellent analogies for this group exist elsewhere in the first place at Langmattersdorf in lower Austria (Angeli, 1952-53), where Bayer's excavations yielded good evidence of settlement conditions and, in this case certainly, hunting preferences, mammoth constituting 32% of the recovered fauna. Hahn (1970) has distinguished other quantitatively similar lithic assemblages at Grossweikersdorf and Bockstein-Törle layers VII-V, all constituting a final phase of the Aurignacian in Central Europe.

(2) A late position has also been claimed for the industry at Rozdrojovice (No.13), although the geological grounds claimed for this are not perhaps as strong as could be wished. One's impression on examining the material is that it is a rather idiosyncratic industry - in part due to the extensive employment of quartz - and Rozdrojovice's position as an unconnected outlier is confirmed by the analysis, particularly average link.

(3) A second grouping confirmed by both analyses comprises nos. 16, 17, 21, 22 and 23, joined according to Ward's method by no.18: Miškovice, Křepice, Malměřice-Borky II, Kvasice, Nova Dědina, and Maloměřice-Občiny. It is remarkable that all these sites (apart from Miškovice, which has never before been quantitatively analysed) have hitherto been classified as Aurignacian. Three are in the Brno area and three on the Middle Morava. The range of main 'type group' indices is as follows: endscrapers 25 - 47, burins 18 - 36, sidescrapers 3 - 22, leafpoints 0 - 6. Clearly there are some differences of emphasis within this group; but it is noteworthy that only in the case of Miškovice and Borky II do burins exceed endscrapers, sidescrapers are always 10% or less except in the case of Občiny, and leafpoints except in the case of Nova Dědina are always at least present.

(4) Jezeřany 1 and 2 (nos. 6 and 7) are constantly linked, and their nearest neighbour is Otaslavice (no.5). Valoch (1966) regards the first two sites as "archaic"; in part in the author's opinion this is based upon an incorrect assessment of the so-called core tools, and they are better seen as large-scale tool manufacturing sites. In any case they form something of a separate entity.

There is some difference of emphasis between the two methods over the allocation of the remaining sites, but Ward's method appears to give the more coherent results and will be adhered to in the following description:

(5) sites 9, 19 and 20 (Ořechov I, Stránska Skála and Podstránská) form a single group. The link which they have in common undoubtedly is that they have large numbers of unretouched Levallois blanks. Hahn (1972) has cast doubt upon the homogeneity of such assemblages, and so far as Stránska Skála is concerned he may be right, since we know that the hornstone obtainable here was used over a wide area in various contexts. However, there is now excellent

PRINCIPAL COMPONENT 1

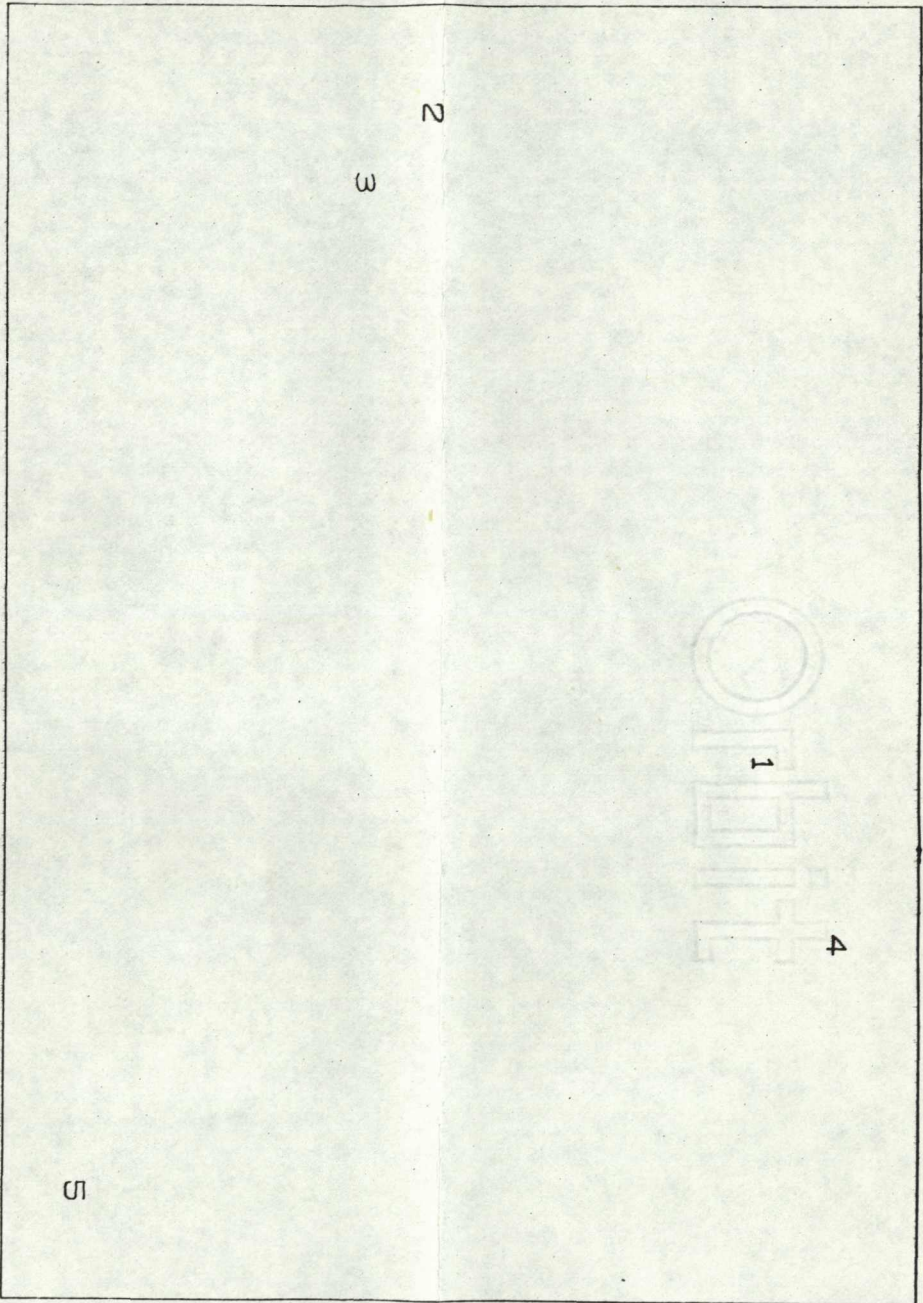


Fig. 2. Drabany sites: principal components 1 and 2

(98)

PRINCIPAL COMPONENT 1

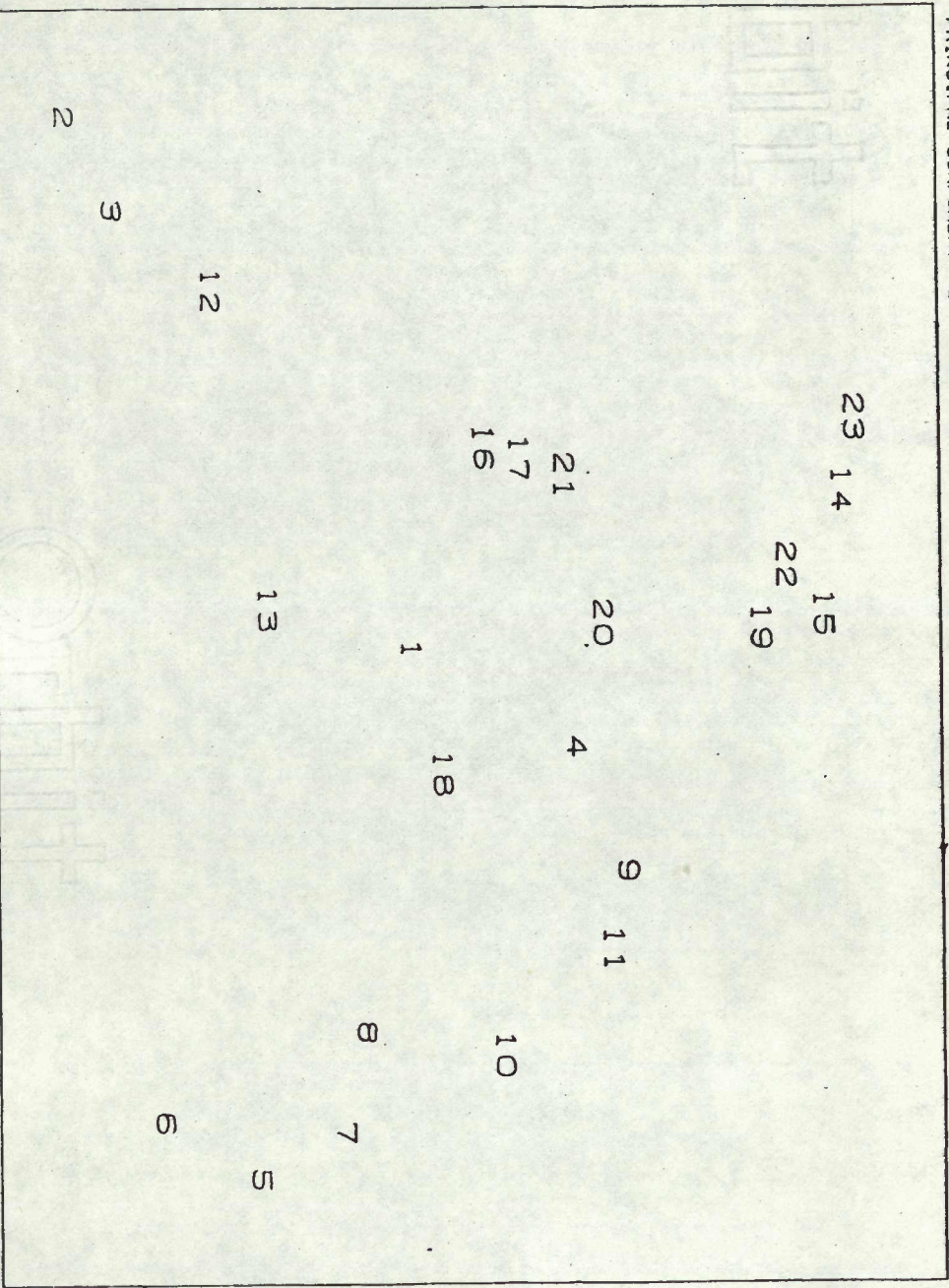


Fig. 3. Moravian sites: principal components 1 and 2

PRINCIPAL COMPONENT 2

PRINCIPAL COMPONENT 2

stratigraphic proof from the Brno area, at Bohunice, of a Levallois industry (made of Stránska Skála hornstone) with upper palaeolithic forms, so that such a conjunction is not impossible. In a further analysis, which there is not space to report here, Bohunice was added to the 23 listed sites, and took up a position very close to Podstránska.

(6) Sites 14, 15, 1 and 4 (Droždín, Dubicko, Ondratice III-VII and 1) form a further group, which at a higher phenon level goes on to join the rather Aurignacianlike group already mentioned. All four sites are situated on or near the edges of the Drahaný uplands and it seems that we have something of a regional grouping here. Whereas the two Ondratice sites have a significant Levallois element this is virtually lacking at Droždín and Dubicko. The Levallois element no doubt explains why under the average link method the Ondratice sites join Orechov 1 and Podstránska.

(7) In the final grouping under "ard's method sites 11, 10 and 8 (Želešice, Orechov 2 and Neslovice) join Jezeřany 1 and 2 and Otaslavice. All (except insofar as the status of Otaslavice has been left uncertain) have hitherto been classified as Szeletian. The range of the main 'type group' indices is as follows: endscrapers 20 - 36, burins 04 - 11, sidescrapers 18 - 36, leafpoints 05 - 29. Clearly there are quite wide differences within this group. Only Jezeřany 1 and 2 have leafpoints in excess of 20% - all the others have less than 10%, so that in this respect the two sites are unique in the Moravian spectrum. Only Jezeřany 1 and Otaslavice have sidescrapers in excess of 30% and in this respect again they are unique. Levallois technique, except in the case of Orechov 2, is largely absent. If group (3) could be said to form an "Aurignacian" 'pole' therefore, this forms a "Szeletian" one; but it should be plain from the foregoing that the situation is more complicated than that. Just as leafpoints make an occasional appearance even in the 'late' burin-dominated group, so do 'typical' Aurignacian elements such as carinate endscrapers and burins in this group.

As has been said, the majority of these sites are surface collections without adequate stratigraphic provenance, but although their value is thereby reduced there are indications elsewhere that the kind of variability they exhibit is a reflection, however muddled, of a genuine phenomenon which did exist. Mention has already been made of Langmannersdorf and Bohunice. Bohunice is now dated at $40,172 \pm 1200$ BP (Q - 1044). A site which unfortunately has not yielded enough material for inclusion in the cluster analysis but which has an undoubted stratigraphic context is Gottwaldov-Louky (Klima, 1955). The assemblage contains both 'Aurignacian' types such as carinate endscrapers (Klima 1956, fig 26-31) and at least one fragment of a leafpoint (Klima 1956, fig 21). Hahr (1972) mentions similar find circumstances in Rumania at Ceahlau-Cetatica and Ripiceni-Izvor; and it is not too fanciful to remind oneself of the situation at Molodova V, layer 10, on the Dniestr (Chernysh, 1961, p.27-32, fig 10), where a small assemblage also contained at least one carinate endscrapper and a bifacial leafpoint. Layer 9 above is dated

at 28,100 \pm 1000 and 29,650 \pm 1320 (IG-15).

Therefore we can accept the phenomenon as, in principle, genuine. If one confines oneself to Moravia, however, it is difficult to interpret it in the absence of environmental and faunal data. As stated, the majority of Czech archaeologists have favoured the explanation of Prošek, whereby the Szeletian was formed under the influence of the Aurignacian. This implies two entities and a theory of culture contact. It is not an impossible model. Smith (1966, p.390) has drawn attention in this context to the importance of some work of Davidson in North Australia, whereby he showed (Davidson, 1935, p.168-172) how a single type of spearhead could be traded over 400 miles and accepted by another group because they admired it, although in use it was more fragile than their own products. A different view of the Czech material has been taken by E. and J. Neustupný (1960, p.102-103). They consider that the idea of the simultaneous existence of two independent 'cultures' over a long period of time in Moravia is untenable, and regard the overlap in the assemblages as proof for the existence of two, presumably seasonal, variants of the Aurignacian. The attraction of this theory is obvious, and ethnographic material can also be used to buttress it (e.g. Thomson, 1939). Professor Clark has shown how fruitful this approach can be to explain variability in the mesolithic of Northern England (1972a and b, n.d.), but, as he says, 'on the basis of the flints themselves no definite answer could be provided', and analysis of the biological materials is urgently required. It is the present lack of such materials for the early upper palaeolithic in Moravia that makes one chary about drawing wide interpretative conclusions based only on the lithic data analysed so far in this paper.

Lastly therefore I wish to draw attention in a preliminary way to two further matters arising from this study. The first is methodological, the second cultural-historical. Firstly, the sites considered here are all open air sites, with sufficient material to allow statistical analysis, and in their general situation comparable to each other. But it is known that, so far as the Aurignacian is concerned, there are other related cave sites which it would be difficult to compare statistically with these; in Central Europe they are often in the mountains, and while the stone tools may be few or rather nondescript, the bone tools may have commonly accepted Aurignacian characteristics. It seems hard to avoid the conclusion that these sites should be regarded not as a separate 'culture', but as seasonal and often briefly occupied, Aurignacian-related hunting camps (Hahn 1970, 1972). A similar situation may arise with regard to some other cave inventories in which leafpoints play a very prominent role. In 1972, for example, the author was able to study the inventory from layers 4 - 6 of Nietoperzowa cave in Poland and of the Ilsenhöhle unter Burg Ranis in East Germany (for which many thanks go to Prof. W. Chmielewski, Warsaw, and to Dr. V. Toepfer, Halle). It requires no cluster analysis to point out the differences between these inventories and the ones presented here. Out of 129 tools from the three layers at Nietoperzowa, 77 according to the author's count are leafpoints and 12 are retouched pointed blades (a closely allied form): at Ranis there are extant 50 tools from layer 2, of which no less than 36 are leafpoints. In this

case, cluster analysis can perhaps point out the gross differences, but we must seek an explanation in the nature of the sites themselves.

Secondly, we might do well to consider, with all their limitations, the significance of the facts outlined for Moravia and adjacent regions in a broader European context. It has been shown that we now have some evidence in that part of the world for at least an Aurignacian 'facies' with leafpoints, whether the sites which are usually regarded as Szeletian are held to belong to it or not. Elsewhere the Aurignacian is not generally accompanied by leafpoints, although we know that other regional differences can be quite pronounced (deSonneville-Bordes 1960, 1965, 1971). Leafpoints in the upper palaeolithic of Western Europe are a characteristic of the Solutrean: in Belgium and Great Britain they have been commonly regarded as 'proto-Solutrean' and linked with the Font-Robert variant of the Perigordian (Garrod 1926, Eloy 1956, Smith 1966). An alternative suggestion has been made by Dr. McBurney (1965) that perhaps the British early upper palaeolithic material, including the leafpoints, could more profitably be linked with Central European assemblages of the type we have been discussing here, and in particular with Ranis.

Two recent works have suggested that this question merits re-examination. On the one hand, Dr. John Campbell has completed a thorough re-investigation of the upper palaeolithic of Britain (Campbell, 1971) and on the other M. Marcel Otte has, quite independently, re-examined the occurrences of leafpoints in Belgium (Otte, 1974). Otte concludes that the type of leafpoint with predominantly unifacial ventral retouch (such as occurs in Britain as well as at Ranis and Nietoperzowa, and at certain of the Moravian sites) is to be linked not with the Perigordian of Font Robert facies (as now known in Belgium from the rich site of Maisières; de Heinzelin, 1971) but with the early upper palaeolithic, and probably with the Aurignacian, above all at Spy. It is almost certainly an oversimplification to treat the British Early upper Palaeolithic as a whole in view of the fact that, among other things, undoubted examples of Font Robert points do occur here; but the predominant impression typologically is certainly that of an Aurignacian; and if it can be plausibly demonstrated that the leafpoints are to be associated with this, then one would have a situation analogous to that postulated by Otte in Belgium. The most reliable so far published C14 dates, from Kent's Cavern, 28,160 ± 435 and 28,720 ± 450 BP (Grn-6201 and -6202) (Campbell and Sampson, 1971) are perhaps rather young for the Aurignacian but are certainly a pointer in that direction.

In order to investigate the likeness between the British material and the Moravian material presented here therefore the author has recalculated Dr. Campbell's figures for Kent's Cavern and Paviland using the 55 tool classes employed in this work. The material from the caves is quite adequate for this purpose (Paviland 554 tools, Kent's Cavern 112). The overall structure of the industries does not appear on first sight very different from the Central European ones: but the cluster analysis has shown that the two British sites are most like to each other and form a further group on their own; their nearest neighbour according to Ward's

method is the agglomeration formed by the more 'Aurignacian' sites plus the 'Drahany' group. This is not surprising, and closer inspection of the type lists for the British sites reveals many details which are much more characteristic for the Western European Aurignacian than they are for the Central European (de Sonneville-Bordes, 1960): notably, nosed endscrapers more frequent than carinated, presence in significant numbers (at Paviland) of true busked burins, and comparatively few sidescrapers. The same kind of contrast between the French Aurignacian sites and the central European ones was revealed by Hahn's principal components analysis (1972). Clearly therefore caution will be needed in assessing this and other aspects of the new data, and even more so before any claim is made for a possible link between the British material and the West European Solutrean, but at least the data for a full and quantified reappraisal is at hand, and some promising new avenues have been opened up.

Numbered key to sites:

- | | |
|----------------------|------------------------|
| 1. Ondratice III-VII | 13. Rozdrojovice |
| 2. Začni Hony | 14. Drožďin |
| 3. Urcice-Golstýn | 15. Dubicko |
| 4. Ondratice I | 16. Miškovice |
| 5. Otaslavice | 17. Křepice |
| 6. Jezeřany I | 18. Maloměřice-Občiny |
| 7. Jezeřany II | 19. Stránská Skála |
| 8. Neslovice | 20. Podstránská |
| 9. Ořechov 1 | 21. Maloměřice-Borky 2 |
| 10. Ořechov 2 | 22. Kvasice |
| 11. Zelešice | 23. Nova Dědina |
| 12. Kohoutovice | |

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