

Waldemar Chmielewski

THE UPPER PLEISTOCENE ARCHEOLOGICAL SITE ZWIERZYNIEC I IN CRACOW

The archeological and geological literature concerning the Zwierzyniec site is both rich and poor. The generally known monograph by Ludwik Sawicki is considered to be a model documentation of a geological research on an archeological site (Sawicki 1952). The chronological interpretation of the Zwierzyniec exposure presented by Sawicki has been criticised both by geologists (A. Jahn 1969, S. Z. Różycki 1967) and by archeologists (W. Chmielewski 1964, 1969a, J. K. Kozłowski 1969). The archeological sources found by the discoverer of the object Albin Jura and later during the explorations by L. Sawicki, have been discussed by the present author and by J. K. Kozłowski (A. Jura 1938, 1939, 1951a, 1951b; L. Sawicki 1952, 1957; W. Chmielewski 1964, 1969a; J. K. Kozłowski 1965, 1966, 1969). The discussion revealed two trends in the interpretation of the sources. L. Sawicki maintained that the materials excavated by him from the fossil soil and from the layer immediately below represent a homogeneous aurignacian assemblage with possible seletian elements. Albin Jura tended to see Zwierzyniec as containing the remnants of nearly all stages of the aurignacian separated stratigraphically and a few stages (3) of the older, mousterian settlements. The present author suspects mechanical mixing, caused by solifluction of many assemblages mainly aurignacian ones as well as other discernable assemblages. In the same materials J. K. Kozłowski distinguished the following assemblages: levalloisian, mousterian with handaxes, aurignacian, and seletian.

The views cited above and concerning the cultural character of the finds explored so far have not been supported by any source publication. Such views have been based on the exploration of the materials and fragmentary examinations. The collections in question are very large. L. Sawicki's collection contains several dozen thousand of flint artifacts. A. Jura's collection is smaller. It was presented to the Museum of Archeology in Cracow together with his Journals 1937 - 1941. Mr. Kazimierz Radwański, Director of the Museum and Mr. Stanisław Kowalski, Custodian of the Palaeolithic and Mesolithic Department kindly allowed me to examine and use these materials. I wish to thank the two gentlemen for their permission.

The survey of A. Jura's materials disclosed an enormous significance of the Zwierzyniec site in the Pleistocene archeology of Poland. The significance consists in the occurrence of several, at least partially identifiable assemblages of archeological sources and in the possibility of reconstructing their stratigraphic ordering both from the archeological and geological point of view. In Poland, there exist only a few sources of this sort. They are extremely valuable whenever an attempt is made to present the oldest primaevial history of Poland. I have decided to publish the results of this survey to create conditions for further discussions and explorations, even if I do realize both difficulties and weak foundations on which some of my conclusions are based.

The main difficulty encountered so far during the exploration of the Zwierzyniec site has been strong disturbances of the original pattern of archeological remains through solifluction and upheaving of ground masses. The explorations conducted so far, especially the documentation presented by L. Sawicki, reveal the disturbances through solifluction occurring in the lower loess, the soil and the upper loess (principally its lower part). The two explorers found flint artifacts in all these sediments. L. Sawicki claimed that solifluction disturbed the arrangement of one large aurignacian site.

A. Jura also noticed solifluction, but he interpreted the flints occurring at various horizons as representatives of different settlements from late mousterian up to upper aurignacian. It is difficult to find arguments in support of either view. The issue is further complicated by the fact that the two explorers examined different parts of the site, where different archeological assemblages could have occurred.

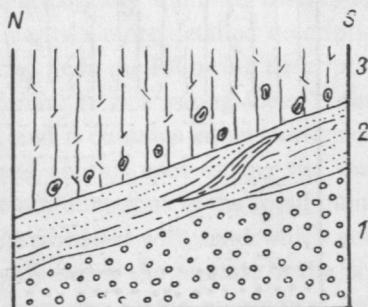
A few words are due about the methods of work and documentation adopted by A. Jura. It is also necessary to locate his trenches in relation to those made by L. Sawicki. A. Jura conducted his explorations in the steep walls of a clay-pit and in the area south of the pit. His main trench, labelled J began about 22 m. to the east from the SE corner L. Sawicki's trench 1 and continued for about 20 m. eastwards, its width being between 7 and 15 m. Only sporadic excavations, accompanying the gradual decay of the clay-pit were conducted in other parts of the site. We attach a special significance to the fragment labelled as "point P" situated about 50 - 60 m to the north-west from the NE corner of L. Sawicki's trench 1, as well as the so-called "trench in the street by the gate", situated about 95 - 100 m. NE of the same point of trench 1 (plate I).

A. Jura's Journals (1937 - 1941) contain descriptions of his explorations, sometimes lists of finds, their preliminary cultural identifications, drawings of sections. Especially valuable was the network of square metres employed in the description of the trench J, where the excavations and observations were conducted and the practice of using Indian ink or hard pencil to write information concerning the vertical distribution of the artifacts on the flints themselves. Phrases like "Upper Aurignacian", "Aurignacian 5", "Mousterian" are used to describe the situation

of artifacts with relation to layers or horizons which the explorer considered to be representative of particular stages of camping. Flint artifacts from point P and from the trench in the street by the gate are marked with the letter "P" or the inscription "by the gate". Some of them have attached specifications of the place where they were found. Thanks to these devices A. Jura's collection has retained its value.

A. Jura's notes concerning geological observations are of great significance too, since they make it possible to discover associations between the finds and the well documented layers in L. Sawicki's sections. They show that the first explorer of the site was well aware of the existence of the traces of fossil solifluction and other cryoturbations, this sort of realization being not very common in those days. The notes and drawings provide grounds for the view that the main body of A. Jura's finds, the so-called aurignacian finds, occurred in the fossil soil damaged by solifluction. The most valuable aspect of the collection is the fact that it contains two distinguishable assemblages of finds, one lying above the fossil soil, the other lying below it, principally in the layer enriched with ferruginous compounds. It was a layer of the loess containing ferruginous compounds under the damaged fossil soil. The layer was documented by L. Sawicki in his sections. I suppose that in both cases we deal with the same stratigraphic horizon.

Fig. 1. Fragment of the section of the trench "in the street by the gate", according to A. Jura's notes
1 - gravel, 2 - sand with lenses of clay, 3 - loess with limonite concretions in the lower part. Scale of about 1 : 10



The flint artifacts from point P have an exact stratigraphic location. They occurred in the irregularly layered medium-grained sand, in its upper part changing into sandy loess and covered with the damaged fossil soil. Only on one drawing, from 1940, by A. Jura is there an indication (fig. 2A) that under the sand there was gravel. I have not yet been able to establish the exact thickness of the loess and of the sand. The drawing mentioned above would suggest that the lower loess around point P reached the thickness of 4 m. Underneath there lay up to 25 cm of yellow sand with charcoals and flint artifacts above gray sand with individual pieces of charcoal and flakes (fig. 2B). The flints formed oval concentrations, 6 - 8 m. in diameter, with traces of a hearth in the middle.

The relation of the section and the finds from point P to the section of Sawicki's site is quite obvious. In Sawicki's section the sand underlies also the loess covered with the fossil soil.

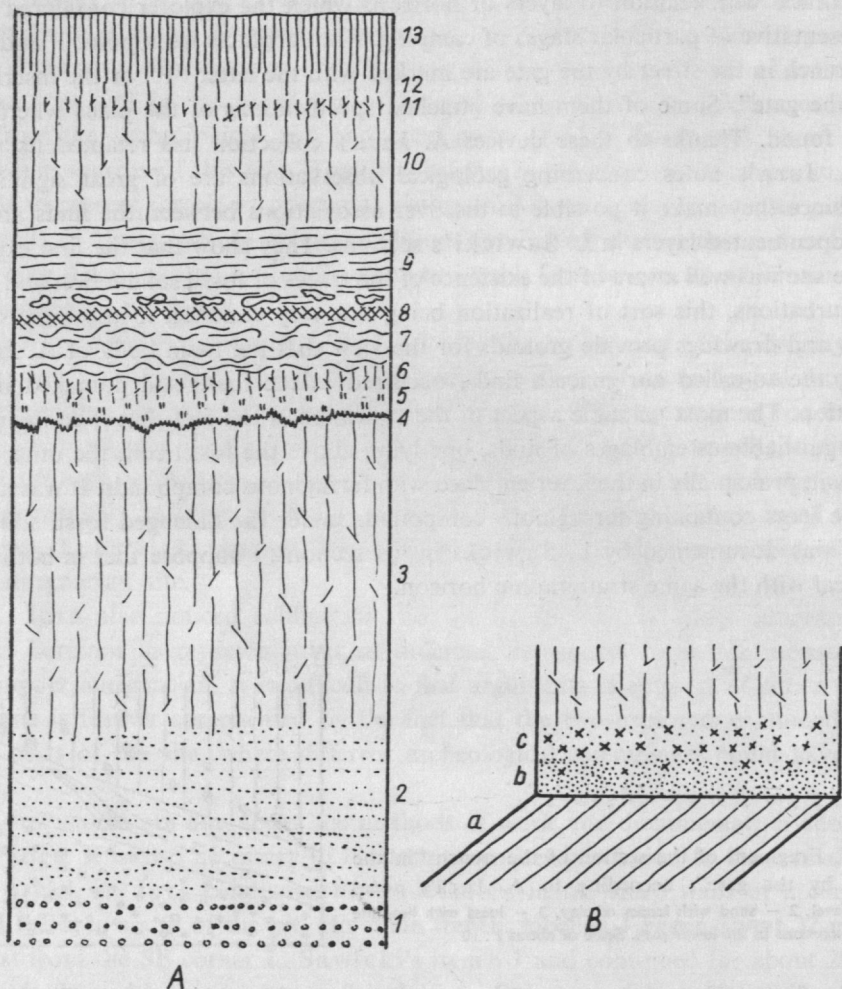


Fig. 2. Fragments of sections near point P and from it, according to A. Jura's notes.

A — section in the exposure about 10 m. west of point P. 1 — gravel, 2 — horizontally bedded sand, 3 — lower loess, 4 — the horizon of limonite precipitations, 5 — white-gray loessic loem, 6 — brown clay loessic loem, 7 — loess with undulating stratified structure, 8 — gray layer with charcoals and flints, "middle aurignacian" artifacts, 9 — horizontally stratified loess with lime concretions in the lower part, 10 — light yellow limy loess, 11 — brown loess, 12 — decalcified loess, 13 — contemporary soil.

Scale of about 1 : 100

B — section at point P. a — the floor of the trench in gray sand, b — the gray sand with single charcoals and flints, c — white-yellow sand with numerous charcoals and levalloisian flint artifacts. Scale of about 1 : 20

As to A. Jura's finds from the trench by the gate, the relations are somewhat different. At the time of the explorations the site was considerably damaged and had no upper layers. A. Jura's notebook contains a schematic drawing of a profile without a scale, representing an area in the proximity of the trench (fig. 1). On

the profile three layers are marked: the loess with limonite concretions in the lower part, about 10 cm of sand with lenses of clay and gravel underneath. It is not clear which of the three layers contained the artifacts. Most probably they came from the middle layer or from the surface of the gravel. The present lay of the land suggests that the layer containing the artifacts from the trench in the street by the gate lay about 10 m. above the present valley of the Rudawa River.

A. Jura's notebook contains a drawing of the section, which explains how he found the materials which he refers to in his notebooks and on the flints themselves as late aurignacian or as "Jasiek's aurignacian" from the name of one of his collaborators (fig. 5). These artifacts occurred in the layer of weathered loess, immediately beneath the contemporary soil. A. Jura recognized as late aurignacian also those materials which lay the highest in trench J. It must be remembered that the layer of loess above the damaged fossil soil in this trench, which was situated upon the slope of the Zwierzyniec spur, was only from 70 to 200 cm thick, whereas at point P and in L. Sawicki's trench situated on the axis of the spur, the loess was up to 8 m. thick (fig. 3 and 4).

The data presented above clearly suggest that the finds coming from point P, from the trench by the gate and in part also the "upper aurignacian" ones can be treated as fairly homogeneous and in a sense mechanically unmixed assemblages of sources. The situation of finds from trench J merits a more detailed description.

On pages 12 and 13 of A. Jura's notebook one finds the following description: "A description of the cultural layer from mousterian: It is a young loess I; fossil humus appears as gray clay, fairly thin 5 - 7 cm. and it contains either aurignacian or mousterian elements, proving that people lived on this spot during the warm period of the last glaciation. Mousterian flints are not numerous in the fossil humus, but they occur 10 - 15 cm below it, in the loess interbedded with sand which could easily be sliced during the excavations. Immediately below the humus, in the layer 5 - 7 cm thick there also occur parts which are rusty due to the presence of ferric hydroxide, but later they disappear altogether. Flints occasionally occur in the rusty-brown loess layer but more often below it. Flints are fairly scarce, sometimes 3 - 5 pieces on one square metre".

The description of conditions in which the "mousterian" flint artifacts occurred and the survey of these artifacts, preserved and identified so far in the collection, make it possible to state that: 1 — under the layer of the fossil soil damaged by solifluction, A. Jura discovered an assemblage different from the aurignacian one; 2 — the assemblage contains no mechanical admixtures of later artifacts; 3 — in the fossil soil damaged by solifluction (and even above it) there occur assemblages of different ages, in a mechanical mixture. It is worthy of note that the materials published by L. Sawicki contain elements which are closely analogous to the "mousterian" finds of A. Jura (L. Sawicki 1957, plate I, 1; plate III).

It is impossible to defend A. Jura's claim that several distinct layers or stages of aurignacian settlements can be distinguished in Zwierzyniec. According to him

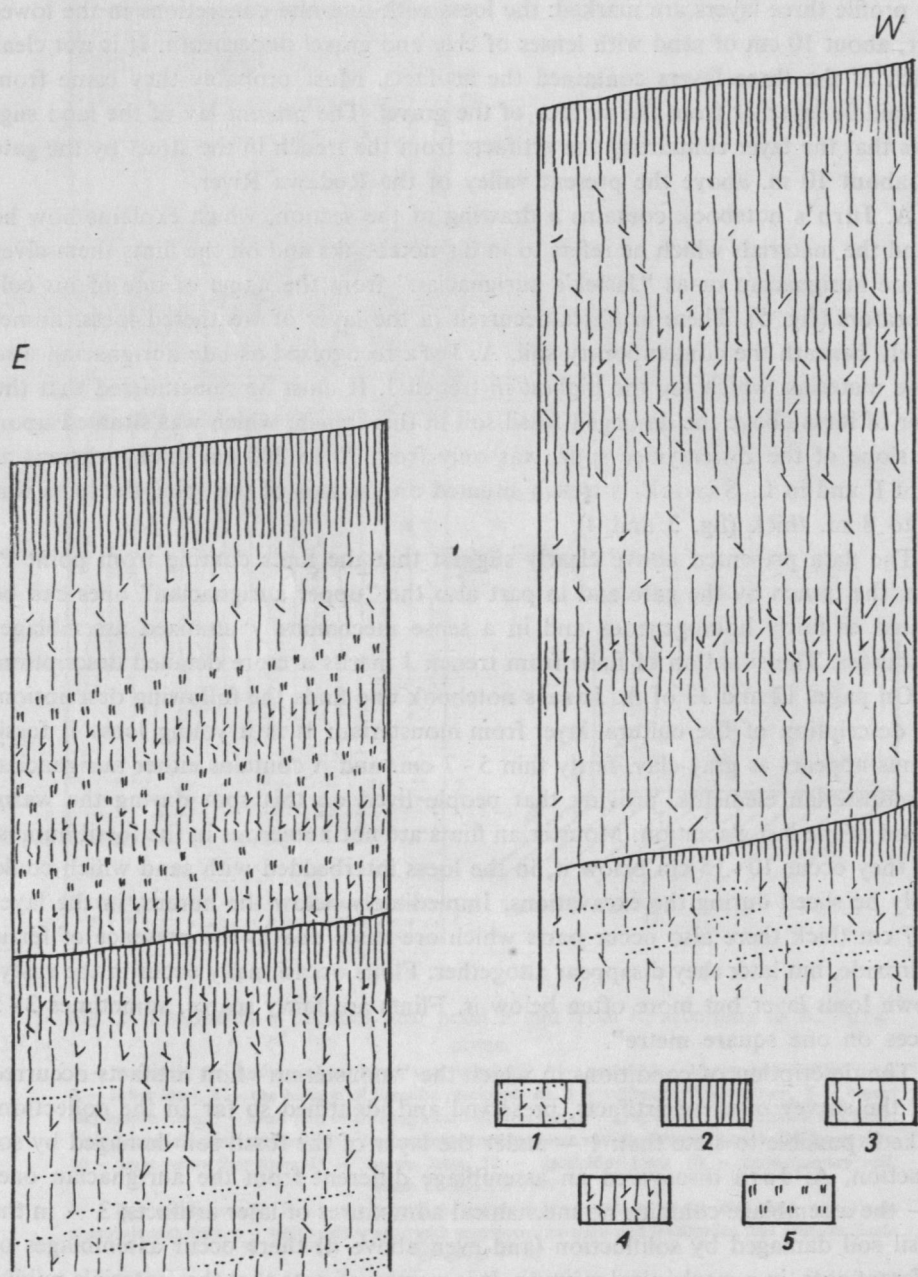


Fig. 3. Sections in metres III/10/A/ and III/15/B of A. Jura's trench J from 1937. Scale of 1 : 20
 1 - lower loess, sandy, 2 - soils (fossil and contemporary), 3 - light yellow upper loess, 4 - brown loess, 5 - white gray loess

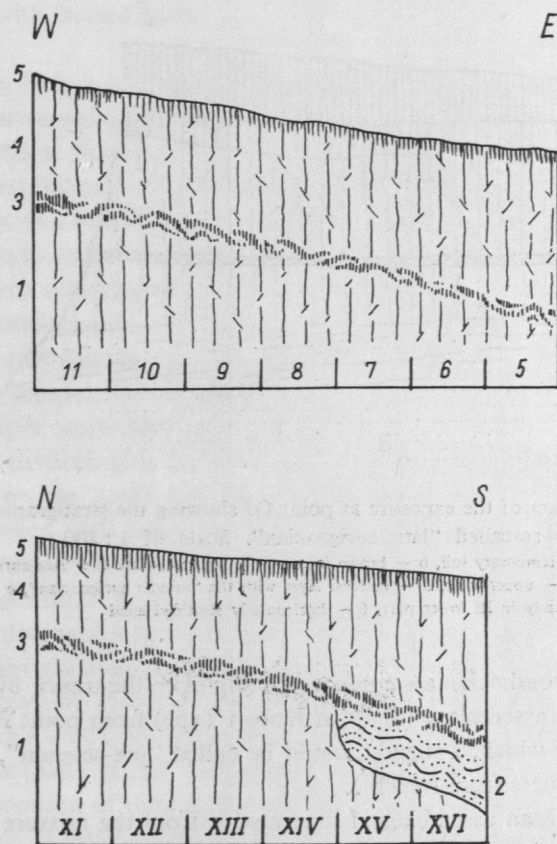


Fig. 4. Sections of the eastern part of trench IIJ, according to A. Jura. Scale of about 1 : 100

1 - lower loess, 2 - "older" (?) cultural layers, 3 - the fossil soil damaged by solifluction, 4 - upper loess with the contemporary soil

the presence of the mousterian types, including points type abri audit in the lower part of the fossil soil damaged by solifluction, supported the hypothesis concerning the occurrence of the old aurignacian stage. In reality such artifacts were found even in the uppermost part of the solifluction, above the humus horizons. They only reflect the upheaving of the ground caused by frost, the solifluction of old deposits and the displacement of flints on the slope of the Zwierzyniec spur. In this way sources of different ages were mixed. Identification of constituent elements of such a mixture, based on typological comparisons with homogeneous assemblages is possible but will always be uncertain. It concerns a part of the materials distinguished below and coming from the damaged layers of the fossil soil.

The survey of the flint artifacts excavated by A. Jura and of their documentation has led me to distinguishing the following assemblages and establishing their stratigraphy:

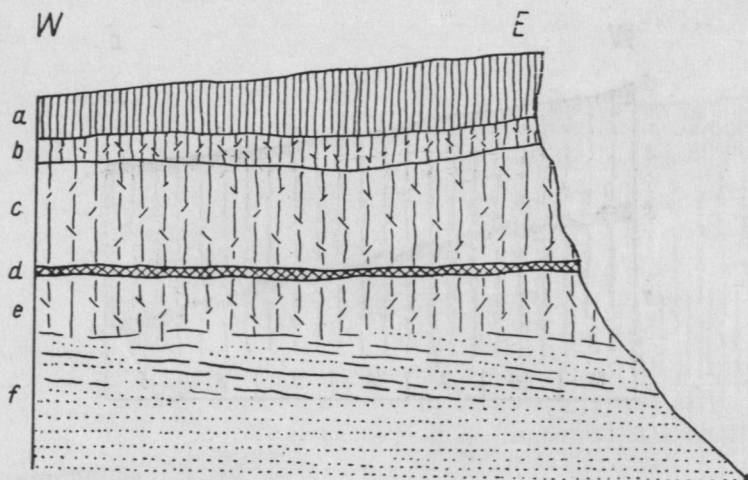


Fig. 5. Section of the exposure at point OJ showing the stratigraphic position of the so-called "late aurignacian". Scale of 1 : 100

a - the contemporary soil, b - brown loess - the horizon where the "late aurignacian" occurred, c - upper loess, d - cultural layer with the "middle aurignacian", e - lower loess, sandy in its lower part, f - horizontally stratified sand

1. The micoquo-prondnician assemblage, coming from the trench by the gate.
2. The levalloisian assemblage (Shaytan Koban Type) from point P.
3. The assemblage which, I suggest, could be called "pre-seletian", from the upper part of the lower loess from trench J.
4. The late levalloisian assemblage. I separated it from the mixture occurring in the fossil soil damaged by solifluction.
5. The "aurignacian" assemblage from the same stratigraphic horizon. Its homogeneity and aurignacian origins are fairly dubious.
6. A fragment of a late pleistocene assemblage, possibly connected with the magdalenian settlement and coming from the upper part of the upper loess.

I shall now present a brief description of the assemblages, some reasons underlying the adopted classification and the stratigraphy ascribed to them.

THE MICOQUO-PRONDNICIAN ASSEMBLAGE

The preserved artifacts found "in the street by the gate" constitute a group of 120 flint objects. It is a mixed assemblage within which 3 groups can be distinguished. The groups differ by the state of the preservation of the examples, the technique of acquiring flakes and blades and the types of the tools.

The largest group **consists** of 79 objects. I included in it:

- 6 primary flakes with cortex on the butts
- 42 flakes with flat butts with a wide angle (often more than 90°)

20 flakes with faceted butts

11 tools

Their common feature is a rusty, spotted patina and shiny surfaces. The following tools have been preserved (plate II, 3):

1 asymmetrical handaxe

1 unfinished fragment of a bifacially retouched tool

1 fragment of a bifacial tool

3 convex side-scrapers

1 convergent side-scraper

1 simple side-scraper

1 oblique side-scraper, partially damaged

1 coinlike scraper, denticulated

1 side-scraper retouched on the ventral side

This group is characterized by the occurrence of handaxes and other tools bifacially retouched on the surface, a large number of side-scrapers from flakes of various sizes, worked with large, extensive retouch, remade into tools from flakes formed by a technique other than levalloisian. The asymmetry of the handaxe makes it resemble examples known from the micoquo-prondnician assemblages. 9 examples in the collection distinguish themselves by being made of gray flint. The same raw material was exclusively used in the assemblage discovered at point P. In the collection from "the street by the gate" those nine examples are distinctly levalloisian in character. They are a levalloisian core (plate IV, 1), 2 levalloisian blades and 6 pseudo-levalloisian points (plate III, 2). The differences in the flint raw material used, the state of the preservation of the artifacts and their types make it possible to identify this group of finds as different from other groups in the collection.

The remaining 32 examples are 6 blade cores with one striking platform, 21 blades, 1 flake, 2 end-scrapers and 2 burins. Their distinct character in comparison with the other two groups is obvious.

The data presented above show that the collection "from the street by the gate" contains mixed materials but the most numerous are the artifacts of the first group which are related to the well-known micoquo-prondnician assemblages. It is quite difficult to determine the layer in which these objects originally occurred. The section of the area where the collection was picked up, mentioned above (fig. 1), the description and the occurrence of the rusty, spotted patina on the flints suggest that the flints were found in the lower part of the loess covering the thin horizon of sand and gravel, 10 cm thick. I do not suppose that this is the original deposit of the flints but that originally they lay in the sand which was strongly eroded in that area. The flints eroded from the sand lay on the surface for a long time (which can be inferred from their being shiny) and were later covered by the loess whose bottom part formed a limonite crust. Rusty, brown patina was formed as a result of the fact that the flints were lying in the crust. Considering this the assemblage under discussion would be the oldest one on the Zwierzyniec site. It must be emphasised,

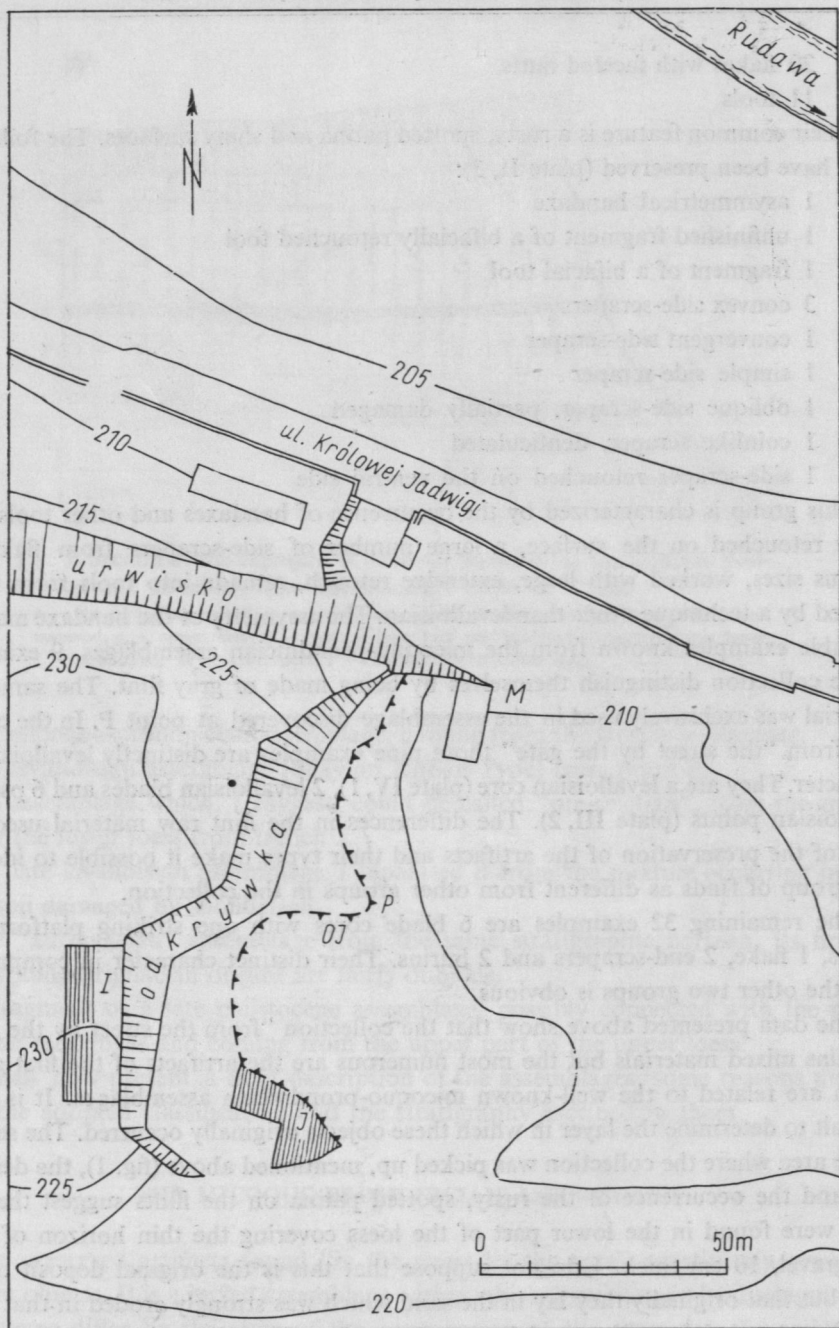


Plate I

Cracow. Zwierzyniec. Location plan of site and excavation area: I — L. Sawicki's trench, J — A. Jura's trench "J" from 1937 - 38, M — the place where the micoquo-prondnican assemblage occurred, i.e. the trench in the street by the gate, P — place where the levalloisian assemblage occurred at point P, OJ — place where the late pleistocene assemblage, i.e. A. Jura's late aurignacian, occurred

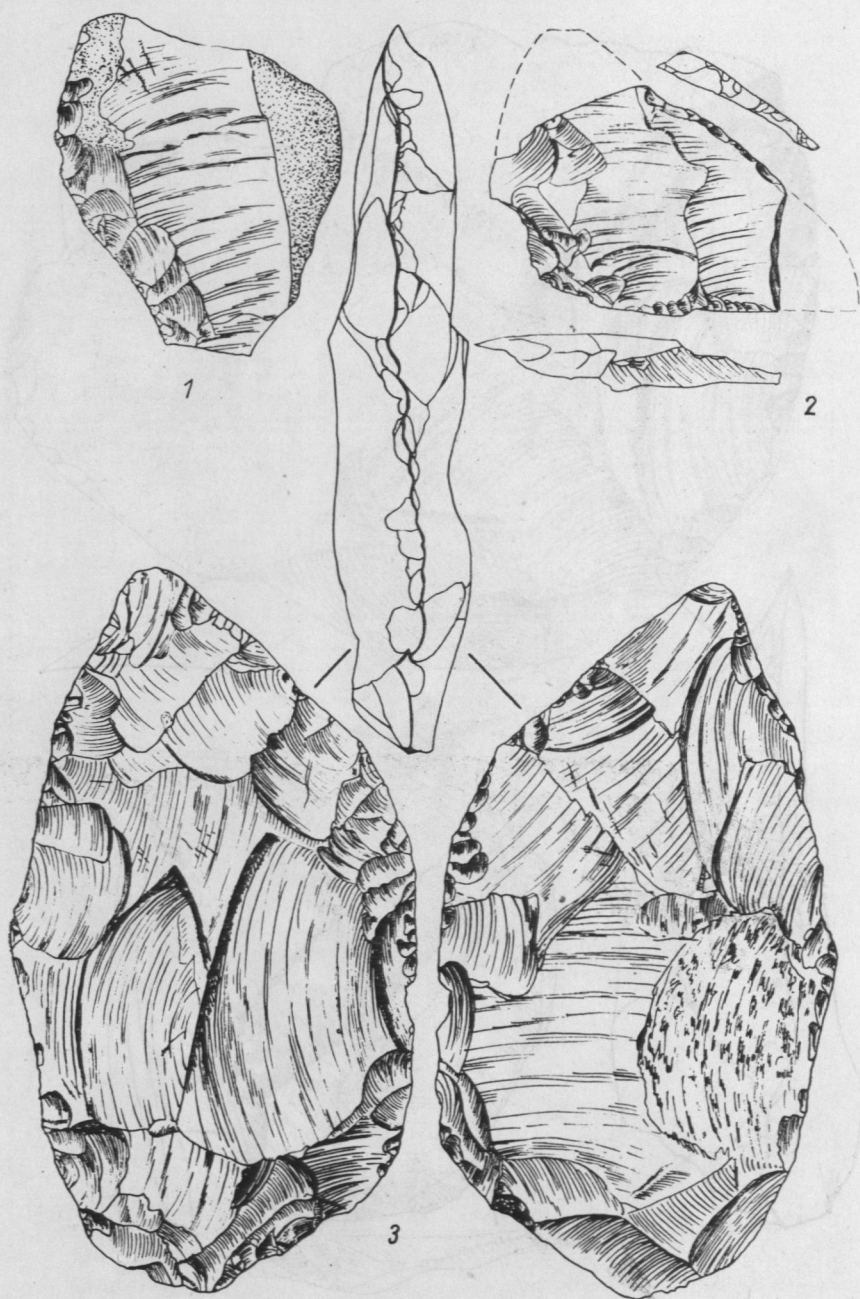


Plate II

Cracow. Zwierzyniec. Flint artifacts of the micoquo-prondnician assemblage from the trench in the street by the gate

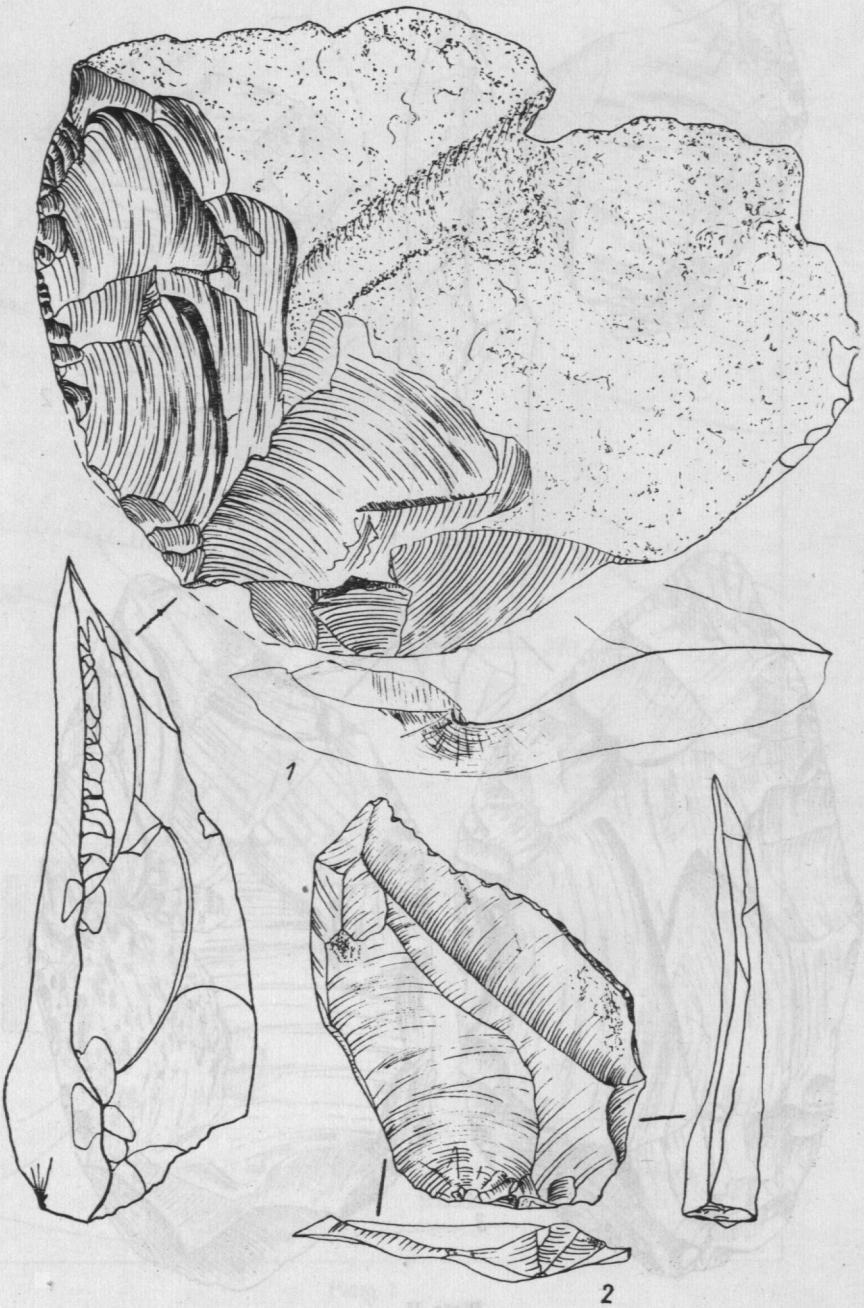


Plate III

Cracow, Zwierzyniec. Flint artifacts of the micoquo-prondnician assemblage from the trench in the street by the gate



Plate IV

Cracow. Zwierzyniec. A levalloisian core and a convergent sidescraper found in the trench by the gate

however, that only one micoquo-prondnician assemblage from the lower part of the older Würm loess is known to have been found in Poland (The Ciemna Cave); but the assemblage contained no handaxes (W. Chmielewski 1969 b, T. Madeyska-Niklowska 1969).

THE LEVALLOISIAN ASSEMBLAGE (SHAYTAN KOBAN) FROM POINT P

In one of his works (1939 : 18) A. Jura says that he found a concentration of about 100 flints lying on 60 square metres. I have been able to find only 57 artifacts in the preserved collection in addition to 6 examples which were included in the collection by accident. A. Jura's notes contained a schematic drawing of a rectangular trench of about 6·12 m. Its longer axis was oriented along SN and its centre was occupied by the hearth represented as the hatched area. The flint concentration is marked in the north-western corner of the trench. In addition to this drawing there is a schematic drawing of the section of the western loess wall (fig. 2B) with the following description: "yellow loess; yellowish sand with numerous pieces of coal — the main cultural layer, i.e. flints and charcoal, thickness 20 - 25 cm; gray sand, rarely coal and rare flint flakes, thickness from 5 to 17 cm."

As I have already said, in his later notes A. Jura gave further information concerning the thickness of the loess and the sand, the occurrence of the gravel below and the way in which these series were covered by the fossil soil damaged by solifluction and by younger loess. Thanks to these notes our knowledge of the stratigraphy of the assemblage from point P is relatively clear.

The preserved part of the assemblage consists of the following types of artifacts:

- 9 ordinary flakes
- 12 levalloisian flakes
- 7 levalloisian blades (plate VI, 1, 2)
- 18 fragments of blades and flakes
- 5 levalloisian points
- 1 pseudolevalloisian point
- 2 arch-shaped lateral side-scrapers from flakes (plate VI, 4)
- 1 side-scraper "tranché" (plate VI, 3)
- 1 denticulated tool from a flake (plate VI, 5)
- 1 burin formed from a small levalloisian core (plate VI, 6).

The assemblage is characterized by the homogeneity of the flint raw material which was gray and carefully selected and by the homogeneous levalloisian technique of forming flakes. Apart from levalloisian points, tools are not numerous and their retouch is very delicate. All these features make the assemblage resemble the levalloisian-mousterian sites Molodova I and V on the Dniestr River and consequently other assemblages of this type in the Dniestr basin, the Balkan Peninsula and the Crimean site Shaytan Koba (A. P. Tchernysh 1965, W. Chmielewski 1971).

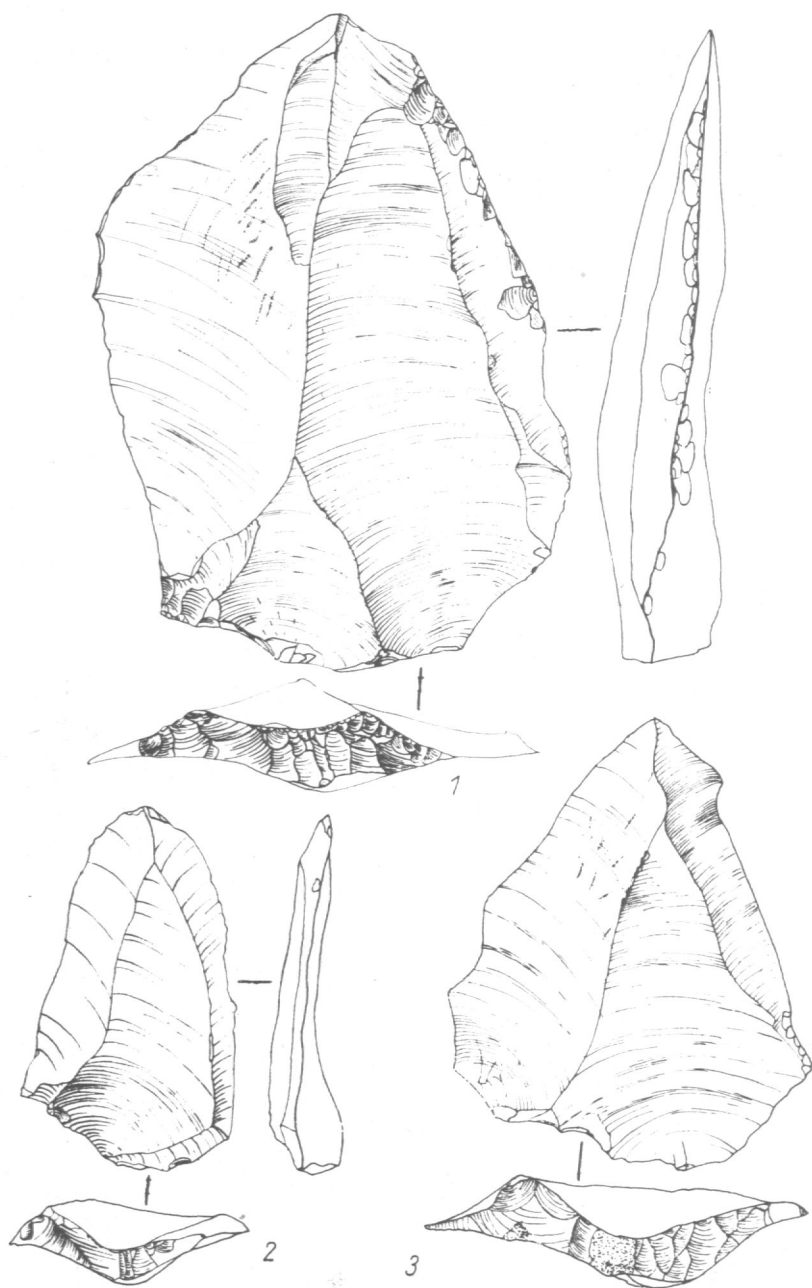


Plate V

Cracow. Zwierzyniec. Flint artifacts of the levalloisian assemblage from point P

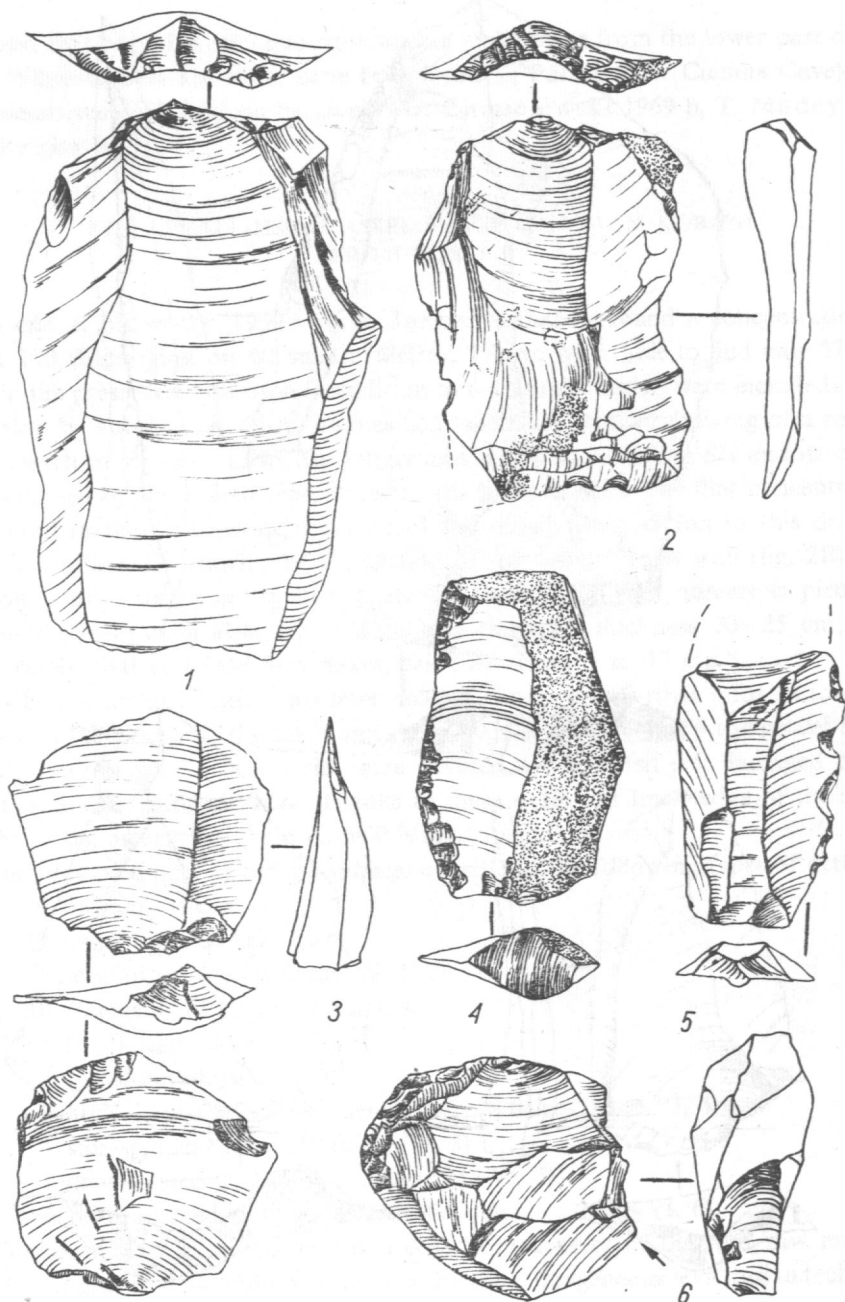


Plate VI

Cracow. Zwierzyniec. Flint artifacts from the levalloisian assemblage from point P

THE PRESELETIAN ASSEMBLAGE FROM TRENCH J

The separation of this assemblage from A. Jura's collection from trench J may be subject to doubts. Therefore, I am going to present some criteria on which I have based the isolation of this assemblage.

A. Jura's publications contain numerous mentions of the mousterian assemblage discovered by him in the upper part of the old Würm loess independently of the assemblage labelled as levalloisian, from point P. Only one example from the collection known to me is marked with the inscription "1.I". It is a massive leaf-like point, partially bifacially retouched on the surface, with a broken base subsequently repaired.

From trench J comes another, very similar example with a rounded base covered with cortex and with the top struck off (plate VII, 2). It has the inscription "VIII, 25 m or. najst", which means that the example was found on the 25th metre of zone VIII in trench J, in the horizon associated by Jura with the oldest period of the aurignacian settlement. The collection contains 5 more examples with indications of the same stratigraphic horizon. They all have the following features in common: they are made from large flakes with broad, flat butts or from flint debris, with large retouch and deep negative around the bulb. The retouch is superficial. All the examples have equivalents in assemblages formerly called mousterian. Not a single example belongs to the group of characteristic aurignacian tools or later tools (plates X, 1, XI, XVI, 3, XIX, 3, XX, 2).

Analysing A. Jura's notes I have concluded that he distinguished the horizon of the oldest aurignacian more on the basis of the stratigraphic proximity of this horizon to the overlying "lower aurignacian" than on the basis of a typological analysis of flint artifacts found in that horizon. He would emphasise the "mousterian" appearance of these finds, but he was also influenced in his judgements by the fact that analogous examples occurred in higher horizons together with aurignacian tools. The present author sees this problem in a different way, since he considers these finds to have been displaced by solifluction and upheaving of the ground from the upper part of the lower loess. It must be emphasised again that no tools of the aurignacian or other type occurred in this horizon.

The next step was the isolation from the collection of the tools found in the "lower, middle and upper aurignacian" horizon according to A. Jura's marking, which were related to the examples found in the horizon of "the oldest aurignacian" by virtue of the features of flakes and the technique of formation. In this way the collection illustrated on tables VII to XX was isolated. Being aware of all the doubts which can be evoked by the method used in isolating this assemblage but having no other available criteria, I consider this assemblage as and representative, internally extremely homogeneous as well as illustrative of a large fragment of an interesting, new assemblage. Below is its approximate characterization.

The tools were made from large flakes with butts either covered with cortex or flat, usually broad with well marked traces of blows with a hard hammerstone,

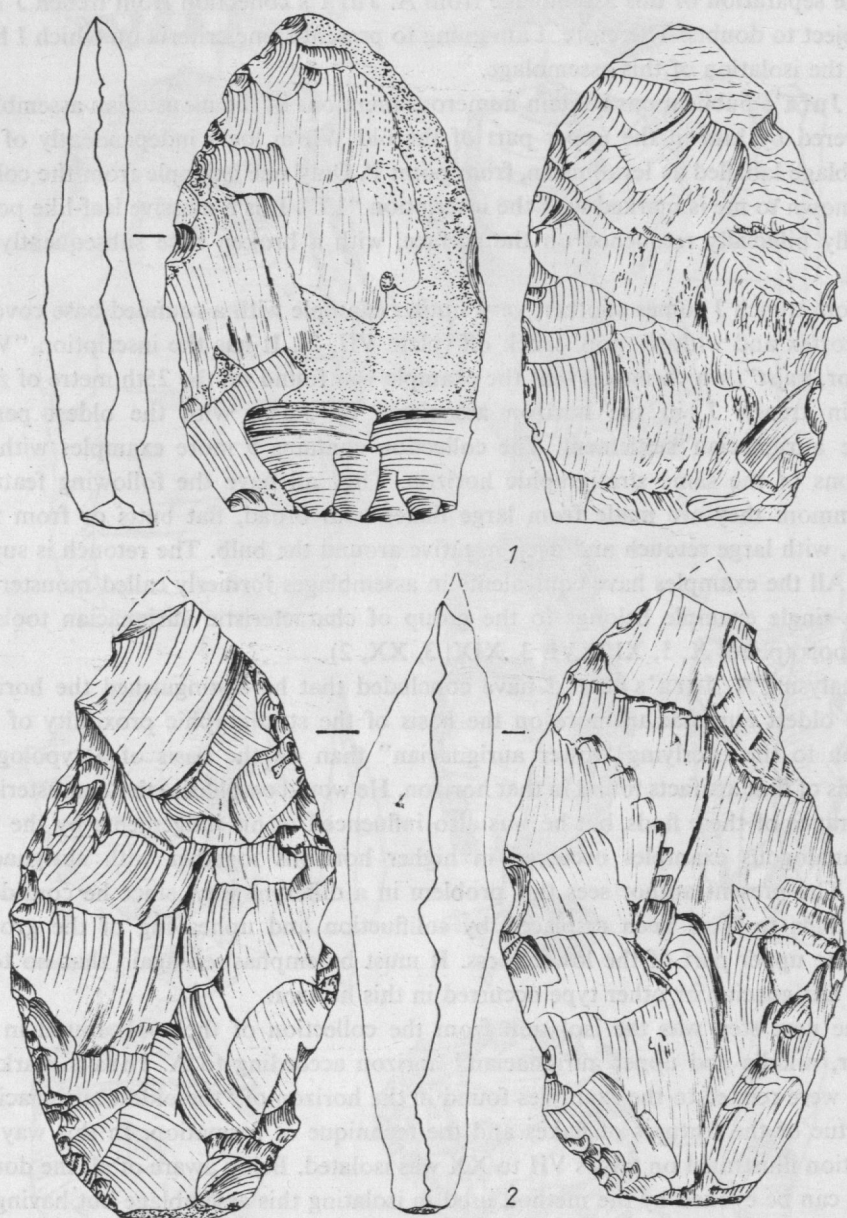


Plate VII

Cracow. Zwierzyniec. Trench J. Flint artifacts of the preseletian assemblage

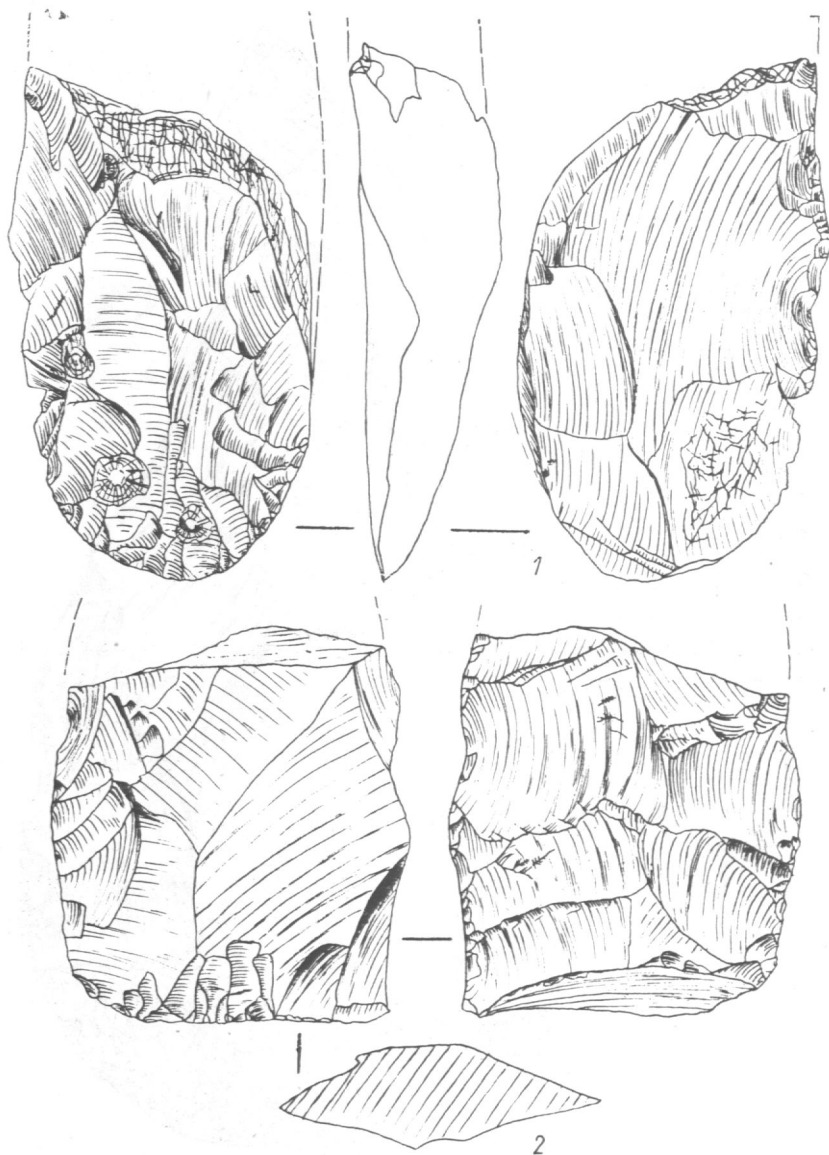


Plate VIII

Cracow. Zwierzyniec. Trench J. Flint artifacts of the preseletian assemblage



Plate IX

Cracow. Zwierzyniec. Trench J. A massive burin from the preseletian assemblage



Plate X

Cracow. Zwierzyniec. Trench J. Flint artifacts of the preselection assemblage

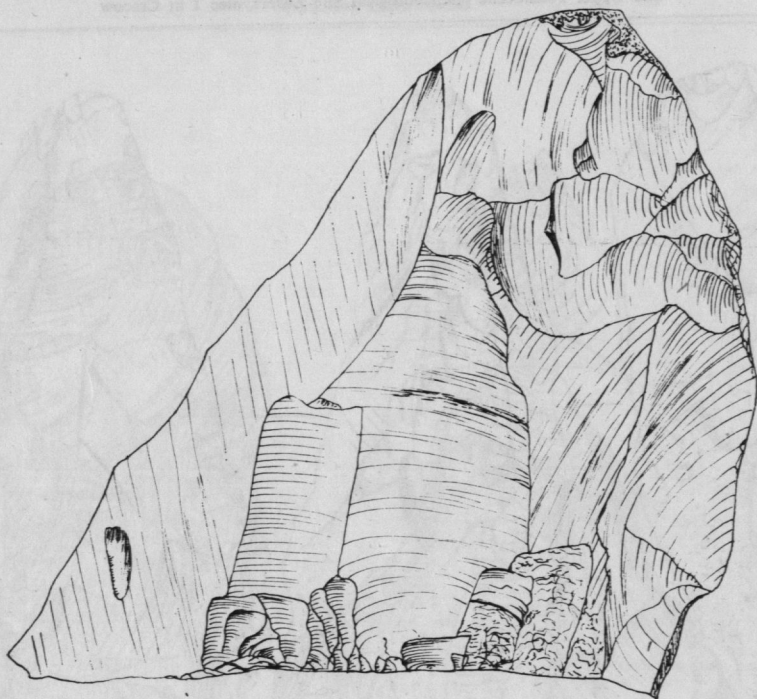


Plate XI

Cracow. Zwierzyniec. Trench J. A massive, arched, bifacial sidescraper of the preseletian assemblage

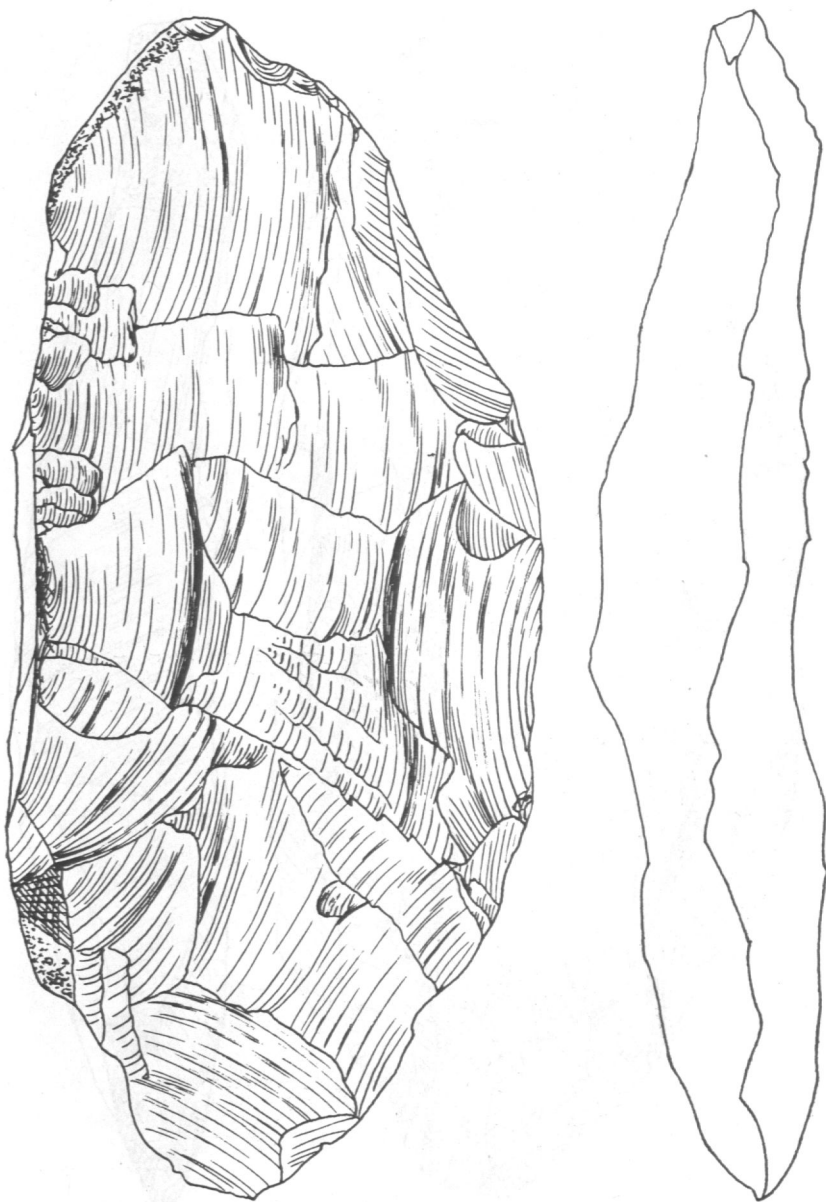


Plate XII

Cracow. Zwierzyniec. Trench J. A bifacial, arched sidescraper-knife of the preseletian assemblage

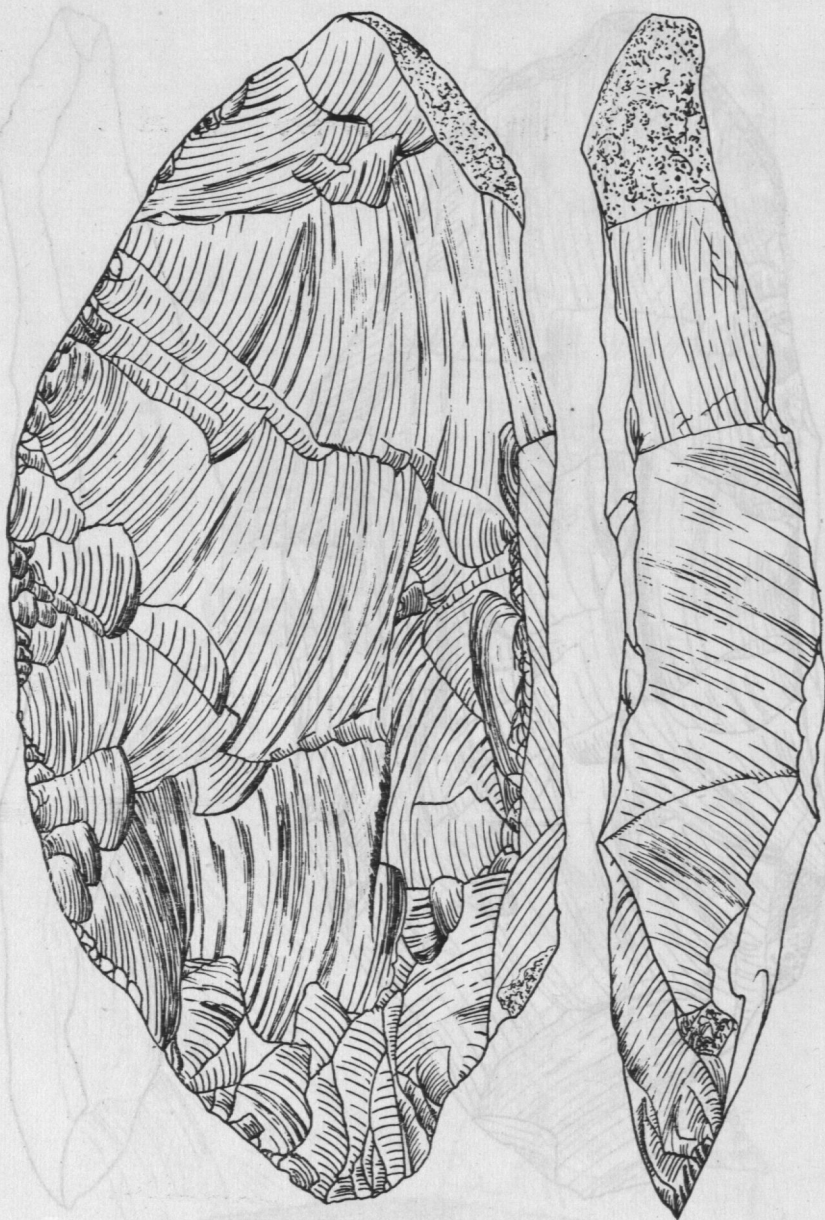


Plate XIII

Cracow. Zwierzyniec. The reverse side of the sidescraper from table XII

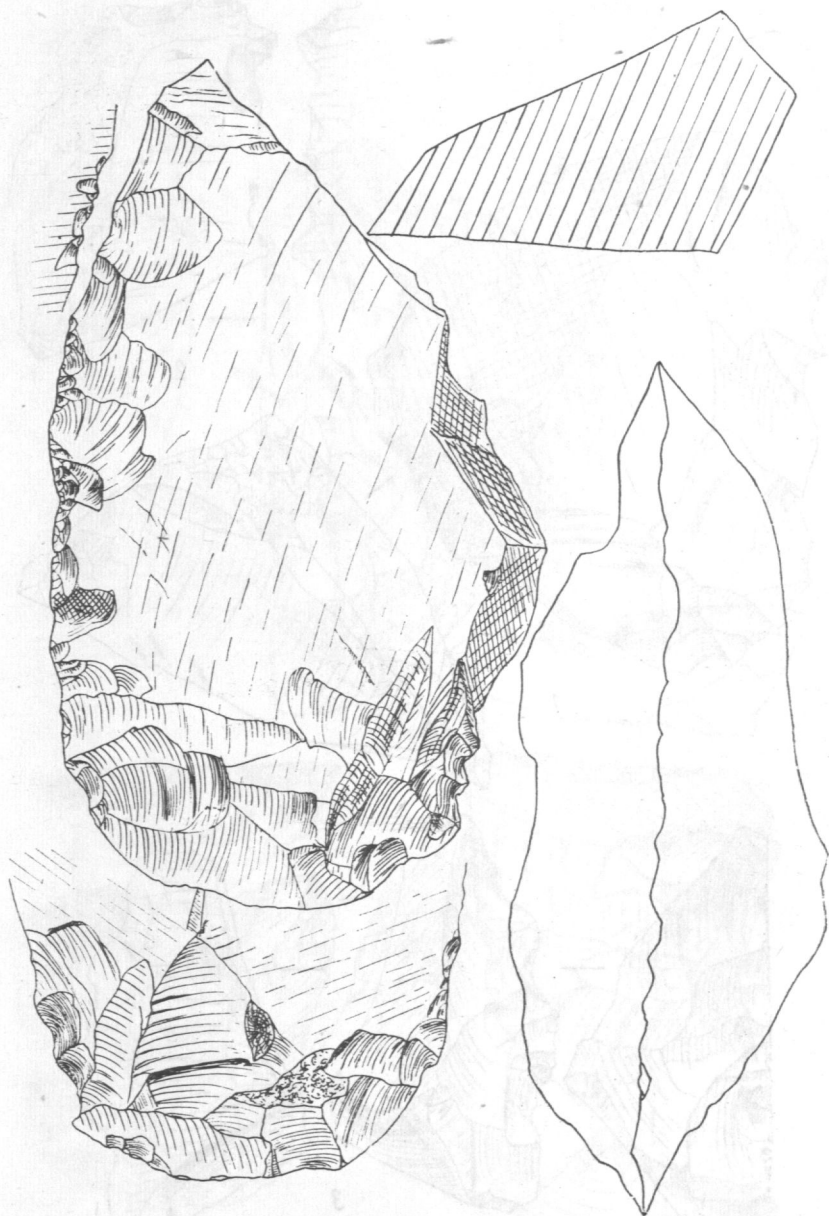


Plate XIV

Cracow. Zwierzyniec. Trench J. An arched sidescraper-knife, partially bifacial, of the preseletian assemblage

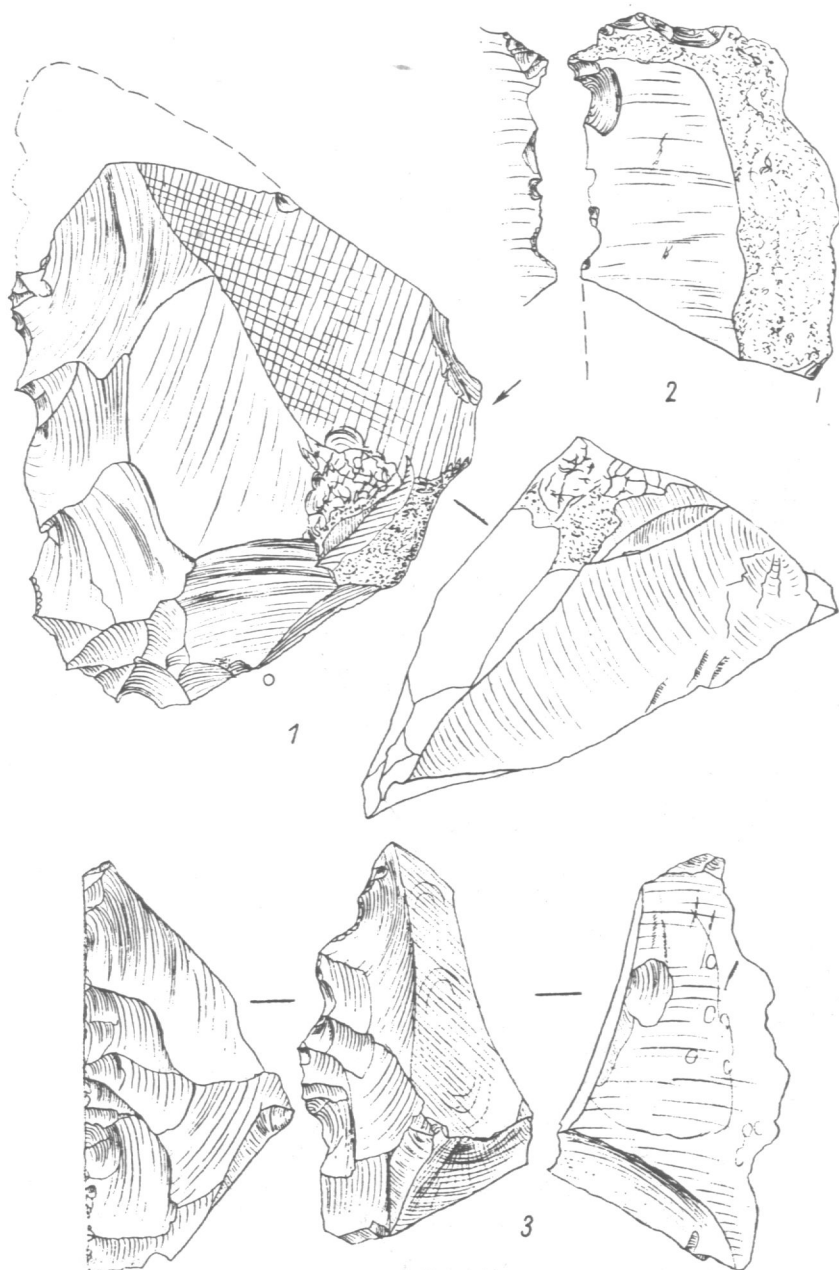


Plate XV

Cracow. Zwierzyniec. Trench J. A denticulated tool of the preseletian assemblage

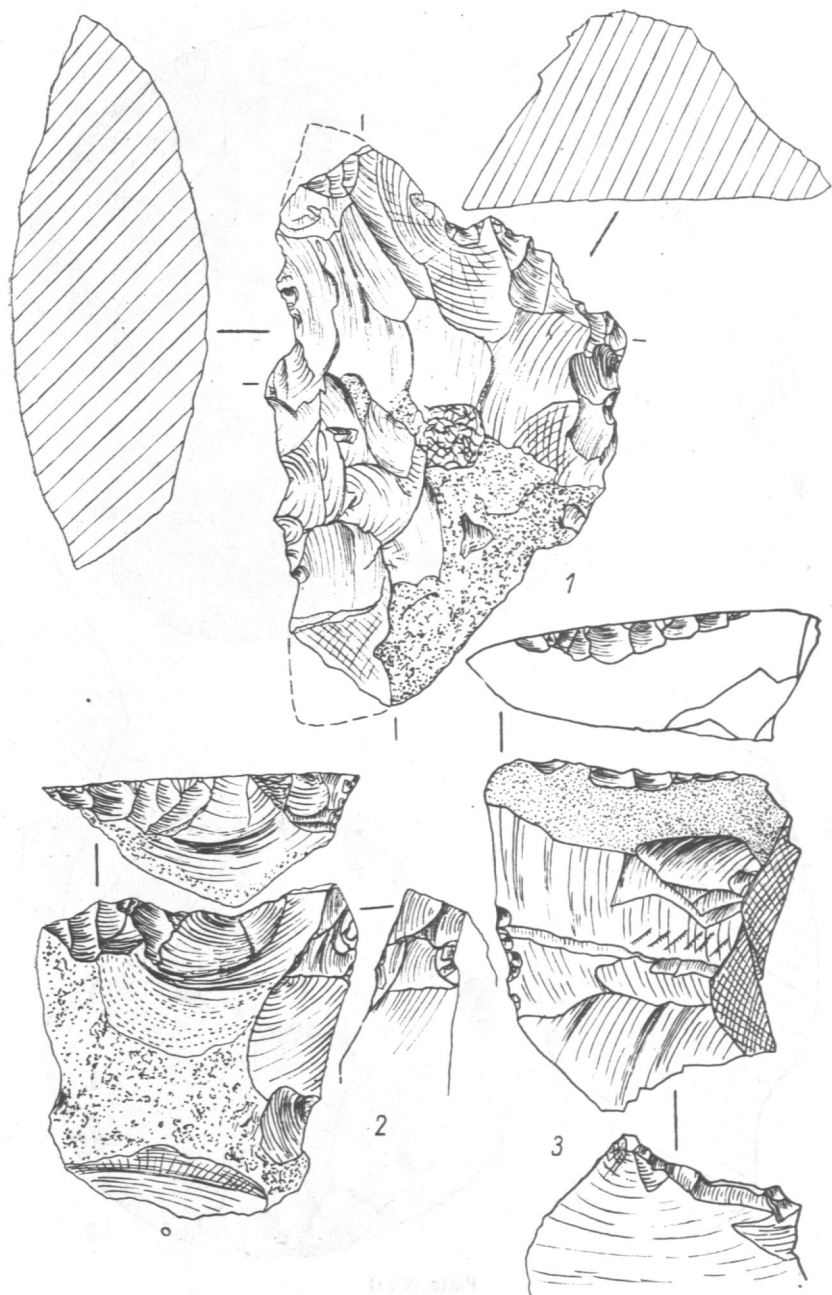


Plate XVI

Cracow. Zwierzyniec. Trench J. Flint tools of the pre-lesian assemblage

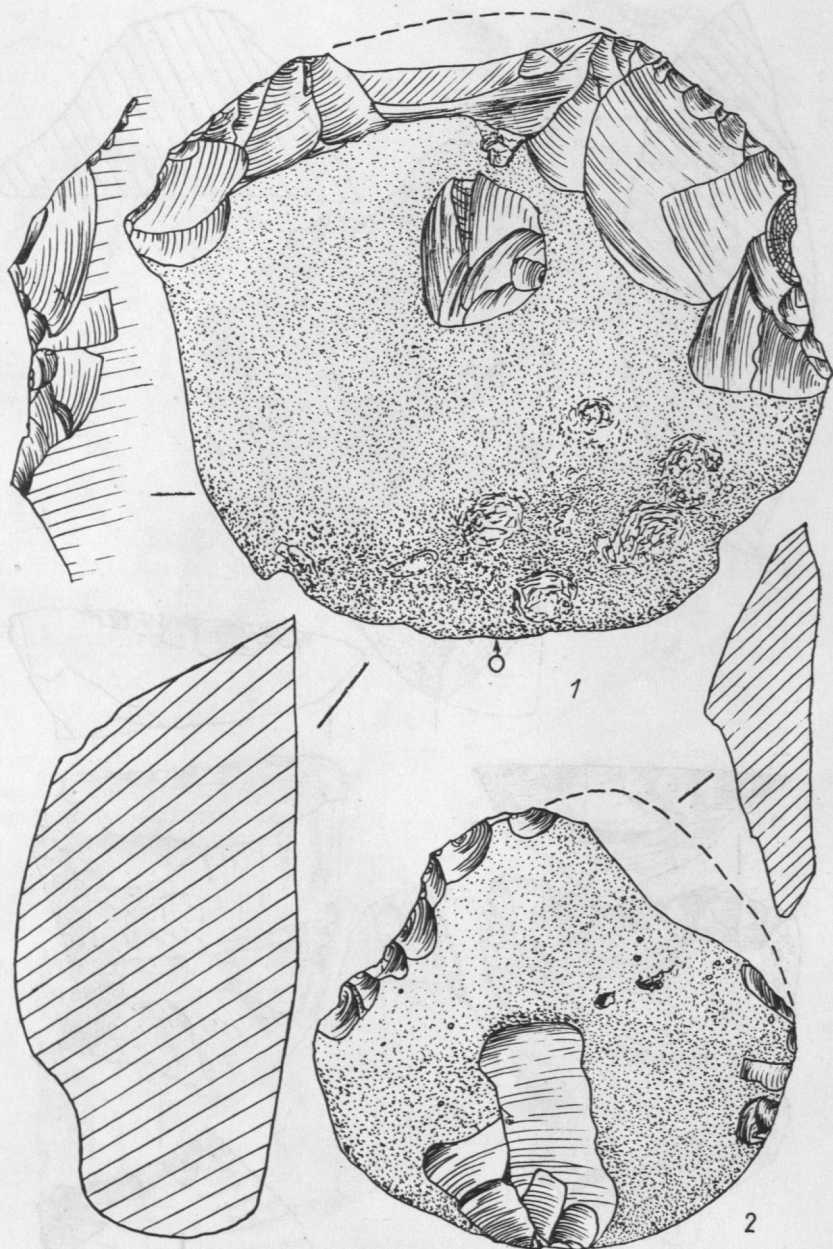
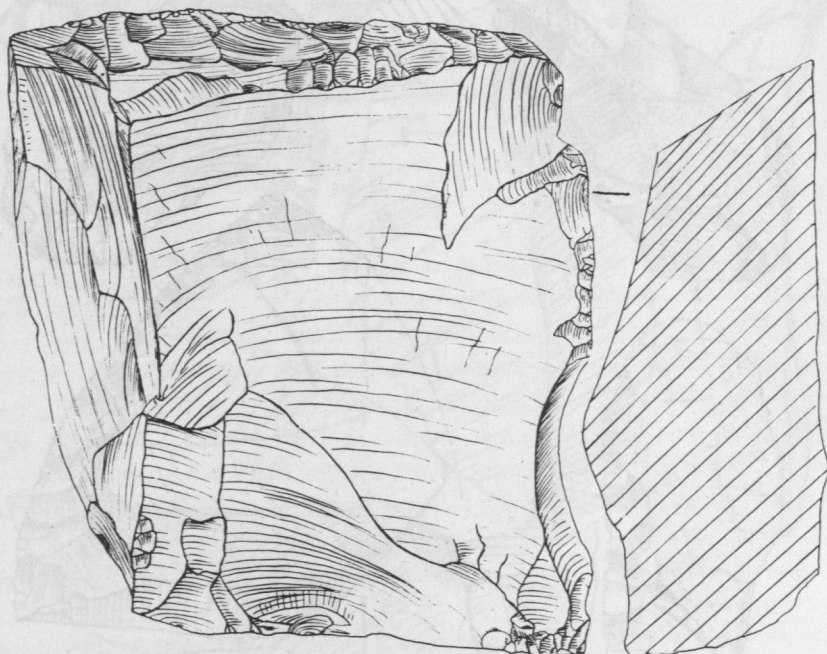
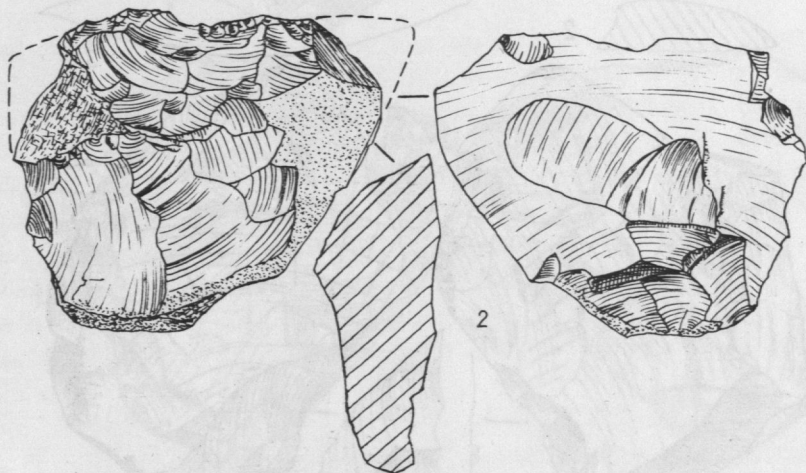


Plate XVII

Cracow. Zwierzyniec. Trench J. Transversal arched sidescrapers of the preseletian assemblage



1



2

Plate XVIII

Cracow. Zwierzyniec. Trench J. Transversal sidescrapers of the preseletian assemblage

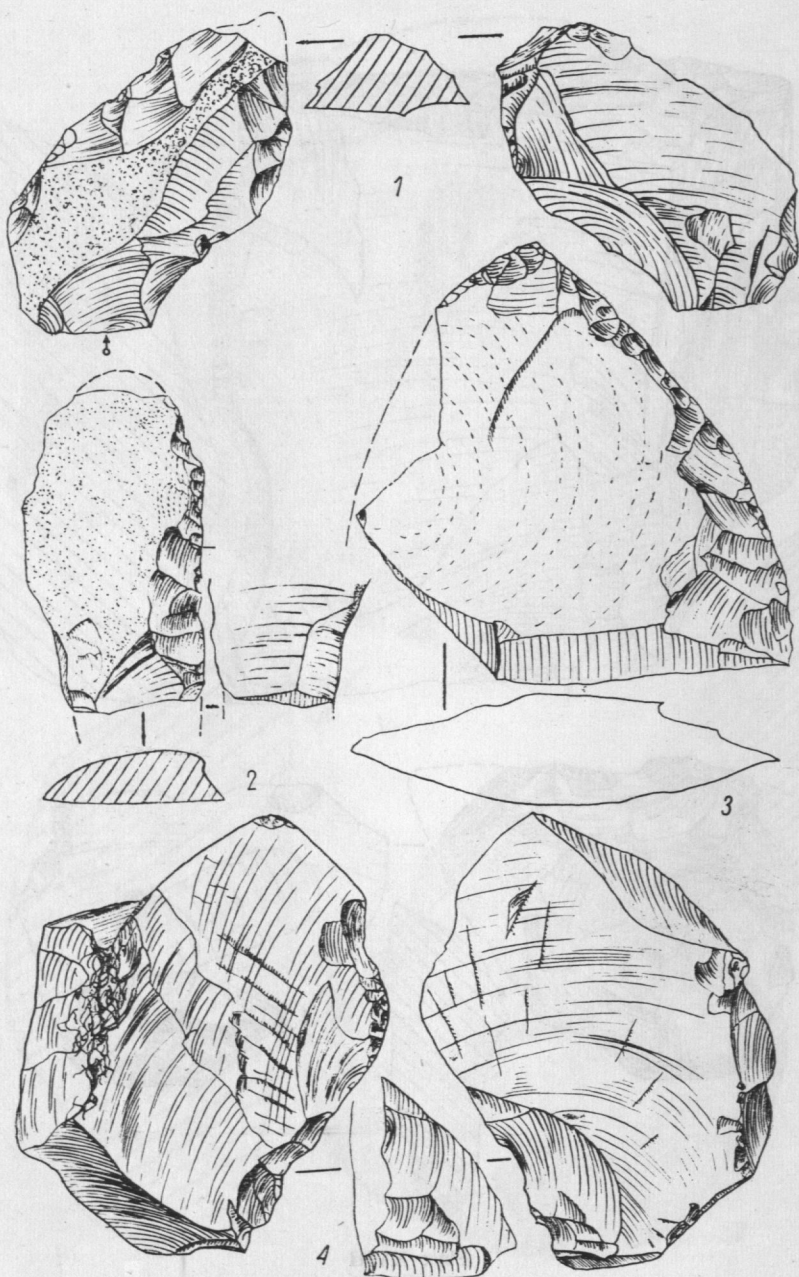


Plate XIX

Cracow. Zwierzyniec. Trench J. Sidescrapers of the preselection assemblage

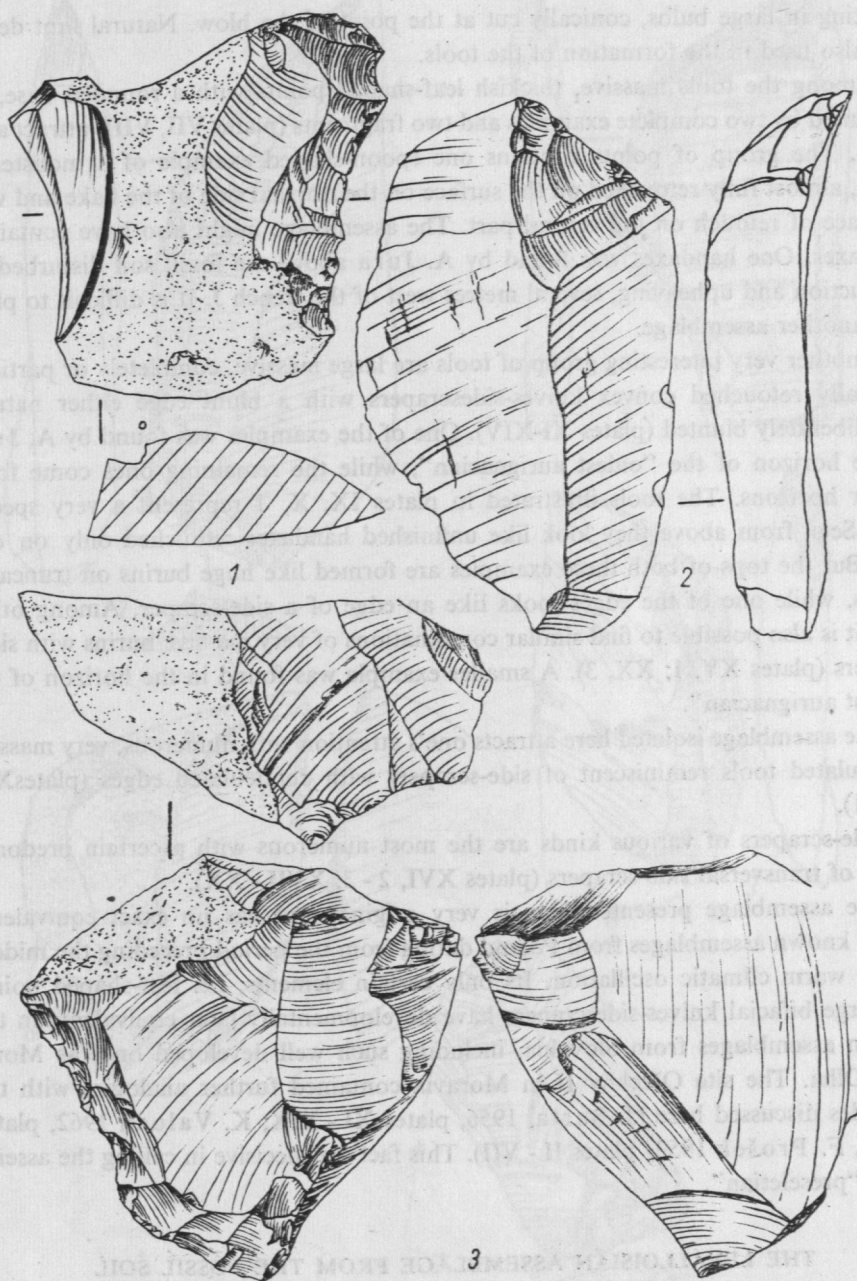


Plate XX

Cracow. Zwierzyniec. Sidescrapers of the preseletian assemblage

resulting in large bulbs, conically cut at the point of the blow. Natural flint debris was also used in the formation of the tools.

Among the tools massive, thickish leaf-shaped points with a rounded base, represented by two complete examples and two fragments (plates VII, VIII) attract attention. The group of points contains one spoon-shaped example of a mousterian point, almost fully retouched on the surface on the dorshal side of the flake and with no trace of retouch on the ventral part. The assemblage might also have contained handaxes. One handaxes was found by A. Jura above the fossil soil disturbed by solifluction and upheaving, several metres west of the trench J. It is difficult to place it in another assemblage.

Another very interesting group of tools are large massive, completely or partially bifacially retouched convex knives-sidescrapers with a blunt edge either natural or deliberately blunted (plates XI-XIV). One of the examples was found by A. Jura in the horizon of the "oldest aurignacian", while the remaining ones come from higher horizons. The tools illustrated in plates IX, X, 1 represent a very special type. Seen from above they look like unfinished handaxes retouched only on one side. But the tops of both these examples are formed like huge burins on truncated blades, while one of the edges looks like an edge of a side-scraper. Among other tools it is also possible to find similar combinations of very massive burins with side-scrapers (plates XV, 1; XX, 3). A smaller example was found in the horizon of the "oldest aurignacian".

The assemblage isolated here attracts one's attention with numerous, very massive denticulated tools reminiscent of side-scrapers with denticulated edges (plates XV, XVI, 1).

Side-scrapers of various kinds are the most numerous with a certain predominance of transversal side-scrapers (plates XVI, 2 - 3; XVII - XX).

The assemblage presented here is very original and has no exact equivalents in any known assemblages from Poland dating from the period preceding the middle Würm warm climatic oscillation. Its only certain elements, i.e. leaf-shaped points and large bifacial knives-sidescrapers have developmentally later equivalents in the seletian assemblages from Slovakia, including such well developed ones as Moravany Dlha. The site Ořechov II in Moravia contained further analogies with the examples discussed here (J. Barta, 1956, plates XI - XIX; K. Valoch 1962, plates I - VII, F. Prošek 1953, plates II - VII). This fact was decisive in calling the assemblage "preseletian".

THE LEVALLOISIAN ASSEMBLAGE FROM THE FOSSIL SOIL

The present author finds it very difficult to isolate this assemblage from A. Jura's collection gathered from the fossil soil of trench J and containing a mixture of flint artifacts of different ages, such as the preseletian ones discussed above and generally labelled as aurignacian. The only criteria available for the isolation were: gray

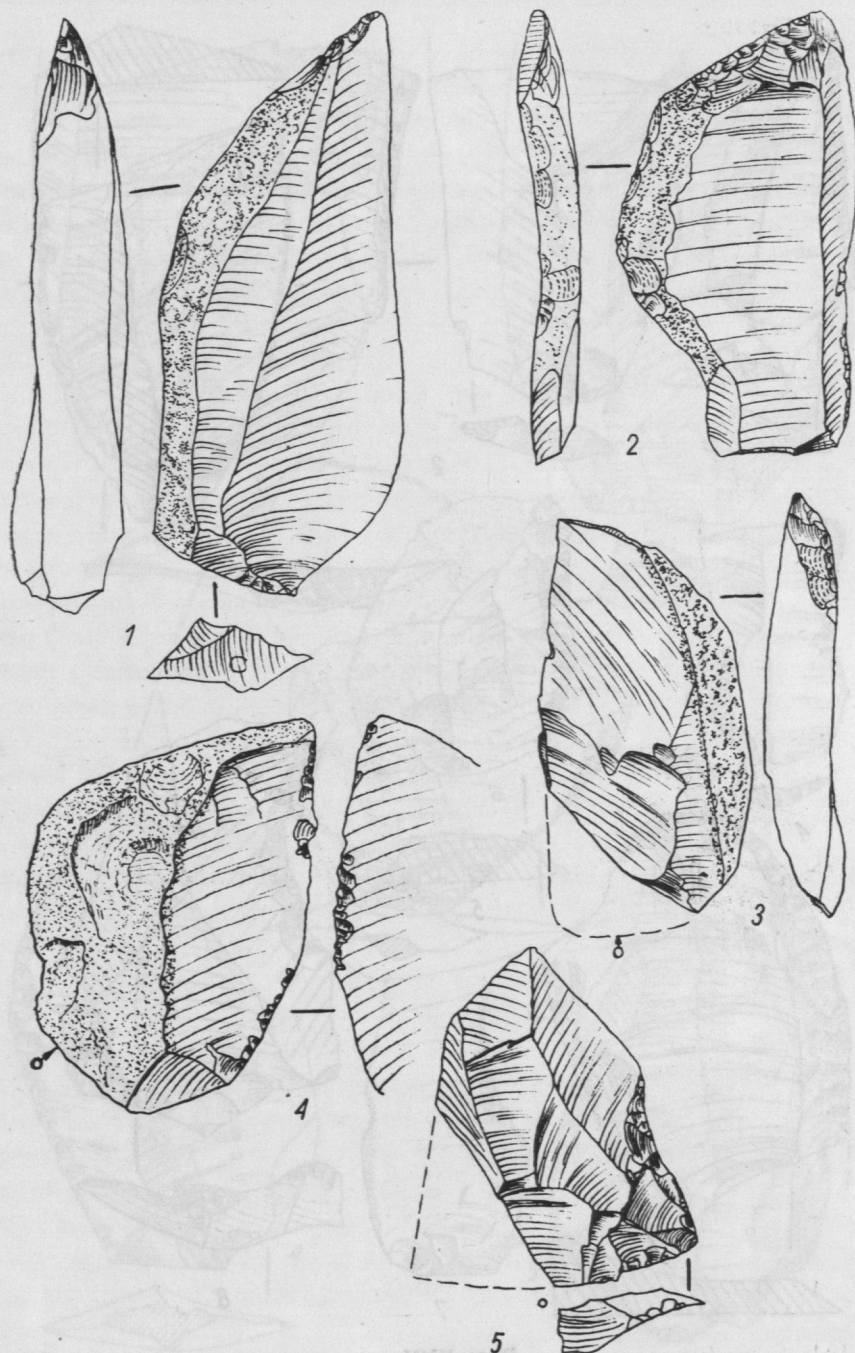


Plate XXI

Cracow, Zwierzyniec. Trench J. Tools of the supposed late levalloisian assemblage from the fossil soil

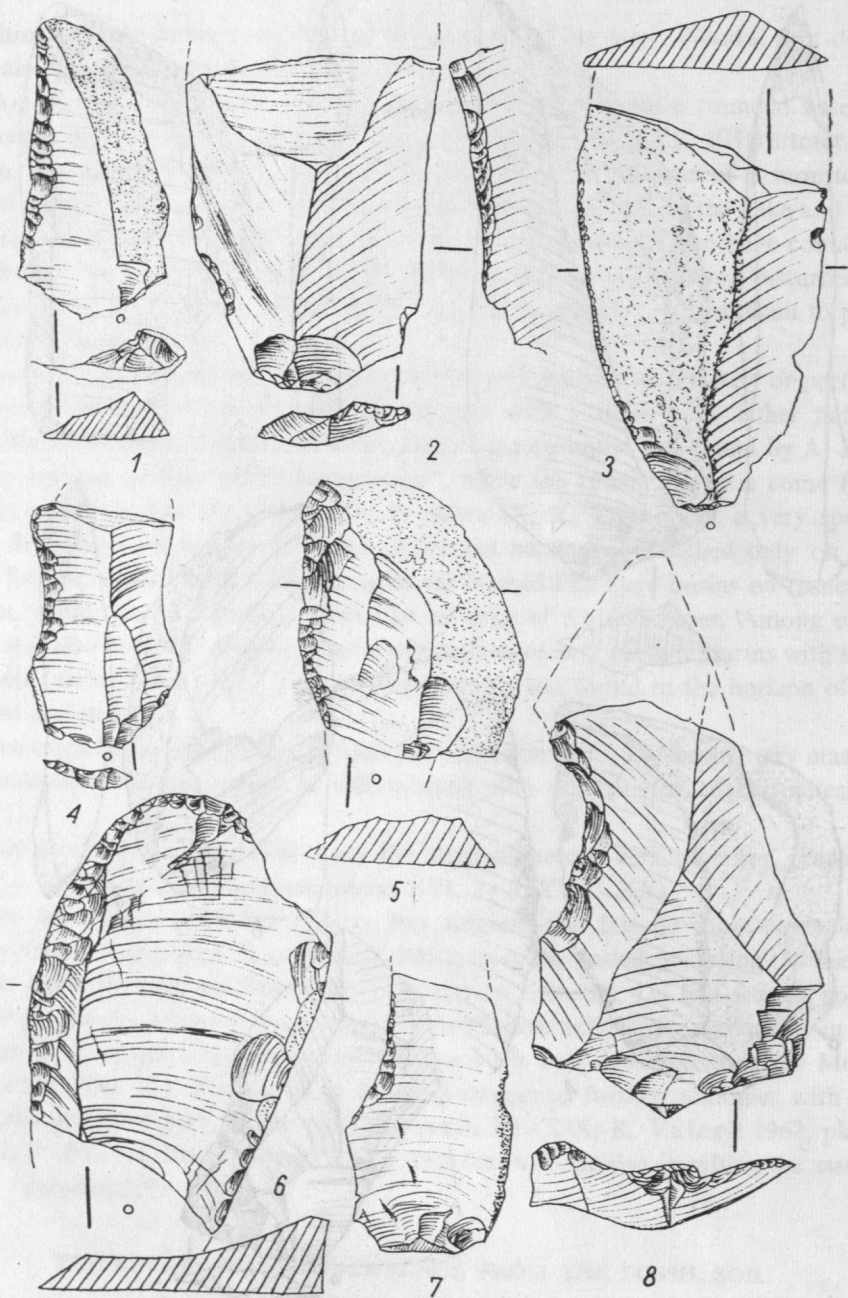


Plate XXII

Cracow. Zwierzyniec. Trench J. Sidescrapers of the supposed late levalloisian assemblage from the fossil soil

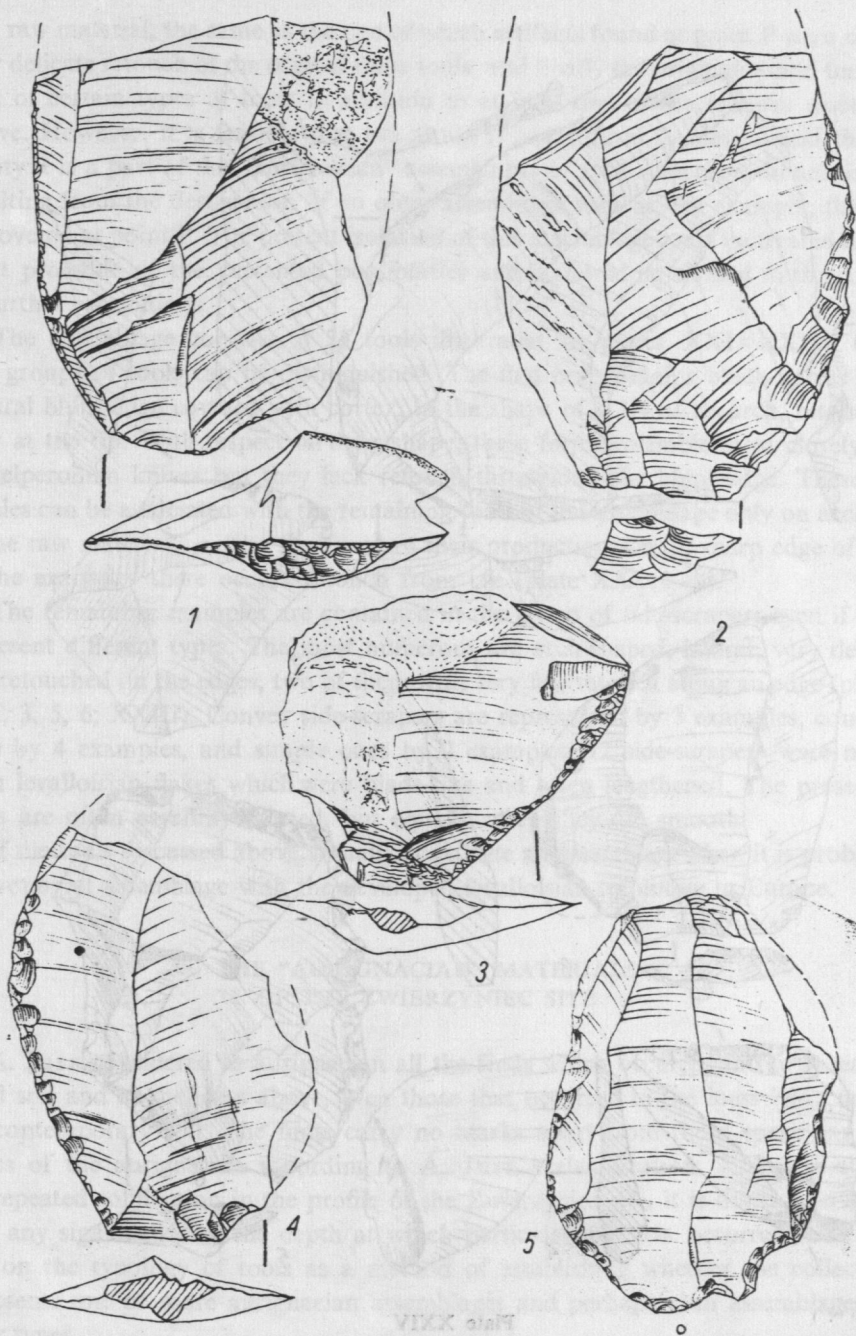


Plate XXIII

Cracow, Zwierzyniec. Trench J. Sidescrapers of the supposed late levalloisian assemblage from the fossil soil

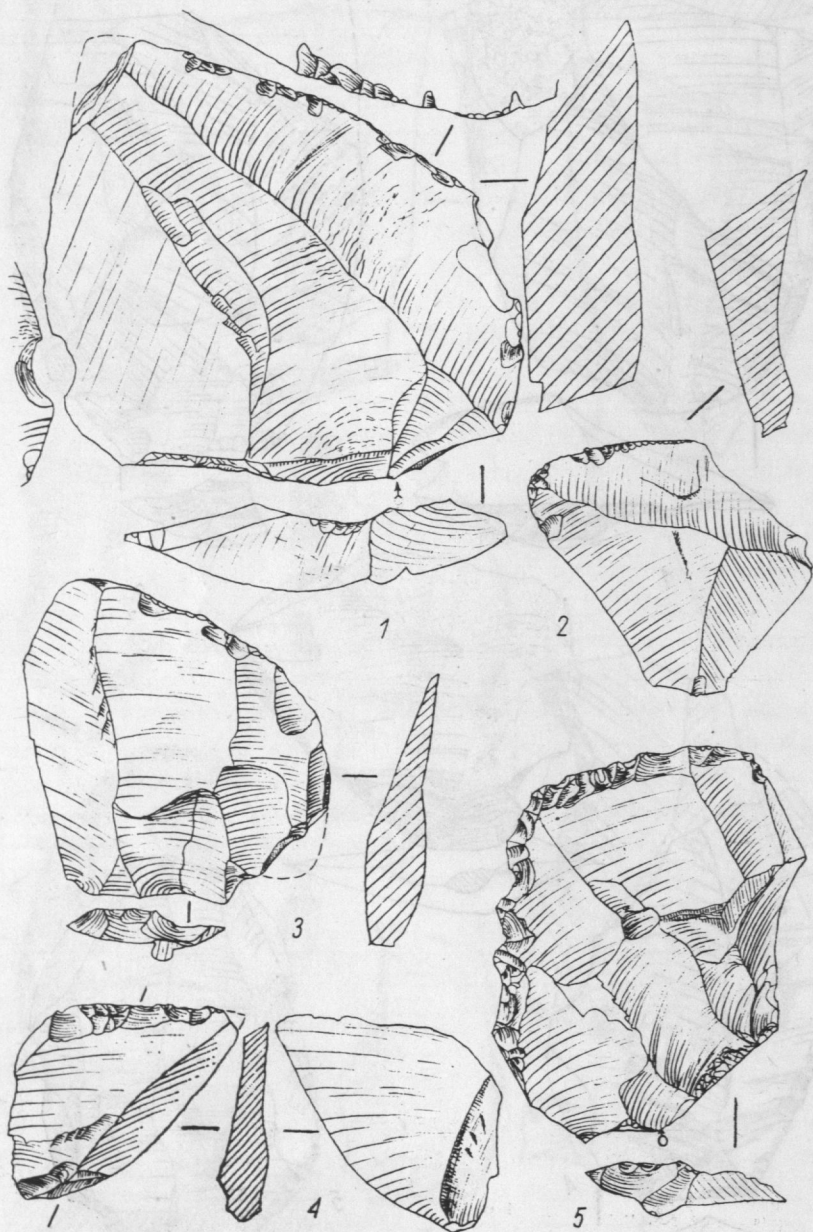


Plate XXIV

Cracow. Zwierzyniec. Trench J. Sidescrapers and denticulated tools from the fossil soil

flint raw material, the same as the one of which artifacts found at point P were made; very delicate retouch of the edge of these tools, and finally the originality and uniqueness of certain types of tools in addition to at least one of the features discussed above. However, it is feasible that the group is an artificial formation and that in reality it is a part of the "aurignacian" assemblages or even a mechanical admixture resulting from the destruction of an older assemblage such as, for example, the one discovered at point P. The present isolation of this assemblage must be treated as the most probable of the presented possibilities and it should be verified in the course of further excavations.

The assemblage consists of 25 tools illustrated in plates XXI - XXIV. Only two groups of tools can be distinguished. The first one contains blade-knives with natural blunt edge covered with cortex, in the shape of a $3/4$ of an arch, retouched only at the tip. With respect to their shape, these forms resemble most closely the châtelperonian knives but they lack retouch throughout the blunt edge. These examples can be associated with the remaining tools of the assemblage only on account of the raw material, i.e. gray flint used in their production. On the sharp edge of two of the examples there occurs retouch from use (plate XXI, 1 - 4).

The remaining examples are contained in the group of side-scrapers even if they represent different types. The most numerous are arch-shaped, lateral, very delicately retouched on the edges, two of them with very fine retouch along an edge (plates XXI, 3, 5, 6; XXIII). Convex side-scrapers are represented by 3 examples, concave ones by 4 examples, and simple ones by 2 examples. 12 side-scrapers were made from levalloisian flakes which were blade-like and often lengthened. The preserved butts are often carefully faceted, but equally often they are smooth.

If the tools discussed above actually constitute an assemblage, then it is probably the youngest assemblage with the developed levalloisian technique in Europe.

THE "AURIGNACIAN" MATERIALS OF THE ZWIERZYNIEC SITE

A. Jura considered as aurignacian all the finds which occurred in the damaged fossil soil and in the loess above, even those that occurred in the loess lying under the contemporary soil. The flints carry no marks apart from those specifying the stages of the aurignacian according to A. Jura's classification. Knowing about the repeated solifluction in the profile of the Zwierzyniec site, it is difficult to attribute any significance to the depth at which particular artifacts occurred. One can rely on the typology of tools as a method of establishing whether the collection represents one or more aurignacian assemblages and perhaps even assemblages of other types.

The collection contains 127 preserved tools (excluding those discussed earlier) in addition to a number of cores, blades and flakes. I ignore the three last classes of artifacts with the exception of 6 cores for forming microblades. It is very easy

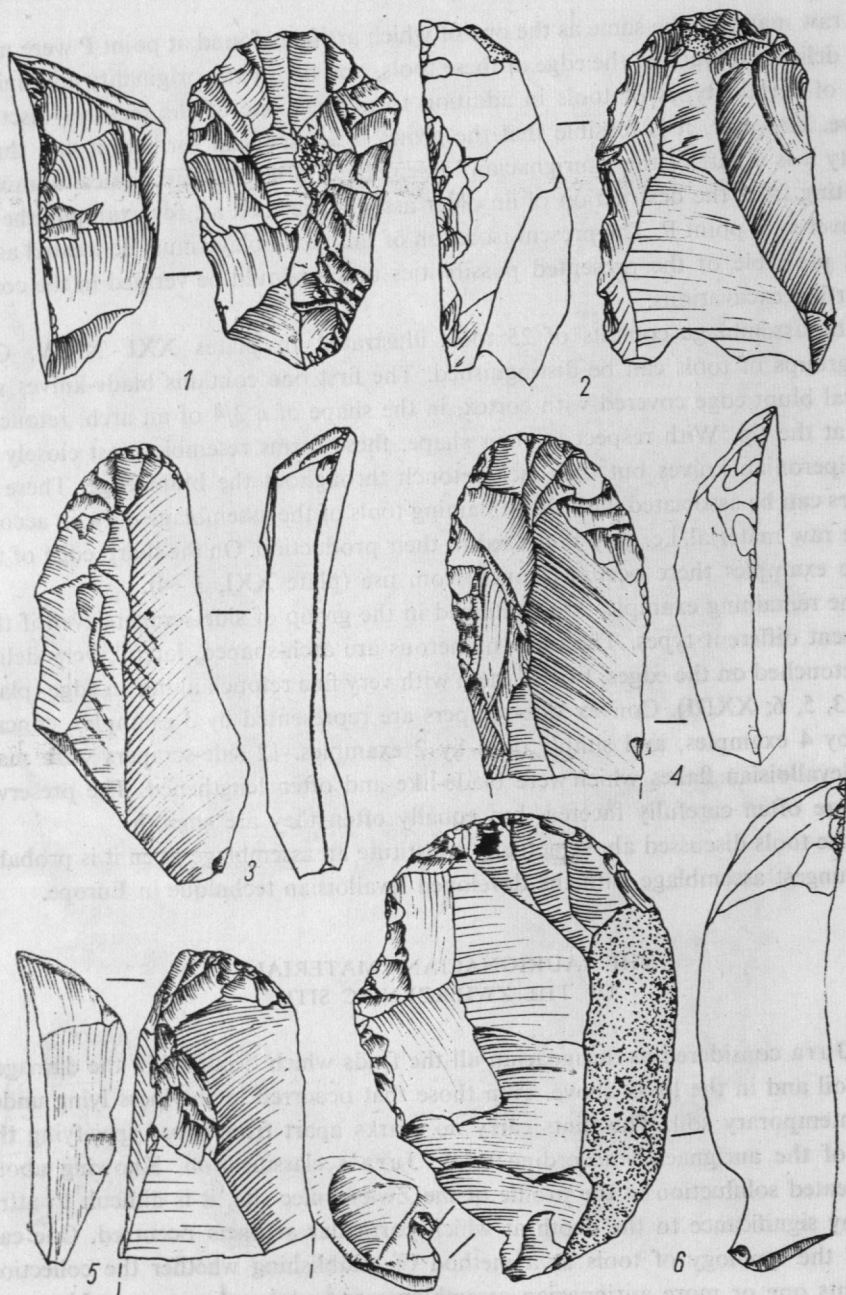


Plate XXV

Cracow. Zwierzyniec. Endscrapers from the fossil soil and upper loess

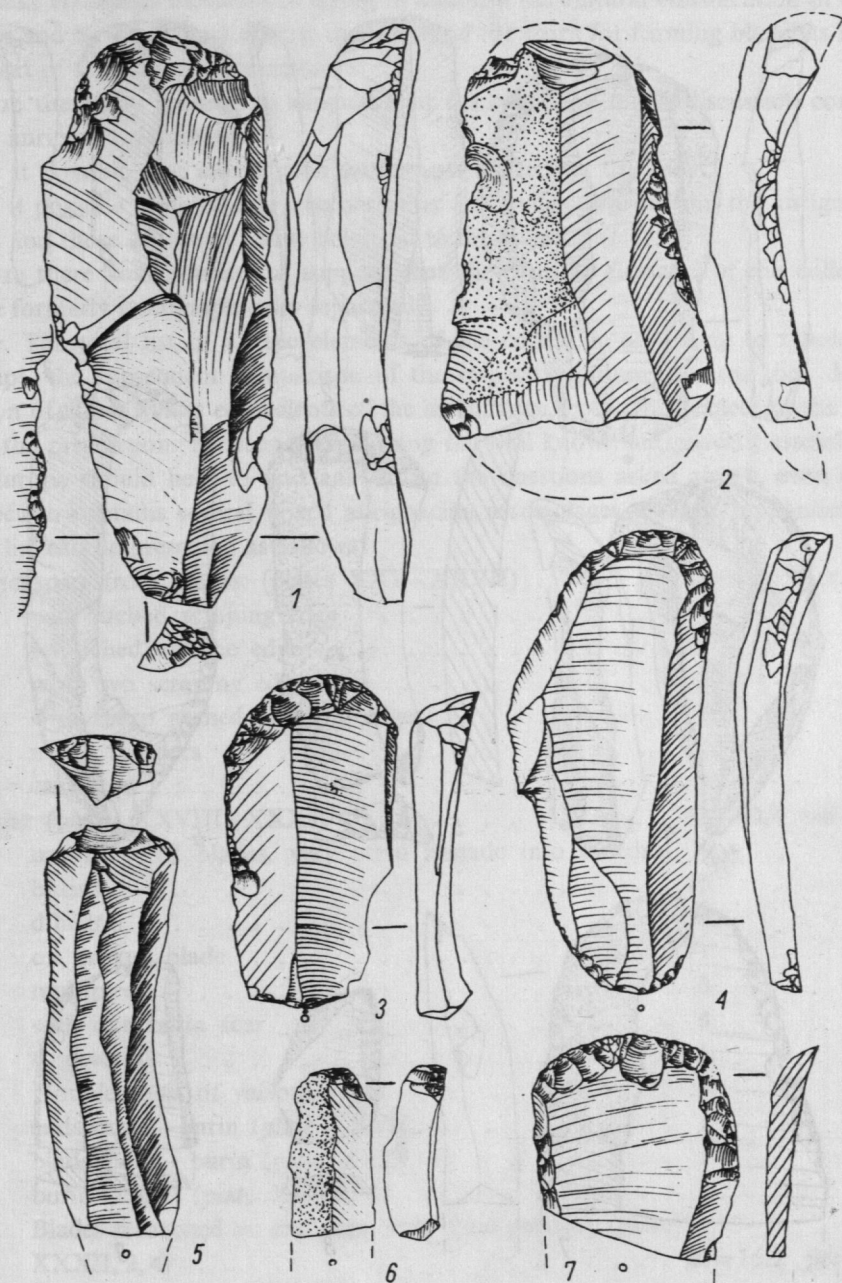


Plate XXVI

Cracow, Zwierzyniec. Trench J. Endscrapers from the fossil soil and upper loess

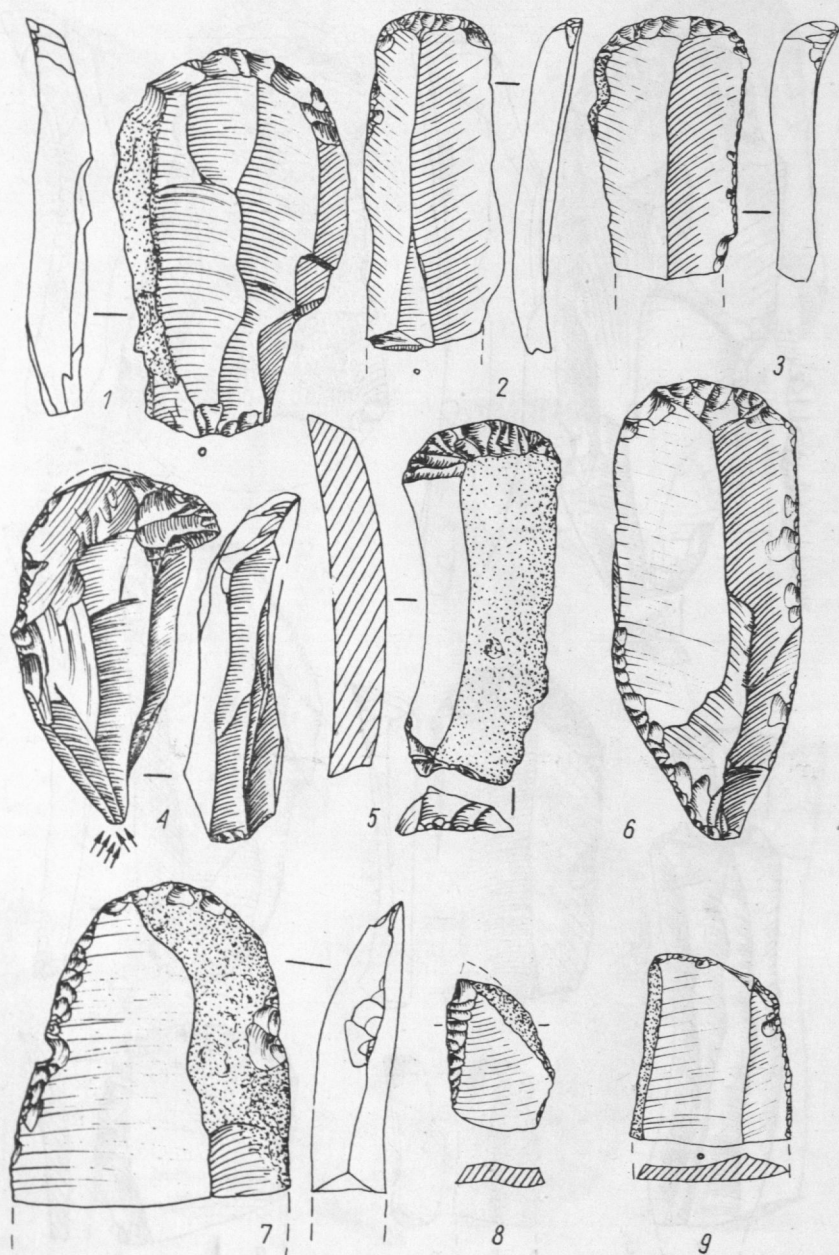


Plate XXVII

Cracow. Zwierzyniec. Trench J. Tools from the fossil soil and upper loess

to make erroneous estimates in trying to establish the cultural classification of cores, flakes and blades. I shall discuss the tools and the cores for forming bladelets in the context of the following questions:

1. Are there any grounds to suppose that the collection under discussion contains only aurignacian elements?
2. Is it possible that aurignacian settlements existed on the site?
3. Is it possible to determine whether other assemblages apart from the aurignacian ones and those discussed above belonged to the collection?
4. Are there any premises to suppose that the possible elements of the collection were formerly stratigraphically separated?

1. The total list of all the elements of the collection according to typological groups, the subsequent comparison of the respective proportions and their identification of approximate equivalents of the assemblage, both with respect to the types and the proportions between them among the well known aurignacian assemblages in Europe should help to find answers to the questions asked above, even if the collection contains several mixed aurignacian assemblages or their preponderance.

The list can be presented as follows:

Endscrapers from blades: (plates XXV - XXVII)	28=21.7 per cent
with arched scraping edge	14
retouched on one edge	2
with two scraping edges	2
with sharp arched scraping edge	2
nosed scrapers	1
carinated	7
Burins: (plates XXVIII - XXXI)	52=40.3 per cent
on truncated blades, very often remade into dihedral	
burins	20
dihedral	10
on broken blade	11
multiplied	6
with one burin scar	4
transversal	1
Double tools of various types	3
endscraper + burin (plate XXVII, 4)	1
blade point + burin (plate XXIX, 4)	1
burin + chisel (plate XXXII, 1)	1
Blades retouched on one edge, very often partially (plate	
XXXII, 2, 4)	20=16.2 per cent
Pointed blades (plate XXXIII, 5)	1
Denticulated blades with notches (plate XXXIII, 3)	9
Truncated blades (plate XXXIII, 1, 2)	3
Racl�ttes (plate XXVII, 9)	3

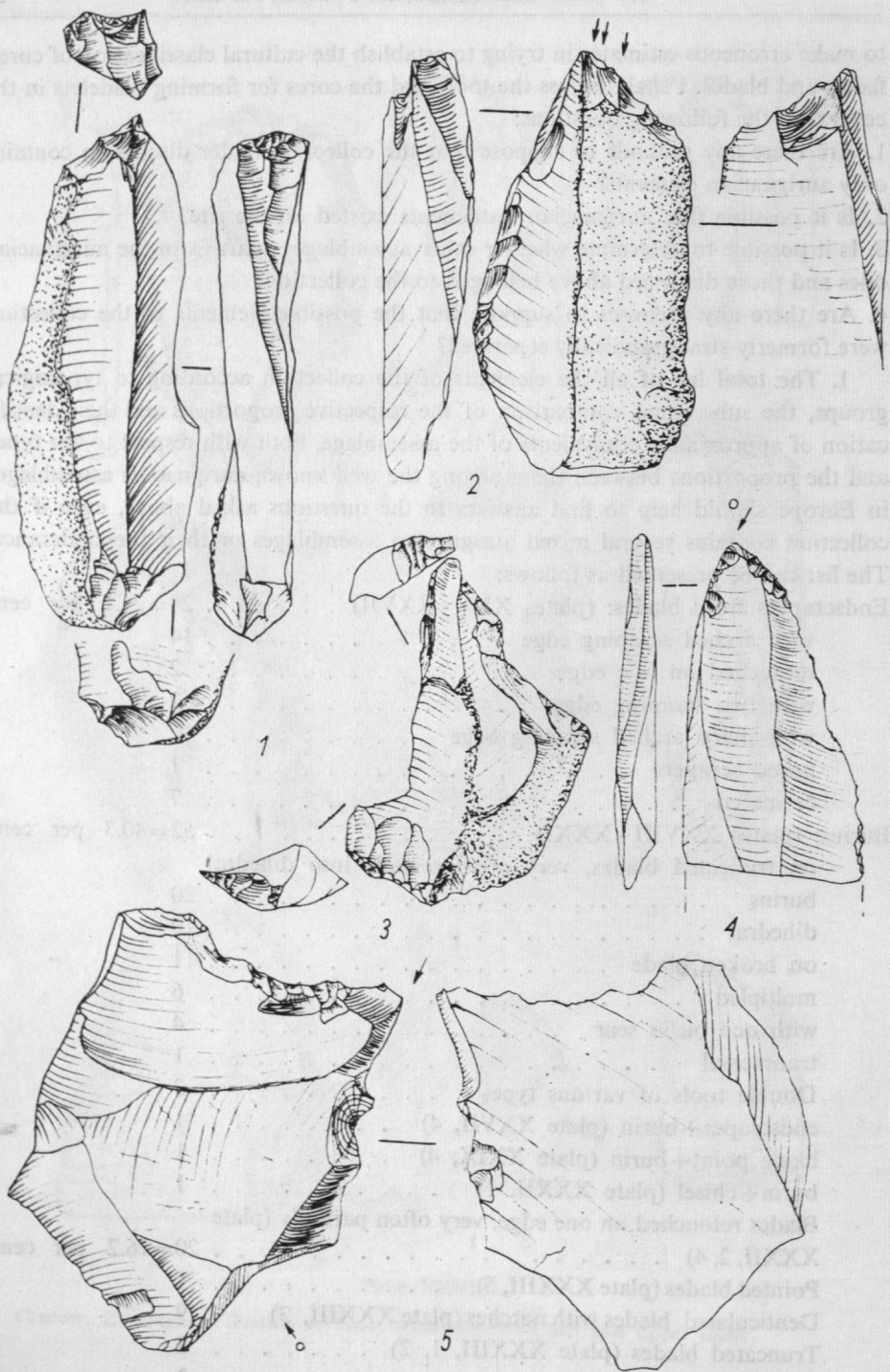


Plate XXVIII

Cracow. Zwierzyniec. Trench J. Burins on truncated blades from the fossil soil and upper loess

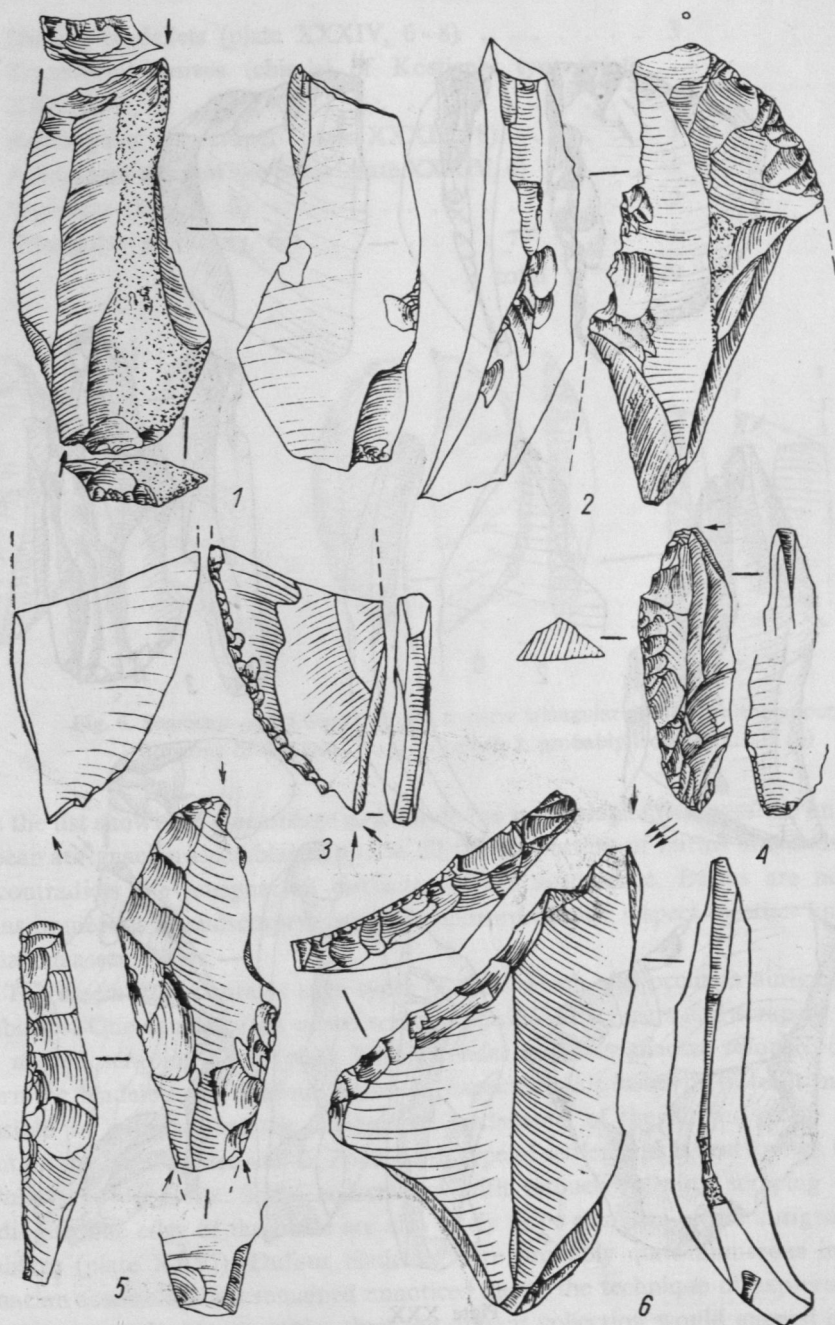


Plate XXIX

Cracow, Zwierzyniec. Trench J. Burins from the fossil soil and upper loess

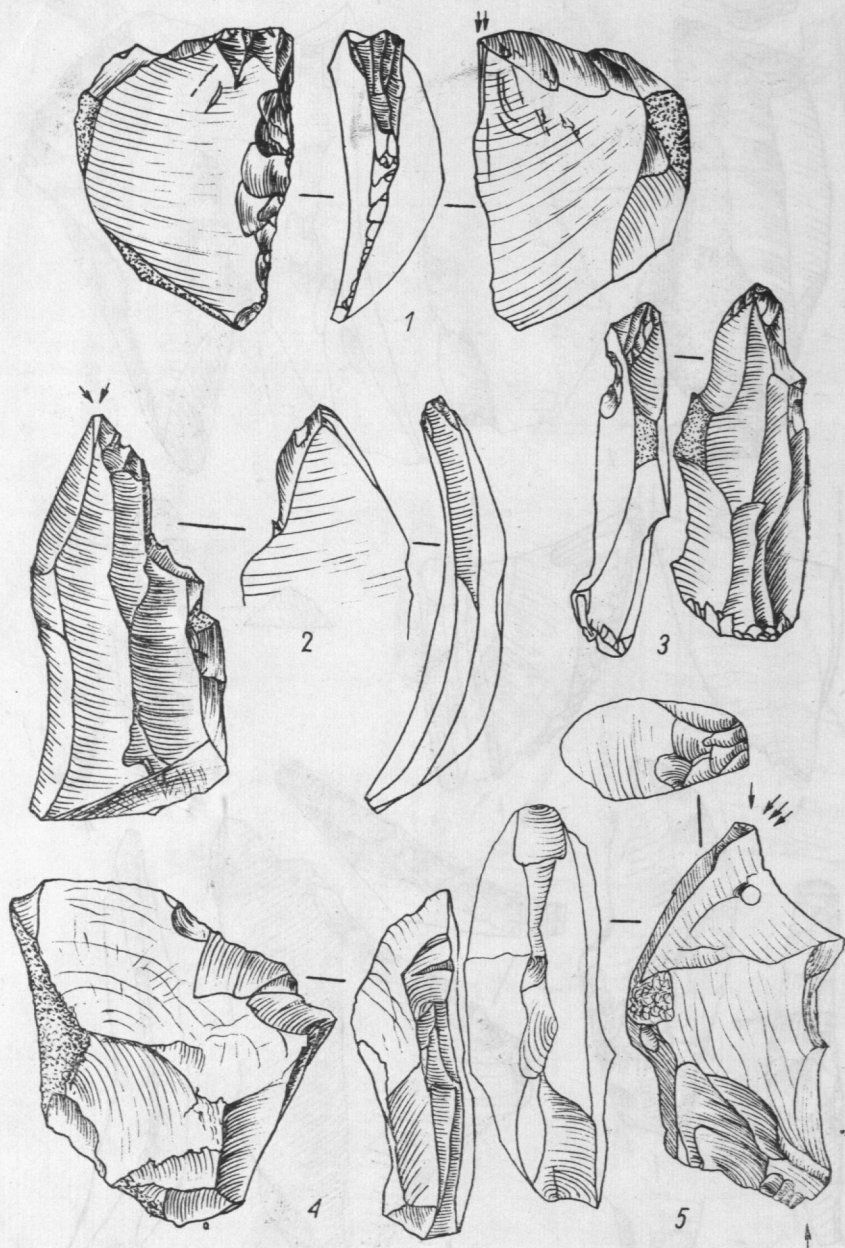


Plate XXX

Cracow. Zwierzyniec. Trench J. Burins from the fossil soil and upper loess

Dufour bladellels (plate XXXIV, 6-8)	3
Transversal knives (chisels) of Kostienki type (plate XXXIII, 6, 7)	2
Rectangular sidescraper (plate XXXIII, 8)	1
A fragment of a leaflike point (plate XXXIV, 4)	1
Segments (fig. 6a, b)	2
Triangular point (fig. 6c)	1
total	129

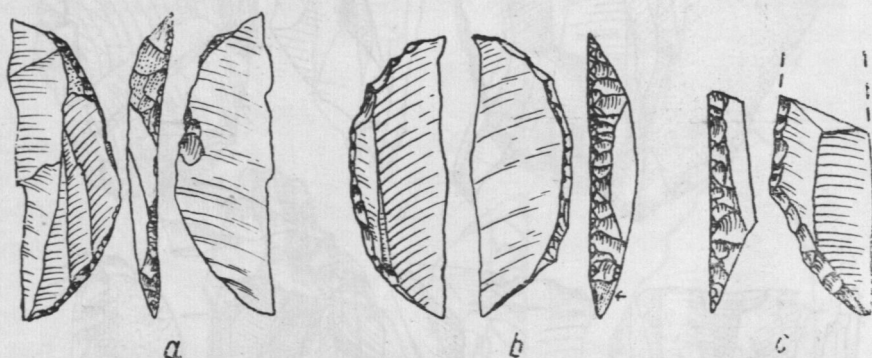


Fig. 6. Segments and a fragment of a massive triangular point from the uppermost horizons of the loess (a, c) in trench J, probably from point OJ (b)

As the list shows the assemblage as a whole has no analogies in any of the known European aurignacian assemblages. Above all the proportion of burins and endscrapers contradicts the aurignacian character of the assemblage. Burins are nearly twice as numerous as endscrapers, which is unheard of with respect to other known aurignacian assemblages.

2. The assemblage contains such types of tools which also occur in aurignacian assemblages. One can mention nosed scrapers, carinated scrapers and scrapers with sharp arched scraping edge (plate XXV); blades with aurignacian retouch, cores for forming bladelets and Dufour bladelets. Especially this last type of tools makes it possible to surmise that the aurignacian settlements of the Krems group were present on the Zwierzyniec site. In Poland this type of settlements is best known from the Puławska Góra site. Some endscrapers with retouch forming scraping edge extending to one edge of the blade are also likely to be elements of the aurignacian assemblage (plate XXVI). Dufour bladelets were probably quite numerous in the aurignacian assemblage but remained unnoticed due to the technique of exploration. Their presence in larger quantities than the present collection would suggest as indicated by fairly numerous cores used in the formation of bladelets.

3. Burins constitute the largest group of tools in the assemblage under discussion. Burins made from truncated blades attract special attention on account of their

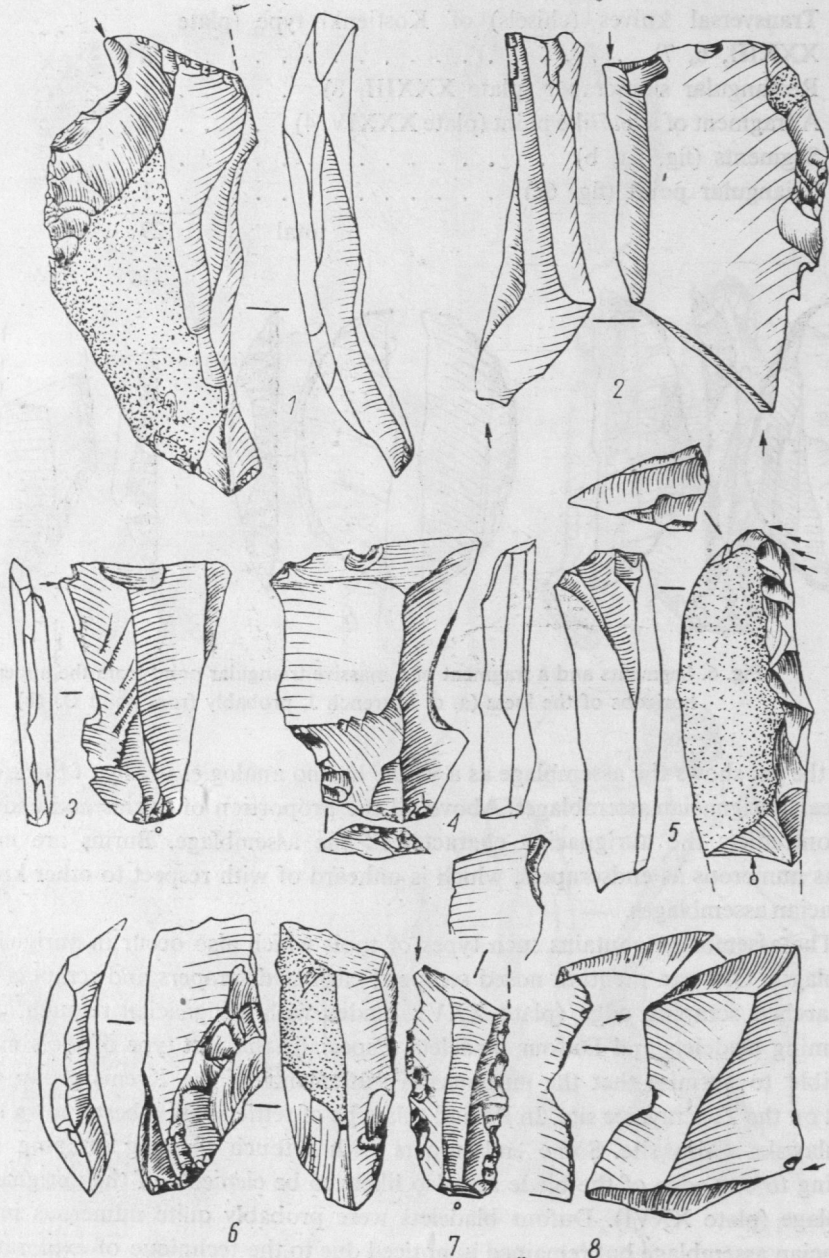


Plate XXXI

Cracow. Zwierzyniec. Trench J. Burins from the fossil soil and upper loess

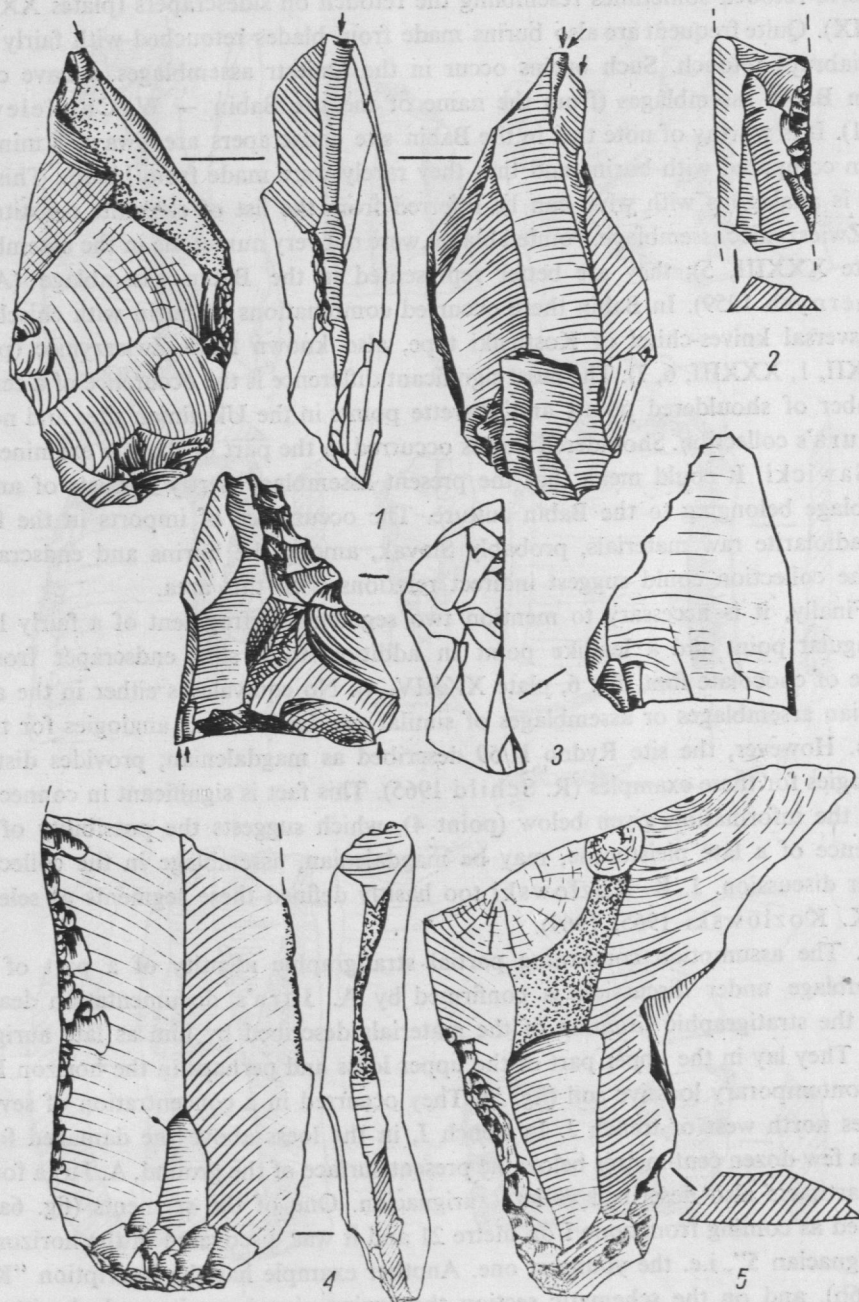


Plate XXXII

Cracow. Zwierzyniec. Trench J. Doubled tools and partial blades from the fossil soil and upper loess

massive retouch sometimes resembling the retouch on sidescrapers (plates XXVIII, XXIX). Quite frequent are also burins made from blades retouched with fairly long semiabrupt retouch. Such burins occur in the Dniestr assemblages. I have called them Babin assemblages (from the name of the site Babin — W. Chmielewski 1971). It is worthy of note that in the Babin site endscrapers are always in minority when compared with burins and that they rarely were made from blades. This last fact is analogous with what can be inferred from the list of elements constituting the Zwierzyniec assemblage. Pointed blades were not very numerous in the assemblage (plate XXXIII, 5); they are better represented in the Babin assemblage (A. P. Tchernysh 1959). In Babin there occurred combinations of burin with chisel and transversal knives-chisel of Kostienki type, also known from Zwierzyniec (plates XXXII, 1, XXXIII, 6, 7). The most significant difference is the occurrence of a certain number of shouldered points and gravette points in the Ukrainian sites and not in A. Jura's collection. Shouldered points occurred in the part of the site examined by L. Sawicki. It could mean that the present assemblage partly consists of an assemblage belonging to the Babin culture. The occurrence of imports in the form of radiolarite raw materials, probably Slovak, among the burins and endscrapers of the collection could suggest indirect relations with this area.

Finally, it is necessary to mention two segments, a fragment of a fairly large triangular point and a leaflike point in addition to a slim endscraper from a blade of chocolate flint (fig. 6, plate XXXIV, 4). No equivalents either in the aurignacian assemblages or assemblages of similar can be found as analogies for these tools. However, the site Rydno II/59 described as magdalenian, provides distinct analogies for these examples (R. Schild 1965). This fact is significant in connection with the information given below (point 4), which suggests the possibility of the presence of a late pleistocene, may be magdalenian, assemblage in the collection under discussion. J. K. Kozłowski too has defined these segments as seletian (J. K. Kozłowski 1965, 1969).

4. The assumption concerning partial stratigraphic identity of a part of the assemblage under discussion is confirmed by A. Jura's documentation dealing with the stratigraphic situation of the materials described by him as late aurignacian. They lay in the upper part of the upper loess and perhaps in the horizon B of the contemporary loessive soil (fig. 5). They occurred in a concentration of several metres north west of trench J. In trench J, in the loess above the damaged fossil soil, a few dozen centimetres below the present surface of the ground, A. Jura found flint artifacts also described as late aurignacian. One of the segments (fig. 6a) is marked as coming from zone I on metre 21 and it was discovered in the horizon of "aurignacian 5", i.e. the youngest one. Another example has the inscription "KB" (fig. 6b), and on the schematic section the aurignacian layer is marked with the letter "b". Therefore, I presume that both these examples justify the view concerning the stratigraphic separation of the horizon with the late palaeolithic assemblage different from older assemblages. As a result of the mixture of the elements of this

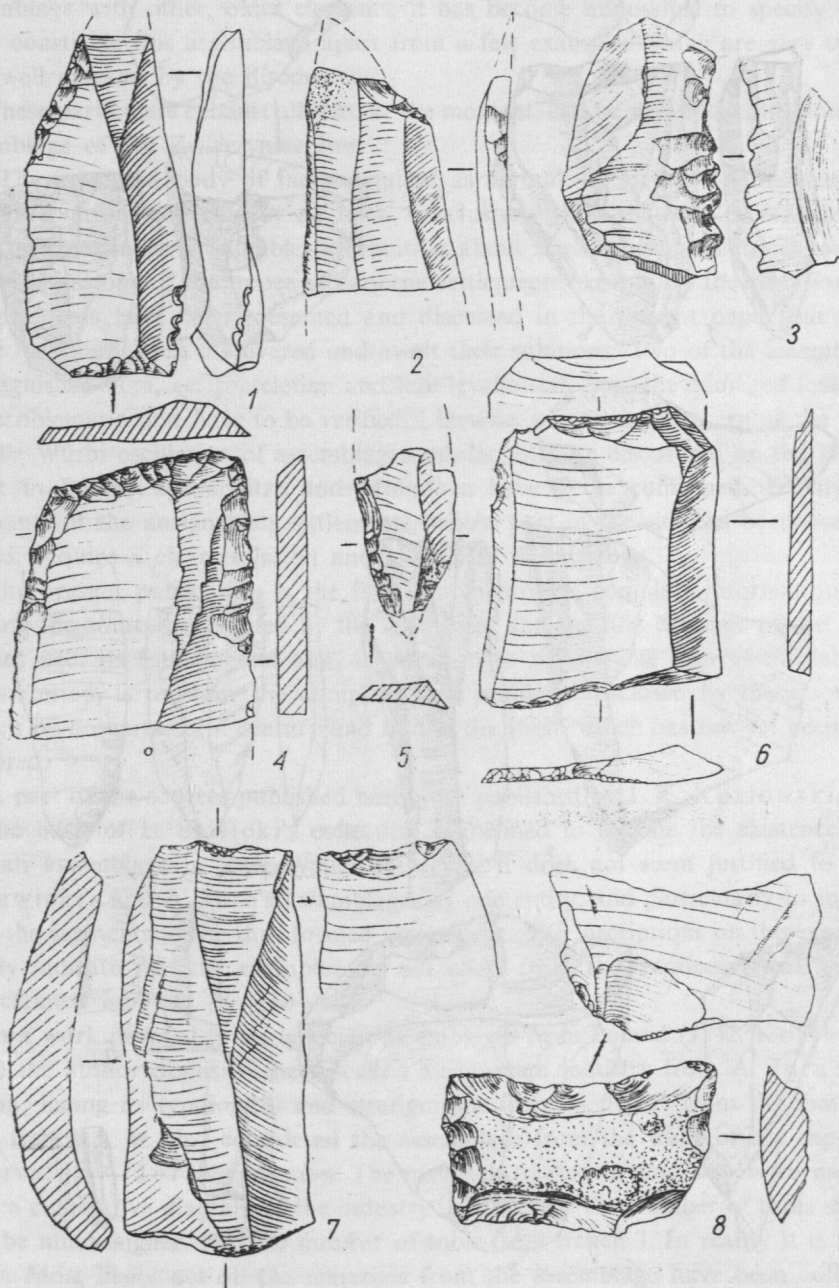


Plate XXXIII

Cracow. Zwierzyniec. Trench J. Truncated blades, denticulated tools, pointed blade, chisel-like tools, and a sidescraper from the fossil soil and upper loess

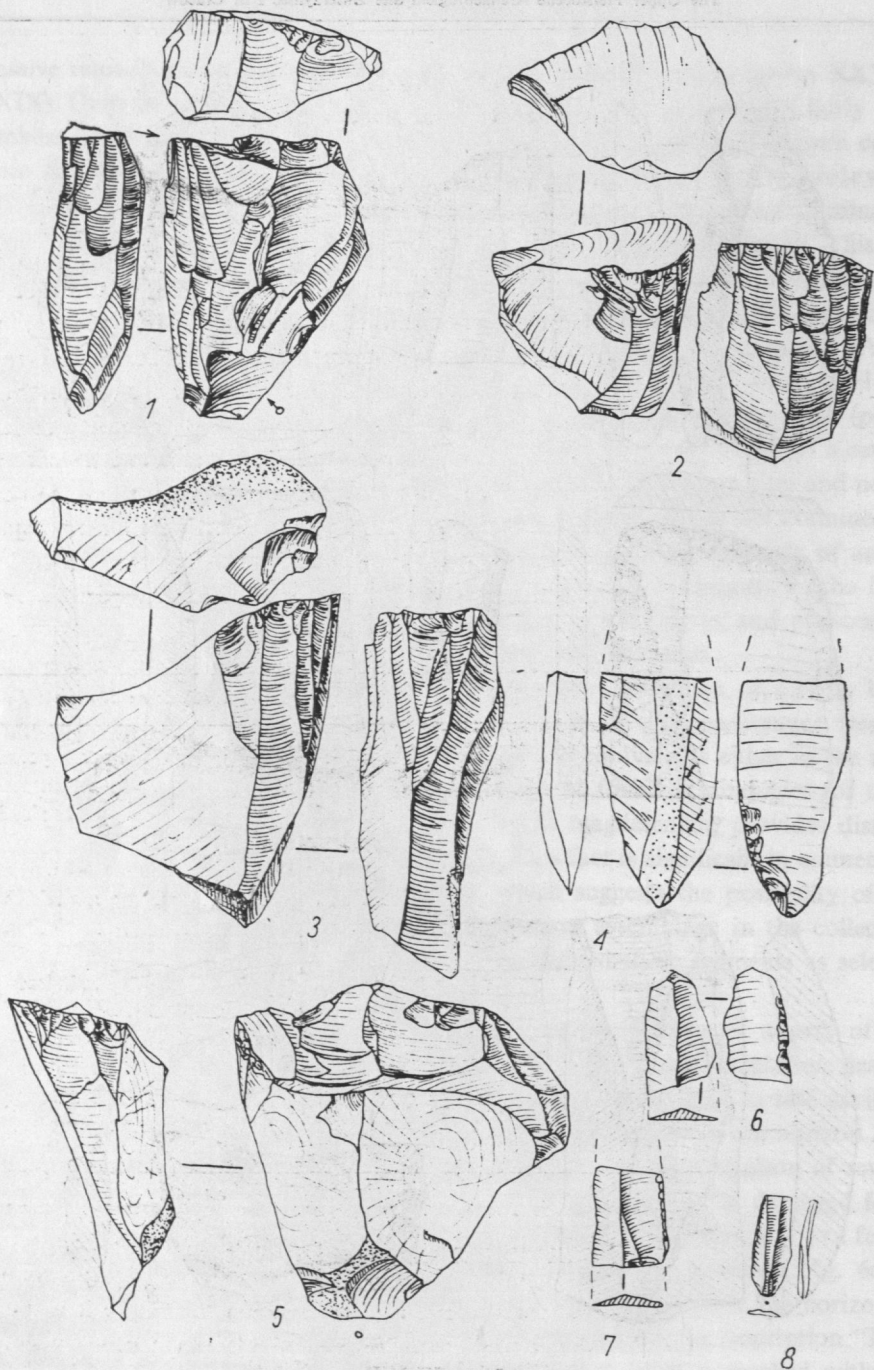


Plate XXXIV

Cracow. Zwierzyniec. Trench J. Cores for the production of flakes, fragment of a leaflike point and fragments of microretouched bladelllets (Dufour) from the fossil soil and upper loess

assemblage with other, older elements, it has become impossible to specify which tools constitute this assemblage apart from a few examples which are very typical and well marked by the discoverer.

These particulars exhaust all that, at the moment, can be said about this youngest assemblage of the Zwierzyniec site.

The presented body of facts acquired as a result of studies on the materials and observations collected by A. Jura, conclusively show that the Zwierzyniec site contained particularly valuable information about the stratigraphic succession and cultural relations of the upper pleistocene settlements existing on the site. Some of the problems have been presented and discussed in the present paper but many more have only been discovered and await their solutions. Two of the assemblages distinguished here, i.e. preseletian and late levalloisian from the damaged fossil soil are problematic and have to be verified. Likewise, suggestions concerning the warm middle Würm oscillation of assemblages similar to those discovered on the Dniestr River in Babin, Voronovitsa and Molodova have to be confirmed. Finally, the remnants of the aurignacian settlements, whose part in the site has been overestimated, require a clear isolation and a detailed description.

The present publication is the first one to provide complete information concerning the sources excavated by the discoverer and the first explorer of the Zwierzyniec site. Its fundamental aim, in addition to making the sources available to all interested, is to show the complexity of problems disclosed by these sources, hidden by a quarter of a century and by the site itself, which has not yet been fully explored.

A part of the sources published here were published by J. K. Kozłowski, who on the basis of L. Sawicki's collection is inclined to assume the existence of a seletian assemblage in Zwierzyniec. However, it does not seem justified to treat L. Sawicki's and A. Jura's assemblages as one entity, and particularly to include both the segments in the thus formed assemblage. The inscriptions on the examples clearly indicate that the examples do not come from the intraloess fossil soil as was claimed by J. K. Kozłowski.

In a work devoted to aurignacian assemblages from Poland (J. K. Kozłowski 1966) the author discusses the so-called aurignacian industry from A. Jura's collection, listing its typological and stratigraphic features. Apart from the materials from trench J, he also considered the assemblage from the walls of the exposure preserved in A. Jura's collection. The materials treated in this way were used to draw a cumulative diagram of the industry in question. The number of tools should then be much higher than the number of tools from trench J. In reality it is much lower. Most likely not all the materials from the assemblage have been collected and considered. Therefore, the information about the Zwierzyniec aurignacian contained in the publication in question is so distorted that it is impossible to argue with the views based on such poor sources.

Likewise, the materials from point P, from the trench in the street by the gate,

as well as the handaxe found by A. Jura in the lower part of the upper loess were discussed by J. K. Kozłowski in his work on geochronology of the Palaeolithic in the valley of the Vistula near Cracow (1969). Assemblages from various parts of the site were in this case combined into one unit with the resulting artificial assemblage, without any foundations in the preserved materials and respective information.

The story of A. Jura's collection is a warning against delays in making the results of explorations available and in publishing general results of such explorations before exhaustive monographs of sources. The extremely important and methodologically relatively well assembled materials had to wait for a quarter of a century before they were made available and thus despite all the efforts they cannot play the kind of role which they were originally likely to play. Only further explorations on those interesting materials can provide new revealing information confirming or refuting former hypotheses and discovering new areas of investigation.

The summary of our discussion can be presented in the following table, showing the succession of the isolated assemblages and their relations with the stratigraphy and chronology of the upper Pleistocene.

Name of the assemblage	Layer in which the assemblage occurs	Suggested chronology
Late pleistocene (magdalenian) Babin	Aluvium of the holocene soil Lower part of the upper loess	Alleröd (?) Beginning of the second climax of cold of the Würm period
Middle aurignacian (?) Late levalloisian	Fossil soil damaged by upheaving and solifluction	One or more stages of the Middle Würm warmer climatic oscillation
Preseletian	Upper part of the lower loess	Final stage of the first climax of cold of the Würm period
Levalloisian (Shaytan Koba)	Sand underlying the lower loess (upper part)	Cool spell of Brørup interstadial?
Micoquo-prondnician	? gravel or sand	Ascending (early) stage of the Würm period

REFERENCES CITED

- Barta J., 1965: *Slovensko v staršej a strednej dobe kamennej*, Bratislava.
- Chmielewski W., 1964: *Dzieje grup ludzkich zamieszkujących ziemie Polski w plejstocenie*, Materiały do prahistorii ziem Polskich, s. 1 - 128, Warszawa.
- Chmielewski W., 1969a: *Influence exercée par le milieu périglaciaire sur l'habitat au Pléistocène Supérieur de Pologne*, „Biuletyn Peryglacyjny”, No 20, p. 9 - 27.
- Chmielewski W., 1969b: *Ensembles Micoquo-Prondnikiens en Europe Centrale*, „Geographia Polonica”, 17, p. 371 - 386.

Chmielewski W., 1971: *The continuity and discontinuity of the evolution of archaeological cultures in central and eastern Europe between the 55th and 25th millenaries B.C. The Origin of Homo Sapiens*. Paris, p. 173 - 179.

Černisch A. P. 1959: *Późnij paleolit średniego Pridniestrowija*, „Trudy Komisji po izučeniju četwertičnogo perioda”, vol. 15.

Černisch A. P., 1965: *Rannij i srednij paleolit Pridniestrowija*, „Trudy Komisji po izučeniju četwertičnogo perioda”, vol. 25.

Jahn A., 1969: *Structures périglaciaires dans les loess de la Pologne*, „Biuletyn Peryglacjalny” No 20, p. 81 - 97.

Jura A., 1938: *Das Aurignacien in Polen*, „Quarter”, t. I, p. 54 - 75.

Jura A., 1939: *Brama Krakowska w starszej epoce kamiennej*, „Wiadomości Geograficzne”, t. XVII, z. 1, s. 14 - 29.

Jura A., 1951a: *Stanowisko kultury ściankowej w Krakowie na Zwierzyńcu z ostatniego interglacjalu Masovien II (Riss Würm)*, Sprawozdania z czynności i posiedzeń PAU, 52, s. 64 - 66.

Jura A., 1951b: *Kultura lewaluaska VI w Krakowie na Zwierzyńcu*. Sprawozdania z czynności i posiedzeń PAU, 52, s. 929 - 930.

Kozłowski J. K., 1965: *Studia nad zróżnicowaniem kulturowym w paleolicie górnym Europy środkowej*, Kraków.

Kozłowski J. K., 1966: *Uwagi o przemysłach oryiniackich w Polsce*, „Folia Quaternaria”, 24, Kraków.

Kozłowski J. K., 1969: *Problemy geochronologii paleolitu w dolinie Wisły pod Krakowem*, „Folia Quaternaria”, 31, Kraków.

Madeyska-Niklewska T., 1969: *Situation stratigraphique des ensembles Micoquo-Prond-nikiens*, „Geographia Polonica”, 17, p. 387 - 393.

Prošek F., 1953: *Szeletien na Slovensku*. Slovenská Archeologia I, s. 133 - 194.

Różycki S. Z., 1967: *Plejstocen Polski środkowej*. Warszawa.

Sawicki L., 1952: *Warunki klimatyczne akumulacji lessu młodszego w świetle wyników badań stratygraficznych stanowiska paleolitycznego lessowego na Zwierzyńcu w Krakowie*. „Biuletyn Państwowego Instytutu Geologicznego”, nr 66, s. 5 - 33.

Sawicki L., 1957: *Sprawozdanie z badań stanowisk paleolitycznych Zwierzyniec I i Piekary II przeprowadzonych w 1955 r.* „Sprawozdania Archeologiczne”, t. IV, s. 11 - 22.

Schild R., 1965: *Nowy przemysł cyklu madleńskiego w Polsce*, „Archeologia Polski”, t. X, z. 1, s. 115 - 150.

Valoch K., 1962: *Die Blattspitzenindustrie von Ořechov II bei Brno*. „Anthropozoikum”, X, p. 35 - 47.