FUNCTIONAL ANALYSIS OF A WORKSHOP TOOL KIT

FROM TIKAL

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A THESIS

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THE TEST PIT

The Tikal sustaining area investigations which began in 1965 included a ceramic test pit survey under the direction of Robert Fry (Haviland et al. 1968). Mound groups along the north and south brecha were selected by random sampling techniques and investigated by means of 1-2 sq. m. test pits. Suboperation 136U occurs in an area of fairly dense settlement near Str. NE(N)-69, 3.6 km. north of the center of Tikal (see figure 1). 160 m. west of this test pit (fig. 2) there is another on the southwest corner of Str. NE(N)-65 excavated as Subop. 136V which is also of interest here and will be discussed later. .3 km. farther north there is a deep natural arroyo cutting across the north brecha survey strip. A little further, .5 km. to the north of Subop. 136U, the North Earthworks of Tikal (Puleston and Callender 1966) cut across this same brecha.

These two pits have come to our attention because of the unusually large quantities of worked flint they produced.which seem to have been used in a workshop situation. Though large quantities of flint have been found before in connection with ceremonial deposits, as in association with Burial 6 in Temple 1 (Adams and Trik 1961:124), few possible flint workshop loci have been discovered in the course of excavation at Tikal. A possible exception to this is material from

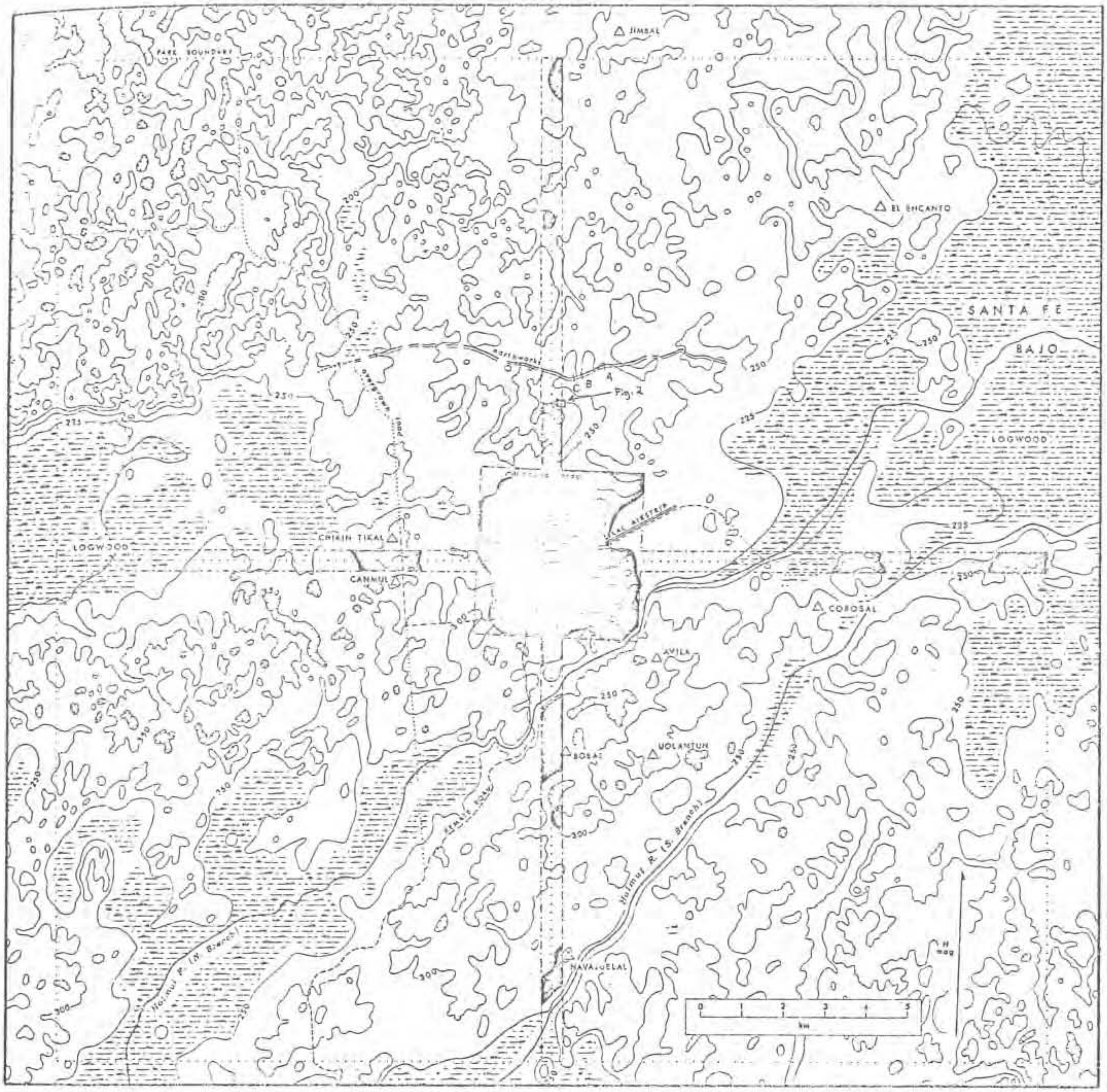


Fig. 1: Overall map of the Tikal National Park showing the location of Fig. 2 and the general area of Subop. 136U (and Subop. 136V) on the North Brecha. The shaded portions represent areas of greates settlement density in Late Classic times. (From Puleston and Callender 1967)

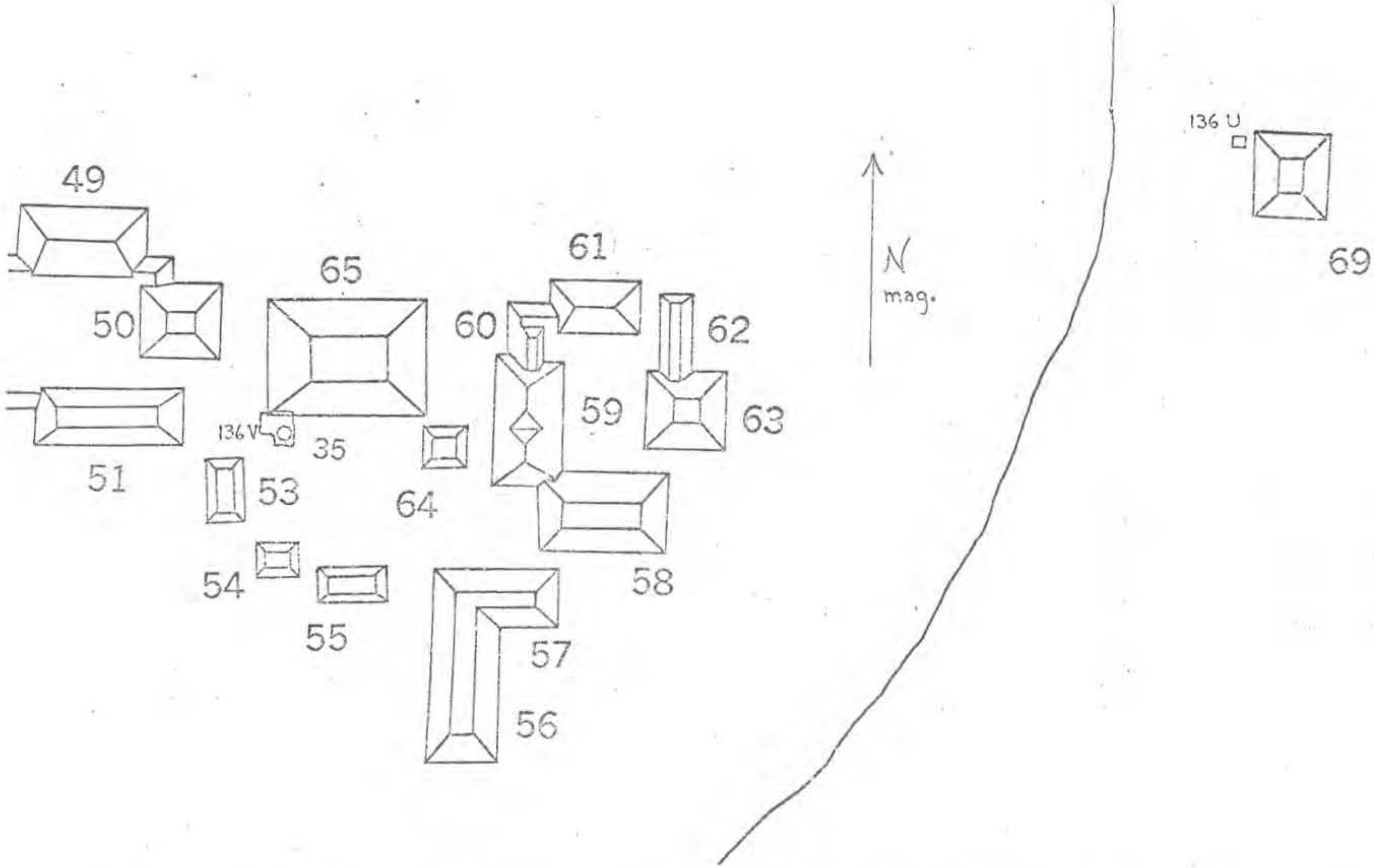


Fig. 2: Locus of the Subop. 136U and 136V test pits in the NE quadrant of the Tikal National Park (1:1000).

a group near the east end of the Tikal airfield excavated by Marshall Becker in 1963. Large quantities of flint nodules occur in this area which may have been used for tool-making. Unfortunately the data we do have is limited since previous to 1966 only samples of large ceremonial flake deposits were kept, the bulk of these collections having been discarded for lack of storage space.

The flint from Subop. 136U contained 814 pieces which revealed a number of unusual features that drew attention to it. Out of all the test pits excavated by Robert Fry, none showed such uniformity of flint type, color, texture, manufacture and shape as this one. The striking thing about this collection was that of the 814 flint pieces, 186 were pointed or wedge-shaped tools. Of the 483 flakes, most were rounded, very thin and flat with used edges. The 145 other flint pieces included nodules, and cores all of which can be seen listed in Table I. This kind of deposit is so far unique in Tikal. Its association with a floor greatly enhances its significance.

Subop. 136V, which is only 160 m. southwest of Subop. 136U also contained large quantities of flint, suggesting a relationship between these two deposits and the possibility that we are dealing with an area of occupational specialization. Subop. 136V comprises

Table I: Distribution of artifacts of Subop. 136U test pit

levels	lots	Nodules & chips	Cores	All Flakes	Flakes Analyzed	Points & Wedges	Other Cat. Obj.**
00 - 20 cm.	lot 4*	34	4	28			10
200-- 40 cm.	lot 5	13		10			4
40 - 60 cm.	lot 6	21	2	46	36	4	2
60 - 80 cm.	lot 7,8	28		303	264	160	7
80 - 100 cm.	lot 9	29	8	96	64	22	
100 -±120 cm.	lot 10	5	1	10			1
	totals	130	15	483	364	186	24
				493			

* Lots 1-3 were used for postholes. These contained a total of 5 nodules and chips, 1 core, and 2 flakes.

** For a more detailed description of the tools ofrthis category see Table III.

the contents Chultun NE(N)-35 which contained large well-preserved Preclassic sherds and pot fragments along with seeds, carbon, a little obsidian, fragments of stone artifacts, other than flint, and 1979 flint artifacts, flakes, and pieces of flint debris. The character of most of the flint flakes, of which there are 1177, is quite different from those of Subop. 136U. Whereas Subop. 136U flakes are quite uniform in size, shape, color, and use, the Subop. 136V flakes are of different colors and textures of flint. A great number of them seem unused and they display great variety of shapes and striking patterns. Subop. 136V contains none of the pointed tools so characteristic of Subop. 136U. Very few of the flakes were retouched or used. On the whole the material shows much greater diversity than that produced by Subop. 136U, and a much greater proportion may be simply waste flakes.

Description of the Test Pit

Once the mound group to be tested had been determined by random sampling, the location of the test pit was chosen by postholing to find areas of greater sherd densities. Fry made 3 postholes (lots 1, 2, and 3) before choosing the location for the test pit of Subop. 136U. This 1.5 m^2 pit was placed over posthole #2 just west of

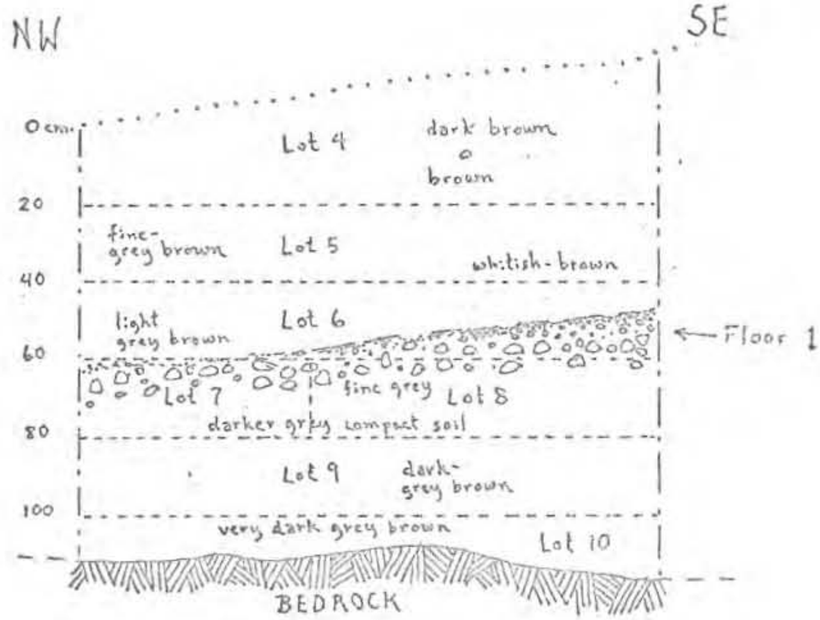


Fig. 3: Cross-section of the Subop. 136U test pit. (scale 1/20)

the north corner of Str. NE(N)-69. The upper ten cm. were of dark brown soil and humus. Below that, at 10-20 cm. (lot 4 is the 0-20 cm. level) there was limestone chunk fill (fig. 3). The 18 ozs. of ceramics from this layer contained, according to Robert Fry, some Tepeu but mainly Tzakol material (see Table II for ceramic evaluations and Table I for numbers of artifacts in each lot).

The 20-40 cm. level (lot 5), in the eastern half of the pit, contained soil that was light gray-brown at the top and whitish brown at the bottom. In the western half of the pit the soil became lighter gray-brown with depth. The sherds (8 ozs.) from this level are predominantly Tzakol with some possible Tepeu bodies and a small quantity of possible Preclassic. (For stone artifacts from this lot see Table I)

At 40-60 cm. (lot 6) there is light grey-brown soil in a limestone chunk fill overlying a layer of light grey-brown soil. Beneath this a possible floor, hereafter referred to as Floor 1, was visible in the east and south walls of the pit. Apparently it was in very poor condition. Many medium-sized limestone chunks probably represent a layer of ballast for this floor. The lot ended at the level of these chunks and contained the first large quantities of flint pieces. The 10 ozs. of ceramics were again Classic including Tzakol with some possible Tepeu bodies

Table II: The ceramic evaluations for lots in test pit Subop. 136U.

Lot	Total Weight	Evaluation
4	18 ozs	Tepeu; possibly? - mainly Tzakol
5	8 ozs	Classic including Tzakol, Some possible Tepeu bodies. Possible Preclassic?
6	10 ozs	Classic; including Tzakol; some possible Tepeu bodies. Possible Preclassic
7	76 ozs	Mixture of Tzakol and Later Preclassic sherds including Cauac
8	?	Both mixed Cauac and Tzakol - sherds of the Preclassic period, mainly a few red ware medial flange bowls. Tzakol sherds mainly of coarser storage ware
9	28 ozs	Classic composed of Tzakol; and Preclassic (Cauac or Chuen)
10	9 ozs	Mainly Tzakol; some Preclassic bodies.

Table III: List of "Other Catalogued Objects" (Table I). These were not available for study in the US.

Object	Total No.	Lot 4	Lot 5	Lot 6	Lot 7,8	Lot 9	Lot 10
Flint core	1				1		
Flint flake-blade frags.	2	1	1				
Flint point-ret. flakes	2			1			1
Flint var.-ret. flakes	1				1		
Flint biface unclass.	1	1					
Flint biface ovate	1	1					
Obsidian Flake-blade core	1				1		
Obsidian Flake-blade frags.	11	6	3		2		
Jade pendant frag.	1				1		
Pottery censer frag.	1	1					
Quartzite metate frags.	2			1	1		
Totals	24	10	14	2	7	0	1

and possible Preclassic sherds including Cauac. Stone artifacts from lot 6 included 21 flint nodules and chips and a number flakes and cores much like those of lots 7 and 8.

The western 2/5 of the 60-80 cm. level (lot 7) was excavated separately because of the poor state of Floor 1 on this side of the test pit. It produced 100 flint pieces, most of them used and variably retouched flint flakes and small pointed tools. Other artifacts included 1 jade pendant fragment, 2 obsidian flake-blades, and 1 obsidian flake-blade core fragment. Here Fry found light fine-grey-brown to grey soil with many large limestone chunks. Below the limestone chunks which take up a layer of 15 cm., the soil is darker grey, harder and more compact and again a fairly heavy limestone chunk fill is present. Some of the limestone chunks are burned.

The eastern 3/5 of the 60-80 cm. level (lot 8) lies beneath better preserved portions of Floor 1. This layer is composed of fairly fine grey soil comparable to that of lot 7. It contained medium-sized limestone chunks which Fry interprets as floor ballast or platform fill. many of these chunks are possibly unbroken flint nodules. They were put to one side in a large pile during the excavation. Below this again there is heavy limestone chunk fill with some burned pieces. By far, the largest number of flint pieces came from this level of the pit.

For the sake of comparability lots 7 and 8 should be combined as they represent a single level in the test pit and there is little evidence of disturbance in lot 7. As shown in fig. 3 this level contained two layers. The uppermost, comprised of the ballast of Floor 1 and a fine grey soil, contained most of the flint objects listed in Table I, and very few ceramics. The layer below this consisting of more compact darker grey fill contained the bulk of the ceramic content of these lots and very little flint (Fry, personal communication). The ceramics of both lots comprised a mixture of Cauac and Tzakol, the latter being mostly undecorated storage ware.

At 80-100 cm. (lot 9) the soil is dark grey-brown, harder and coarser than in the above layers. Again limestone chunk fill permeates it. The chunks become smaller and some burned pieces occur on the bottom of the pit. The sherds are again Classic with only Tzakol identifiable. Cauac or Chuen ceramics are definitely present. From this lot a much higher proportion of cores and cortical flakes was excavated in proportion to flakes and tools. The flint is somewhat different in appearance from the previous two lots in that it is cruder and the pieces are larger.

The level of 100 cm. to bedrock, at about 120 cm., (lot 10) is composed of very dark grey-brown soil which is fairly compacted. Limestone chunk fill continues with some pieces being burned. The bedrock surface is irregular and eroded. The sherds are mainly Tzakol with some Preclassic bodies. Only 10 flint flakes, 5 chips, 1 core, and 1 point-retouched flake were found in this lot. The sherds are mostly Tzakol with a few Preclassic bodies.

Dating of the Test Pit

The fact that no Tepeu material occurs in or below Floor 1 suggests a Tzakol construction date for this feature. Since Tzakol material occurs in all lots below the floor, the Cauac material has probably been included as fill. Thus, the flint workshop which appears to predate Floor 1 could date to either Tzakol or Cauac times, since there is a good mixture of sherds from both these ceramic phases beneath the floor. The fact that the flint deposits of Subop. 136V are definitely Preclassic, being sealed beneath a fairly well-preserved floor with pure Cauac and possibly Cimi material favors the possibility that the flint of Subop. 136U also dates to this period. This does not mean that flint-working activities could not have continued into Early Classic and even Late Classic times, however.

<u>Artifactual Contents of the Test Pit</u>

Table I is a list of the contents of all the lots with a separate column for the numbers of flakes which were actually available for study. The striking feature of this test pit, as has already been mentioned, is the concentration of material in combined lots 7 and 8, with a rather definite cultural discontinuity above and below. This discontinuity is a quantitàtive one and qualitative only in so far as different proportions of the various kinds of flints might indicate. For instance both lots 6 and 9 contain a much larger proportion of nodules. Lots 4, 5, and 6, contain many of the cores and catalogued artifacts. Lot 9 contains a large proportion of cortical flakes and spalls and few of the thin delicate flakes characteristic of lots 7 and 8. All these difference point to the fact that the main locus of activity was in the redeposited fill of lots 7 and 8.

The material from this test pit was processed in the laboratory in 1967 at Tikal and the pointed tools and wedges were brought to this country for analysis. After some examination of the tools it became clear that the large quantities of flakes found in the same lots should also be studied for use patterns. In the fall of 1968 a shipment containing most of the uncatalogued lithic material of Tikal was shipped to the Rochester Museum for study by Miss Lilita Bergs. It was with her kind help that the author separated out about 90% of Subop. 136U test pit flakes. These were then numbered and analyzed for use marks along with the pointed tools which had been brought separately to Philadelphia.

The other catalogued artifacts remained in Tikal and were therefore unavailable for study. They are tabulated by lot in Table I, , then presented in more detail in Table III.

METHODOLOGY

Approach and Purpose

The significance of test pit Subop. 136U, as has already been mentioned, is that it produced a large collection of tools which seem to have been produced and used in a workshop situation. The material comes from a roughly datable deposit, which is not far from another such large deposit (Subop. 136V) both of which may represent a larger locus of specialized activity. It was also hoped that a study of this workshop would lead to more information about the perishable items the Tikal Maya were using. In a climate so destructive to organic material the only kind of data available on tools of perishable material is indirect.

It was also hoped that this study would lead to information on technology and behavioral patterns in a specific situation including the approach of the Tikal Maya to a certain task, and to some knowledge of Tikal Maya specialized activities. To do this, it was necessary to study how the tools were used, what materials might have been worked in the workshop as well as how this material was worked.

To have selected attributes at random to build into behavioral or conceptual modes as outlined by Rouse (1960) would not have provided many answers. There are at least three major factors which affect and determine morphology which Rouse does not consider separately. These are 1) The physical properties of the material itself. Semenov (1964:39) states that:

> "The dependence of the morphological characteristics of stone tools on the quality and properties of the source material is insufficiently appreciated by scholars. The quality of the material formed part of the natural environment in which man lived; it showed its influence in the economic life and technology of society; empressing its mark on the types of tools, methods of work and manufacturing practices."

Thus the first restriction on shape is posed by the nature and properties of the raw material. Another is, 2) the requirements imposed on the morphology of a tool by the nature of the task it was constructed to perform. The third operating factor is 3) non-functional or indirectly functional cultural tradition and individual deviation from it within the limitations posed by the first two factors.

The first two factors are determined by the material and the nature of the task, both of which are culturally determined but being at a lower level of abstraction they are perhaps easier to deal with than the third. The behavior of flint during shaping is well known to the artisan who is using it and the choice of type of flint is probably often made on the basis of its physical properties. In order to determine why a particular material was chosen we, too, must know the physical properties. This is the task of the student of tool manufacture and is too much to deal with in this paper.

The second major determinant of shape is the task. The way to study this is to examine the marks left by actual use and reconstruct the actual activity. This can be done by assigning meaning to use marks through experimentation as Semenov (1964) did. After that the uses can be correlated with certain features of form which are dependent on them. Once all the attributes dependent upon the physical and chemical properties of the material, and those attributes which are dependent upon function have been isolated, those which still remain are related to cultural values of style, ornamentations, etc., personal skill and idiosyncrasies of the tool maker, and accident.

It must be remembered that the tool maker is not always the same person who uses the tool which might cause discrepancies between the way a tool was designed to be used and the way it actually was used. In every case there is some slight discrepancy but sometimes it can be very misleading.

This paper deals particularly with the use of these tools and the work that was done by them. The only morphology dealt with is that which relates directly to use. This is determined by finding correlations between specific attributes of form with specific attributes of function.

In view of the purpose of this paper, it would have been totally meaningless to classify the tools of Subop. 136U according to the type-variety system (Smith et al. 1960). Perhaps , had there been more regularity of form within the collection it might have been possible, but even though there is regularity of form when compared to other collections even at Tikal, internally it is quite diverse.

Types and varieties are useful for dealing with very large collections made up of objects which have many consistent and ornamental attributes which represent the third type of factors affecting and determining form. Gifford (1960:343) quotes Kluckhohn (1958 :473 in Gifford 1960) in saying "when recognizing and defining types, the analyst is describing the material manifestations 'of preferred paths of behavior that take their direction from varying concepts of the desirable.'" However, there are different degrees of regularity and desireability of regularity. It is one of the arguments of this paper that physical appearance was not the major concern of the maker and the user of these tools, whereas usability was. In other words, there were few minimal requirements of shape which served function and almost no ornamental or stylistic features which did so.

Of course there is regularity here also, especially on higher levels of classification; but to classify in this particular case would seem to be useless. If classification is to be used as a means for discovery of modes (Smith, Willey, and Gifford 1960:331) and if classification is to be made on the basis of morphological regularities, it would seem that where morphological regularities are almost all functional regularities, modes can be achieved more easily through analysis of function.

Techniques of Analysis

Because not all of the 814 flint pieces would have been worthy of cataloguing in the Tikal system, it was suggested by W. R. Coe (personal communication) that a separate system of field numbers be used. Therefore, all the flint pieces which were available for study both in Philadelphia and Rochester were numbered consecutively. This system of numbers includes objects which were already catalogued in the Tikal system and a list of concordances will be found in Appendix A. Gaps in the numbering system, both accidental and intentional, are listed as voided numbers.

After receiving numbers all the pieces were separated into two main groups -- those which were pointed tools or wedges and those which were flakes or cores. This separation was easy to make for the pointed tools and the wedge-like core fragments (wedges) were so different from the flakes and true cores that there was almost no overlap between the categories.

All the pointed tools and wedges were analyzed for use marks with the naked eye, under small magnification (7X) and larger magnification (25X-50X). The material appeared transluscent under the microscope and it was therefore necessary to coat the areas under examination with India ink following Semenov's (1964:24) techniques. This helped visibility tremendously but there was the danger of creating streaks when applying the ink. In the beginning the ink was applied with a brush and was not blotted. Consequently striation-like marks suggesting a rotary motion were created. Luckily, upon re-examination of all the early work it was found that the rotary striation-like marks on one specimen were in fact streaks made by the bristles of the brush. This problem can be avoided by simply blotting the tool after applying the ink.

The interpretation and meaning of the use marks was taken from Semenov (1964). In the beginning of this study the author's observations were checked over by John Witthoft who significantly helped the author learn to distinguish the different markings. It was extremely difficult to see the striations under the microscope even when following Semenov's advice of coating the specimens. The stone out of which these flints were made is a grain y white chert and its coarseness prevents the formation of clearly visible striations. Consequently, they are sparse and uneven and very difficult to see under even the best conditions.

The edges and surfaces were also examined with the naked eye, under a hand lens (7X), and some were even inspected under the microscope. No striations were visible due to the coarseness of the flint and the crushing of abraided edges. The study of the edges under magnification, however, was very informative as can be seen on the photomicrograph (figure 19) of the heavily abraided scraper edge of specimen No. 8.

Polish and burnish were extremely difficult to distinguish on many tools especially since so many were made on flakes taken from former tools whose surface had already been altered by use or weathering. In most cases polish and burnish are combined in discussion. The best way of observing them was found to be by direct sunlight.

Many specimens which showed no shine at all under any kind of artificial light were found to show surface alteration very clearly in direct sunlight.

As a last step in the process of data collection, all the specimens were photographed. Since the tools are of a greyish chert they were photographed against a charcoal grey background. A coarse cloth was placed under a slightly elevated plate of matte glass to avoid the formation of shadows, and the camera, a leicaflex, was mounted over the glass on a tripod. Two ordinary lamps with 200 watt bulbs were fixed as stationary lights at a proper level to cast an even light on the objects. A floodlight was used as a flexible light to cast shadows. Panatomic X 35 mm. film was used for all these photographs.

The photomicrographs were taken with the help of Miss Gayle Wever of the University Museum who made available her own microscope adaptor for the Museum's binocular microscope. The camera used was a Pentax, loaned by Lanny Bell of the Egyptian Section of the Museum. The Pentax was one of the few cameras which fit the Honeywell Asahi adaptor used. Plus-X film was used for the photomicrography because the lack of light necessitated a higher speed film. The photographs were processed and enlarged by Dennis E. Puleston.

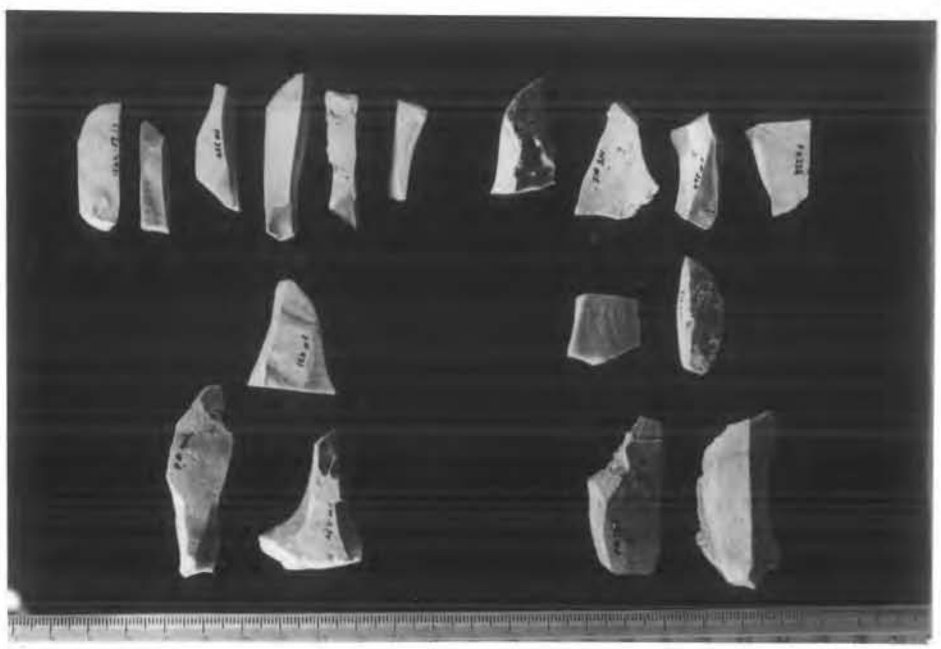
From observation a rough list of what were possibly significant features was drawn up and used as the basis for the tables of Appendix B. The tables proved to be extremely useful in rearranging and correlating the data.

The Use of the Term "Flint"

The term "flint" as used by the Tikal Project refers to many kinds of massive opague chalcedony (Berry and Mason 1959:479). This includes some forms of agate and onyx (both are banded forms of chalcedony), jasper (red, yellow, or brown), and chert and flint (white, pàle yellow, gray, or black). The flint found in areas right around Tikal tends to be light grey and fairly coarse-grained. This is the most common kind of flint used for making utilitarian chipped tools, such as bifaces, flakes, and hammerstones. A light blue variety with white speckles is found in areas around Chikin Tikal out of which a few blades are made. It has commonly been said that light brown banded flint out of which some of the daggers and blades are made is not found locally. One such possible source is mentioned by Gann (1918:23) in connection with the modern Yucatecans where he states that old men could remember when arrowheads were obtained down the Mopan River. He goes on the say "This seems quite possible, as at Baker's, not far from Belize, there is an outcrop of flint, where, judging by the great heaps of fresh-looking chips and rejects still in existence, a considerable "factory" must have existed at a comparatively recent date."

POINTED TOOLS AND WEDGES

The following shape classes are not representative of a system of classification but reflect general sorting for the sake of simplifying photography and description. The description of the shape classes is included here to acquaint the reader at least briefly with all the studied pointed tools and wedges from Subop. 136U.



Class A artifacts

Fig. 4: top row, l. to r. Nos. 59, 153, 350, 52, 210, 154, 473, 371, 260, 228; middle row, l. to r. 431, /, 214; bottom row, 402, 234, 389, 375 (1/2X)

Class A - The Wedge (fig. 4)

Members: 59, 152, 153, 154, 210, 214, 228, 234, 269, 350, 371, 389, 402, 431, 473

This class is separated from cores and combined with pointed tools because many of these pieces look like the fragments out of which pointed tools were made. Also, it is because use, like that which is on the pointed tools, was visible on the edges of some of them. Pointed tools and wedges are overlapping classes but cores are completely distinct. The cores are crudely made and of much coarser flint.

A wedge may be a blade, a fragment of a blade core, or a thick long rectangular core fragment with a thick cross-section. Some of them are rather irregular but they often show signs of being fragments of blade cores. No. 59 is a thick blade (fig. 4) with a rectangular cross-section. There is a bulb on the one surface and a bulb scar on the opposite surface. The striking platform was finely prepared and displays narrow shallow flake scars. The distal end was rounded and retouched on one corner; the other, remaining sharp. The blade was snapped off before retouching. It was used as a fairly heavy duty scraper as the angle of the edge is close to 90°. The angle of the platform on the bulbar face is 110°. The blade is an example of a very fine one from which many of the artifacts were possibly made. Not many such blades occur unaltered in this collection. No. 59 happens to be one of the least altered. No. 52 is much thicker with a cross-section approaching a square. No bulbs are present on the faces, indicating that this is a fragment. The distal end is present, but where the bulb should have been there is an abraded edge. The angle of the edge is slightly larger than 90° and is heavily undercut by scraping. This specimen seems to be a fragment of what probably was a large and heavy scraper. Tool reuse after breakage is not inconsistent with the Tikal Maya attitude toward other flint tools. Often, flint tools such as elongates were remade after breakage into shorter adzes and axes, then used as pounders, hammers, and scrapers. Rouse (1960:20) describes a case in the West Indies where "many stone celts appear to have been used as axes until the cutting edges were too worn to be resharpened any more, and the same tools were then pressed into use as hammers."

Nos. 153, 154, 350, and 210 are all such long pieces with square or rectangular sections. None show the bulbs of percussion or their scars. No. 154 has a finely retouched steep end. No. 210 has a scraper edge on one side. It is possible that some of these specimens are representatives of a blade technique, but that will have to await further analysis.

No. 234 seems to have been a possible blade core from which the pieces removed were very slender and no more than 21 mm. long. This is probably why the core was abandoned. Some of the surfaces may have been previous tool surfaces. It seems to happen quite often that a larger tool will be used as a core for flakes out of which still smaller tools are made. The smaller tools often retain surfaces and edges of the previous form. No. 234 seems to have been a tool with a fine surface at one time. At some point it was broken up and an attempt was made to use only this piece as a blade core. There is no remaining evidence of use on the tool now, but that may be a result of the way it was broken.

No. 402 was shown to Desmond Clark who identified the distal end as a typical burin. This end shows heavy use on a side edge. The bulbar end is the striking platform from which the few later blades were removed at a 90° angle. The earlier blades were removed from a platform which was later broken off. The cross-section of this core is roughly square. It is 48 mm. long maximally, 14 mm. wide, and 9 mm. thick.

Nos. 375 and 389 are unused and irregular. They show little use and no bulbs. One small concave edge shows use as a light and sharp scraper, impossible to use on an object much larger than 16 mm. in diameter.

These wedges, blades, blade-like flakes, and blade cores, are by-products of specific technological activities which created them and they are the basic material for others which will make other tools out of them.

However they were made, whether by specific chipping techniques or perhaps by shattering a core, the fact remains that we find pointed tools made out of all these different kinds of wedges as well as ordinary flakes.

Class B - Triangular wedges (fig. 5)

Members: 28, 57, 63, 65, 67, 80, 116, 127, 19, 193, 297, 314

All of these specimens have triangular cross sections. All of them have two very flat unworked faces which meet in a very fine, unworked faces which meet in a very fine, unworked, unretouched edge which was found to be used on only two specimens. All but Nos. 67 and 116 have cortex on the third face which is at least slightly retouched and therefore has at least one edge. The edge is steep. Nos. 57 and 116 are notable as exceptions. No. 28 combines all these characteristics with the additional trait of a point on one end which has been broken off just below the tip. On most of these specimens the ends are broken off straight across and either left smooth or retouched.

On No. 67, there is a bulb of percussion on one face. It will be remembered that this specimen has no cortex but does have a retouched side edge. The retouch is over previous flaking as if on the face of a biface tool. On one end there is a tiny flake scar of an unsuccessful attempt to remove this whole flake. The striking platform

Class B Artifacts
Fig. 5: top row, l. to r. Nos 57, 28, 63, 297; middle row 65, 80, 314, bottom row 191, 67, 127, 116, 193 (1/2X)

is irregular and narrow. The distal end was broken off at a narrowing in the cross-section. The flaking on the surface and the retouch on the edge were done before the distal end was broken off. The other two faces show no bulb scars, indicating that the striking platform from which this flake was removed was not the same for the previous flakes. The possibility exists that blades were removed from opposite ends and that these were core preparation flakes which were reworked into tools.

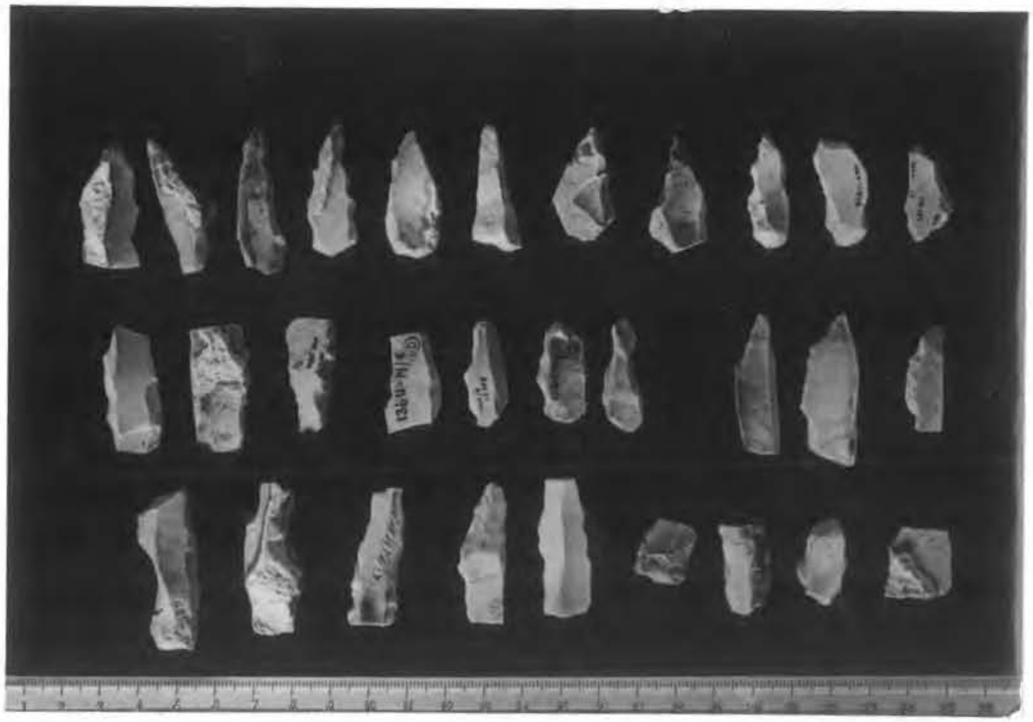
No. 297 tapers to a rough point at one end. The very tip is broken off and there is a spot of cortex near where it used to be along one edge. Of the three triangular faces the widest and flattest is referred to as the bottom. Therefore, it is one of the top faces that has a previously flaked surface which shows signs of burnish. The burnish is on the central ridge of the specimen and it is not clear whether it is from a previous tool form or from a haft.

Class C - (figs. 6 & 7)

Members: 7, 13, 14, 15, 16, 17, 19, 20, 22, 32, 33, 35, 42, 43, 66, 68, 70, 75, 84, 88, 99, 117, 118, 123, 138, 146, 184, 189, 195, 203, 204, 231, 296, 313, 318, 322, 326, 338, 354, 481, 484, 525

The specimens belonging to this class are rather thick in cross-section, have steep sides which are worked or abraded to an angle of 90^{o} or more, and tend to have points. Many of the specimens are fragments, some included here with difficulty. Many pieces have patches of cortex, generally on the "upper" surface (when the tool is oriented with a concave or flake surface down). The edges tend to be quite uneven.

Specimens Nos. 318 and 296 are good examples of side scrapers. No. 318 is 8 mm. thick and 14 mm. wide. The lower surface is flat and the upper is partly covered



Class C artifacts

Fig. 6: top row, l. to r. 117, 7, 313, 70, 99, 354, 123, 88, 68, 118, 195; middle row 15, 146, 296, 14, 184, 16, 204, 32, 481, 33; bottom row 75, 318, 19, 13, 20, 22, 322, 17, 326 (1/2X)

with cortex (see fig. 18b)which shows a closer view of the edges). It probably had a point at one time that was broken off. The butt end is sharp and is formed by the intersection of the cortex with the original flake surface. It is slightly chipped but this is probably accidental as there is little uniformity of direction. One edge (as can be seen on fig. 6 and fig.22) has a distinct concavity which is a steep scraper edge. The other edge is divided into three sections. The section nearest to the butt end is steep and undercut. The middle section is sharp and bifacially worked, while the third section is somewhat steep and unifacially worked. No. 296 has two edges which are steep and so undercut that the width at one point along its length is 6 mm. on one face and 10 mm. on the other. The working edges are on the narrow side.

Fig. 7: Class C artifacts
top row l. to r. 231, 35, 203, 66, 138, 484; bottom row 42, 189, 43, 338, 84, 525

Almost every specimen in this class has at least one such steep side edge. Not all show use, however. One very heavily used side scraper is No. 75 (fig. 6, bottom row, first on the left). One side edge is concave and so heavily abraded and undercut that the very edge is dull and rounded. The other side edge is also a steep scraper, however, it is straight.

On most specimens no striking platforms are visible. On others the striking platform became the butt end and therefore remained on the fragment. There are basically three kinds of butt ends. The first type has a striking platform which is the whole butt. Examples with this kind of butt are No. 15, 19, 22, 32, 43, 99, 231, and 313. The butt is the widest part of the tool in each of these cases. The second type of butt has a blunted end but the striking platform and the bulb appear at one corner. From the point of impact the butt itself has been retouched to a steep rounded edge. Nos. 132, 42, 138, 189, and possibly 88 are of this kind. The third type is the distal end of the blade or a portion of edge of the flake. It is an edge formed by the natural union of two faces. Nos. 13, 16, 146, and 318 have such butts.

Class D - (fig. 8)

Members: 2, 3, 4, 21, 34, 48, 69, 86, 87, 100,
114, 129, 134, 145, 183, 190, 320, 364

Class D artifacts
Fig. 8: top row l. to r. 4, 48, 3, 21, 364, 114; middle row 86, 183, 190, 34, 134, 129; bottom row 87, 69, 2, 320, 100, 145; (1/2X)

Of this shape class all but two specimens are broken. The general shape of thes objects is a wide base and middle tapering down to a point. The sides are steep and on some they seem to have been used as scrapers. The two complete specimens are No. 4 (measuring 39 mm. in length, 13 mm. in width, and 5 mm. in thickness) and No. 48 (measuring 38 mm. in length, 16 mm. in width, and 4 mm. in thickness). On both specimens the side edges seem to have been used as scrapers. No. 4 is not quite complete for it seems the butt end was snapped off by pressure on the upper side of the tip (see fig. 16)for a detail of this). Whereas the sides of the Class C objects have rather parallel side edges, all of the Class D pointed tools taper from the base, or near the base, to the rather sharp point. The side edges are not so irregular nor so heavily undercut as those of Class C and the cross-sections of these tools are much thinner.

All the specimens of this class have steep scrapers or edges made to look like steep scrapers but which do not always show use. The breaks are oblique to the central long axis (henceforth to be referred to as the C-axis) on most of the thin tools and perpendicular to the thick ones.

This class does not hold together very well for the two whole tools seem to have a ridge down the center of the upper surface (see fig. 8), indicating that they were made either on thick blades or flakes which were oriented in a similar manner. All the other tools are similar in the absence of such orientation. The two whole tools were more like these than any of the others.

Class E - (fig. 9)

Members: 9, 29, 40, 44, 45, 46, 49, 50, 60, 61, 62, 90, 94, 103, 104, 112, 120, 126, 128, 133, , 332, 361,

The main characteristics of this class as a whole are as follows: 1) median ridge or two ridges; 2) wider at or near the base; 3) pinched at or near point; 4) edges at least near point are steeply retouched - even perhaps used; 5) base either planar, a prepared striking platform or retouched; 6) sides are not straight but curve in and out and are not parallel; 7) generally asymmetrical with one side edge distinctly more curved than the other; and 8) tools are generally short and thick (see fig. 9).

Class E artifacts

Fig. 9: top row l. to r. 29, 103, 126, 60, 120, 50, 128, 61, 62, 94; middle row 44, 332, 49, 361, 9, 46, 217, 112, 133, 104; bottom row 32, 40, 90, 45 (1/2X)

This is a rather uniform class, almost none of the specimens (all photographed and visible on fig. 9) being broken, probably due to the fact that they are short and thick. Almost all have a median ridge parallel to the side edges. Most are wider at the base and narrow unevenly toward the tip. There is a slight pinching generally just below the point or lower on the body. The specimens are small and massive with short points which vary from the very fine to quite rounded.

No. 60 is slightly anomolous because it was made from a previous tool whose edge still remains, affecting the shape. This tool may have been broken off at the base. The point is asymmetrical and has a small notch on one edge which could have been used as a small scraper as it does show undercutting. Nos. 44, 45, 46, 49, and 61 have a bulb on the flat surface in the center of the butt so that the butt end was the striking platform. These seem to have been made on blade-like flakes. Figure 10 shows the butt end of specimen No. 46. The bulb of percussion is clearly visible as is the very dull rounded point.

Many specimens have bulbs of percussion near the butt end. Some of these ends are simply smooth surfaces while others such as Nos. 9 and 90 are neatly finished by minute chipping. The butt of No. 49 is shaped into a delicate end scraper (fig. 11), and the notches on the sides of the same tool are visible on fig. 21.

Fig. 10: The butt end and lower face of tool No. 46. This tool has a rounded tip and distinct burnish near butt end on one face. (2X)

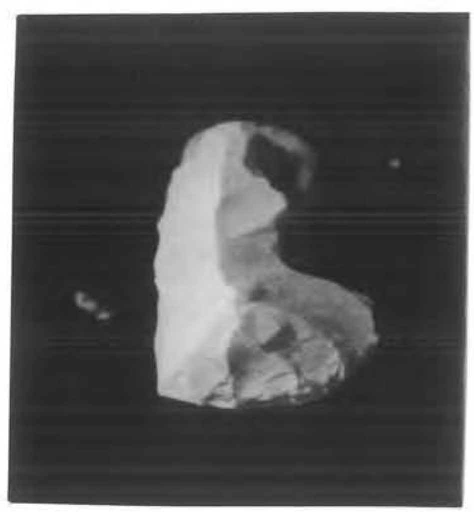
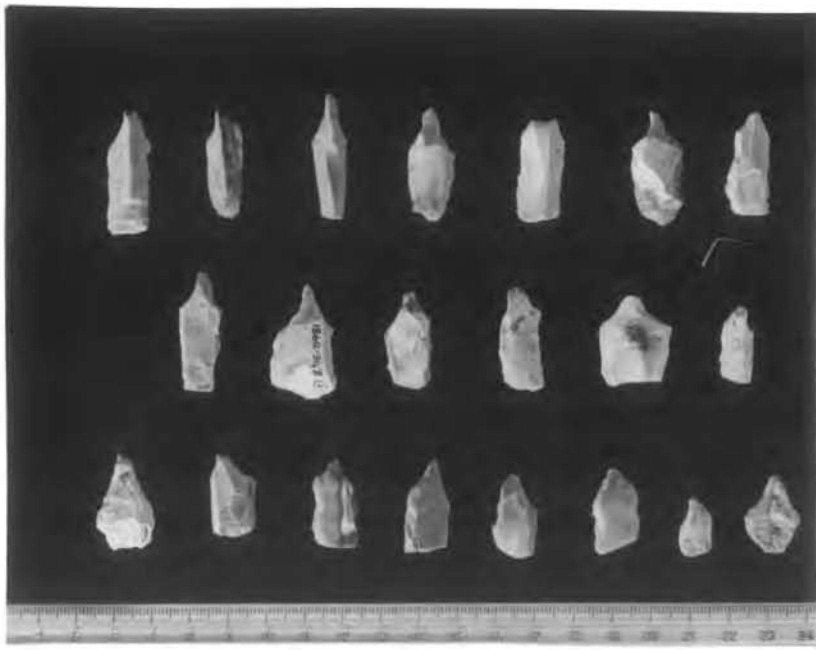


Fig. 11: No. 49, on the butt which is shown here there is an end scraper. Note the chipping on the very edge as if from use. (2X)



Class F artifacts
Fig. 12: top row l. to r. 47, 122, 186, 51, 18, 305, 135; middle row 81, 36, 301, 98, 97, 109; bottom row 89, 257, 360, 356, 95, 91, 113, 140; (1/2X)

Class F - (fig. 12)

Members: 18, 36, 47, 51, 81, 89, 91, 95, 97, 98, 109, 113, 122, 135, 140, 186, 257, 301, 305, 356, 360

The tools of this shape class tend to be parallel-sided or nearly so. They have a shouldered point, steeply retouched sides, some of which show scraper use. The butt end is usually thinner in long section. The top and bottom faces tend to be flat. The members of this class are distinguished from those of Class C by the much more delicate chipping of the side edges and points and their generally smaller size.

Some members of this class are carefully fashioned to appear symmetrical while others have obvious asymmetry. This asymmetry is visible on figure 12. It occurs sometimes on the shoulders, sometimes on the point and sometimes on the body itself. There seems to be little regularity.

Specimens Nos. 18, 95, 135, 140, 257, and 356 have bulbar end butts which were prepared striking platforms of the parent core. The other butts are either distal ends of flakes or wedges or simply flat surfaces. No. 97 has battering on the base at the upper surface, probably made either in an attempt to thin the tool or to remove the flake itself. The thickness of the tools for the most part varies from 3 to 6 mm. with No. 18, which is 13 mm. thick being the thickest.

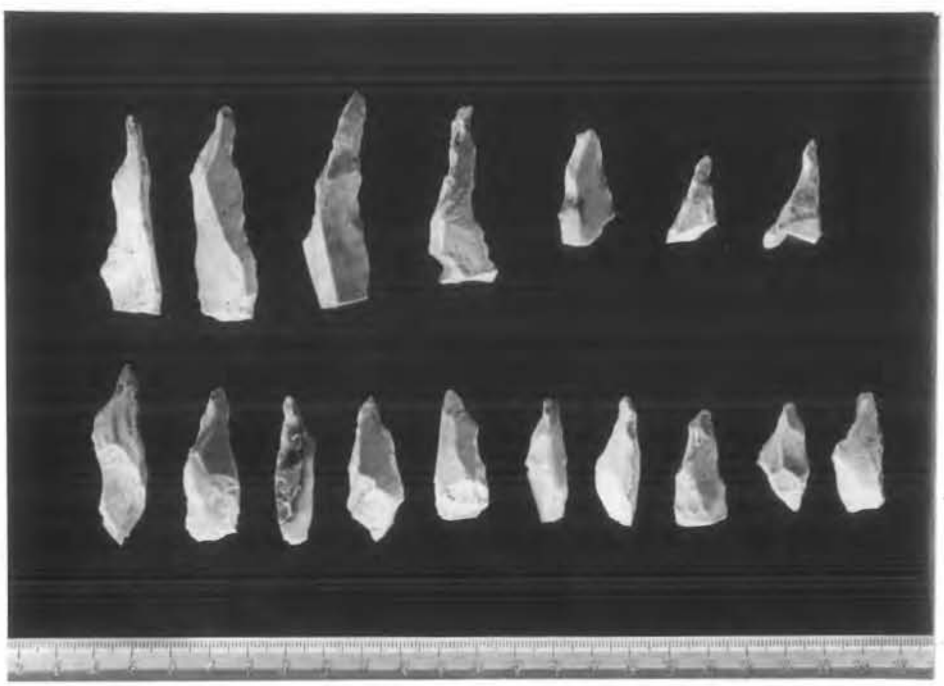
There is probably some overlap of this class with Class C. However, Class C does tend to contain specimens of much coarser workmanship.

Nos. 81, 113, and 356 seem to have portions of old tool surfaces and edges. They seem to have been made from a core that had been already a tool.

Class G - (fig. 13 top row)

Members: 8, 10, 11, 58, 74, 142, 188

The specimens of Class G tend to be non-parallel-sided and asymmetrical, having one curved side edge and one straight edge, both of which are usually steep side scrapers (see figures 19, 22 and 23 for details on Nos. 8, 10, and 11). The longest complete specimen is 55 mm. long and the shortest complete specimen is 46 mm. long.



Class G (top); Class H (bottom)

Fig. 13: top row l. to r. 11, 10, 74, 8, 142, 188, 58; bottom row 79, 6, 131, 78, 130, 24, 83, 77, 139, 311; (1/2X)

One of the faces is a curved or flat flake scar surface while the other shows two or more facets. There are heavy undercutting and abrasion marks on the edges but no regularity as to which face is undercut. The butt ends are broken off straight across on Nos. 11 and 74 and formed into end scrapers on Nos. 10 and 8 (see fig. 23) for end scraper on butt of No. 10). The points are generally flat. The striking feature of this shape class is the heavy undercutting and abrasion on some of the side edges.

Class H - (fig. 13 bottom row)

Members: 6, 24, 77, 78, 79, 83, 130, 131, 311

All of these tools are very thick with multifaceted, triangular, or quadrangular cross-sections. Almost all show signs of previous tool form edges. On the photograph (fig. 13 bottom row) such an edge is visible on No. 83. None are broken, probably because of their massiveness. The butts are either shaped to a rounded edge, such as on No. 6, left as striking platform remnants, or made into pointed ends. Nos. 78, 79, and 139 are double-ended tools. The side edges on the specimens of this class tend to be non-parallel. Many of the side edges are steep but few are retouched into scrapers.

A few individual specimens exhibit some interesting features. Nos. 77, and 78 have multifaceted cross-sections and two of the non-adjacent edges are heavily hammered. These hammered edges are visible on the photograph (fig. 13 bottom row). One of them seems to have been part of an earlier tool form. No. 79 is distinclty S-shaped although very little of the edges show use. No. 131 has flaking on one surface which is also of a previous tool shape. No. 139 again exhibits evidence of having been remade from a tool for it has a very even polished surface. It is unlikely that this polish is from use of the present tool for it does not overlap the edges, indicating that the edges were made after the polish. The butt end of No. 77 retains a remnant of a striking platform of a previous core.

Class I - (fig. 14 top row)

Members: 25, 26, 27, 85, 92, 192, 352

This class is not very numerous nor is it very uniform. The specimens are characteristically long and narrow, with triangular cross-sections, and a working tip on each of the two ends. No. 192 and 85 have very finely retouched notches on the side edges, clearly visible in the photograph (fig. 14 top row). The only specimens which show any possible use of side edges are Nos. 27 and 192. No. 27 is broken obliquely. No. 352 has may never had a second end although it tapers in the same way the others do which might indicate that the end was broken off. The length varies from 29 mm. to 32 mm. with the exception of No. 85 which is much smaller and quite different in appearance, and No. 27 which is broken and therefore, shorter. No. 26 seems to have been made on a Class B wedge.

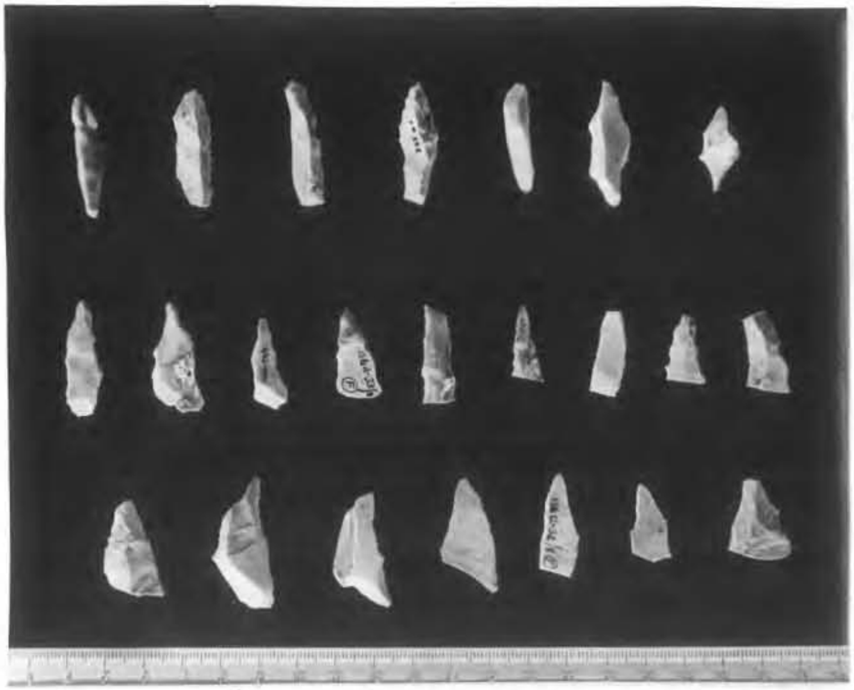
Class J - (fig. 14 middle and bottom row; fig. 15 top row)

Members: 5, 30, 31, 37, 38, 39, 41, 52, 53, 54, 55, 93, 102, 106, 111, 119, 143, 194, 197, 272, 308, 517

This is a miscellaneous category within which the tools have very little in common (see fig. 14 middle and bottom row and fig. 15 top row). The specimens that did not fit into any other were included here. The only characteristics which all the specimens do share are that they are all made on very flat flakes and each tool has or had some kind of point. They are all very fragile and delicate with retouched, crushed, or abraded edges, which on some appear rather jagged.

Notch-like indentations are present on No. 37, 38, 39, and 197. The latter may not have had a point although its general shape does suggest the presence of one. The first three specimens listed have notches on both sides of the tool just below the point which may have served no other purpose than to narrow the point even though they are scraper-like in appearance.

No. 111 is a very thin flake less than 1 mm. in thickness the edges of which were shaped by crushing.



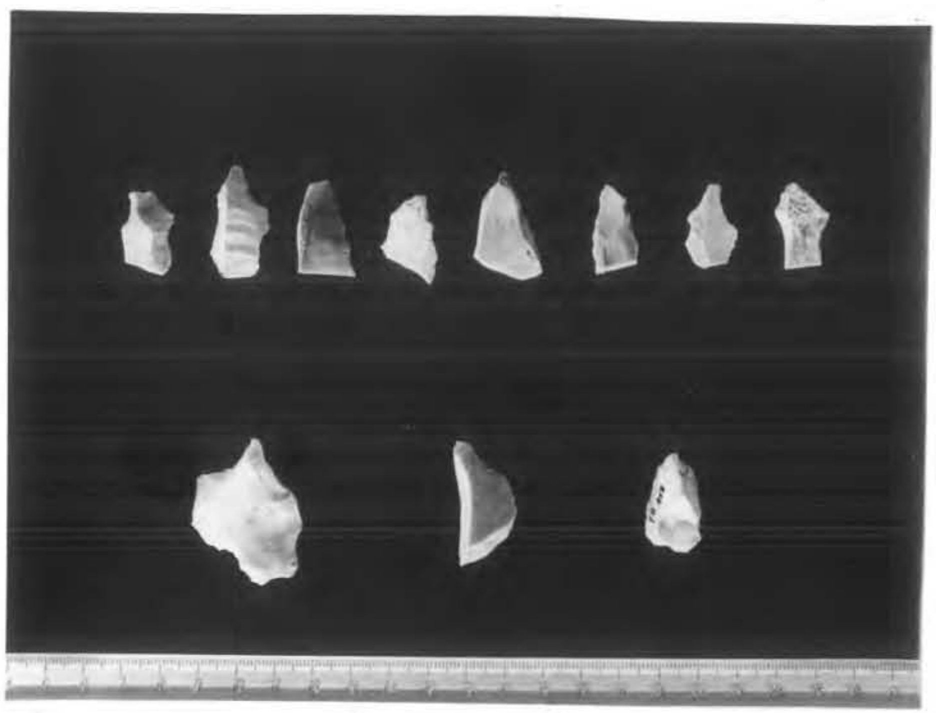
Class I (top); Class J (middle and bottom)
Fig. 14: top row l. to r. 25, 92, 26, 352, 27, 192, 85; middle row 30, 38, 93, 53, 31, 185, 106, 119, 143; bottom row 5, 55, 102, 54, 52, 111, 56; (1/2X)

Class K - (fig. 15 bottom row)

Members: 304, 428, 448, 477, 518

This class most resembles what are usually referred to as awls, that is flakes with a retouched short point. No. 304 is a typical awl made on a flat flake by retouching the edges all around (see fig. bottom row, not all of the members of this class appear on the photograph), and creating a retouched point which in this case protrudes 8 mm. from the body.

No. 518 is long and narrow with a curved point. It is really a triangular wedge with a curved point. No. 428 is also triangular in cross-section but curved with a rounded thick point on one end. No. 448 is a thick rounded point on a triangular wedge but the lower half was spalled off. No. 477 seems to have been the butt end of some rather heavy tool. It actually may not have had a point at all although its general shape suggests that it did which is why it is included here. One edge is retouched into the typical steep scraper and is slightly abraded. The other is unused.



Class J (top); Class K (middle and bottom)
Fig. 15: top row l. to r. 197, 39, 308, 272, 41, 194, 37, 517; bottom row 304, 428, 448 (1/2X)

It is not surprising that more awl-like flakes were not found for the work which an awl could have done was probably done by one of the other classes of pointed tools, which were flexible in their performance. In terms of function these specimens were probably not too much different from some of those in the other classes.

<u>Use on the Pointed Tools and Wedges</u>

Examination of the tools according to the procedures outlined in the section on techniques produced the following kinds of use marks and subdivision of tool form which appear to coincide with functional subdivisions of use.

1. Striations from back and forth movement
    a. sharp tip
    b. rounded tip
    c. flat tip
2. Abrasion, chipping, and crushing on edges caused by scraping - steep and low angles
    a. straight edge
    b. notch
    c. end scraper
3. Polish and/or burnish of present tool form
    a. polish from hand grasping
    b. burnish from haft
    c. polish or burnish from use

Striations

All the pointed tools with complete tips which were broken, retouched, or chipped, were examined under a hand lense (7X) and then those with visible wear were examined more closely under the microscope. Forty out of the 147 pointed tools were found to have enough wear to possibly show striations. Of these, a total of 32 showed definite or probable striations. These marks were parallel to the long axis (C-axis) of the tool.

By observing the position of the striations on each point it soon became evident that there were three different ways in which the points were used. Eight of the 32 pointed tools showing striations were found to have striations on the very tip of a sharp point or just off the very tip. Five specimens, also with very sharp points, had no visible striations. None of the other pointed tools with visible striations had sharp fine tips, and it was therefore evident that this shape correlated nicely with the small patch of wear on the very tip or just .5 to 1 mm. to one side. Such a pointed tip can be seen on the photograph, fig. 16, of No. 4.

Fig. 16: No. 4, showing the general shape, the sharp pointed tip, and snapped butt. (see also fig. 8)(2X)

The second type of use was found on rounded tips evenly distributed on the wide platform of the very tip and up the sides for as much as 2 mm. on the protruding ridges of some of the tools. In some cases in the center of the very tip there was a little conical protrusion which was formed by rubbing away the areas around the top and not the spot itself. Such a rounded tip is illustrated in figure 17 which is a photomicrograph of the rounded point on No. 25. The tiny conical tip is visible only as a light spot on the photograph and the striations themselves are very poorly visible as black short lines. This photograph is by no means a clear one but it has value in that the general pattern of the wear is clearly visible, and a few of the deeper striations do show up. On most of these specimens the striations are oriented parallel or nearly so to the C-axis of the tool. They tend to show up best just off the point and have the appearance of poorly drawn pencil lines. They are seen one at a time, or two together, but not parallel to each other. This would indicate that the tool was not always used in the same direction.

Eight specimens exhibited this type of wear and all were heavily worn with dull, rounded tips. On 3 others which had tips of the same shape, no striations were found at all. Again there were no exceptions in that no

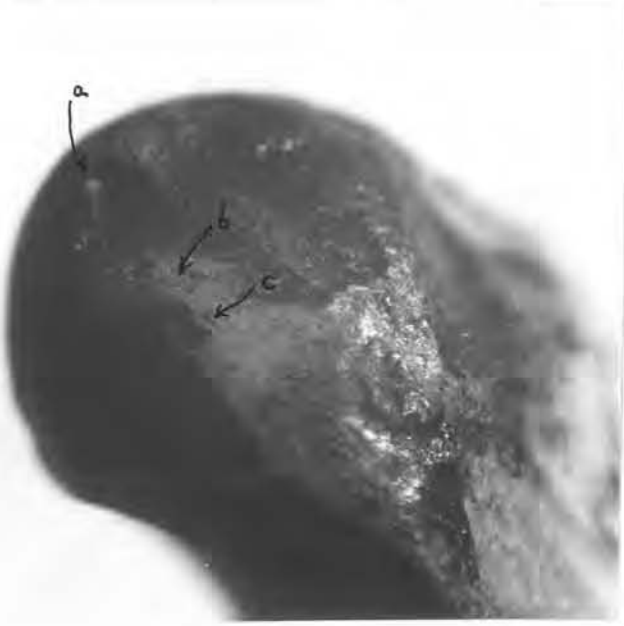


Fig. 17: Striations on No. 25, a rounded tip. "a" is the tiny protrusion sticking up out of the center. "b" and "c" are short rough striations.(20X) (see also fig. 14)

striations of this type were found on any other shape of point. (For more examples of this shape point see No. 11 fig. 22 and No. 49 fig. 11)

On the third type of point, the flat tip, the wear tends to be on the corners of a point with a flat top and bottom and a ridge across the tip connecting the two faces. This can be seen rather clearly on figure 18a. If the tool were laid on a table with the flat (upper or lower surface) down, the tip edge would be vertical. The darkest part of the tool on the photograph on the right is the upper (faceted) face. The striations are off the tip on the corner which is in focus and the three arrows point to the three rather long striations. As can be seen, they cross each other near the tip. They are not as rough and broken as those of fig. 17 and this pattern seems to hold true for others of this shape. If a jag protrudes from the vertical edge on the tip, it generally has no wear on it at all. It differs from the protrusion visible on No. 25 (fig. 17) in that there is no wear around it at all. On No. 25 it is differential wear on the surface of the tip which created the protrusion, whereas a jag on the flat tip is an accident of production. The wear is heaviest on the corners in the middle of the top and bottom faces.

Fig. 18a: Flat type of tip. No. 85. "a," "b," and "c" arrows point to the striations. (20X) (see also fig. 14)

Fourteen of the specimens were positive as to this type of wear with visible striations. Out of these 14 6 had absolutely no wear on the most protruding part of the tip center but only on the upper and lower ridges. The wear on the two sides is not always equal in depth and there is a tendency for the heavier wear to be on the faceted face (top side) of the tool. Two others of the fourteen specimens with visible striations did show wear on the most protruding part of the center of the tip. There were 2 more specimens of this shape which did not exhibit striations.

It became evident very early in the analysis that the different distributions of the areas of wear corresponded very nicely to the three different shapes of tool points. The type of striations, whether long or short, clear or crude is important for deciding how they were used. Each type of tip exhibited a slightly different kind of striation. The sharp points were the least informative in this respect as the patch of wear was usually so small. However, that in itself is a significant fact.

From the observations of the striations it is possible to draw several conclusions about the activities being carried out with them. The position of the striations indicates that the tools were moved back and forth and not rotated. They seem to have been moved back and forth with random movements rather than quick parallel movements.

The tools with the sharp tips were probably held perpendicularly or almost perpendicularly to the worked surface and left a fine narrow groove. The fact that the wear is found on only a small area of the tip suggests that the tool was used for making a fine, narrow groove. The striations are short and light, showing that not too much pressure was needed. As the sharp tips wore down or broke off they probably changed in function, becoming more generalized. This more generalized tool would probably be the rounded point.

The rounded point was probably used for making wide grooves or smoothing incised areas. It was probably held at an angle so that the heaviest wear was off the point. It was turned around so that all the surface off the tip was used, leaving a spot on the tip itself protruding (see fig. 17). The fact that the striations are short indicates that probably short motions were made with this tool. The direction of the back and forth movement was probably changed often as the striations are at angles to one another. Probably quite a bit of pressure was employed in the work for the striations are rather deep.

The flat point appears to have been used for making a deep wide groove. The thick corners of the points provided a strong engraving tool. At first this was sharp but as it wore down the surface area of the working edge widened and on some tools also flattened. The tool was rarely held vertically as the lack of wear on the center of the tip indicates, but was usually held at an angle of between 30-50°. The striations are generally longer and shallower than those on the rounded points indicating that less pressure was applied and larger, more even strokes were made.

It is not surprising to find no marks of rotary motion. The most a point such as one of these could do is make a conical hole no more than 5 mm. (in most cases it would be less) deep. Even so only the long sharp points would be able to do this work. The only medium in which this would be useful would be in drilling sherds, for certainly wood or bone could not be easily perforated with such an implement. Also the drill would need abrasion and once it were smoothed would no longer be functional.

It is probable that the activity of drilling was not carried out at this locus with these pointed tools. If such an activity were being carried out at all it was probably accomplished with perishable material. To this effect Kidder, Jennings, and Shook (1946:122) say "it is probable that the solid drills were of wood and functioned by activating an abrasive. McQuire's experiments with a pumpdrill on a black catlinite summarized by Holmes (1919, p. 356) are interesting in this connection:

'A jasper point was first used, but it began to choke when the hole was one-half or three-fourths of an inch deep. A pine drill wore away very fast. The addition of water made matters worse, for it softened, the wood, and the dust of the catlinite formed a puttylike mass, which choked the drill. A shaft of ash wood was subsitituted for the pine and dry sand instead of wet, whereupon the drill ran smoothly, and by giving a slight jumping motion to the shaft a great deal of dust was expelled with the sand and work progressed satisfactorily.'"

The authors also go on to say that

"Haury (1931) duplicated the minute perforations in ancient beads in Arizona by means of a cactus spine and very fine abrasive, and, although he was working on relatively soft slate, it is probable that with spines or thorns similar results could, with sufficient labor, be obtained in the case of jade." (Kidder et al. 1946:122)

These experiments are not proof in themselves but they do show the possibility of drilling with perishable materials softer than stone. In order to study the drilling procedure we must look at the marks left by the drill (Semenov 1964:18). However, we cannot exclude drilling from the tool kit of test pit Subop. 136U for even though the stone tools show no evidence of drilling it is not necessarily absent.

In Uaxactun Kidder (1947:6) found ten objects he called "drills." They were small and stubby, 2.5 cm. to 5.5 cm. in length and will be discussed along with other comparative material on page 84.

The pointed tools which still had some kind of point were divided by shape into the three functional classes. The list of specimens in each class along with information on which of the tools were examined under the microscope and which did and did not show striations is given in Appendix C.

Edge Abrasion, Chipping, and Crushing

Approximately 70% of all the pointed tools had edges which were carefully chipped. They were analyzed under the microscope but no striations were visible on any of them. However, there was evidence of abrasion, accidental chipping, and crushing of the edge which clearly indicated at least their use as scrapers. The edges were morphologically divided into steep scrapers and low-angle scrapers. On the steep scrapers the side edges were steeply retouched from one or both faces without pattern and had angles of between 80-100° which meant that they were very strong. This did not seem to correlate with size, as many tiny specimens also had steep sides, but it was found that on many tools the abrasion of the edge was so severe that it had cut into the tool and this did seem to correlate with size. This kind of abrasion will be called undercutting. It is illustrated in fig. 18 and can also be seen to some extent on figs. 18b, 20 and 22. At the point where the tool is undercut it becomes narrower in cross-section.

When examined under the microscope the undercut edge looked as if it had been chipped and then smoothed (see fig. 19) which is probably the result of use on a soft but irregular substance. Specimens Nos. 6, 7,

Fig. 18b: No. 318 midsection fragment, which shows heavily undercut edge (2X).

11, 13, 74, 75, 78, and 79 are all very heavily undercut. All of these specimens are long, averaging 45.3 mm. in length with the shortest being 37 mm. The thickness averages 8 mm. and varies between 7 mm. and 10 mm.

These are the longest and thickest of the pointed tools. It therefore seems that the heaviest scraping was done by longer and thicker tools. This would indicate that there is a functional relationship between tool size and heaviness of scraping. The largest, heaviest scrapers show the most vigorous wear and the smallest steep-sided scrapers show almost none at all, even though they often have neatly retouched edges. Some specimens show evidence of very minute chipping on the edges of the tiny tools but the significance of this is uncertain. (Another example of a steep scraper is given in fig. 20 which shows how the edge was chipped).

Fig. 19: No. 8 steep scraper, heavily abaded edge under 20X magnification. (see also fig. 13)

Fig. 20: No. 60, the steep scraper side edge and how it was made. (see also fig. 9) (2X)

The small number of low angle scrapers for either wedges or pointed tools (see Table IV) indicates that they were not the dominant form, although they might have been very important in the work. It is possible that the low-angle scrapers were used for finishing and doing fine work after the heavy scraping had been completed. On specimen No. 4 one side edge is a low-angle scraper and it is a very finely chipped sharp (specimen No. 4 is illustrated in fig. 16 but these features do not show up). This edge begins on the distal half of the tool and continues back to where the butt was broken off. It is possible, that the retouch on the edge was made to strengthen it and keep it from breaking when the tools were hafted or held in the hand. It is probable that many scraper edges served more than one function. They may have been made to strengthen the tool or to dull the edge as well as serve as scrapers.

Table IV: Distribution of the different kinds of scrapers on the edges of the pointed tools and wedges.

One side edge	Other side edge	Pointed Tools	Wedges
steep scraper	steep scraper	97	3
steep scraper	low-angle scraper	4	1
low-angle scraper	low-angle scraper	2	
steep scraper	no scraper	34	14
low-angle scraper	no scraper	3	
no scraper	no scraper	7	19
		147	37

As can be clearly seen in the photographs of the shape classes, almost none of the side edges are straight. Almost all are irregular, jagged and curving. This would indicate that the surface being scraped was not flat and wide but narrow or curved. In some instances there was a distinct concave notch (spokeshave) which brings us to the other kind of scraper.

In order to discuss the position of notches it is necessary to orient the tool so that the left and right edges are constant. When the flat or concave surface was placed down on the table and designated the bottom face, the convex, faceted surface became the upper face. When the point is placed away from the examiner and the butt end toward him, the left and right edges are distinguished.

A notch is a concave indentation in an edge which was used for scraping. It tends to occur on the same steep scraper edges which have heavy undercutting and abrasion although they do occur on small thin simple flakes as well. Many of the notches are steep scrapers themselves (fig. 20 and 21) but some are on low-angle scrapers.

From Table V it is evident that the notches occur most often on the right edge or on the left and less often on both edges. Very few of the total number of specimens have more than two notches. The difference in number between the 17 occurring on the left side only and the 25 occurring on the right only is not large enough

Fig. 21: No. 49 view of the steep scraper notches, (2X). (see also figs. 9 and 11)

Table V: Distribution and number of notches on the pointed tools and wedges.

Object Number	Right Notch	Left Notch	2nd Right Notch	2nd Left Notch	3rd Notch
8	X				
10	X				
28	X				
29	X				
32	X				
42	X				
43	X				
46	X				
48	X				
49	X				
56	X				
75	X				
82	X				
83	X				
85	X				
86	X				
91	X				
97	X				
118	X				
204	X				
217	X				
257	X				
361	X				
364	X				
517	X				
36	X	X			
37	X	X			
38	X	XX			
44	X	X			
51	X	X			
74	X	X			
81	X	X			
94	X	X			
128	X	X			
140	X	X			

Table V: (continued)

Object Number	Right Notch	Left Notch	2nd Right Notch	2nd Left Notch	3rd Notch
186	X	X			
197	X	X			
318	X	X			
45		X			
47		X			
57		X			
60		X			
61		X			
78		X			
93		X			
122		X			
131		X			
135		X			
138		X			
189		X			
297		X			
301		X			
304		X			
311		X			
518		X			
7	X		X		
39	X		X		
11		X		X	
68		X		X	
40	X	X	X		
70	X	X	X	X	
192	X	X	X	X	
62 total					

to attribute to left or right handedness. It may mean, however, that the tool was not hafted but grasped at one end or the other arbitrarily. Sixty-two of the total 186 specimens have at least one notch which is exactly 33.3% of the total, and there is a total of 90 individual notches.

These notches, as seen from the marks of abrasion, were probably concave scrapers for scraping objects not more than 15 mm. in diameter. The position of the notches and the fact that on the tools with more than one they do not occur exactly opposite each other would seem to indicate that they were not for the attachment of a haft. The most likely explanation for their existence is that they were for scraping shaft-like objects. (See fig. 22)

End scrapers are a particularly interesting category for they seem to have been designed for a very specific function which is not necessarily scraping as the term implies. However, as this shape of tool is commonly called "end scraper" throughout the literature, it will be retained in a morphological sense. These end scrapers are found as narrow delicate edges on the butt ends of some of the pointed tools. Some of these scrapers have carefully chipped edges, with steep (fig. 11) and low angles (fig. 23), while others are simply natural edges of the base flake or blade (No. 48 fig. 8). Many of the tools

Fig. 22: Notches and steep scraper edges on tool No. 11. (2X)

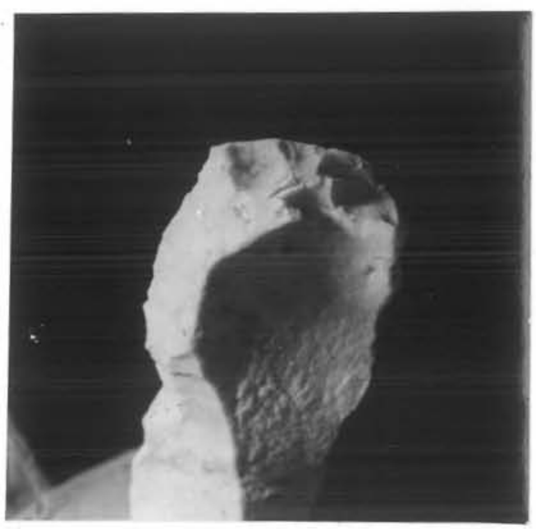


Fig. 23: End scraper on tool No. 10. (2X)

with butt end flake edges probably are not end scrapers at all and therefore only one such certain one is included. Those specimens which have definite end scrapers are Nos. 26 (fig. 14), 45 (fig. 9), 48 (fig. 8), 49 (fig. 9), 145 (fig. 8), 190 (fig. 8), 191 (fig. 5). Nos. 59 (fig. 4) and 80 (fig. 5) have end scrapers instead of true points on the narrower end of the tool. There is a point-like edge at the intersection of the retouching and the side.edge.

Specimens No. 48 (fig. 8) and 21 (fig. 8) are of particular interest because they exhibit a polish on the scraper edge on the upper surface. On No. 21 (fig. 8) the polish extends down over the sides and on the corners of the butt end but it clings to the very edge. On No. 48 the polish is found on two sides. No striations were visible under magnification.

If Semenov's (1964:85) interpretation of their use is correct, it would seem that these end scrapers were used upside down on a soft substance for cutting or whittling. This means that the facetted or "upper" surface was actually the lower surface during use, and occasionally in contact with the worked surface.

Several recent studies of steep scrapers have shown working edges similar in some ways to those of Subop. 136U which were apparently used for such tasks as cutting meat (Frison 1968:154) and scraping various materials

(Wilmsen 1968:159). Wilmsen (1968:157) suggests that some kinds of steep retouch were meant for blunting an edge to provide a hand hold and that unretouched edges were used for cutting or scraping. He mentions many tools from the Paleo-Indian sites which appear to be similar to those of Subop. 136U and the photographs confirm (fig. 2 p. 158) this similarity. The great point of diversity is in the blunting of the edge. No such smoothed blunting is seen on the Subop. 136U scraper edges, neither on the retouched edges nor on the unretouched edges. The abraded edges from the test pit were being crushed as they were being smoothed which resulted in a completely different appearance of the wear on the edge.

The tools most similar to the Tikal specimens are those which are short and thick with retouching on two sides and a steep working edge. Speaking of their function he states that

> "Steeper bits display a shattered edge that appears to consist of a stepped series of tiny chip-scars extending over the dorsal face of the tool and sometimes onto the ventral face as well (Fig. 2h-i). This suggests that these tools were drawn with heavy pressure, somewhat in the fashion of an adze or plane, over a tough, unyielding surface. The high incidence of heavy tips and concavities associated with steep bits supports the inference that these tools were employed in the manufacture of wooden and bone implements." (Wilmsen 1968:159)

This association is further supported by the fact that Frison (1968:149) found no notches or points in his collection which comprised a butchering tool kit.

Polish and Burnish

The small tool was made from a larger one in so many cases that it is difficult to separate old polish and burnish from new marks. In a number of cases it has been found to be on protrusions on the butt end, where one would expect to find the burnish from a present tool form haft, if such a haft were employed. Burnish was defined as very shiny patchy spots which were located only on the higher surfaces and not on any of the indentations. It has a typical shine which is much like that of the burnish on the biface elongates which is found, near the butt end on the flat surfaces or on the ridges. Polish on the other hand, has an oily look about it and it tends to extend down into some of the hollows.

Often on a smooth surface on these tools it is very difficult to distinguish polish from burnish accurately when it is very light. Nevertheless, it seems that 39 of the specimens had certain traces of polish or burnish, which in many cases was fairly certain. Thirty-two pieces had probable burnish or polish and 7 had burnish or polish which possibly resulted from a previous tool form being used.

When the shape classes were tabulated for percentage of specimens with burnish or polish the results did not indicate that there was a functional relationship between general shape and polish or burnish. In fact, except in the cases of Class A and Class F, the opposite was confirmed; that is, that the only sh͜ape classes which possibly do have some functional reality are A and F, the others all being fairly equal as to numbers of specimens with polish or burnish, both certain and probable. being included, in each shape class.

Table VI
Percentage of polish or burnish in each of the shape classes.

Shape Class	% of Specimens with Polish or Burnish
A	6
B	41
C	45
D	33
E	30
F	62
G	43
H	33
I	43
J	35
K	40

As can be seen on the percentage table (Table VI), the important classes to look at are A and F, all the others clustering between 30% and 45% with two sub clusters at 30-35% and 40-45%. Class A is easily separated because so many of the specimens have no points and no use on the edges. Class F seems to be a strong class in itself and it is very possible that these tools were actually hafted. Although none have certain end scrapers on butt ends a number do have steep scraper sides and notches which would not be available for use if the too were hafted. However, all these uses did not necessarily coincide in time, so that it is possible that the tools were used as scrapers and later hafted or vice versa. Considering the very low correlation between form and function it is very possible that some tools from each class were hafted.

Comparisons with Similar Types at Tikal

There are many individual pointed tools from Tikal similar to those of Subop. 136 test pit. A few of the specimens which were most like those of the test pit were examined and compared briefly. Of the pointed tools most like the Subop. 136U tools, 3C-56/4 and 61A-15/3 are good examples. They were long with broken points which had been reused, and had steep scrapers on the sides. 43A-40/9 also had steep scraper sides and a sharp point. It seemed to have been made on a fragment from a previous tool. 1B-23 was thick with steep scraper sides, a dull point and very heavy burnish from a haft. 7D-11 was a midsection with very even straight sides which were shaped as steep scrapers. 10A-46/24 was a reworked tool with steep scraper sides very similar to number 46 of our collection (fig. 10). 11D-120 was of dark glass-like flint, and had a triangular section with steep scrapers on all edges near to the point, but the point itself was broken. 27K-6/1 had steep scraper sides but it also had two notches. The position of the notches, however, which were opposite each other midway up the tool, seemed to indicate that they were meant to facilitate hafting. 66X-101/32 was very long and thick with cortex on one surface. It had finely retouched side edges, one of which was straight and even and the other was jagged or notched. 12L-186/28 had a very large wide notch with probable haft burnish on one surface. This would indicate that the notch was probably for hafting. 98B-81/8 was very large, with a very round wide dull point. One edge was notched and the others were sharp.

The predominant difference between these pointed tools and those of Subop. 136U is the quality of workmanship, and the general size. All of the tools mentioned above had very finely shaped edges which in most cases looked like steep scrapers. Very few showed any abrasion. Also it is very dear that some were hafted as one showed heavy burnish and two had notches for attaching the haft.

THE FLAKES

There are 485 flakes from test pit 136U, however only 364 of them were available in the States for study.

The flakes were studied in much the same way as the pointed tools. They were first divided into gross shape classes for convenience of description, then examined for traces of wear. Wear was visible in the form of abrasion and chipping on the edges and as polish or burnish, but no microscopic striations were visible. From the position of the abrasion and the patterning of shapes it was possible to divide the flakes into the following functional groups: scraper edges, notches, graver-like points, polish or burnish from present or previous tool form use.

The flakes seemed to divide rather well into three very general shape classes by thickness and presence of large cortical areas. The first class consisted of thin delicate flakes, all taken from prepared cores or core tools. The second class contained thick flakes which were larger in general size, and much less regular in shape. And the third class consisted of the cortical flakes.

MacNeish et al. (1967:49 fig. 31) also divide the retouched flakes of Tehuacan according to thickness and then subdivide by the kind of use visible on the edges. From the illustrations it would seem that the general shape of many of the flakes corresponds to the general shape of many of the flakes from Subop. 136U.

Class - Thin Flakes (Fig. 24)

The thin flakes make up about 30% of all the flakes of lot 6, 40% of the flakes of lots 7 and 8, and 28% of the flakes of lot 9. With the exception of lot 9 the percentages stay close to an average of 44%. Lots 7 and 8 have the greatest percentage of the flat flakes and they also have the highest number of the finest, thinnest flakes of all. (See fig. 24 for examples.) There are 145 flakes

Fig. 24: Thin Flakes and Tool Fragment Flakes. top row l. to r. 536, 489, 597, 587, 505, 534, middle row 480, 173, 158, 466, 449, 488, 176, bottom row 462, 533, 487, 427, 409, 444 (1/2X)

in this class and like all the specimens in Subop. 136U they are made of the same greyish chert. About half of the examples of the thin flakes show evidence of having been taken from a previous tool form. The very high concentration of this type of flake is somewhat unusual at Tikal. It is possible that such flakes were found but that they are no longer available for study. In the existing collections there are individual flakes which resemble these thin specimens but they represent only occasional finds and do not occur in large quantities.

Class - Thick Flakes (Fig. 25)

The thick flakes are not as rounded as the thin specimens, probably because the edges are not so fragile. They make up 32% of the lot 6 flakes, 40% of the flakes from lots 7 and 8, and 30% of lot 9 flakes. Many of them are heavily retouched into steep scrapers. These flakes are not as fine as the thin specimens and the scars on the upper surfaces tend to be larger and deeper. Again many are removed from used cores and core tools (fig. 25). On the photographs it is difficult to see the distinction between the two classes but when the actual specimens are laid out most of the flakes are easily separated. The thin flakes are smoother and the chert has a different feel to it. The thick flakes tend to be rather

Fig. 25: Thick Flakes, some retouched. top row l. to r. 254, 249, 236, 265, middle row 219, 256, 241, 261, bottom row 239, 213, 264, 233, 226, 229 (1/2X)

flat and even in cross section. The edges are retouched deep into the flake in many cases. They all seem to have been made with a similar striking technique that produced flakes of fairly even thickness which were not very regular in plan but which were all rather flat.

Class - Cortical Flakes

The cortical flakes make up 38% of the lot 6 flakes, only 12% of those of lots 7 and 8, and 27% of those of lot 9. They are primary and secondary decortification flakes and are rather crude in appearance. A few chips and spalls were included here simply as cortical pieces. Of the 64 flakes of this class, 12 are flat and of a fairly even thickness.

Class - Blade-like Flakes (Fig. 26 several of the specimens)

True blades are almost non-existent in this collection. A few long narrow thin flakes were put into this separate class because of their thin, long and narrow cross section, a prepared striking platform, and a scar of a previous long flake on the outer surface. Lots 7 and 8 contain the highest number of these, a total of 9. Lot 9 has only 2. These are hardly true blades in the technological sense.

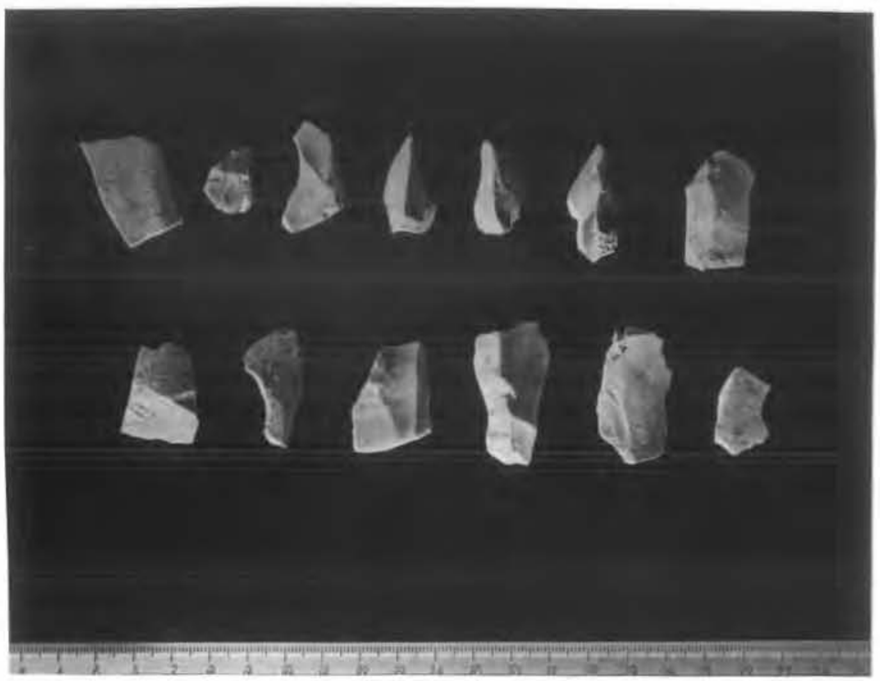


Fig. 26: Thin Flakes, some Blade-Like. top row l. to r. 335, 210, 347, 362, 325, 349, 340 bottom row 358, 302, 281, 299, 300, 334 (1/2X)

Class - Cores and core fragments

The wedges which have already been discussed in earlier sections are probably also core fragments, some of them perhaps serving as some kind of blade core. The nine cores which were not also wedges were placed into this category. They were all polyhedral with only one good specimen, all the others being very small and broken. The whole core was about 12 cm. in diameter and nearly round. Some of the edges were smooth and rounded, presumably by abrasion in use.

It is reasonable to suppose that those flakes which were not taken from biface tools or wedge-like cores, were probably taken from polyhedral cores. MacNeish et al. (1967:12) describe crude blades of flint taken from polyhedral cores which may be much like some of the longer and blade-like flakes. They also found very few cores but reconstructed their possible shape from examination of the blades.

Use on the Flakes

All the flakes were examined for the presence of use on the edges and surfaces and the results are presented in Table VII. The percentages are taken for each use separately and the uses overlap so that the total percentage for the pointed tools and wedges exceeds 100%. The notches almost always occur on scrapers, for instance.

Table VII: Percentages of the different kinds of uses on pointed tool and wedges and Flakes. They were computed for the total number of edges for the pointed flakes because then overlap was not taken into consideration.

Type of Use	points and wedges (186) 372 edges	flakes (364)
striations on points	12%	
steep scrapers	67% (252/372)	17% (62/364)
low-angle scrapers	4% (15/372)	3% (11/364)
Notched edges	22% (83/372)	6% (21/364)

From Table VII it can be seen that 12% of all the points and wedges had visible striations. The flakes at first showed no visible pointed edges and therefore this is one of the chief distinctions between the two categories. This left only the other uses for the flakes and as can be seen, the number of used edges, not even considering the overlaps, does not exceed 26%. What then, were the flakes for? Why did they exist at all? Were they blanks out of which other tools like points were being fashioned or were they waste material?

Actually they were probably both blanks and waste material at the same time; blanks for one technological process and the waste flakes of another. Upon closer, examination, however, there did emerge one interesting feature about these flakes and that was the large numbers which were snapped or broken in such a way that a sharp corner with a vertical angle was formed (figs. 27 and 28). In some cases it was just a point-like corner with no apparent functional utility while in others it was a keen edge. There were approximately 130 flakes which were snapped in such a way that a sharp point or edge was produced. In many cases this probably was not intentional but instead the result of use as a scraper. Many others, however, closely resemble burins in general shape. They resemble burins so closely that it seems worthwhile to investigate the possibility that they were used as such. Semenov (1964:98) states that "The presence of a burin facet, which is regarded as a morphological trait of burins is not a criterion of function in all cases." On the other hand he also states that many "beaked" implements which functioned in the same manner as true burins were not made with the burin blow but by chipping of the edge (1964:100). This means that the burin blow is a technological trait which does not conform to function in all cases, and that it is possible to make tools which look and function like burins but which do not exhibit the classic technique.

The broken burin-like flakes at Tikal do not seem to have been made by a burin blow but by snapping. It is not that the blow was technologically unknown for it has appeared on several pointed tools, the most prominent being on No. 402 (fig. 4). It is therefore, possible that there was a preference for snapping the flakes perhaps to produce burin-like edges. On the two photographs (figs. 27 and 28) many of the pieces look so similar that it seems likely that this form is intentional. These flakes generally show use on the old flake edge but not many show use on the possible burin-like edge. This, however should be investigated further for when it was realized that there was a possibility that these tools served as burins, the specimens had already been returned.

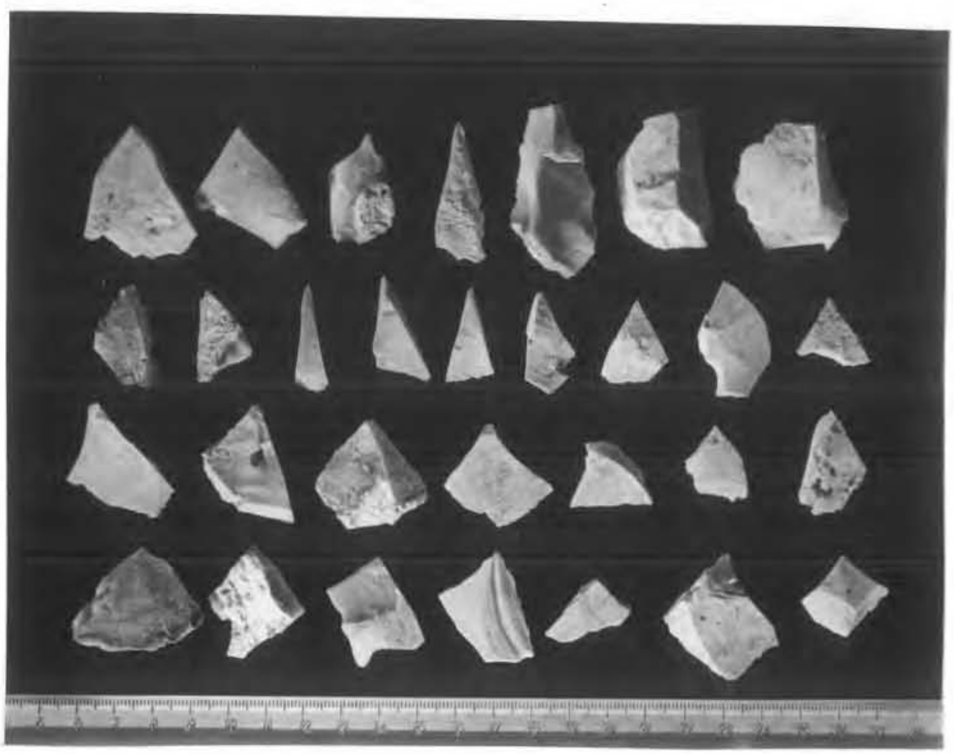


Fig: 27: Possible "burin-like" flakes. top row l. to r. 464, 502, 298, 490, 23, 529, 417, second row 438, 543, 577, 579, 513, 440, 581, 436, 450, third row 527, 479, 519, 468, 542, 589, 459, bottom row 412, 573, 585, 150, 474, 470, 452. (1/2X)

Fig. 28: More Possible "burin-like" flakes. top row 203, 260, 216, 222, bottom row 200, 199, 242, 205, 267, 207. (1/2X)

Some of the snapped flakes, as well as some of the pointed tools (Class K in particular, fig. 15 bottom row) resemble what in the United States are commonly called "gravers." In describing the tools from the Fletcher site of Alberta which is Paleo-Indian, Forbis (1968:6) states that "Of unifaces, two spokeshaves (Fig. 2a,b) have graver-like tips created by contiguous concavities. The concavities would accomodate a round shaft about 15 or 20 mm. in diameter, a dimension which accords with the stem widths of many projectil points." Here there is an association between pointed graver-like tools and notches. This association points to that fact that perhaps certain types of pointed tools are functionally dependent, or functionally related to, notches. If this were so, it would seem possible that this functional relationship exists among the tools of test pit Subop. 136U.

Frank H. Roberts (1935:26) states that gravers at the Lindenmeier Site in Northern Colorado are flakes with very short sharp points similar to those used as drills and borers. "...on several of the present example small almost microscopic flakes have been broken away from the point." The appearance of this feature is such as to suggest that it was caused by scratching or gouging movements of the implement rather than by rotary twist such as used in drilling. Some of the objects he called gravers look very much like our pointed tools and like many of the snapped flakes. From the illustrations provided by Roberts (1935; 1936) it can be seen that there is a tremendous resemblance between Folsom man's gravers and the pointed flakes and pointed tools of Subop. 136U. The same kind of "spurred" flake, as Warnica and Williamson (1968:21) call it, is also found at Milnesand Site and they mention a common occurrence of these tools at the Clovis Site.

The term "graver" itself has been used rather loosely to apply to tools which do not necessarily conform to European standards. The tendancy is to apply the term to "implements bearing small points which may have had a similar function, although they are not characterized by the typical burin technique."(Wormington and Lister 1956:23). It seems sensible, therefore, to continue using this term for objects of graver use and shape even though they may not have been made with the classic burin blow. Most of the graver-like flakes from Subop. 136U seem to have been snapped. The burin blow technique was not used, and it is not certain that the points were used. However, because of their large numbers and regularity, a graver use is very possible.

True burins are not absent from North America in general for they have been reported by Giddings (1951) to occur in fairly large quantities in in the Denbigh Flint complex as well as in Alaska, Greenland, and along the western and northwestern parts of the Hudson Bay.(1956:266). Moving south, burins were found in Southern Virginia in Paleo-Indian sites (Miller 1956:311), in the Tennessee Valley (Kneberg, 1957:55) where only 2 specimens were found, and in several parts of Texas (Epstein 1960:93). Forty-seven specimens were found in two rock shelters along the Rio Grande. "A few were produced from broken or discarded scrapers. The prevailing type is a burin bec de flute in which the engraving end is formed by the intersection of two burin facets. Less common examples are formed by the intersection of a burin facet with a hinge fracture or scraping edge." (Epstein 1960:93). Kelley, Campbell, and Lehmer (1940:114) describe a scraper of whitish chert (Plate VII b, 8) which appears to show a combination of functions. Its point is formed by a classic European graver stroke, giving a chisel-like edge. Minute chipping at places on this point suggest its use as an engraving tool. This composite tool is not unlike the scrapers and points in its design. It is thus not uncommon to find a single tool being used in different ways.

From the comparative material it seems possible that flakes which were snapped in such a way that a fine point resulted, could very easily have been snapped purposefully just to create that point. No. 205 (fig. 28) is a tool with a snapped plane meeting a scraper edge. In fact the scraper edge is slightly indented just near the point. There are many scrapers with such breaks and it seems possible that they were used as engraving tools.

TOOL REWORKING

The techniques of manufacture of these blades and flakes will not be dealt with in any detail in this paper. Another project, separate from this one treats the techniques of flint knapping. It will be remembered that this paper is designed to deal specifically with function. Nevertheless, a few basic technological aspects of manufacture will be mentioned.

There are two ways in which a Maya artisan can approach the production of a small tool. He can either start with a nodule or he can start with a discarded biface tool. If he starts with a nodule he must follow these steps: 1)He must go to or send someone to the deposit of flint known to contain the proper grade of store (assuming such a site is already known); 2)He must find a likely nodule and test it by chipping off at least a flake or two; 3) He must then transport the nodule back to the camp; 4) He must shape it (or he can do the shaping at the place of origin and then transport a prepared core); 5) He must remove the proper blades and flakes which he is going to use and 6) He must make the tools he needs out of those flakes and blades.

If the artisan takes a discarded biface he eliminates the first three steps and part of the fourth. He saves himself a great deal of time. From examination of the biface elongates, it is very clear that they were reshaped, retouched, and reused, many times over. It is not inconsistent, then, to think that they were not always discarded in the end but broken down further perhaps to make the tiny points typical of this test pit.

In the charts of Appendix B there are categories for previous tool use and burnish. Many of the present tools showed some kind of sheen or luster which could not always be correlated to the present form. This made it difficult to separate the different kinds of polish. It would be interesting to make a study of just the polish on these tools for it would provide clues as to how the present tools were used as well as yield information about the previous tool form uses. The scope of this project did not permit a more thorough research of this problem.

THE TOOL KIT

Tools very similar to the pointed tools of Subop. 136U have been reported with a Late Classic association at Barton Ramie (Willey et al. 1965:433-437) and in Early Classic (Kidder 1947:pl. 6. fig. 1) and Preclassic (Ricketson and Ricketson 1937:55) at Uaxactun. The tools mentioned by Kidder were all from one deposit and were almost identical to some Subop. 136U forms. The tools referred to by the Ricketsons correspond more to the awl-like (Class K) pieces and to some of the snapped flakes.

The unusual collection of 5543 blade tools from Jaketown (Ford 1955:137) has a striking similarity to the Subop. 136U collection. The similarity of the Tikal specimens to the Poverty Point material was first brought to the author's attention by John Witthoft. The micro-blades, as Ford called them, are different in techniques of manufacture in that they are true blades with blade cores but the general shapes are similar and the uses represented by the shapes were similar also. The Jaketown specimens were all found in a small area on the surface in association with few Poverty Point traits. This could be taken to suggest that this is a workshop situation. The tool kit contains "perforators" which morphologically resemble the pointed tools, heavy side scrapers, low-angle scrapers, and notched tools. The tremendous significance of the similarity of these associations in the two tool kits can hardly be overemphasized. Because of the great distance between them geographically, it is suggested that we are dealing with a generalized tool kit designed to perform basically similar tasks at both Poverty Point and Tikal. It would seem that this generalization also applies to the eight Paleo-Indian sites mentioned by Wilmsen (1968).

Further studies should be directed toward statistical analysis of the degree of correlation between the various attributes and the various uses represented in the kit as a whole.

The Nature of the Workshop: Conclusions

The summary of activities that seem to have taken place at the locus of Subop. 136U would include incising, engraving, cutting, scraping fairly straight surfaces, scraping shaft-like objects, and whittling. At first glance one might think this was an area where some perishable material such as wood or bone was worked. It certainly was not a stone-working tool kit for lack of chisels necessary for soft stone work, because of the presence of scrapers, and the lack of hammerstonesfor chipping work. So what was being worked at this test pit in Tikal?

If the graver-like flakes did serve as burins, then it might be worthwhile to investigate what function burins did serve. Traditionally burins have been considered to have been boneworking tools and the association of burin-like tools with Paleo-Indian artifacts and bones does substantiate this view (Hibben 1941; Miller 1956; Warnica and Williamson 1968; Forbis 1968; Roberts 1935). They have also been found in hunting cultures of the northern part of Canada and Greenland (Giddings 1956) and in the Denbigh Flint Complex (Giddings 1951). In all of these cultures they were probably used primarily for working bone. Epstein, however, (1960:96) reports burins from Texas which were found in a Desert Culture context and he states that this is

> "in striking contrast to the association of burins with the large game hunting cultures in the north. It is generally

> assumed that burins are tools designed for splitting and engraving bone. These functions could have little application in the Pecos River focus where our excavations yielded few deer bones and a plethora of fish and rodent remains. Clearly burins, like screwdrivers are multi-purpose tools. To the people who lived a Desert Culture existence along the Rio Grande, burins may have been more valuable in woodworking, and certainly useful in splitting reeds for basketry. Here the essential engraving function of the burin would be retained even though the medium for which it was originally intended had changed."

Apart from limestone, wood is certainly one of the most abundant natural resources the Maya had at their disposal, and as is evidenced by the many finely-carved lintels at Tikal, they must have known how to use this resource. With the natural environment of the Tikal Maya so full of splendid woods of so many species, it would be unreasonable to suppose that they did not exploit this magnificent resource as other Central American Peoples do today and have done before. To this effect Kidder (1947:2) states

> "One can only conclude that the Maya actually used relatively few chipped and ground stone tools and tools of bone, their place presumably having often been taken by implements of the extremely hard woods so abundant in the lowlands. Woods, both hard and soft, had to be worked, however, not only to make small objects but also to procure house materials and beams for ceremonial structures, to say nothing of the enormous amounts which, as Morris has pointed out, were required for burning lime (Morris, Charlot, and Morris, 1931:219).

The historical and ethnographic sources provide abundant evidence for the use of wood by the peoples of Central America. Landa (1941:94) makes many references to woodworking and the use of wood by the 16th century Maya. Among the many uses he mentions wooden furniture, tools, weapons, idols, drums, and other utilitarian and ceremonial objects. The relative importance of woodworking is indicated by his statement "The trades of the Indians were making pottery and carpentering." This suggests that woodworking was of greater significance relative to pottery than is usually assumed on the basis of the archaeological record.

Even today in other parts of Central America the use of wood is well-documented. Marshall (1950:102) states that Cuna "weapons were tipped with bone and hardwood." Formerly most weapons were made of the chonta palm, Guilielma utilis (Wafer 1834:52). Arrows were tipped with a point of this wood or an iron rod point balancing a hard wood foreshaft which was inserted into a hollow reed making up the latter end of the shaft (Marshall 1950:102). Wafer (1934:52053) confirms the report of arrow heads of wood. Other weapons to have been used frequently in Central America were the dart, harpoon (mostly for fishing), lance and spear with an atlatl. Lances pointed with bones of fish have been reported for the Miskito (Conzemius 1932:74), indicating once more that stone is easily replaced with other materials. Conzemius also reports arrows tipped with alligator teeth for th Miskito. Wooden swords and spears tipped with bone are reported for the Cuna (Bell 1909:630). The blowgun is another weapon of wood which was described by Thompson (1930:88) for the Yucatecan Maya. It was made of wood known as komolišе and was used for shooting birds. The missile was a small baked clay pellet. Another important wooden weapon is the club (Linné 1929:53) reported for the Cuna by Linne.

Although today many of the spears, darts, and arrows have received iron heads (Gabb 1879:516), there are still occurrences of wooden tips on many of them today. When writing of the Cuna, Marshall (1950:285) states that "Stone projectile points are not characteristic of the Darien, though they have been found in western Panama. This is to be expected, for conquest accounts report the use of bone, firehardened and hardwood points. These are still in use, and the climatic conditions are such that preservation of this material is unlikely." What kinds of tools would be suitable for working with wood? It seems that tools such as those found in the collection of Subop. 136U test pit would have served the function rather well. There are thin flakes to strip the wood, thicker flakes to scrape and split the shafts, end scrapers and perhaps also some of the steep scrapers for whittling, and points for grooving the shafts or decorating, or perhaps even for smoothing out the joins.

In the case of wooden weapons, as Marshall points out in the previous quotation, nothing could be expected to remain archaeologically. It has been a known fact that few flint or obsidian dart points have been found at Tikal, Uaxactun, and other Lowland Maya sites. This is not proof in itself that there was no hunting or warfare. It is only proof of the fact that there were few stone-tipped weapons. The arrow, of course, probably did not come into Mesoamerica till rather late, but darts and other pointed weapons were certainly in use very early.

Weapons, however, are not the only wooden tools which were used by Central Americans, nor were they the only wooden tools which necessitated the production of a shaft. Shafts for agricultural implements, weaving implements (Stone 1949:20A), and needles (Wafer 1934: 52-53) could also have been made by notch scrapers.

The list of documented wooden domestic implements for the Central American peoples is quite large. Beyond those that have been already mentioned there are grinding troughs or metates of wood "made of great logs of mahogany or other hard wood, sometimes as much as ten or twelve feet long" (Skinner 1920:68; Stone 1949:20A).

Skinner also mentions a hunting knife which is made with an old metal knife blade and the wood of the Pejibaye (Guilielma utilis). Thompson mentions the modern use of wooden beds made out of the bark of the Huhul, which is probably Belotia cambelli (Thompson 1930:98). The bark of the same tree has been known to have been used for clothes even within the last 80 years. He also mentions boomerangs (1930:152) which his Kekchi informants described to him, which he believes to be native to this area and not imported by the Spaniards.

There are many other uses for wood, some of which are obvious and other which are more obscure. Only a few have been mentioned here. Wood was probably used in many more ways than bone for obvious reasons. The abundance of woods of great variety certainly provided the Maya with a fine technological resource and there is no reason to think that they did not use it to its fullest. The attention archaeologists lavish on the stone and ceramic material they find so well-preserved is, of course, outrageously out of proportion to their importance in the aboriginal culture. These non-perishable technologies must be placed in proper perspective if we ever hope to achieve a better understanding of human activities.

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APPENDIX A

Concordance of the Lots, Catalogue Numbers and Field Numbers of the Pointed Tools and Wedges

<u>Inventory of 136U Special Flakes and Pointed Tools</u>

Loaned by the Guatemalan authorities to Dennis Puleston for study purposes in 1967

Field No.	Cat. No.	Lot
1 void		
2	136U-2	8
3	136U-3	8
4	136U-4	8
5	136U-5	8
6	136U-6	8
7	136U-7	8
8	136U-8	8
9	136U-9	8
10	136U-10	8
11	136U-11	8
12 void	136U-13	
13	136U-13	8
14	136U-14	8
15	136U-15	8
16	136U-16	8
17	136U-17	8
18	136U-18	8
19	136U-19	8
20	136U-20	8
21	136U-21	8
22	136U-22	8
23	135U-23	8
24	136U-24	8
25	136U-25	8
26	136U-26	8
27	136U-27	8
28	136U-28	8
29	136U-29	8
30	136U-30	8
31	136U-31	8
32	136U-32	8
33	136U-33	8
34	136U-34	8
35	136U-35	8
36	136U-36	8

Field No.	Cat. No.	Lot
37	136U-37	8
38	136U-38	8
39	136U-39	8
40	136U-40	8
41	136U-41	8
42	136U-42	8
43	136U-43	8
44	136U-44	8
45	136U-45	8
46	136U-46	8
47	136U-47	8
48	136U-48	8
49	136U-49	8
50	136U-50	8
51	136U-51	8
52	136U-52	8
53	136U-53	8
54	136U-54	8
55	136U-55	8
56	136U-56	8
57		7
58	136U-58	8
59		7
60	136U-60	8
61	136U-61	8
62	136U-62	8
63		7
64 void		
65		7
66	136U-66	8
67		7
68		7
69		7
70		7
71		7
72		7
73		7
74		7
75		7
76		7
77		7
78		7
79		7
80		7
81		7
82		7

Field No.	Cat. No.	Lot
83		7
84		7
85		7
86		7
87		7
88		7
89		7
90		7
91		7
92		8
93		8
94		8
95		8
96		8
97		8
98		8
99 void		8
100		8
101		8
102		8
103		8
104		8
105		8
106		8
107 void		
108 void		
109		8
110 void		
111		8
112		8
113		8
114		8
115 void		
116		7,8
117		7,8
118		7,8
119		7,8
120		7,8
121		7,8
122		7,8
123		7,8
124		7,8
125		7,8
126		7,8
127		7,8
128		7,8

Field No.	Cat. No.	Lot
129		7,8
130		7,8
131		7,8
132		7,8
133		7,8
134		7,8
135		7,8
136		7,8
137 void		7,8
138		7,8
139		7,8
140		7,8
141		7,8
142		7,8
143		7,8
144		8
145		8
146		8
147 void		
148		8
149 void		
150		8
151		8
152		7,8
153		7,8
154		7,8
155		8
156		7,8
157		8
158		8
159		7,8
160		8
161		8
162		7,8
163		8
164		7,8
165		8
166		7,8
167		8
168		7,8
169		7,8
170		7,8
171		7,8
172		7,8
173 Void		8

Field No.		Cat. No.	Lot
174			8
175	void		
176			8
177	void		
178	void		8
179	void		
180			7,8
181			8
182			7,8
183			8
184			8
185			8
186		136U-57	8
187			7
188		136U-59	8
189			7
190			7
191			7
192		136U-63	8
193			7
194		136U-64	8
195		136U-65	8
196			7
197		136U-67	8

APPENDIX B

Table of Observed Attributes on the Pointed Tools, Wedges, and Flakes

NOTE: Appendix C point classification supercedes column 9 of the Points and Wedges Tables (pp. 104-128) of Appendix B.

Pointed Tools and Wedges

Field No.	Lot No.	Shape Class	left edge scraper	left edge notch	right edge scraper	right edge notch	point: P=present B=brok	tip P=pointed R=rounded F=flat	double-ended	second point P=present B=broken	tip #2 P=point R=rounded B=broken	haft burnish	previous tool burnish	end scraper	wedge	triangular wedge	previous use	
2	8	D	SS		SS													
3	8	D	LS		LS													
4	8	D	SS		LS		P	P										
5	8	J	SS		SS													
6	8	H	SS				P	R						X				
7	8	C	SS		SS	2	P	P										
8	8	G	SS		SS	1	P	F						X				
9	8	E	SS		SS		P	R										
10	8	G	SS		SS	1												
11	8	G	SS	2	SS		P	P										
13	8	C	SS		SS													
14	8	C	SS		SS													
15	8	C	LS		SS							X?						
16	8	C	SS		SS													
17	8	C	SS		SS													
18	8	F	LS		LS		B											
19	8	C	SS	S	SS													
20	8	C	SS		SS													
21	8	D	SS		SS													
22	8	C	SS		SS							X						
23	8	?	SS	SS	SS	1	P	F	?	?		X						
24	8	H			SS		P	R										
25	8	I	SS		SS		P	R	X	R	P	X				X		
26	8	I	SS			P	R	R						X		X		
27	8	I	SS				B		X?									
28	8	B	SS				B		?	?	P					X		

Scrapers:

SS=steep
LA=low
angle

Pointed Tools and Wedges

Field No.	Lot No.	Shape Class	left edge scraper	left edge notch	right edge scraper	right edge notch	point: P=present B=brok	tip P=pointed R=rounded F=flat	double-ended	second point P=present B=broken	tip #2 P=point R=rounded B=broken	haft burnish	previous tool burnish	end scraper	wedge	triangular wedge	previous use
29	8	E	SS		SS	1	P	F				X					
30	8	J	SS		SS		P	P/F				X					
31	8	J	SS		SS												
32	8	C	SS			1	P	F				X					
33	8	C	SS				P	F									
34	8	D	SS									X?					
35	8	C			SS	1	B										
36	8	F	SS	1	SS	1	P	P									
37	8	J	SS	1	SS	1	B										
38	8	J	SS	1		1	P	F				?					
39	8	J	SS		SS	2	B					X					
40	8	E	SS	2	SS	2	P	F/P				?					
41	8	J			SS?		P	P									
42	8	C	SS		SS	1	B					?					
43	8	C	SS		SS	1	B					X?					
44	8	E	ss	1	SS	1	P	R									
45	8	ES	SS	1	SS		P	F/P						X			
46	8	E	SS		SS	1	P	R				?					
47	8	F	SS	1	SS		P	R				?		X			
48	8	D	SS		SS	1	B					X		X			
49	8	E	SS		SS	1	P	R									
50	8	E	SS		SS		P	F									
51	8	F	SS	1	SS	1	P	P				?					
52	8	J	SS		SS		P	F/P									
53	8	J	SS		SS		P	F				X					
54	8	J	SS		SS		P										

Scrapers:

SS=steep
LA=low angle

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Pointed Tools and Wedges

Field No.	Lot No.	Shape Class	left edge scraper	left edge notch	right edge scraper	right edge notch	point: P=present B=brok	tip P=pointed R=rounded F=flat	double-ended	second point P=present B=broken	tip #2 P=point R=rounded B=broken	haft burnish	previous tool burnish	end scraper	wedge	triangular wedge	previous use	
55	8	J	SS		SS		P	P									X	
56	8	J	LS		SS	1	B					X						
57	7	B	LS	1												X		
58	8	G	SS		SS		P	F				X						
59	7	A			SS							?		X	X			
60	8	E		1	SS		P	P				?						
61	8	E	SS	1	SS		P	F										
62	8	E	SS				P	P				X						
63	7	B	SS													X		
64	void																	
65	7	B	SS															
66	8	C	SS		SS		B											
67	7	B	LS										X				X	
68	7	C	SS	2	SS		P	P										
69	7	D	SS		SS							X?	X?					
70	7	C	SS	2	SS	3	P	F					X					
74	7	G	SS	1	SS	1	R	P										
75	7	C	SS		SS	1	B											
77	7	H			SS		P	R				X						
78	7	H	SS	1	SS		P	P	X	P	F	X?	X?				X	
79	7	H	SS		SS		P	F	X	P	F						X	
80	7	B	SS									?		X		X		
81	7	F	SS	1	SS	1	P	F				X						

Scrapers:

SS=steep
LA=low angle

Pointed Tools and Wedges

Field No.	Lot No.	Shape Class	left edge scraper	left edge notch	right edge scraper	right edge notch	point: P=present B=broken	tip P=pointed R=rounded F=flat	double-ended	second point P=present B=broken	tip #2 P=point R=rounded B=broken	haft burnish	previous tool burnish	end scraper	wedge	triangular wedge	previous use	
82	7	?	SS		SS	1	P	R									X	
83	7	H	SS		SS	1	P	R				?				X	X	
84	7	C					P	F	X	P					X			
85	7	I	SS		SS	1	P	P	X	P	P							
86	7	D	SS		SS	1	B											
87	7	D	SS		SS		B					X						
88	7	C	SS		SS		P	P/R				X?						
89	7	F	SS		SS		B?					X?	X?				X?	
90	7	E	SS		SS		P	F									X	
91	7	F	SS		SS	1	P	P				X?					X	
92	8	I	SS				P	R	?			?					?	
93	8	J	SS	1	SS		P	P										
94	8	E		1		1	P	R										
95	8	F	SS		SS		B					?						
97	8	F			LS	1	B											
98	8	F	SS		SS		P	R										
99	8	C	?															
100	8	D			LS		B											
102	8	J			SS		B					?						
103	8	E	SS		SS		P	F										
104	8	E	SS		SS		P	R									X	
106	8	J	SS				B					X?	X?					
107	void																	
108	void																	
109	8	F	SS				P	R										

Scrapers:

SS=steep
LA=low angle

Pointed Tools and Wedges

Field No.	Lot No.	Shape Class	left edge scraper	left edge notch	right edge scraper	right edge notch	point: P=present B=brok	tip P=pointed R=rounded F=flat	double-ended	second point P=present B=broken	tip #2 P=point R=rounded B=broken	haft burnish	previous tool burnish	end scraper	wedge	triangular wedge	previous use	
110	void																	
111	8	J	SS		SS		P	P										
112	8	E	SS		SS		P	R										
113	8	F					P	P				X						
114	8	D	SS		SS		B										X	
115	void																	
116	7,8	B														X		
117	7,8	C	SS		SS		P	F				X	X?				X	
118	7,8	C	SS		SS	1	P	R	X	P		X						
119	7,8	J	SS		SS		B					?						
120	7,8	E	SS		SS		P	R				X					X	
122	7,8	F		1			P	F				X						
123	7,8	C			SS		P	P				?					X	
126	7,8	E					P	R										
127	7,8	B	SS									X				X		
128	7,8	E	SS	1	SS	1	P	P				X?						
129	7,8	D			SS							X						
130	7,8	H			SS		P	P										
131	7,8	H	SS	1			P	P								X	X	
133	7,8	E			SS		B					?						
134	7,8	D	SS				B					X?	X?					
135	7,8	F	SS	1	SS		P	R				?						
138	7,8	C	SS	1	SS		B					X						
139	7,8	H	SS		SS		P	P	X	P	P	X						
140	7,8	F	SS	1	LS	1	P	P				X						

Scrapers:

SS=steep
LA=low angle

Pointed Tools and Wedges

Field No.	Lot No.	Shape Class	left edge scraper	left edge notch	right edge scraper	right edge notch	point: P= present B=brok	tip P=pointed R=rounded F= flat	double-ended	second point P=present B=broken	tip #2 P=point R=rounded B=broken	haft burnish	previous tool burnish	end scraper	wedge	triangular wedge	previous use	
142	7,8	G	SS		SS		B					?						
143	7,8	J			SS		B											
145	8	D	SS		SS									X				
146	8	C			SS							X						
152	7,8	A													X			
153	7,8	A													X			
154	7,8	A													X			
183	8	D	SS		SS							X						
184	8	D	SS									X						
185	8	E	SS		SS		P	R										
186	8	F	SS	1	SS	1	P	P										
188	8	G	SS		SS		P	R/F				X?						
189	7	C		1	LS													
190	7	D	SS		SS		B					X						
191	7	B	SS									X?				X		
192	8	I	LS	2	SS	3	P	P	X	P	P	?					X?	
193	7	B	SS													X		
194	8	J	SS	SS	SS							X						
195	8	C	SS		SS		P	P				X						
197	8	J	SS	1		1												
203	7	C	SS		SS		B					X						
204	7	C	SS	SS	SS	1	P	P?				?	?					
210	7	A													X			
214	7	A					P?	?							X			
217	7	E	SS		SS	1	P	F										
228	7	A													X		X	
231	7	C			SS		B					?						
234	7	A													X		X	
257	7	F				1	B											
269	7	A													X			

Scrapers:

SS=steep
LA=low angle

Pointed Tools and Wedges

Field No.	Lot No.	Shape Class	left edge scraper	left edge notch	right edge scraper	right edge notch	point: P=present B=brok	tip P=pointed R=rounded F=flat	double-ended	second point P=present B=broken	tip #2 P=point R=rounded B=broken	haft burnish	previous tool burnish	end scraper	wedge	triangular wedge	previous use	
272	7	J	SS		SS		B											
297	9	B	LS	1			B					X				X		
296	9	C	SS		SS		B					?					X	
301	9	F	SS	1	SS		B					X						
304	9	K	SS	1			P	P				X						
305	9	F					P/B					X						
308	9	J			SS													
311	9	H	SS	1	SS		P	F				?						
313	9	C	SS		SS		P	F				X						
314	9	B			SS											X		
318	9	C	SS	1	SS	1	B											
320	9	D	SS		SS		B										X	
322	9	C	SS		SS		B					X				X	X	
326	9	C	SS															
332	9	E			SS		P	R										
338	9	C	SS												X			
350	9	A													X			
352	9	I	SS		SS		P	P										
354	9	C					B?								X			
356	9	F	SS		SS		P	F				X						
360	9	F	SS		SS		P	P				X						
361	9	E			SS	1	P	R				X?						
364	9	D	SS		SS	1	P?											
371	6	E													X			
375	6	A													X?			
389	6	A													X			
402	6	A													X			
428	6	K					P	F							awl		X	
431	8	A													X			

Scrapers:

SS=steep
LA=low angle

Pointed Tools and Wedges

Field No.	Lot No.	Shape Class	left edge scraper	left edge notch	right edge scraper	right edge notch	point: P=present B=brok	tip P=pointed R-rounded F=flat	double-ended	second point P=present B=broken	tip #2 P=point R=rounded B=broken	haft burnish	previous tool burnish	end scraper	wedge	triangular wedge	previous use	
448	8	K					P	P									X	
473	8	A													X			
477	8	K			SS							X?			X			
481	8	C	SS				P	F				X?	X?		X			
484	8	C	SS		SS		B											
517	8	J	SS		SS	1	?											
518	8	K	SS	1			P	P										
525	8	C													X			

Scrapers:

SS=steep
LA=low angle

FLAKES (Key)

Flake Type	
Nf	Thin, flat flake
Nt	Thin, flat flake, made on a tool fragment
Kf	Thick flat flake
Kt	Thick flat flake made on a tool fragment
C	Cortical, crude
Cf	Cortical, flat
B	Blade

Use	
SS	Steep scraper
LS	Low-angle scraper
ES	End scraper

Striking Platform Type	
F	Flat
C	Cortical
H	Hammered
B	Broken off
P	Prepared

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use
71	7	Nf		F				X				
72	7	Kf					X					
73	7	Nt	LS	H								
76	7	Nt	LS	F								X
96	8	B	SS	H				X				
101	8	Kf	SS		X			X	X			
105	8	Nt	SS									
121	7,8	Kt										X
124	7,8	B	LS					X				X
125	7,8	B	SS									
132	7,8	Nt	LS									
136	7,8	Kf						X				
141	7,8	Nf	LS					X				
144	8	Kt	SS	F	X	X						
148	8	Kt	SS		X			X	X?	X?		X
150	8	Nt	LS				X	X				X
151	8	Nf	SS					X				
155	8	Nt		H								X
156	7,8	Nt	LS	H	X							X

See key for symbols

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use	See key for symbols						
157	8	Kf						X											
158	8	Nt	LS	H								X							
159	7,8	Kt	LS					X	X			X							
160	8	Nt	LS	H					X?	X?									
161	8	Nt		H															
162	7,8	Nt	LS					X				X							
163	8	Nt	LS		X				X?			X							
164	7,8	Kt	LS		X							X							
165	8	Kt	LS	H	X			X				X							
166	7,8	Nt										X							
167	8	Nt	LS					X				X							
168	7,8	Nt		F															
169	7,8	Nf						X											
170	7,8	Nt	LS					X				X							
171	7,8	Nt		H	X							X							
172	7,8	Bt	LS																
174	8	Nt	LS	H								X							
176	8	Nt	LS		X							X							
180	7,8	Nt						X				X							
181	8	Nt						X				X							
182	7,8	Nt						X				X							
187	7	Nt						X				X							
196	7	Nt	SS			X													

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use
198	7	Nf					X	X				
199	7	Nf					X	X		X		
200	7	Nf	LS				X	X				
201	7	Kf	SS			X		X				X
202	7	Nf	SS					X			X?	X?
203	7	Kf					X	X	X			
204	pointed tool etc.											
205	7	Nt	LS				X	X	X?	X?		
206	7	Nt	LS					X		X		
207	7	Nf					X	X	X?	X?		
209	7	Nf					X	X				
210	pointed tool											
211	7	Cf	LS	C								
212	7	Nf	LS			X		X	X?	X?		
213	7	Kf		F				X	X?			
214	pointed tool											
215	7	Nt	LS	B		X		XXX				
216	7	Nf					X	X				
217	pointed tool											
218	7	Nt		H								
219	7	Kf		F				X				
220	7	Kt		P	X	X				X		
221	7	Nt		H								
222	7	Nf	SS		X	X	X				X	X
223	7	Nf						X				X
224	7	Nf					X	X				

See key for symbols

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use
225	7	Cf	ES	P		X					X	
226	7	Kf	LS	C			X?	X				
227	7	C										
228	pointed tool											
229	7	Kf		F								
230	7	C										
231	pointed tool											
232	7	Nt		H	?							
233	7	Kf	LS					X				
234	Pointed tool											
235	7	Nf	SS					X				X
236	7	Kf		P				X				
237	7	Nf						X				X?
238	7	Nf						X				
239	7	C7	SS					X				X
240	7	Nf	LS					X	X?			
241	7	Kt		H	X							
242	7	C										
243	7	Kf	ES	H				X				X
244	7	B		H								
245	7	C						X				
246	7	B		P				X				
247	7	Kf	LS	P				X				
248	7	Nf	LS					X				X
249	7	Kt	LS			X		X				X
250	7	C										
251	7	B		F				X				
252	7	C										

See key for symbols

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use
253	7	Kf	SS			X		X				X
254	7	Nt		H				X				
255	7	Nf						X				
256	7	Kt	LS/SS	P	?	2		X				X
257	pointed tool											
258	7	C					X	X				
259	7	Nt	LS	F						X		
260	7	Nf					X	X				
261	7	Nt	LS	H	?							X
262	7	C										
263	7	Nt	LS	F	X							X
264	7	Kf	SS	H	X			X				X
165	7	Kt	LS	H				X				
266	7	Cf	LS	C								
267	7	Nf					X	X				
268	7	Nf	SS	P	X	X		X				
269	pointed tool											
270	7	Kt	LS	H/P				X				X
271	7	Nf	SS			X		X				
272	pointed tool											
273	9	core frag										
274	9	C		F								
275	9	Kf					X	X	X?	X?		
276	9	Nt	LS	F								X
277	9	Kt	LS	P	X			X		X		
278	9	C	SS				X	X				
279	9	C										

See key for symbols

								Flakes					
Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use	See key for symbols
280	9	Kf	LS	C					X				
281	9	Nt						X	X				
282	9	C		F									
283	9	core											
284	9	Nt	LS				X	X				X	
285	9	C											
286	9	Kf	LS	F		X?							
287	9	Kt	ES	F		X	X	X					
288	9	Kt	ES	H									
289	9	Kt/Cf		F									
290	9	C											
291	9	Nf	SS					X					
292	9	C						B					
293	9	B	SS	F	X								
294	9t	Kt	SS					X		X?			
295	9	Kf	LS/SS				X	X					
296	pointed tools												
297	pointed tools												
298	9	Kt	SS					X				X	
299	9	Kt						X		X			
300	9	Nf	LS					X					
301	pointed tool												
302	9	Nf	SS	P	X	X		X	?				
303	9	C		F									
304	pointed tool												
305	pointed tool												
306	9	Kf		F				X					

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use
307	9						X	X				
308	pointed tool											
309	9	Kf	SS					X				
310	9	B		H					X			
311	pointed tool											
312	9	Kt		P								
313	pointed tools											
314	pointed tool											
315	9	C						X				
316	9	Nf	LS		X							
317	9	chip						x				
318	pointed tool											
319	9	C		C								
320	pointed tool											
321	9	Nt						X	X?	X?		
322	pointed tool											
323	9	C										
324	9	C		F				X				
325	9	Nt	SS	H			X	X				
326	pointed tool											
327	9	C										
328	9	Kt	SS						X?	X?		
329	9	Kt	SS	P	X					X		
330	9	Nt	LS	P/H				X				X
331	9	C		F								
332	pointed tool											
333	9	C						X				

See key for symbols

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use	See key for symbols
334	9	Nf						X					
335	9	Nf	LS					X					
336	9	Kt					X	X	X?	X?			
337	9	Nt		H				X					
338	pointed tool												
339	9	Kt		P									
340	9	Nt						X		X			
341	9	C						X					
342	9	C											
343	9	Nf		P				X					
344	9	C		F									
345	9	core											
346	9	Kf		P						X			
347	9	Nt	SS					X		X			
348	9	Nt	LS	H								X	
349	9	Kf										X	
350	pointed tool												
351	9	chip											
352	pointed tool												
353	9	Cf	SS				X	X					
354	pointed tool												
355	9	Kf					X	X					
356	pointed tool												
357	9	Nf	SS				X	X					
358	9	Nt	LS					X					
359	9	core frag											
360	pointed tool												

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use	See key for symbols
361	pointed tools												
362	9	Kf		H				X		X			
363	9	C						X					
364	pointed tool												
365	9	Nt	LS	H	X			X					
366	9	C						X					
367	6	Kf		H									
368	6	Kf		P									
369	6	Kf		F				X	X?	X?			
370	6	Kf		H				X					
371	pointed tool												
372	6	spall											
373	6	Nf						X		X			
374	6	C		F				X					
375	pointed tool												
376	6	C											
377	6	Kt	SS		X			X	X?	X?			
378	6	Kf	LS	P									
379	6	Kf						X					
380	6	Kt	LS	H	X?			X	X?	X?			
381	6	Kf						X	X?				
382	6	C	SS					X					
383	6	Nf	LS					X					
384	6	Nt	LS	H	X			X	X				
385	6	Kf	LS	H				X	X				
386	6	C											
387	6	C		C									
388	6	Nf		F				X					
389	pointed tool												
390	6	Kt	LS	H	X			X	X?				
391	6	C		F				X					
392	6	Nf		P				X	X?	X?			
393	6	Nf		P									
394	6												

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use
388	6	Nf		F				X				
389	pointed	tools										
390	6	Kt	LS	H	X			X	X?			X
391	6	C		F				X				
392	6	Nf		P				X	X?	X?		
393	6	Nf		P								
394	6	Cf	LS	C								
395	6	C		C								
396	6	C										
397	6	Kf	ES	F								
398	6	C										
399	6	C		P								
400	6	Cf						X				
400	6	Nt	LS	H					X?	X?		
401	6	Nf		F				X				
402	pointed	tool										
403	6	C						X				
404	6	C		F								
405	6f	Nf						X	X?	X?		
406	6	Nt						X		X		
407	8	C	SS	F								
408	8	C	LS	F								
409	8t	Kt	LS	H								
410	8	Kf	LS			X	X	X	X?			
411	8	Kf	SS					X				
412	8	Kf	LS				X	X				
413	8	Kf	LS					X				
414	8	Nt	LS	H	X		X	X				

See key for symbols

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use
415	8	Cf		F								
416	8	Nt	LS					X				X
417	8	Kf	LS					X				
418	8	Nf					X	X				
419	8	Kt	LS					X	X?	X?		X
420	8	C						X				
421	8	Cf						X				
422	8	Nt		H				X				
423	8	C										
424	8	Nt	SS					S	S?	X?	X?	X?
425	8	Kf	LS	F?				X				
426	8	Nt						X				X
427	8	Kt		H	?			X				
428	pointed tool											
429	8	Kt	LS/SS	H				X				
430	8	Kf						X				
431	8	Kt		H	X			X	X?	X?		
432	8	Nt	SS				X	X				
433	8	Kf						X	X	X		
434	8	Nt						X				X
435	8	Kf						X				
436	8	Xf	SS				X	X	X?	X?		
437	8	C						X				
438	8	Kf					X	X				
439	8	Nf		F								
440	8	Kf					X	X				
441	8	Kf		F								

See key for symbols

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use	See key for symbols
442	8	Nt		H/F				X				X	
443	8	Kf	SS				X	X					
444	8	Kt	LS	H				X				X	
445	8	Nt						X				X	
446	8	Kt	LS?SS	?	X			X					
447	8	Nt	LS					X				X	
448	pointed tools												
449	8	Nt	LS					X				X	
450	8	?	SS				XX	X					
451	8	Kf	LS	P	?			X					
452	8	Kf	SS				X	X				X	
453	8	Nf		H				X					
454	8	C	LS	F									
455	8	Kt	LS	F	?							X	
456	8	C		F				X					
457	8	Kf						X					
458	8	Kf	LS					X					
459	8	Kf					X	X					
460	8	B		F				X					
461	8	Nf	LS				X	X				X?	
462	8	Kf	LS	H				X					
463	8	Nf		P	X			X					
464	8	Kt	LS				X	X				X	
465	8	?		F									
466	8	Nt	LS					X				X	
467	8	Cf		F				X					
468	8	Nt					X	X				X	

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use
469	8	Nf	SS				X	X				
470	8	C	LS									
471	8	Nf	LS				X	X				
472	8	Kf	SS					X				
473	pointed	tools										
474	8	Kf	SS				X	X				
475	8	Kf	LS	C	X							
496	8	Cf										
477	pointed	tool										
478	8	Kt		H								
479	8	Kf					X	X				X
480	8	Nf	LS					X				
481	pointed	tool										
482	8	Nf					X	X	X?	X?		
483	8	C	LS					X				
484	pointed	tool										
485	8	Nf						X				
486	8	Nt	LS				X	X				X
487	8	Nt	LS					X				X
488	8	Nt						X				X
489	8t	Nt	LS				X	X	X?	X?		
490	8	Nf	LS				X	X				
491	8	Kf	SS			X	?	X				
492	8	Nf						X				
493	8	Nf						X				
494	8	Nf		P				X				
495	8	Kf						X				

See key for symbols

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use
496	8	C						X				
497	8	Kf	LS/SS	P		X		X				
498	8	C						X				
499	8	Kf						X				
500	8	Kf						X				
501	8	Nf						X				X
502	8	Kf	SS	P	X		X	X				
503	8	Nf	LS					X				
504	8	Kf						X				
505	8	Kt		H	X			X	X?	X?		
506	8	Nf	LS					X				X
507	8	Kf	LS					X				
508	8	Nf	LS	H				X				X
509	8	Kt	ES	H				X				
510	8	Kt	SS					X				
511	8	Kf						X				
512	8	Nf	LS					X				
513	8	Kt	LS				X	X				
514	8	Nf	LS					X	X?	X?		X?
515	8	Nf	SS				X	X				
516	8	Kt	ES/LS					X				X
517	pointed	tool										
518	pointed	tool										
519	8	Kf		P								
520	8	Kf		C								
521	Void											
522	8			P				X				

See key for symbols

Flakes

See key for symbols

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use
523	8	Nt	LS	H	?			X	X?	X?		
524	8	Kf		F				X				
525	pointed tool											
526	8	Kf	SS					X				
527	8	Kf	LS				X	X				X
528	8	Nt	LS					X				X
529	8	Kf	LS					X				
530	8	B		F				X				
531	8	Kf						X				X
532	8	Kf	LS					X				
533	8	Nt		H				X				X
534	8	Kt		H				X	X?	X?		
535	8	Nf	LS					X	X?	X?		
536	8	Nt	LS	H					X?	X?		
537	8	Kt	SS					X				X
538	8	Kf		C								
539	8	Nt	LS	H				X				X
540	8							X				
541	8	Nt						X				X
542	8	Nf					X	X				
543	8	Kf					X	X				
544	8	Kt	SS				X	X				
545	8	Nt	LS	H	X			X				
546	8	Kt		F/H								X
547	Void											
548	Void to572											
572	8	Kf	SS				X	X				X
573	8	Cf	SS				X	X				
574	8	Kf		H				X			X	
575	8	Kf	LS	F	X			X	X?		X?	X

Flakes

Field No.	Lot	Flake type	Use	striking platform	burnish on lower bulb	notch	point	broken (any way)	burnish from haft	burnish from prev. use	polish, pres. use	polish, prev. use	See key for symbols
576	8	Kf		F									
577	8	Kt	SS				X	X					
578	8	Nf					X	X					
579	8	Kt	LS				X	X					
580	8	Kf	LS			X		X					
581	8	Kf	LS				X	X	X?	X?			
582	8	Nf		F/H									
583	8	Nf		H				X					
584	8	Kf	SS				X	X					
585	8	Nt					X	X	X?	X?			
586	8	Nt						X				X	
587	8	Nt	LS					X				X	
588	8	Kf	SS				X						
589	8	Nf					X	X					
590	8	Nf	LS					X					
591	8	Kt	SS					X		X			
592	8	Kt											
593	8	Nf		F									
594	8	Kf	LS					X					
595	8	Kf	LS					X					
596	8	Kf		F									
597	8	Nt	LS	H	X			X					
598	8	Cf					X	X					
599	8	Kt	LS	F/H									

APPENDIX C

This is a list of the pointed tools, with points still complete or nearly so, by functional type. One asterisk (*) indicates that the tool was inspected under the microscope. Two asterisks (**) indicate that the tool was inspected under the microscope and that striations were present.

Sharp Points

4**	36	68*	93	140
6**	41	74	113	186**
7	51*	78	123	
10**	55	83*	128	
24**	60	88	130*	
29**	61**	90**	131	
30	62	91	139*	

Rounded Points

6	26**	77	98	118
9	40*	82	104	120*
11**	46**	88**	109	126**
24	47**	92	112	135
25**	49**	94	115*	185

Flat End

8**	33	52	70	92**
9**	38**	53*	79	103**
28	44*	58**	81	117**
30**	45**	61	85**	122
32**	50**	63**	90	135**
				188