VIII

RAW MATERIAL USE

by

DIXIE WEST AND ANTA MONTET-WHITE

This section summarizes the study of variability in raw material use within and between the four major archaeological levels recorded todate. It focuses on the various kinds of flints and radiolarites of non-local origin and is oriented toward the study of raw material economy. Samples from AL3 and AL4 may be considered the most representative of Epigravettian industries since they were derived from middens containing the debris produced by a wide variety of activities, whereas assemblages from the AL2 habitation structure and the AL1 workshop probably represent a more limited range of activities. However, the samples are large enough to make possible a search for trends and patterns in raw material use.

1. Frequency of raw material types.

A total of 3,185 pieces weighing nearly 10 kilograms was distributed as follows: 598 items weighing 1,990 grams from AL1 , 265 specimens and 1,675 grams from AL2, 443 pieces and 1,143 grams from AL3 and 1,881 artifacts representing 4,794 grams from AL4. The top 3 levels were characterized by comparable artifact density of 21, 19 and 20 chipped stone artifacts per square meter whereas a figure of 75 lithic specimens per square meter was recorded for AL4.

The assemblages were sorted into the eight categories of flint and the five categories of radiolarites identified by Pawlikowski *(cf. supra)*. A few specimens which could not fit into these established types were assigned to unidentified or miscellaneous categories. Artifacts were then separated by level and by categories of blanks, blades and flakes, debitage, shatter and chips, tools, cores and debris. Sorted specimens were counted and weighed to the nearest gram.

Marked differences in the distribution of raw materials separate the four levels (Fig.VIII-1). In AL1 , radiolarites outnumber and outweigh flints. The former comprise 80% of the total number of artifacts and 52% of the material weight at that level. The green radiolarite variety (R4) is the dominant component (N=220) and artifacts made of brown radiolarite (R1) are in significant number (N=87). White flint (F4) is the most commonly utilized flint type whereas little use was made of the patined flint (F2).

In the assemblage from AL2, flints exceed radiolarites in both number and weight. Flint specimens account for 73% of the total number of artifacts and account for 72% of the total weight. As is the case in AL1, F2 is the most commonly used type of flint. A coarse variety of green radiolarite is represented by a prepared core and a few large tools.

Flints are even more common in layer AL3 where they account for 83% of the recovered number of pieces and 78% of the total weight. An even greater use of different types of flints is evidenced in AL4 where they comprise 95% of the artifact counts and

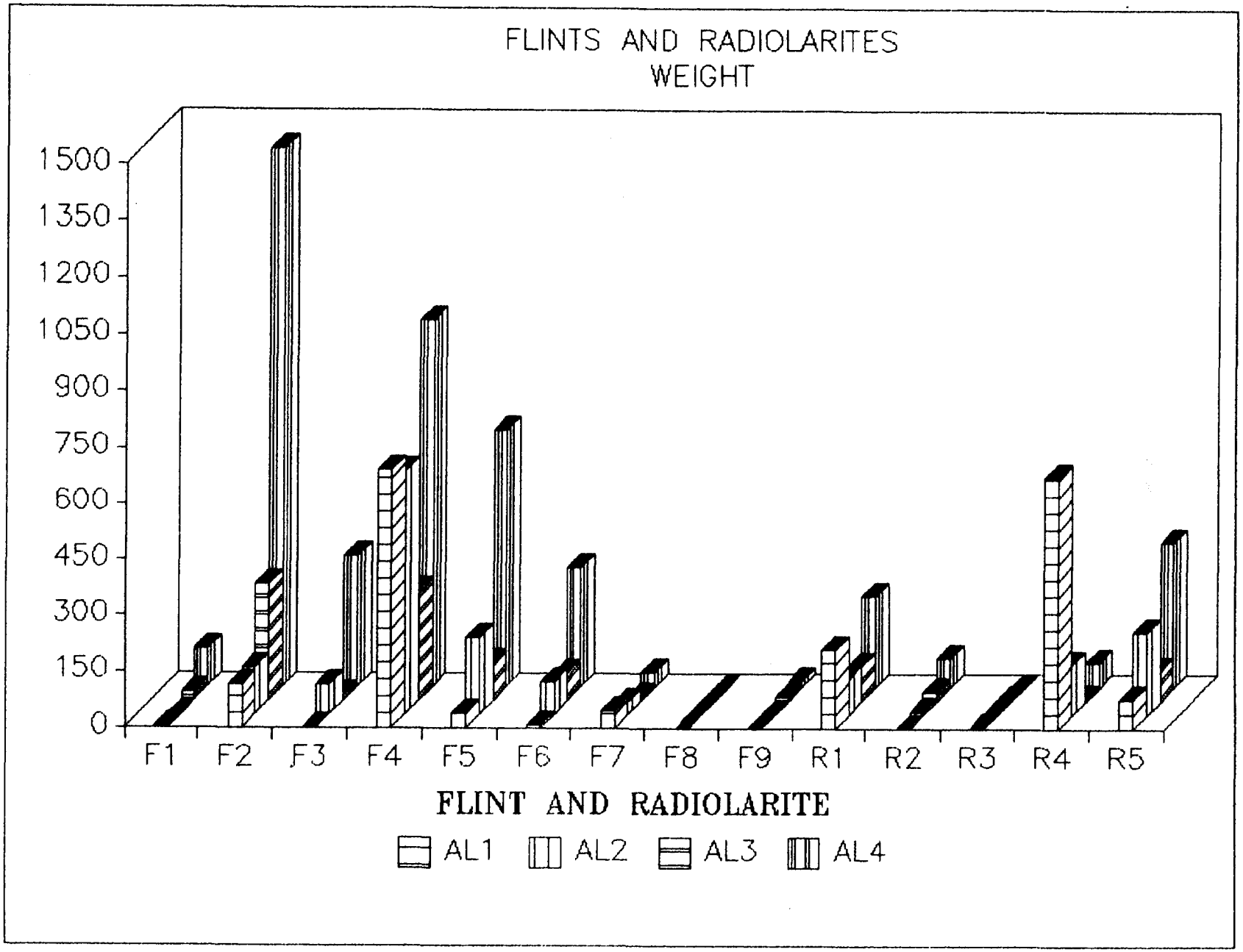

Fig. VIII-1 Weight distribution of flint and radiolarite varieties by level.

83% of the artifact weight. The quantity of patined flint (F2) increased markedly toward the bottom of the sequence and constituted an important component of the AL4 assemblage. Other varieties of flint (F3, F5, and F6) are represented in significant numbers in the lower level.

During the climatic amelioration that corresponded to the formation of AL4, there was greater use of the site as marked by the greater density of artifacts at that level, either a longer stay and/or more frequently repeated occupation of the campsite. Furthermore, occupants of AL4 must have had relatively free access to sources of patined so-called northern the source of which may have been in Silesia, in the Upper Oder region. The presence of the material, albeit in small quantities, demonstrates that acquisition points, wherever they were located, remained accessible during most of the Pleniglacial.

Throughout the sequence Epigravettian occupants relied on the white flint (F4) probably procured in the area of Stranska Skala. This does confirm that the Morava remained a major axis of communication during the Epigravettian. Varieties of radiolarites, found in small quantities in AL4, AL3, and AL2, became a more important resource in AL1. The presence of cortical pieces indicates that radiolarites were often procured in the form of water-worn pebbles which suggest that some of the material was gathered along the Danube. However, the larger blocks of green material found in AL2 and some of the brown pieces from AL1 were probably obtained from in situ outcrops. At the present stage of analysis, the Vah Basin seems the most probable, and nearest, source of these materials.

At Grubgraben, as at Willendorf (Felgenhauer, 1958-59; Kozlowski, 1986) radiolarites were used to complement other, apparently preferred, sources. According to Kozlowski (1986) assemblages from Willendorf II, levels 5, 6 and 9, contained high frequencies of flints originating from the Upper Oder Basin. Reliance on northern flint sources was a cultural tradition established during the Gravettian which persisted during the Epigravettian at Grubgraben in spite of worsening climatic conditions. During the occupation of AL1, there is some evidence of increased reliance on substitute materials as was the case at Willendorf II, levels 6 and 7.

Among the materials brought to the site, were small pieces of heterogeneous materials including agate, rock crystal, as well as flint and radiolarite. It is probable that these pieces did not come from any single source, that they were picked up when the occasion arose, and some of them probably came from the Danube gravel beaches. This fortuitous collecting of raw materials accounted for a small part of the assemblages. The bulk of the raw materials were evidently acquired as the result of long range strategy.

2. Raw materials use (Table VIII-2).

(a) The brownish, heavily patined flint (F1) is rare at all levels, represented by 1 or 2 flakes in the upper levels. The pieces recovered from AL4 include a core, a blade, several tools, a few retouch flakes, and a piece of shatter. The nature of that small assemblage and the lack of trimming flakes indicates that the material was introduced into the site in the form of prepared cores and perhaps also a few large blanks from which tools were made at the site. The ratio of usable to non usable products is 1 to 2, a rather high figure.

(b) The transparent greyish flint with white patina (F2), often designated as chalcedony in the archaeological literature and identified as Northern flint by Pawlikowsky (cf. supra) was introduced into the site in the form of small rounded pebbles with a thin water worn, outer surface or, occasionally, as tabular pieces with heavy, granular cortex. The former fits well the descriptions of the moraine materials. The latter, however, similar in texture, color and patina, do not appear to come from glacial moraines but from in situ beds.

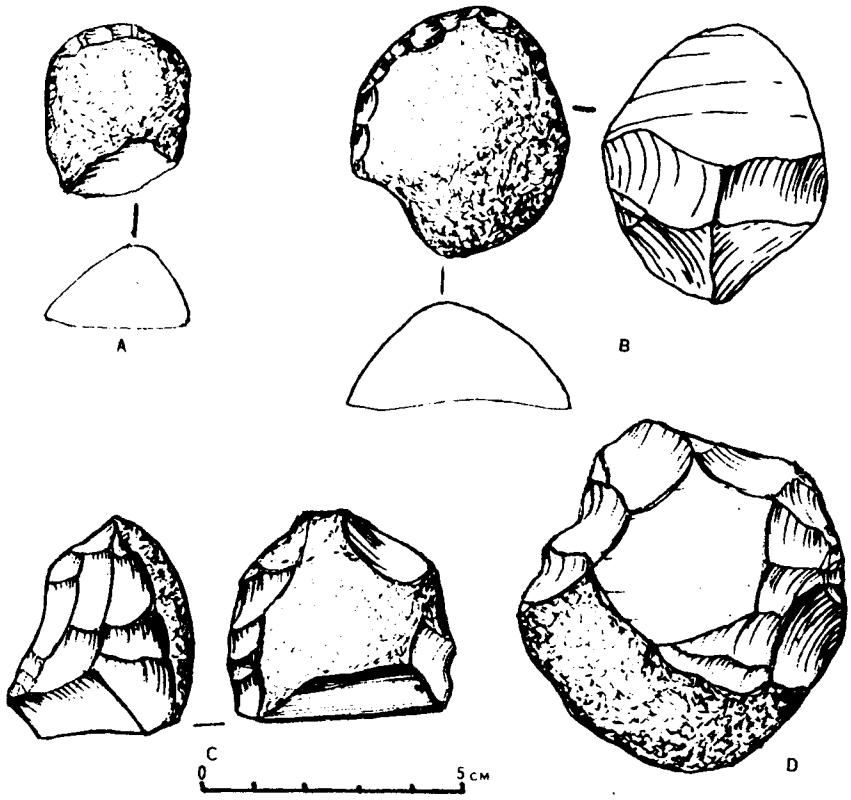

Fig. VIII-2 Tools (A and B) and cores (C and D) made from patined flint (F2) cobbles.

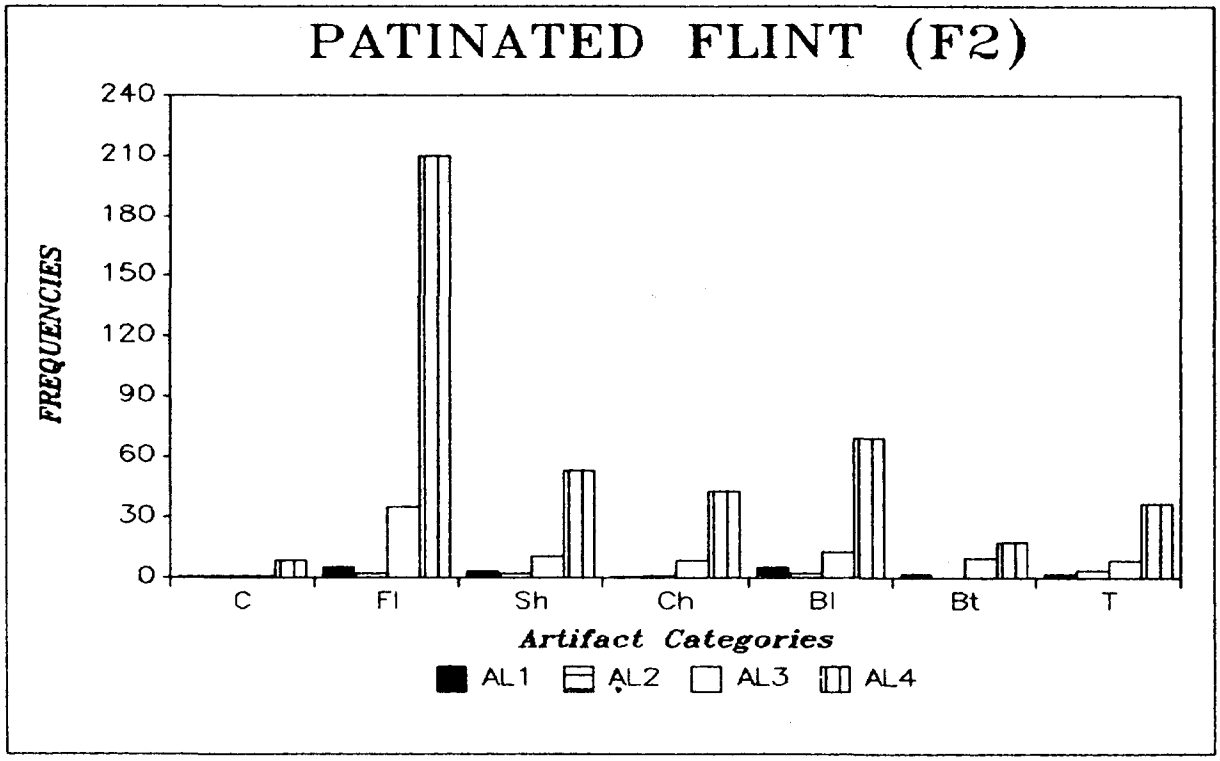

Fig. VIII-3 Frequency of patined flint (F2) by artifact categories and levels. C, cores; Fl, flakes; Sh, shatter; Ch, chips; Bl, blades; Bt, bladelets; T, retouched tools.

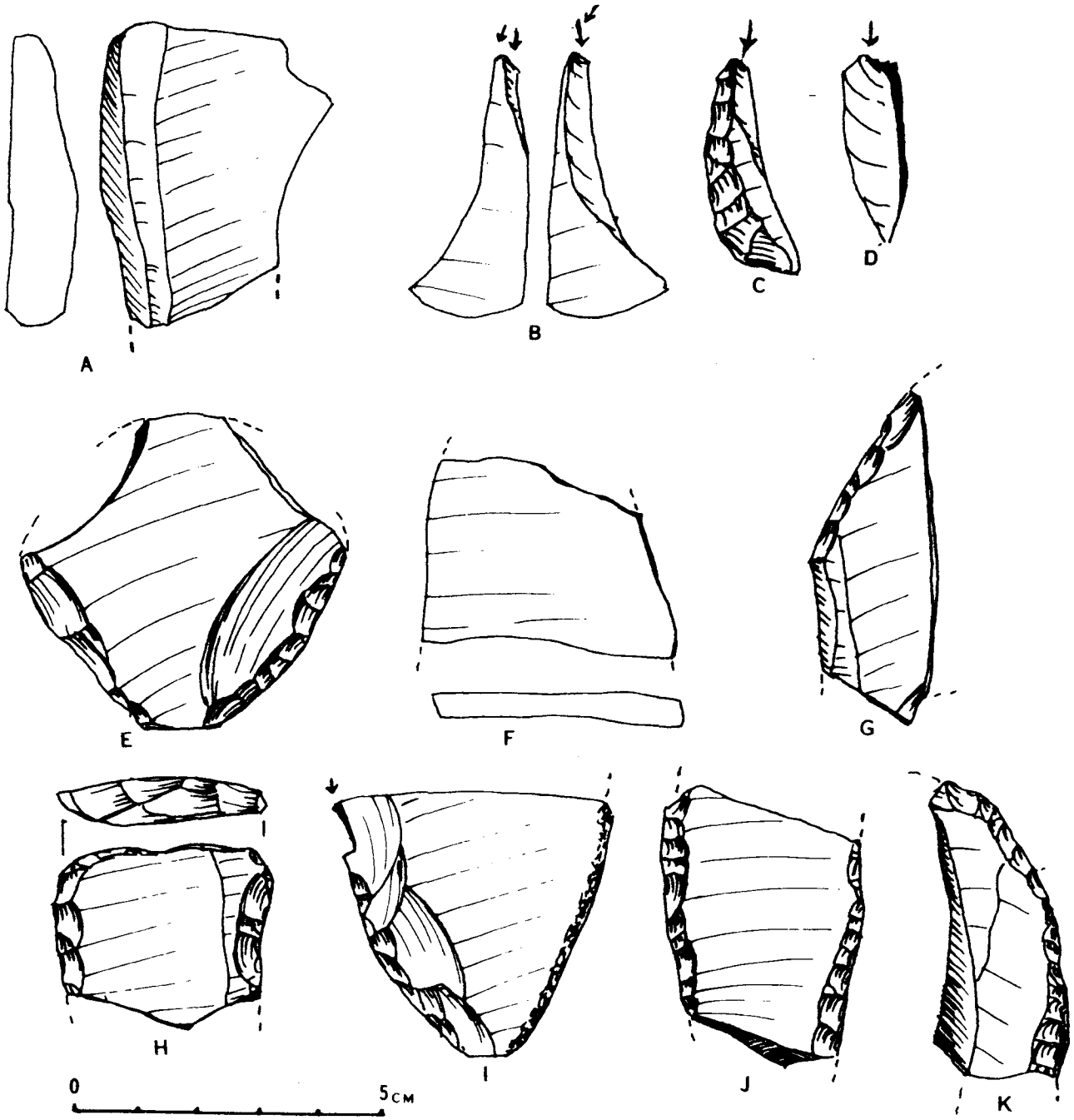

Fig. VIII-4 Spalls and reduced tabular pieces reutilized as bladelet cores, white flint (F4).

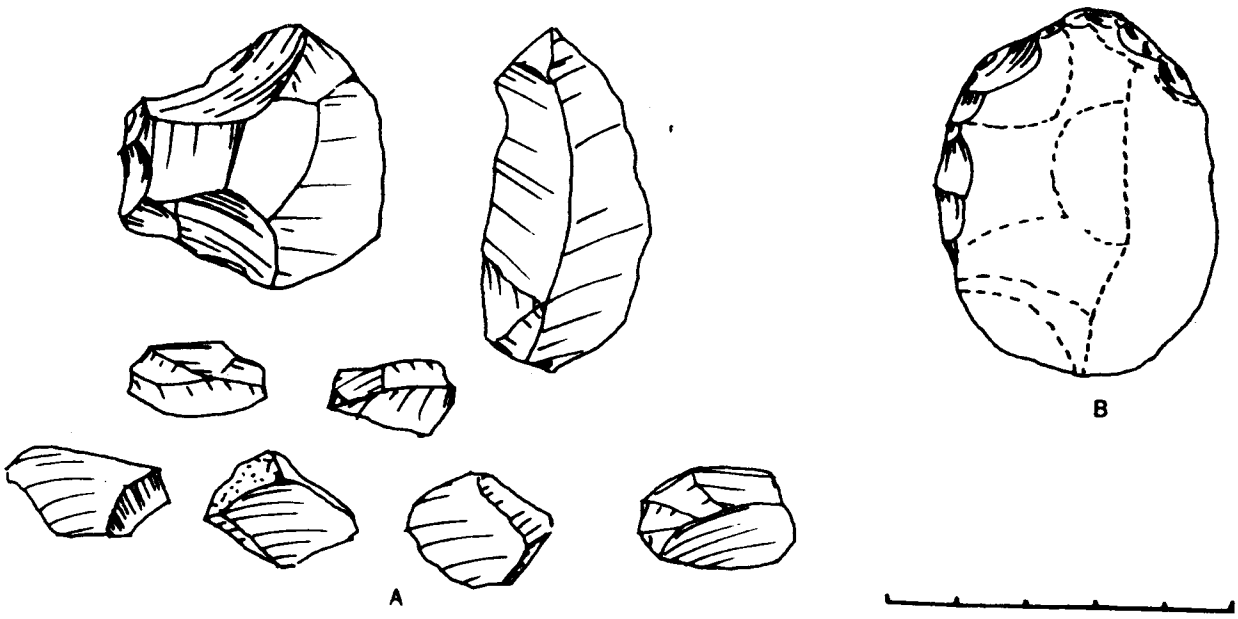

Fig. VIII-5 Blade, small flakes and "denticulate" piece derived from the reduction of an end-scraper on tabular flake; B, the scraper reconstructed from refitted pieces.

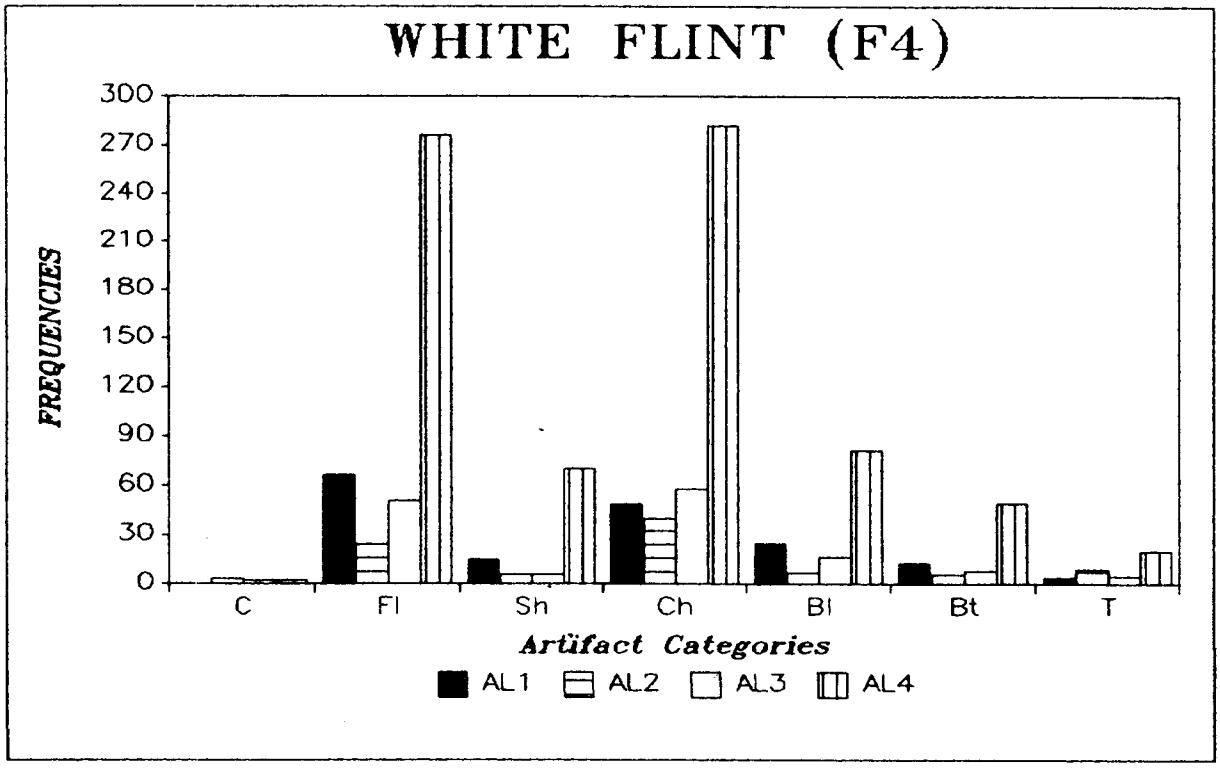

Fig. VIII-6 Frequency of white flint by artifact categories and by levels.

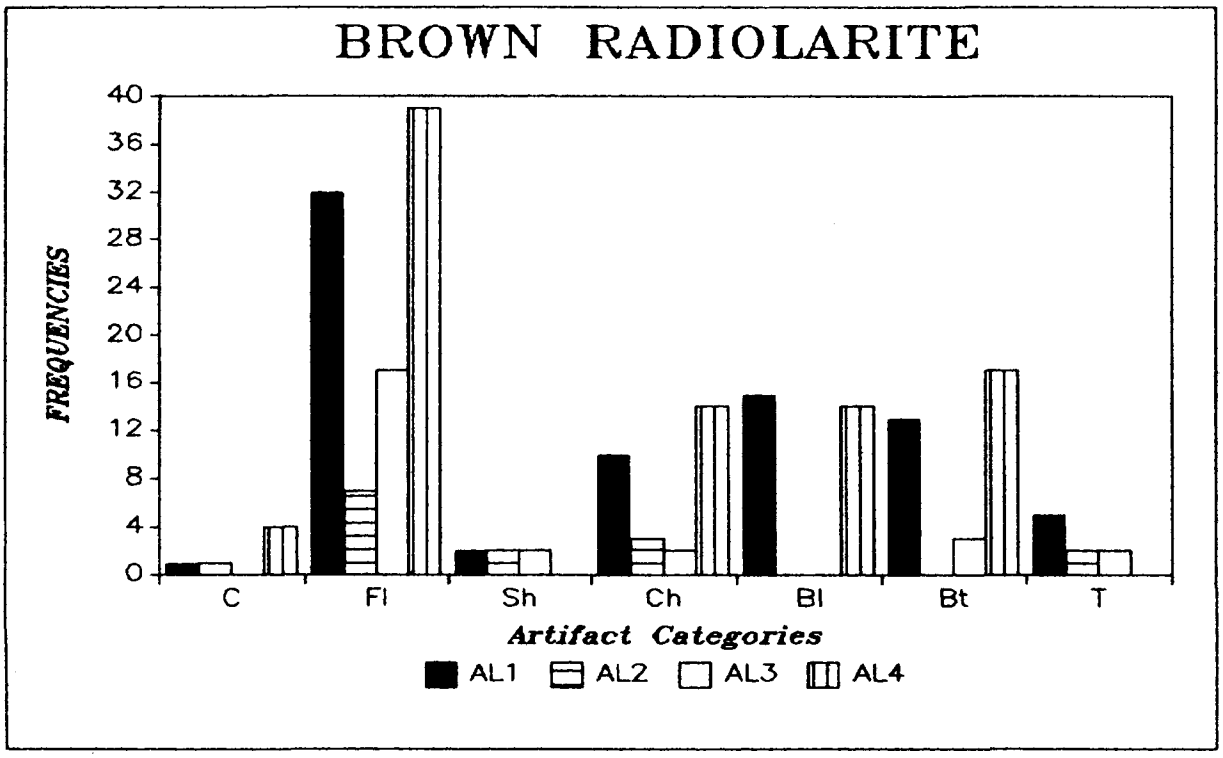

Fig. VIII-7 Frequency of brown radiolarite by artifact categories and by levels.

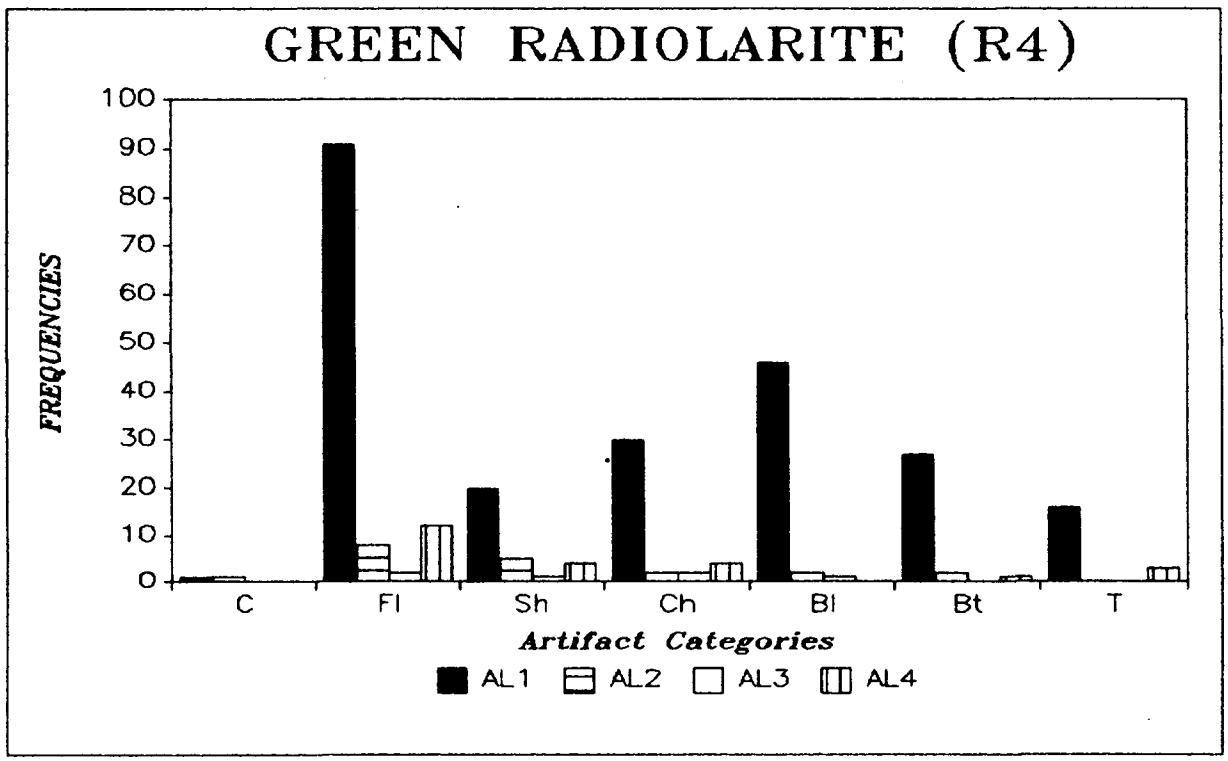

Fig. VIII-8 Frequency of green radiolarite by artifact categories and by levels.

Cap flakes removed from the end of pebbles were transformed into scrapers (Fig. VIII-2 A&B); split pebbles were turned into cores or denticulate tools (Fig. VIII-2 C&D). Small blades and spalls were drawn across tabular pieces producing burin like cores. Trimming flakes are numerous and shatter represents 11% to 12% of the artifact count. The by-products of F2 reduction are small irregular blade cores weighing between 10 and 30 grams *(cf. infra)*. Within the AL4 assemblage, the ratio of blades to cores is 7 to 1 , that of large tools is 5 to 1 and that of bladelets was 2 to 1; in all, a 15 to 1 ratio of usable products per core.

c) The white flint (F4) was the material that produced the most sizeable blanks. The small percentage of trimming flakes noted in AL2, AL3 and AL4 suggests that the blocks of materials were at least partially prepared before they were brought into the camp itself. However, an assemblage of a dozen trimming flakes found together in AL1 demonstrates that at least some complete nodules were brought in. It should be noted that the trimming flakes were found outside of the main concentration where they had been left whereas the core and usable blanks had been transported elsewhere. Thus far, our excavations have uncovered this single occurrence of the debitage of a complete flint nodule. Still, the find raises a number of questions concerning the presence, the relative importance and the localization of flint knapping workshops at the site. Testing of other areas of the site will be needed before these questions can be addressed.

Products of white flint debitage included blades and large tabular flakes. The latter were selected for the manufacture of scrapers and prismatic burins. Spalls removed by snap or by burin blow are evidence of the continued process of tool sharpening and recycling (Fig. VIII-4 B,C,D). Portions of the lateral edges of large, tabular scrapers were taken off (Fig. VIII-4 E, I, J). When completed, the process produced quadrangular blanks with lateral facets (Fig. VIII-4 F) sometimes retouched into fresh tools as well as spall-like bladelets and small blades. Scrapers made in this way are characterized by lines of abrupt retouch which cover the facet surface (Fig. VIII-4 H). A blade, several chips and a denticulate piece which, once refitted, showed that they resulted from the debitage of an end-scraper made on a tabular flake, illustrate the process of flake-core reduction (Fig. VIII-5). All categories of materials were used parsimoniously; however, the deliberate recycling of exhausted tools was especially practiced on white and grey flints (F4 and F5). Two factors account for this; first, the quality of the material and second, the larger size of the original cores from which tabular pieces and core-flakes could be obtained.

d) The grey flint (F6) is common in AL2 where cores, blanks, and waste are represented. Here again the lack of trimming flakes indicates that core preparation took place outside the habitation area. The material was used for the manufacture of larger tools. Bladelets and armatures are rare or absent.

e) The darker grey flint (F7) is represented in AL1 by a core and a range of tools, blades and flakes. Only a few pieces of this material were recovered from the lower levels. Other flint varieties (F8 and F9) are also represented by a few artifacts.

f) Radiolarites of all varieties were used primarily for the manufacture of smaller blades, bladelets and armatures in AL1 and AL4 (Fig. VIII-6 and 7). The trend is less clearly seen in AL2 and AL3 where radiolarites are less frequent. In the case of brown radiolarite, the ratio of core to blade and bladelets was 28 : 1 in AL1, 11.5 : 1 in AL4. The selection of radiolarite for the manufacture of larger tools, endscrapers and burins, was largely limited to AL1. In particular, AL1 flint knappers must have had access to sources of good quality, fine grained, green radiolarites. Chunks of coarse grained, greyish green radiolarite were recovered from AL2 and AL4. This material was used for the manufacture of large tabular pieces which were made into side-scapers and denticulates (cf. infra).

In summary, clear patterns of raw material selection and use are beginning to emerge from the analysis of the site assemblages. The white flint F4 was the preferred material at

all levels. Smaller size, more inclusions and heavier cortex rendered the F2 flint somewhat less desirable. The materials seem to have become less accessible toward the end of the Grubgraben occupation. Here, as at Willendorf, radiolarites were a complement rather than a primary source of raw materials.

It is difficult to evaluate the effect that long distance acquisition had on technology. Perhaps the limited access people had to material sources led to an increase in recycling. This, in turn, favored the "invention" and use of a greater variety of small sized tools and induced the development of the flake-core technique well suited to the production of small, spall-shaped blades.

Table VIII-2a Raw materials distribution

Level AL1

	number of artifacts	%	total weight in grams	%
F1	1	.17	7	.37
F2	19	3.33	115	6.06
F3	5	.88	2	.10
F4	174	30.53	693	36.55
F5	9	1.58	41	2.16
F6	5	.88	10	.53
F7	12	2.10	49	2.58
F8	0	0	0	0
F9	0	0	0	0
R1	87	15.26	212	11.18
R2	1	.17	0	0
R3	3	.53	6	.32
R4	220	38.59	676	35.65
R5	28	4.91	78	4.11
R9	1	.17	2	.10
Misc.	5	.88	5	.26
Total	570	100	1896 gr	100

Table VIII-2b

Level AL2

	number of artifacts	%	total weight in grams	%
F1	0	0	0	0
F2	13	4.90	124	7.49
F3	10	3.77	78	4.71
F4	95	35.85	654	39.52
F5	46	17.36	207	12.51
F6	20	7.55	89	5.38
F7	9	3.40	34	2.05
F8	0	0	0	0
F9	1	.38	1	.06
R1	15	5.66	95	5.74
R2	3	1.13	8	.48
R3	3	1.13	5	.30
R4	20	7.55	135	8.16
R5	28	10.56	223	13.47
R9	2	.75	2	.12
Misc.	0	0	0	0
Total	265		1655	

Table VIII 2bc

Level 3

	number of artifacts	%	total weight in grams	%
F1	1	.26	24	2.19
F2	93	23.97	314	28.70
F3	7	1.80	15	1.37
F4	146	37.63	295	26.96
F5	40	10.31	103	9.41
F6	27	6.96	74	6.76
F7	6	1.55	13	1.19
F8	0	0	0	0
F9	2	.52	11	1.01
R1	28	7.22	94	8.59
R2	8	2.06	26	2.38
R3	2	.52	5	.46
R4	6	1.55	8	.73
R5	15	3.86	83	7.58
R9	4	1.03	15	1.37
Misc.	3	.77	14	1.28
Total	388		1094	

Table VIII-1d

Level 4

	number of artifacts	%	total weight in grams	%
F1	13	.69	102	2.15
F2	451	29.98	1434	30.29
F3	76	4.04	352	7.43
F4	783	41.63	981	20.72
F5	224	11.91	689	14.55
F6	109	5.79	322	6.80
F7	8	.42	41	.86
F8	1	.05	1	.02
F9	5	.26	18	.38
R1	105	5.63	245	5.17
R2	23	1.22	79	1.67
R3	3	.16	1	.02
R4	24	1.27	68	1.44
R5	46	2.44	391	8.26
R9	4	.21	7	.15
Misc.	6	.32	3	.06
Total	1881		4734	