ARCHAEOLOGICAL AND PALEOENVIRONMENTAL RESEARCH AT LES TAMBOURETS: RESULTS OF THE 1975 EXCAVATIONS

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I. Introduction

The major purpose of this report is to present the results of research supported by National Science Foundation grant SOC75-11142 ("Archaeological and Paleoenvironmental Research at Les Tambourets, Southwestern France"), of which I was the Principal Investigator. It describes the field research activities undertaken in the summer of 1975 at the prehistoric site of Les Tambourets (commune de Couladère, Haute-Garonne, France) as well as analyses carried out between September 1975 and August 1978 at Tulane University and the Université de Bordeaux I. The report refers occasionally to the previously published results of the 1973 test excavation or sondage at the site (Bricker and Laville 1977), and the study of the assemblage sample from Archaeological Level 1 presented here (cf. section V-D) is based on a pooled sample of materials recovered in both 1973 and 1975. Research with archaeological materials and other data from Les Tambourets is continuing (for example, I will be carrying out full-time research in France between 15 September and 15 December 1978 while on sabbatical leave from Tulane University). The answers to some questions raised in the report, as well as data concerning comparisons between Les Tambourets and other sites, will come from work in progress. This is, then, a status report—a final report on one funded segment of an on-going project and an interim report on the project itself.

II. The Excavations of 1975

Field investigations were carried out at Les Tambourets in the summer of 1975 under the terms of Autorisation de Fouilles Archéologiques No. 0832, issued 20 March 1975 by the Service des Fouilles et Antiquités, Secrétariat d'Etat à la Culture, of the French government. The archaeological aspects of the project were under my general direction (M. J.-F. Alaux was associated with the direction), and the geological aspects were directed by Dr. Henri Laville. The excavation season extended for ten weeks, from 10 June through 20 August 1975.

An excavation grid was laid out congruent with that established in 1973 (Fig. 1). Two large metal-roofed shelters (Fig. 2b) and one small portable shelter were constructed to protect the excavators and the exposed archaeological levels from sun and inclement weather. A fence (13 x 17 m.) and locked gate were installed around the main area of excavations. A total of 44 m^2 was opened up, exposing 40 m^2 of the Palaeolithic archaeological horizons. At the end of the excavation season, on 21 August 1975, the main area of excavations was mechanically backfilled.

The following professional anthropologists, students, and amateurs assisted with the excavation (Figs. 2, 3, 4a, 5a) and laboratory tasks (Fig. 5b) during all or part of the ten-week field season:

Dr. Victoria R. Bricker (Tulane University, U.S.A.)
Miss Jacqueline Brind (Newquay, England)
Mr. Joe T. Cooper (Tulane University, U.S.A.)
Mr. A. P. Fowler (Sheffield, England)
Mr. John Fowler (Sheffield, England)
Mr. Marco J. Giardino (Tulane University, U.S.A.)
Miss Marla K. Hires (Tulane University, U.S.A.)
Miss Barbara E. Holmes (Tulane University, U.S.A.)
Dr. Arden R. King (Tulane University, U.S.A.)
Mrs. Isabella E. King (New Orleans, U.S.A.)
Miss Louise Lepie (Tulane University, U.S.A.)
Mr. J. C. M. McNee (University of Sheffield, England)
Dr. Paul Ossa (Skidmore College, U.S.A.)
Mr. Cliff Samson (University of Sheffield, England)
Miss Jeanne Trapolin (New Orleans, U.S.A.)

Mr. Alexander Marshack (Peabody Museum, Harvard University, U.S.A.) spent one day at the site applying specialized photographic techniques to a particularly difficult stratigraphic problem. Dr. David Lubell (University of Alberta, Canada) offered his time and the use of his surveying equipment to help me prepare a rough base map of the hilltop on which the site is located. Dr. Henri Laville (Université de Bordeaux I, France) spent several days at the site in early August 1975 consulting with me about the general program of paleoenvironmental research and collecting samples for sedimentological and palynological analysis (cf. section IX, below). M. Jean Clottes, Directeur des Antiquités Préhistoriques de Midi-Pyrénées, made a visit of inspection to the site in August 1975.

Many people contributed very generously of their time, advice, and other resources in order to make the field season and subsequent analyses possible. I gratefully acknowledge my indebtedness to the following:

--to all members of the excavation crew (mentioned above), who worked hard and well for very long hours, for much of the time under conditions of extreme heat and drought;

--to Dr. Lubell and Mr. Marshack, for their help at critical moments;

--to Dr. Laville, for his continuing invaluable assistance with the paleoenvironmental study and his general good humor and friendship, and to Mlle. Paquereau, for undertaking the study of the pollen of Les Tambourets;

--to Dr. Hallam L. Movius, Jr. (Harvard University, U.S.A.), for permitting me to use again much of the valuable excavation equipment belonging to the Harvard Dordogne Expedition or to him personally;

--to the National Science Foundation, for its support of this research through its grant (SOC75-11142) to Tulane University;

--to M. and Mme. P. Méroc, for their hospitality in Cazères, and for M. Méroc's continuing attenpts to make available to me the results of his father's previous research at Les Tambourets;

--to M. G. Manière, for his much appreciated aid and advice;

--to the owners and staff of the hotels in Cazères where we were lodged, fed, and otherwise very well cared for. In particular, to M. and Mme. Ponsaty and their family, and to Mme. Gouaze and Mlle. Gouaze, I am grateful for their special kindnesses;

--to Mme. Vadon of the Service des Fouilles et Antiquités and Mme. Blanchon of the Direction des Musées de France, for their special efforts to facilitate and expedite various matters necessary to my research;

--to Mr. Marco Giardino and Mr. Richard Beavers, for their help in the laboratory and darkroom after the excavations; and

--to my colleague, Dr. E. Wyllys Andrews V (Director of the Middle American Research Institute, Tulane University, U.S.A.), who kindly placed at my disposal the excellent darkroom facilities of the Institute.

I am particularly grateful to M. Léopold Sentenac and his family for their whole-hearted cooperation in finding ways in which their cultivation activities and our excavation activities could be carried out simultaneously in the same field. I am appreciative also of the material support they rendered on many occasions.

M. and Mme. Portet continued to make indispensible contributions to the research program. Without their offer of space, equipment, and materials for an on-site laboratory, the mundane problems of excavation and artifact processing would have been nearly insurmountable. I am very grateful to both of them for their help and interest.

The support and scientific advice of M. Jean Clottes has continued to make possible the work at Les Tambourets, and I acknowledge with deep appreciation his sympathetic direction of my activities.

Once again, I offer my warmest thanks to M. Yvon Dubois, to Mme. Dubois, and to their family for authorizing my work at Les Tambourets. Their many acts of kindness to me, to my wife and to all the members of the excavation crew were gratefully received as tokens of personal friendship that immeasurably enriched the conditions of scientific research.

III. Stratigraphy

Excavations during the 1975 season took place in three places within the southern sector of the site, just to the north of Route D.62 (Fig. 1):

a) a Main Area that represented an extension of the 1973 sondage in such a fashion that Squares A and B of 1973 became Squares V-A and V-B of the enlarged grid;

b) a test excavation, the Alpha Complex (Test Pit Alpha, Extension-1, and Extension-2), located nearly 50 m. west of the Main Area (Fig. 4b); and

c) a test excavation, Test Pit Beta, located nearly 30 m. east of the Main Area.

A. The Main Area

Four geological levels or couches (A to D) were recognized in the Main Area during the 1973 sondage. In June 1975, the back-filled material from a portion of Square V-B (Excavated to the surface of Couche C in 1973) was removed, and a test pit was dug into Couche C and the underlying sediments to a depth of 2.50 m. from the present surface. This geological test pit (Fig. 6a) provided an exposed face along the southwest corner of Square V-C from which Dr. Laville took a series of 42 sediment samples. The stratigraphic succession revealed in this column is described below (cf. Figs. 7 and 8 and Laville's report, Appendix A):

Couche A. (25-40 cm.) The plough zone.

Couche B. (25-50 cm.) A silty-clayey sediment at the top, changing to a more clearly clayey silt toward the base. At the bottom (the basal 5 to 15 cm.), Couche B contains a very rich lithic industry; this is Archaeological Level 1 (Châtelperronian).

Couche C. (ca. 40 cm.) A silty-sandy clay that contains numerous ferromanganese concretions of rusty or brown color. The upper 5 to 10 cm., which have been excavated extensively, contain a very sparse lithic industry apparently derived mechanically from the overlying Archaeological Level 1. The lower zones of Couche C (as well as all underlying stratigraphic units) have been sampled in small test pits only; they appear to be archaeologically sterile.

Couche D. (ca. 60 cm.) A silty-sandy clay, sticky and plastic when moist, variegated with bluish and rust-colored spots.

Couche E. (ca. 5 cm.) A thin (1 cm.), undulating level of quartz gravel in a silty-sandy clay matrix.

Couche F. (ca. 10 cm.) A silty-sandy clay with numerous ferromanganese concretions.

Couche G. (ca. 15 cm.) A hydromorphized silty-sandy clay with numerous beds of quartz gravel and numerous ferromanganese concretions.

Couche H. (ca. 10 cm.) A sediment of identical matrix to that of Couche G but with less gravel.

Couche I. (ca. 10 cm.) Matrix identical to that of Couche G; quartz gravel is abundant.

Couche J. (ca. 5 cm.) Same matrix; gravel is more rare than in Couche I.

Couche K. (ca. 5 cm.) Same matrix, with gravel once again abundant.

Couche L. (ca. 5 cm.) A true solifluction nappe formed of quartz gravel and small cobbles; very numerous ferromanganese concretions.

Couche M. (ca. 5 cm.) A silty-sandy clay with manifestations of hydromorphy. Quartz gravel and ferromanganese concretions are virtually absent.

A large post-Palaeolithic ditch or gully (shown as "fosse" on Figs. 1 and 7) was found in portions of Squares VI-B, VI-C, and VII-B. This feature, trending roughly north-south, had been dug or was eroded into the upper zone of Couche C, and thus it had removed Archaeological Level 1. At the surface of Couche C, the ditch was 70 to 80 cm. wide (Fig. 9). Four linear meters of the ditch were uncovered in the Main Area, and what appears to be the same feature was seen in the cleaned section of the D.62 (Gensac) roadcut, ca. 8 m. south of the excavated portion. The bottom of the ditch slopes gently to the south, approximately conformably with the modern land surface.

Only at the base of the feature, where it cut into Couche C, were the ditch walls visible in section, and only there could they be followed in excavation. There was absolutely no visible difference between the upper part of the ditch fill and the in situ Couche B to the east and west of the fill (Fig. 6b). Infrared photographs taken by Mr. Alexander Marshack of the south wall of Square VI-B shows a vague difference between the ditch fill and the Couche B sediments. The infrared photographs might be interpreted as showing a very irregular, partially undercut, partially slumped western wall of the ditch, but this is far from certain.

B. Test Pit Beta

Test Pit Beta (2 m. x 2 m.) was located as far east as possible without entering the area where the archaeological level crops out at the modern surface. The stratigraphic sequence in Beta is as follows:

Couche A. (ca. 40 cm.) The plough zone.

Couche B. (8-20 cm.) This is the lower part of the same clayey silt (loess) described for the Main Area. A sparse scatter of artifacts in its basal three to ten centimeters is considered to be an eastern extension of Archaeological Level 1. Châtelperronian.

Couche C. (ca. 40 cm.) A silty-sandy clay containing numerous ferromanganese concretions.

Couche D. (bottom not reached in excavation) A plastic clay, as described for the Main Area.

Because this sequence is essentially identical to that of the Main Area, Dr. Laville did not take sediment samples from Test Pit Beta, and a geological *sondage* was stopped before reaching the base of Couche D. One feature worthy of mention, however, was the presence of ancient frost wedges, originating in the base of Couche B or in Archaeological Level 1, extending down into Couches C and/or D, filled with loessic sediment.

C. The Alpha Complex

The excavation of Test Pit Alpha (2 m. x 2 m.) revealed that both the archaeological level and the surface of an underlying concretion-rich level similar to Couche C in the Main Area had a north-to-south slope greater than that of the modern surface. In order to investigate this context further, Test Pit Alpha was extended to the north by a trench (Extension-1 and -2), 4 m. x 1 m. A stratigraphic column was left in the northwest corner of Test Pit Alpha, from which Dr. Laville removed a continuous series of 27 sediment samples for sedimentological and palynological analyses.

The stratigraphic sequence of the Alpha Complex differs somewhat from that of the Main Area. Recognition of geologic units during excavation was rendered very difficult by the visual homogeneity of the deposits. Until correlation with the Main Area can be aided by palynological data, a separate terminology will be used for the Alpha Complex. Dr. Laville emphasizes the tentative nature of the Alpha sequence by describing a series of sedimentary "ensembles" below the plough zone, as follows (Fig. 10; cf. also Laville's report, Appendix A):

Couche A. (25-40 cm.) The plough zone.

Ensemble I. (ca. 65 cm.) A sandy-silty-clayey sediment, hard when dry and of crumbly texture, containing some ferromamganese concretions. Archaeological material very rare near the top (Very High Scatter; Châtelperronian and post-Palaeolithic), more frequent but still quite dispersed toward the bottom (High Scatter; Châtelperronian).

Ensemble II. (ca. 15 cm.) A sediment of identical matrix but containing some quartz gravel. This is the principal archaeological zone (Main Scatter) of the Alpha Complex. Châtelperronian.

Ensemble III. (ca. 6 cm.) A sediment of the same kind, separated because it lies between the base of the archaeological zone and the top of the visibly very different Ensemble IV. Very rare archaeological material (Low Scatter), probably derived mechanically from Ensemble II.

Ensemble IV. (ca. 20 cm.) A sediment having the same matrix but more indurated and containing very numerous ferromanganese concretions. The top of this ensemble is sharply defined but undulating (Fig. 10b). Sterile.

Ensemble V. (over 25 cm.; base not reached by excavation) A sediment of the same kind, but containing somewhat fewer ferromanganese concretions.

Starting in the lower part of Ensemble I, there are manifestations of hydromorphy that become more and more common with depth, down to the lower limit of excavation.

IV. Definition of Assemblage Samples and Other Series

A. <u>The Main Area</u>

The assemblage sample from Archaeological Level 1 is discussed first because other series in the Main Area are defined with reference to it.

<u>Archaeological Level 1</u> includes all objects from the dense scatter at the base of Couche B (Figs. 11 and 26). The top of the scatter can be recognized with fair accuracy during excavation because in most areas it is a reasonably sharp boundary. There is, however, no visible change in the nature of the sediments above and below the boundary (cf. Fig. 8), and in some areas the top of the scatter undulates markedly. For these reasons, the top of Archaeological Level 1 as defined during excavation has been checked against vertical backplots of the archaeological material (objects were plotted onto either north-south or west-east lines spaced 50 cm. apart), and adjustments in artifact assignment were made when necessary. The base of Archaeological Level 1 is even more difficult to define in the Main Area. In some places, the boundary between the bottom of the Couche B loess and the top of the altered, concretion-rich Couche C clay is sharp and visually distinct. In many areas (especially Squares A and B), however, the boundary is topographically irregular, and the two different sediments are mixed together in a "transitional zone" several centimeters thick.*

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*Such localized blurring of the stratigraphic boundary could very easily have resulted from trampling of the existing land surface during a rainy and therefore very muddy day at some time early in the Châtelperronian occupation. During a very rainy week in June 1975, the loess was so soft that ankle-deep penetration of the modern surface was common.

The base of the dense scatter too was therefore checked and corrected against the vertical backplots. As finally determined, the dense scatter varies in thickness from 3 to 12 cm.; its usual thickness is about 5 cm.

Couche C was sampled extensively only in its upper 5 to 10 cm. Where lower horizons were penetrated by geological sondages, Couche C was sterile. The artifact series from Couche C includes, therefore, objects from the upper zone of the sediments that the vertical backplots show to be clearly below the base of the dense scatter of Archaeological Level 1. As noted elsewhere in this report, some of the Couche C objects were found lying vertically within the fill of ancient animal burrows.

How to deal meaningfully with the objects from that portion of Couche B above Archaeological Level 1 has been an ever-present problem. The question of whether these sediments contained a post-Châtelperronian Palaeolithic occupation became even more relevant when both the sedimentology and palynology showed that a minor break in sedimentation not far above Archaeological Level 1 signalled the beginning of a less cold, more humid climatic oscillation. Although the location of this oscillation is clear in the V-B and V-C sample columns, there is absolutely no visible difference in the sediments that permits the location of a boundary in other standing section walls or during the course of excavation. Division of the Couche B archaeological materials into temporally meaningful series had, therefore, to be done indirectly and by approximation.

In the V-B sample column of the 1973 sondage (cf. section IX-A, below), the beginning of the oscillation is located at the base of sample B5, ca. 10 cm. above the top of Archaeological Level 1 in sample B8 (Fig. 31). In the V-C column of 1975, the base of the oscillation, sample Bb2, lies only 4 cm. above the top of Archaeological Level 1, sample Bb4. If the oscillation sediments are located between 4 and 10 cm. above the dense scatter, there is a 6 cm. zone of uncertainty—not much considering the thickness of many of the artifacts. The zone of uncertainty was arbitrarily divided in half; the bottom 3 cm. were assigned to the lower part of Couche B (ca. 4 cm. thick), and the oscillation sediments were assumed to begin 7 cm. above the top of Archaeological Level 1.

Using all field records plus the artifact backplots, the materials from Couche B were divided into two series:
Couche B:Basal—all objects lying 7 cm. or less above the top of the dense scatter of Archaeological Level 1, and
Couche B:Upper—all objects lying more than 7 cm. above the top of Archaeological Level 1 (plus a few pieces without coordinates but with a Couche B provenience).

That this approach is an approximation to stratigraphic reality is apparent. That it is the best that could be done is, I believe, also correct. That it was successful in isolating two very different kinds of archaeological series (as discussed further in section VIII, below) suggests strongly that the approximation was a close and temporally meaningful one.

Definition of the Ditch Fill series was hindered by the same stratigraphic uncertainty that created the problems in Couche B. The base of the ditch could be defined with stratigraphic precision (the absence of Archaeological Level 1 and the top of Couche C were, of course, quite visible during excavation), but the walls of the ditch above the dense scatter were totally invisible, in plan and section. The Ditch Fill series was conservatively defined; although it is likely that the walls of the ditch sloped upward and outward, only those objects lying vertically above some stratigraphically visible portion of the ditch's bottom were considered to be in the fill.

B. Test Pit Beta

With the exception of two objects found just below the plough zone, which were assigned to Couche B, all archaeological materials from Test Pit Beta formed part of the same thin, dispersed scatter and were therefore assigned to Archaeological Level 1.

C. The Alpha Complex

Test Pit Alpha was excavated in arbitrary spits parallel to the modern land surface. Because that surface is less strongly inclined than the archaeologically relevant Würm-age land surfaces, the original excavation units were stratigraphically meaningless. Once the true slope of the archaeological zone had been established in Test Pit Alpha itself, it was followed in the subsequent excavation of Extensions 1 and 2. Final definition of assemblage samples and series was based on the stratigraphic excavation of the extension squares checked and corrected against vertical backplots of the objects. Because correlations between the Main Area and the Alpha Complex cannot yet be made with certainty, different terminology is employed in the two areas.

The Main Scatter is the assemblage sample from the principal archaeological zone. The thickness of the zone within which the Main Scatter occurs is between 10 and 15 cm., coincident with sedimentary Ensemble II (and especially with samples II1 and II2). Objects from a zone 10-15 cm. thick just above the top of the Main Scatter are included in the High Scatter (= base of Ensemble I). The rare objects located higher up in Ensemble I are included in the Very High Scatter. An almost sterile zone of sediments (Ensemble III) separates the Main Scatter from the altered and concretion-rich Ensemble IV; the few objects found within it are included in the Low Scatter.

V. The Archaeological Materials from the Main Area

The archaeological materials from the Main Area at Les

Tambourets can be grouped into two very different kinds of series. Both the Couche B:Upper sample and the Ditch Fill sample represent a mixture of Châtelperronian and post-Palaeolithic artifacts from stratigraphically disturbed contexts. The other series, including the samples from Couche B:Basal, Archaeological Level 1, and Couche C, represents the principal Châtelperronian occupation(s); stratigraphic disturbance is minor, and the overwhelming majority of the archaeological materials are Palaeolithic. The descriptive analysis of the archaeological materials, beginning with the most recent, is presented here in the sections below, followed by a brief discussion of some of the differences among them and the possible functional significance of these differences.

A. <u>The Series from Couche B:Upper</u>

The so-called "Couche B:Upper" series contains the archaeological material from the higher remaining portions of the Couche B loess plus a few objects, from the 1973 <u>sondage</u> or from the 1975 excavations but without coordinates, whose exact provenience within Couche B is indeterminate. It includes 502 catalogued objects (Table 1)--221 flint artifacts, 6 non-flint artifacts, 250 cracked cobbles and unmodified manuports, and 25 ceramic fragments. Only 44 retouched tools can be tabulated in the 92-type list. The presence of three Châtelperron points, other backed tools, splintered pieces, and one of the characteristic flaking tools or specialized hammers attests to the Upper Palaeolithic component of the archaeological mixture. (As discussed further in section VIII, below, some of the "retouched tools" in this series and that of the Ditch Fill are apparently accidental products of post-Palaeolithic disturbance.) Artifacts made of stone other than flint include, in addition to the specialized hammer already mentioned: one heavy-duty (weight = ca. 300 g.) hammerstone, one lightly modified flaking tool, one cobble chopper, and (listed here for purposes of convenience) one very small flake of light green glass. The chopper, worked unifacially on a large flat cobble, has suffered extensive recent damage (probably by a plough), but the retouch creating the pointed working edge appears to be both ancient and deliberate. It is a classic Lower Palaeolithic type, similar to objects recovered from the higher terraces of the Garonne River in the general area. The high frequency of cracked cobbles (37.45% of all catalogued objects) is an important characteristic of the sample, as is the presence of an appreciable ceramic component (4.98% of the sample).

Ceramic materials were recovered from four units of analysis: Couche B:Upper, Ditch Fill, Archaeological Level 1, and Alpha Complex:Very High Scatter. Except for the three minute sherds from Archaeological Level 1 (found in the 1973 <u>sondage</u>), the entire ceramic sample is described globally in the following section.

TABLE 1.—Les Tambourets, Main Area, Excavations of 1973 and 1975. Typological Inventory of Assemblage Samples.

A. Retouched tools appearing in the type list of de Sonneville-Bordes and Perrot

Type	c.B:Up + Indet	c.B:Basal		Archaeol. Level 1		c.C	Ditch Fill
	n	n	%	n	%	n	n
1. End-scraper	–	–		25	4.88	–	–
2. Atypical end-scraper	1	2	4.00	19	3.71	1	1
3. Double end-scraper	–	–		2	0.39	–	2
4. Ogival end-scraper	1	–		4	0.78	–	–
5. End-scraper on retouched blade or flake	–	1	2.00	5	0.98	–	–
8. Discoidal scraper	–	4	8.00	29	5.66	1	–
12. Atypical carinate scraper	–	1	2.00	7	1.37	–	–
14. Flat nose-shaped or shouldered end-scraper	1	2	4.00	–		–	–
15. Nucleiform scraper	–	–		4	0.78	–	–
16. Rabot or Plane	–	–		3	0.59	–	–
17. End-scraper + Burin	–	–		1	0.20	1	–
18. End-scraper + Truncated piece	–	–		1	0.20	–	–
22. Perforator + Burin	–	–		1	0.20	–	–
23. Perforator	–	1	2.00	4	0.78	–	–
24. Bec or Atypical perforator	2	1	2.00	18	3.52	–	1
25. Multiple perforator or bec	–	–		1	0.20	–	–
26. Microperforator	1	2	4.00	–		–	–
27. Symmetrical dihedral burin	–	–		1	0.20	–	–
28. Asymmetrical dihedral burin	–	2	4.00	14	2.73	–	1
29. Transverse or transverse/oblique dihedral burin	–	–		20	3.91	–	–
30-A. Burin on broken surface	–	–		5	0.98	–	–
30-B. Burin on unretouched edge or end of blank	–	1	2.00	6	1.17	–	–
31. Multiple burin associating Types 27 to 30	–	–		7	1.37	–	–
35. Burin on straight, oblique truncation	1	–		4	0.78	–	–
36. Burin on concave truncation	1	–		4	0.78	1	–
37. Burin on convex truncation	–	–		1	0.20	–	–
38. Transverse burin on straight or convex lateral truncation	–	–		2	0.39	–	–
40. Multiple burin associating Types 34 to 39	–	–		2	0.39	–	–

Table 1 -(Continued).

Type	c.B:Up + Indet n	c.B:Basal n	c.B:Basal %	Archaeol. Level 1 n	Archaeol. Level 1 %	c.C n	Ditch Fill n
41. Mixed multiple burin, Types 27-30 + Types 34-39	-	-		2	0.39	-	-
43. Nucleiform burin	-	-		9	1.76	-	-
44. Flat-faced burin	-	-		1	0.20	-	-
46. Châtelperron point	2	1	2.00	18	3.52	-	-
47. Atypical Châtelperron point	1	1	2.00	3	0.59	-	-
57. Shouldered piece	-	-		2	0.39	-	-
58. Completely backed blade	2	-		6	1.17	-	-
59. Partially backed blade	1	1	2.00	8	1.56	-	-
60. Piece with straight, right-angle truncation	1	1	2.00	9	1.76	1	-
61. Piece with straight, oblique truncation	-	1	2.00	12	2.34	-	1
62. Piece with concave truncation	1	2	4.00	9	1.76	1	2
63. Piece with convex truncation	-	1	2.00	8	1.56	-	1
64. Bitruncated piece	-	-		1	0.20	-	-
65. Piece with continuous retouch on one edge	4	2	4.00	26	5.08	-	2
66. Piece with continuous retouch on both edges	2	-		3	0.59	-	-
74. Notched piece	11	12	24.00	92	17.97	4	7
75. Denticulate piece	4	8	16.00	25	4.88	-	4
76. Splintered piece	4	2	4.00	47	9.18	1	-
77. Side-scraper	3	-		21	4.10	1	-
84. Truncated bladelet	-	-		-		-	1
88. Denticulate bladelet	-	-		1	0.20	-	-
89. Notched bladelet	-	-		1	0.20	-	-
92. Other tools, not included in Types 1-91	-	1	2.00	18	3.52	-	-
Totals	44	50	100.00	512	100.06	12	23

Table 1 -(Continued).

Indices	c.B:Up + Indet	c.B: Basal	Arch. Level 1	c.C	Ditch Fill
Scraper index (IG)	-	20.00	18.55	-	-
Aurignacian scraper index (IGa)	-	6.00	1.37	-	-
Perforator index (IP)	-	8.00	4.49	-	-
Burin index (IB)	-	6.00	15.23	-	-
Dihedral burin index (IBd)	-	6.00	10.35	-	-
Truncation burin index (IBt)	-	0	2.34		
Périgordian Group index (GP)	-	16.00	14.84	-	-

B. Total sample

	c.B:Up + Indet	c.B: Basal	Arch. Level 1	c.C	Ditch Fill
Listed retouched tools	44	50	512	12	23
Blades with miscellaneous retouch	3	1	21	0	2
Flakes with miscellaneous retouch	9	8	60	6	8
Burin and miscellaneous spalls	2	1	51	0	2
Nuclei	4	5	163	2	5
Unretouched blades	16	38	347	12	6
Unretouched flakes	117	127	1467	48	53
Unretouched chunks	26	29	393	8	19
Non-flint artifacts	6	0	14	0	5
Unmodified manuports	62	12	112	4	39
Cracked cobbles	188	13	103	4	65
Ceramic fragments	25	0	3	0	11
Total catalogued objects	502	284	3246	96	238

B. Ceramic Materials

The potsherds and other ceramic fragments from Les Tambourets are few and, for the most part, quite small. Because a full and meaningful ceramic analysis cannot be based on such a sample, it is here divided into eight "groups" for purposes of description. Some of the groups are further subdivided, and indeed the whole spirit of classification of these materials has leaned far more toward splitting than lumping. Table 2 shows the

TABLE 2.—Les Tambourets. Distribution of Ceramic Artifacts in Couche B:Upper, Ditch Fill, and Alpha Complex:Very High Scatter.

Ceramic Groups	c.B: Upper	Ditch Fill	Alpha V.Hi	Total
1. Bricks	1	2	1	4
2. Amorphous eroded lumps	9	3	-	12
3. Untempered red ware	5	-	-	5
4. Tempered red ware	3	-	-	3
5. Tempered brown ware	2	2	-	4
6. Tempered gray ware	4	1	-	5
7. Glazed red ware	1	2	-	3
8. Unglazed slipped red ware	-	1	-	1
	25	11	1	37

(+ 3 sherds in Archaeological Level 1, not shown here)

frequency of each ceramic group in the several units of analysis. The objects in groups 3 to 8 are vessel sherds; those in group 1 are not, and those in group 2 are probably not.

Group 1. Bricks. Group 1 contains four objects, of dark red to reddish-brown paste, tempered with sand (including water-rounded quartz grains), grit, and small water-rounded gravel. The ceramic is soft (Mohs hardness <2), and all fragments are heavily eroded. The largest fragment has both top and bottom surfaces preserved; the thickness is 32 mm. It is apparently a fragment of the square flat bricks found in old structures of the region.

Group 2. Amorphous eroded lumps. This group contains 12 objects. A fine, uniformly orange-red paste is lightly tempered with fine grit (?crushed quartz) and occasional small gravel. One fragment may be grog-tempered, but the inclusions may well be natural impurities in the clay. The ceramic is very soft (Mohs <2), and all objects are so heavily eroded that no exterior surfaces are preserved. The dimensions vary, but all fragments could have come from objects with a maximum thickness of 2 cm. They are probably heavily weathered tile or brick fragments.

Group 3. Untempered red ware, divided into two subgroups. Subgroup 3A (two sherds) has a very fine, uniformly orange-red paste with no apparent temper. It is very soft (Mohs <2) and easily eroded, showing no apparent slip or surface decoration. The largest sherd (Fig. 12, 860) is probably a vessel support, with a basal diameter of 34 mm. The paste of subgroup 3B (three sherds) contains very small mica flakes, and the ceramic is slightly harder (Mohs 2-3). One sherd is a rim fragment (Fig. 12, 1142); the interior wall is striated (?scraped when plastic) in sub-parallel sets. The sherd is too small to permit determination of aperture diameter.

Group 4. Tempered red ware. The three sherds in this group have a fine, moderately hard (Mohs 2-3) paste tempered with water-rounded gravel. The paste fires to an orange-red color either throughout or, on one sherd, at the walls only with a gray core preserved. Vessel wall thickness ranges from 9 to 11 mm. The exterior surface is smooth and matte; the interior surface is irregular (bumpy) and striated in sub-parallel sets. One small sherd (Fig. 12, 944) is a rounded self-rim. Vessel size and shape are indeterminate.

Group 5. Tempered brown ware. Group 5 contains four sherds, all but one so eroded that no exterior surfaces are preserved. The paste is coarse, uniformly reddish-brown, moderately hard (Mohs 2-3), and tempered with medium and coarse grit. Surface treatment of the most nearly intact sherd is nevertheless indeterminate; vessel wall thickness is 6 mm. Vessel size and shape are unknown.

Group 6. Tempered gray ware, divided into two subgroups. Subgroup 6A (three sherds) has a coarse paste, dark gray in the interior of the wall but fired to a dark reddish-brown at both surfaces. It is moderately hard (Mohs 2-3) and abundantly tempered with medium-sized grit. The exterior surface was roughly smoothed while plastic to give an unslipped matte finish. The interior was scraped while plastic—roughly near the vessel bottom, producing gross channelling, and more carefully higher up, producing irregular striations. One sherd (Fig. 12, 881) is from a vessel with a basal diameter of ca. 8 cm. Another (Fig. 12, 2438), again from the base of a flat-bottomed vessel, retains the spiral configuration of the coiling technique of manufacture and is apparently bounded by a coil-line fracture. It varies in thickness from 9 to 10 mm. Subgroup 6B (two sherds) differs from 6A in that the paste color is uniformly light gray throughout and the grit temper is both finer and less abundant. Vessel wall thickness ranges from 6 to 8 mm.

Group 7. Glazed red ware, divided into two subgroups. Subgroup 7A (two sherds) has a fine, uniformly red to orange-red paste, of moderate hardness (Mohs 2-3), and with no apparent temper. Because the glaze is quite hard (Mohs >4), both sherds are well preserved. One, possibly from a plate, is a triangular fragment ca. 20 mm. on a side and 6 mm. thick. The exterior (lower) surface bears fine striae in parallel sets, indicating a wheel-thrown vessel, covered with a thin colorless glaze. The interior (upper) surface has a thin white slip covered with a thicker but nearly transparent glaze. The second sherd (thickness = 7 mm.) could be from nearer to the rim of the same plate. It has a striated exterior surface covered with a thin greenish glaze. The interior surface bears an incised decoration covered with a thin white slip and then with glaze. Most of the interior glaze is green, but at one edge of the sherd there is a slight carination beyond which the glaze is nearly transparent. Subgroup 7B (one sherd) differs from 7A in that the paste is tempered with fine and medium grit. Both techniques of manufacture and exterior surface treatment are indeterminate; on the interior surface, a thin greenish-brown glaze directly overlies the unslipped paste. Vessel wall thickness is 6 mm.; vessel size and shape are indeterminate except that it is not a plate.

Group 8. Unglazed slipped red ware. This group is represented by a single sherd of fine, uniformly red, moderately hard (Mohs 2-3), micaceous paste with no apparent temper. Although erosion has destroyed the exterior surface, the remaining vessel wall thickness is 14 mm. The interior surface, quite smooth, bears a cream-colored slip. Vessel size and shape are indeterminate.

C. The Assemblage Sample from Couche B:Basal

The Couche B:Basal assemblage sample contains objects recovered from the lower zone of the Couche B loess, between the dense tool scatter of Archaeological Level 1 and the slight stratigraphic break signalling a climatic oscillation. The series contains 284 objects (Table 1)—259 flint artifacts and 25 cracked cobbles and manuports. There are no non-flint artifacts and no ceramic artifacts. Fifty of the retouched tools figure on the 92-type list; type percentages and indices may be regarded as roughly indicative of the characteristics of the assemblage, but sampling error is, of course, a serious problem. The Châtelperronian nature of the series is not in doubt; it contains scrapers, Châtelperron points, and other tools that are characteristic of the Tambourets:1 assemblage. Although some of the typological indices, based on inadequate sample sizes, appear quite different from those of Archaeological Level 1, there are no significant differences between these two series in frequencies of scrapers, burins, and backed tools (Chi-square = 2.37, df = 2, $.50 > P > .25$). The tool inventoried as Type 92 is a combination tool, a dihedral burin combined with a side-scraper.

Five nuclei are present in the series—two prismatic, one tabular, and two ébauches. Both manuports (4.23%) and cracked cobbles (4.58%) are infrequent.

Whether Couche B:Basal represents a separate Châtelperronian occupation, slightly more recent than that (or those) of

Archaeological Level 1, is a question that cannot be answered firmly with the evidence at hand. It probably does not; the artifact scatter in the 7 cm. zone cannot be interpreted as forming one or more levels of objects. It is probably the case that the Couche B:Basal series is composed of pieces mechanically derived from the underlying Archaeological Level 1.*

D. The Assemblage Sample from Archaeological Level 1

1. Introduction. As a result of the 1975 excavation season, the assemblage sample from Archaeological Level 1 (= Tambourets:1) was increased from 687 to 3246 objects (Table 1). The number of graphed tools (Fig. 13) increased from 122 to 512. Enlarging the sample changed significantly** our knowledge of the assemblage; recovery of artifacts from a wider area corrected, in part at least, the biased information obtained from Squares V-A and V-B, in which some tool classes were strongly clustered (Bricker and Laville 1977:513). The greatest distortion in the smaller sample was the over-representation of burins, with IB much larger than IG. Most of the typological indices remained very similar, however. The paucity of Châtelperron points, 3.28% of the sondage sample, remains a characteristic of the larger sample (4.10%).

As shown in Table 1, scrapers (IG = 18.55) are now slightly more numerous than burins (IB = 15.23). All objects contributing to the low Aurignacian scraper index (IGa = 1.37) are "atypical carinates", steep end-scrapers made on thick chunks that have no necessary relationship to the Aurignacian toolmaking tradition. Perforating tools are infrequent (IP = 4.49), and most are short, stubby becs. The burin series is composed predominantly of dihedral burins (IBd corrected by removing Types 30-A and 30-B = 8.20); truncation burins are rare (IBt = 2.34, including one truncation burin tabulated as Type 44). Just over half the contribution to the characteristic Périgordian group index (GP = 14.84) is made by truncated pieces (7.62%), but, as discussed further below, these are a miscellaneous lot,

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*One interesting, but not conclusive, datum comes from the fitting together of artifact fragments found in two separate locations. Nine such joins were made of artifact pairs from the 1975 excavations in the Main Area. The fragments of only one pair came from different stratigraphic levels: one piece of a discoidal scraper (Fig. 15, 1295+2244) was found in Archaeological Level 1 in Square VII-B; the other fragment came from Couche B: Basal in the same square.

**A Chi-square test of frequency difference run on a contingency table containing the raw frequencies used to calculate the standard typological indices (IG, etc.) shows that the difference between the 1973 sondage sample and the enlarged sample containing the results of both seasons' work is a significant one (Chi-square = 13.91, df = 5, $.025 > P > .010$).

typologically far removed from the well made truncated pieces of the Upper Périgordian.

The Tambourets:1 industry is very largely a flake industry—63.09% of the retouched tools are made on flakes, 5.08% on chunks, and only 31.83% on blades. Of all the major tool classes, only backed tools and truncated pieces are made more often on blades than on other blanks. Despite the low frequency of blades in the tool sample, they were apparently used preferentially for tool manufacture when available; blade frequency in the sample of chipping debris is only 15.72%. Chauchat (1968:51) defines two blade indices (<u>indices laminaires</u>) in his study of the Basté:3bM Châtelperronian assemblage. A total blade index (I. Lam. T.) is the proportion of all chipped stone objects (except nuclei, chips, etc.) that are blades; it is a measure of blade production. A restricted blade index (I. Lam. R.) is the proportion of all retouched tool blanks that are blades; it is a measure of blade use. The Tambourets:1 values are as follows:

I. Lam. T. = 20.33

I. Lam. R. = 31.83

Although the Tambourets:1 industry is predominantly a flake industry, the flakes (and other tool blanks) are produced from a series of nuclei that are Upper Palaeolithic blade cores in their overall design (cf. description of nuclei, below).

Tools made from stone other than flint are rare; they are primarily hammerstones or flaking tools of several kinds. The cracked cobbles and unmodified cobble manuports are not components of the loess in which the archaeological level is located, and most of them must have been introduced into the living area by human action. They are most frequently of quartzite, but pegmatite quartz and grauwacke are also common. Some of both the cracked and the unmodified cobbles are discolored (reddened or blackened), probably from heat. Although none shows a typical hammerstone damage pattern, the cobbles could have been used in the primary reduction of flint nodules, as well as for cooking. The three very small potsherds, all from a small area in Square V-B, are obviously a result of some minor and undetectable disturbance, possibly by burrowing animals, that transported to a lower level some of the ceramic fragments that are present in higher levels of Couche B.

2. <u>The scraper series</u>. The Tambourets:1 scraper series does not fit easily into the established typological categories for the Upper Palaeolithic, and the 92-type inventory of the series is, therefore, more misleading than enlightening. For purposes of descriptive analysis, the series is divided into somewhat broader but still familiar categories (end-scrapers, etc.), but, as discussed further below, even this division is too arbitrary to accord well with reality.

End-scrapers are scrapers, on blades or flakes, on which the scraping edge is limited to one <u>end</u> of the piece, at an approximate right angle to the bulbar axis; on chunks, with an indeterminate orientation, the scraping edge is strictly limited and has a morphology similar to those on the more common flakes and blades.

Side-scrapers are made on flakes or chunks, but the scraping edge modification is limited to the side (or both sides) of the blank, approximately parallel to the bulbar axis.

End-and-side-scrapers are also made on flakes and chunks. The scraping edge occurs on all or part of one end and continues—with little or no break in the line of retouch—down all or part of one side. There may or may not be a clean break in angle between the two components of the scraping edge.

On discoidal scrapers, made on flakes, the scraping edge modification affects all or the great majority of the circumference of the piece except for the original striking platform of the blank.

3. End-scrapers. The studied sample of end-scrapers includes 51 single tools, 2 double ones, and 2 occurring as combination tools—a total of 57 scraping edges. The greatest number of scraping edges are irregular (36.84%) (Fig. 15, 1957), but many have an arc of circle (26.32%) (Fig. 15, 1706; Fig. 16, 2711) or regular asymmetrical (17.54%) (Fig. 16, 2714) shape. The arc of circle scraping edge, a form common in Middle Périgordian series, is best described in terms of the size (radius) of the circle in question plus the extent of curvature (degrees of arc along which the scraping edge follows the circumference).* The Tambourets:1 arc end-scrapers have a mean radius of 1.88 cm. and a mean arc of 113°. The scraping edge angle is most frequently (47.37%) "medium" (the angle between it and the ventral surface is between 51° and 75°), but many edges are either steep (76°-85°; 35.09%) or perpendicular/overhanging (>85°; 12.28%), usually a result of heavy use and reworking. The pattern of retouch removals forming the scraping edge is almost always (92.98%) non-convergent, and the cross-section of the blank at the scraping edge is nearly equally distributed among triangular (29.82%), trapezoidal (36.84%), and amorphous (33.33%). Most commonly the scraping edge is not mounted "squarely" at the end of the blank, in line with its working axis, but rather is placed asymmetrically either to the left (33.33%) or to the right (26.32%). Such asymmetrical mounting of the edge on the blank is modal for all scraping edge shapes. The width and thickness of the 57 scraping edges are distributed as follows:

width: $\bar{X}$ = 28.58 mm.; s = 8.83 mm.

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*The attribute system used for end-scrapers is described more fully in Movius et al. 1968:9-17.

thickness: $\bar{X}$ = 10.86 mm.; s = 5.05 mm.

The relationship between these estimates ($\overline{Th} \times 100 / \overline{W} = 38.00$) indicates a thick, "blocky" scraping edge (e.g., Fig. 15, 1881).

The majority (64.71%) of the 51 single end-scrapers in the Tambourets:1 series are made on flakes (Fig. 15, 1881; Fig. 16, 1627) (blades = 25.49%; chunks, e.g., Fig. 16, 2711, = 9.80%). Not surprisingly, then, the blank contour is usually irregular (70.59%); only seven examples (13.73%) occur on the parallel-sided blank used for the classic Upper Palaeolithic end-scraper. Nearly half of the blanks are broken, but the mean lengths of the 29 complete (49.45 ± 9.57 mm.) and the 22 broken (44.82 ± 14.46 mm.) blanks are not significantly different (t-test for differences of means of two samples where $s_1^2 \neq s_2^2$; $P_{1\text{-tailed}} > .05$). It seems likely, therefore, that the artificers frequently chose convenient broken blanks on which to manufacture end-scrapers. The distributions of blank width and thickness are as follows:

width: $\bar{X}$ = 36.69 mm.; s = 8.77 mm.

thickness: $\bar{X}$ = 16.73 mm.; s = 7.21 mm.

There is no significant correlation between the width of the scraping edge and the maximum width of the blank ($r = 0.13$; $P > .10$). Because most of the blanks are irregular, this is not surprising, but it does point up the ability of the Tambourets artificers to produce their desired tool morphology from difficult raw material. Eight single end-scrapers bear some kind of marginal retouch, usually partial, and ten have some marginal notching (Fig. 15, 1706, 1957).

In summary, the Tambourets:1 end-scraper series may be characterized by:

a) the use of irregular blanks, often thick flakes, to manufacture heavy, blocky scraping edges that are frequently damaged and/or reworked to a very steep angle; and

b) the appearance of some very regularly worked scraping edges (regardless of the nature of the blank), including, for over one-quarter of the series, the arc of circle form that is characteristic of and even more frequent in the Middle Périgordian.

4. Side-scrapers. Nineteen pieces in the scraper series are considered to be side-scrapers—15 singles (Fig. 15, 3219; Fig. 16, 3711), 3 doubles (Fig.16, 4057), and 1 "combination tool" made on the edge of a nucleus (not a modification of the striking-platform/core-face junction). All but one are made on flakes (the exception is made on a chunk), and fourteen of the blanks are cortical. On single side-scrapers, the scraping edge is most often (n = 12) on the right margin (with reference to the bulbar axis); one single scraper and one edge of a double are inversely retouched. The retouch angle on the 22 scraping edges is almost always medium (45.45%) or steep (45.45%), and

all retouch is non-convergent. Scraping edge dimensions are as follows:

edge "width": $\bar{X} = 32.05$ mm.; $s = 11.34$ mm.

edge thickness: $\bar{X} = 11.50$ mm.; $s = 4.53$ mm.

The dimension that is here designated edge "width" is, of course, parallel to the bulbar axis and might more properly be termed edge length, but it is functionally homologous to edge width of end-scrapers. Side-scraper blanks have the following dimensions (sample size varies because some pieces are fragmentary):

length: $\bar{X} = 57.11$ mm.; $s = 11.63$ mm.; $n = 18$

width: $\bar{X} = 53.71$ mm.; $s = 13.65$ mm.; $n = 17$

thickness: $\bar{X} = 21.42$ mm.; $s = 9.74$ mm.; $n = 19$

The most instructive element of the descriptive analysis of side-scrapers is a comparison between their scraping edges and those of end-scrapers. Many side-scrapers (e.g., Fig. 16, 3711, 4057) could easily be considered end-scrapers on flakes on which the scraping edge was more-or-less transverse to the bulbar axis, but there is, in addition, a general similarity between the kinds of scraping edge mounted on the two arbitrarily separated tool classes. This is best seen in a comparison of edge dimensions: neither mean edge width nor mean edge thickness differs significantly betwen end-scrapers and side-scrapers (as tested by Student's t; for edge width, $t = 1.44$, $.20 > P > .10$; for edge thickness, $t = 0.52$, $.70 > P > .60$). Classic typological understandings would lead one to expect that the scrapiing edge of a side-scraper would be very different from that of an end-scraper, but that is not the case in the Tambourets:1 series. Moreover, the similarity is even more specific. When the side-scraper edges are studied as if they were found on end-scrapers, the frequency of the arc of circle contour (31.82%), the most regular and patterned of the contours (e.g., Fig. 15, 3219), does not differ significantly from that in the end-scraper sample (Chi-square = 0.24, df = 1, $.75 > P > .50$). The arc of circle scraping edges of side-scrapers are, furthermore, similar to those on end-scrapers in their metric characteristics. Although the mean degrees of arc in the side-scraper sample (90^o) is somewhat smaller than that in the end-scraper sample (113^o) ($t = 1.78$. $.05 > P_{1\text{-tailed}} > .025$), the mean radius of circle (2.07 cm.) is not significantly larger than the end-scraper value (1.88 cm.) ($t = 0.57$, $.30 > P_{1\text{-tailed}} > .25$).

The general point is clear: despite the fact that customary typological sorting has separated end-scrapers from side-scrapers, the Tambourets artificers were creating extremely similar scraping edges on a varied range of blanks, blades and flakes, without treating the relationship of the edge to the bulbar axis as a significant variable.

5. End-and-side-scrapers. The 13 end-and-side-scrapers in the Tambourets:1 series are all made on flakes, 6 of which are cortical. On most examples (n = 10), the retouch continues from

the end down all or part of the left side. The scraping edge retouch usually varies through a range of angles, but most of the edge is either medium (n = 5) or steep (n = 5). The dimensions of the scraping edge and the blank are as follows:

	$\bar{X}$	s	n
edge width	49.46 mm.	9.42 mm.	13
edge thickness	14.46	7.36	13
blank length	55.75	12.07	12
blank width	50.54	8.34	13
blank thickness	20.91	8.77	11

The "edge width" dimension begins to lose utility with this tool class because the scraping edge itself is often so extensive that a line connecting its extremities has little relationship to the presumed functioning of that edge.

6. Discoidal scrapers. Discoidal scrapers, although not numerous, are a very distictive element of the Tambourets:1 scraper series. The studied series contains nine pieces, one of which is inversely retouched, all on flakes. The blanks are frequently cortical (n = 5) (Fig. 15, 1295+2244), and the length and width dimensions are nearly equal (mean length of seven examples = 47.00 ± 7.57 mm.; mean width of five examples = 49.00 ± 8.54 mm.). The scraping edge extends along all or most of the circumference except for the striking platform and the immediately adjacent margin (Fig. 17, 2776, 2045). The retouch angle varies along the line of edge, but it is always medium or steeper. The scraping edge is thick ($\bar{X}$ = 16.67 ± 3.67 mm.), thicker than that of either end-scrapers (t = 3.31, $.005 > P_{1\text{-tailed}} > .0005$) or side-scrapers (t = 3.05, $.005 > P_{1\text{-tailed}} > .0005$) but not of end-and-side-scrapers (t = 0.83, $.25 > P_{1\text{-tailed}} > .20$). The robusticity of the edge indicated by its thickness and lack of acuity may suggest a "heavy-duty" function, a suggestion that is strengthened by the frequently fragmentary condition of this tool class.*

7. Discussion of the scraper series. The series so far available for study suggests that the Tambourets artificers were producing two generally different kinds of scrapers. The first kind, tabulated as end-scrapers and side-scrapers, has a more limited and thinner scraping edge mounted with various orientations on various kinds of blanks, especially flakes. There is a virtual typological continuum from end-of-blade scrapers (Fig. 15, 1706), to well made end-scrapers on thin, short flakes (Fig. 16, 1627), to pieces with scraping edges of similar size on thick flakes (Fig. 15, 1881) or chunks (Fig. 16, 2711), to similar

*In addition to the nine examples complete enough to be studied, the Tambourets:1 assemblage contains at least six smaller fragments that are probably pieces of discoidal scrapers.

morphologies on the sides of flakes (Fig. 16, 3711, a small scraping edge, or Fig. 15, 3219, a very wide one, or 4057, a double).

The second kind, discoidal scrapers, has a more extensive and thicker scraping edge mounted on sub-circular flakes. The tools described as end-and-side-scrapers appear to be a residual and perhaps heterogeneous category; they do not seem to form a transitional link between the two other kinds. One general conclusion of the study is that although the artificers were differentiating between different kinds of scraping edges, they were accepting great variation in the kinds of blanks used to produce them--the tool is imposed on the blank rather than being determined by it.

Because side-scrapers in Tambourets:1 are morphologically so closely related to end-scrapers, their presence in the assemblage does not give the scraper series a Mousterian character. Typically Aurignacian scrapers (carinates, etc.) are absent.

8. Burins. There are 72 pieces in the Tambourets:1 burin sample, including 9 double burins, 2 mixed burins, and 3 burins as parts of combination tools. Damage, unsuccessful resharpening, etc. reduce the studied sample to 72 burin edges--55 on single tools, 12 on doubles, 3 on mixeds, and 2 on combination tools. The majority of the burins are dihedral burins (56.94%) (Fig. 18, 3249; Fig. 19, 1545), with lesser frequencies of retouched truncations (16.67%) (Fig. 18, 1853, 4842), breaks (11.11%), unretouched edges or ends (11.11%) (Fig. 17, 3870), and retouched ends (4.17%). Because of sample size limitations, most of the analysis concerns dihedral burins and the combined sample of truncation and retouched end burins. Two of the retouched truncations are inverse (Fig. 18, 4842), and one is created by a single blow. Some modification of the striking platform or burin edge is found on seven examples. Most commonly, a small removal or series of removals originating from the (already existing) spall facet narrow or otherwise regularize the burin edge (e.g., Fig. 18, 1853; as seen in the end view, signalled by an arrow, two successive removals from the spall facets on the side of the piece have obliterated a small portion of the retouched truncation and have effectively reduced the width of the burin edge by approximately half). This technique of edge modification, particularly common in later Noaillian assemblages but found elsewhere as well, has been described by David (1966; Movius and David 1970) as "tertiary modification". It appears here on two dihedral burins, five truncation burins, and one retouched end burin. On two other truncation burins (Fig. 18, 4842), the spall removal surface has been modified by a dihedral-like removal before all the burin spalls had been struck off.

Burin angle and edge width estimates are as follows:

	Dihedral (n=41)	Trunc. + Ret. End (n=15)
Angle $\bar{X}$	76.10°	71.33°

	s	9.52°	12.17°
Width	$\bar{X}$	9.10 mm.	10.33 mm.
	s	3.88 mm.	4.75 mm.

Neither difference in burin edge attributes is significant at the .05 level (t tests; for angle, $t = 1.54$, $df = 54$, $.10 > P_{1\text{-tailed}} > .05$; for edge width, $t = 0.99$, $.20 > P_{1\text{-tailed}} > .15$). The shape of almost half (46.34%) the dihedral edges is straight or bevelled; the remainder have a more complex shape (19.51% angulated, 14.63% curved or rounded, 19.51% irregular). The distribution of straight/bevelled ($n = 8$) vs. complex ($n = 7$) shapes on truncation burins is not significantly different (Chi-square = 0.22, $df = 1$, $.75 > P > .50$). In its major attributes of angle, width, and shape, the burin edge of dihedral burins is not differentiated from that of truncation burins.

The majority of dihedral burins (58.54%) are created with multiple spall removals on at least one side of the burin edge. The first removal or set of them (the spall removal surface) is most commonly made on the left side of the edge, after which two or more spalls are removed from the right side. The alternation of blows is also a common pattern. The canting of the burin edge toward the ventral surface is not extreme on dihedral burins. For both them and truncation burins, the burin edge is located with almost equal frequency to the left and to the right of the center of the blank, predominantly for dihedral burins along the lateral edge of the piece (60.98%), rather than in the less extreme "asymmetrical" position (34.15%) or in the center (median) (4.88%). The mean SRS (or non-SRS) angle for dihedral burins is $69.76 \pm 16.20°$; two weak modes at 80° and 60° correspond, respectively, to the lateral and asymmetrical orientations of the edge. That the mean SRS angle for truncation burins ($74.67 \pm 10.60°$) is greater than the mean burin angle (71°) suggests that obliquity of the spall successfully increases acuity; the majority of edges on truncation burins ($n = 10$) are canted toward the ventral surface.

Blanks on which dihedral burins are made are predominantly flakes (84.85%) or chunks (9.09%), and almost half the blanks are cortical (45.45%). Truncation burins also are usually made on flakes (1 blade, 9 flakes, 2 chunks). Blank dimensions for complete single burins are as follows:

		Dihedral	Trunc. + Ret. End
length	$\bar{X}$	42.21 mm.	50.60 mm.
	s	10.49	7.18
	n	24	10
width	$\bar{X}$	27.76 mm.	37.50 mm.
	s	9.45	12.94
	n	33	12

thickness	$\bar{X}$	13.82 mm.	17.75 mm.
	s	5.36	6.77
	n	33	12

The blanks for truncation and retouched end burins are significantly larger in all dimensions than those for dihedral burins (t tests; for length, $t = 2.30$, $df = 32$, $.025 > P_{1\text{-tailed}} > .010$; for width, $t = 2.76$, $df = 43$, $.005 > P_{1\text{-tailed}} > .0005$; for thickness, $t = 2.03$, $df = 43$, $.025 > P_{1\text{-tailed}} > .010$). This is the major difference, other than the manufacturing technique, between dihedral and truncation burins. As noted above, however, the major characteristics of the burin edge do not differ even though blank size does.

Marginal retouch occurs on eight (14.55%) single burins; it is most often heavy retouch found along part of the left margin. Four single burins have marginal notches. Burins combined with themselves occur as follows (regardless of whether all burin edges have been studied): five double dihedrals (Fig.19, 1545), two double truncations, one double break, one double unretouched edge, one dihedral mixed with truncation, and one unretouched edge mixed with truncation. Combination tools involving burins include one end-scraper, one *bec*, and one splintered piece.

In summary, the Tambourets:1 burin series is characterized by the dominance of dihedral burins, the almost exclusive use of flake and chunk blanks, and—except for a difference in blank size—the lack of attribute differentiation between dihedral and truncation burins. Almost all the burins are crude, and it appears that the Tambourets artificers produced only one general kind of burin edge regardless of technique of manufacture or nature of blank.

9. Châtelperron points. The backed tool series includes 21 Châtelperron points—5 completes (Fig. 14, 1388, 1493), 4 almost completes (Fig. 14, 1599, 1609), 6 points (Fig. 14, 3449, 4020, 2276), 3 segments, and 3 butts (Fig. 14, 4850). Most of the pieces (85.71%) have heavy backing (cross-sections I or II*) and bidirectional backing (66.67%) somewhere alomg the backed edge, usually toward the anterior end where the line of backing curves across through the body of the blank. Backing is most commonly (61.90%) on the left edge of the tool, and the working orientation of the tool is most often congruent with the bulbar orientation of the blank (proximal butt = 66.67%; distal butt = 19.05%; indeterminate butt = 14.29%).

On almost all examples (90.48%), the edge opposite the backing is unretouched but shows clear macroscopic signs of

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*The attribute system used in the description of these tools is explained in Movius et al. 1968:37-48.

utilization damage (e.g., Fig. 14, 1599). The techniques used in shaping the anterior point of the tool are available for inspection on 12 tools; all have unretouched points, with the acuity formed by the simple intersection of the line of backing and the unmodified opposite edge (Fig. 14, 3449, 2276). Twelve butts are available for study. Five are unretouched (no modification of the edge opposite the backing), and on four of these, some portion of the original striking platform of the blank is preserved (Fig. 14, 1599). The other seven examples have retouched butts, five formed by obverse removals on the edge opposite the backing (Fig. 14, 4850, 1609), one by inverse removals, and one by both. The inverse butt (Fig. 14, 1388) is of particular typological interest. A series of small, very flat inverse removals originate from the edge opposite the backing and continue across the whole width of the ventral surface. This is the so-called "Vachons" style of butt formation used on Gravette points in the Middle and especially in the Upper Périgordian.

All of the Châtelperron points are, of course, made on blades (or bladelets), in two cases (9.52%) on <u>lames à crête</u> that have been modified by backing. The five complete examples have a mean length of 31.20 ± 9.93 mm., but because the four almost complete tools have a mean <u>broken</u> length of 42.50 mm., it is clear that the longer pieces in the series have not been recovered intact. The width and thickness values for the whole series of 21 tools are as follows:

width: $\bar{X}$ = 13.33 mm., s = 2.61 mm.

thickness: $\bar{X}$ = 5.81 mm., s = 1.78 mm.

$\bar{W} \times 100 / \bar{Th} = 229$

The series of complete and almost complete Châtelperron points includes seven examples with a smoothly curved line of backing (Fig. 14, 1388, 4020) and two examples on which the line of backing breaks sharply to form a "truncated" morphology (Fig. 14, 1599, 1493). The degree of curvature (or, more generally, deviation) of the line of backing can be expressed as a ratio between two linear measurements taken on complete and many almost complete tools (cf. Movius et al. 1968:44 and 45, Fig. 25). One line, "a", is the greatest distance between the backed margin and a second line, "b", connecting the anterior and posterior extremities of the backed margin. The ratio, a : b, is expressed in raw form in millimeters (e.g., 4 : 32) or in reduced form, 1 : n (for the example given, 1 : 8). This ratio can be determined for eight Châtelperron points in the studied series. The mean divergence ratio is 1 : 5.53, indicative of a strongly curved or divergent line of backing.

10. <u>Other backed tools.</u> Other backed tools in the series include: six blades, all broken, with partial backing; two fragmentary shouldered pieces, at least one of which is probably a Châtelperron point broken in manufacture; six <u>lames à dos</u>; and two very small backed fragments. The <u>lames à dos</u> are all

broken, but the extant portion of each (one distal, three segments, two proximal) is completely backed. With the exception of the distal fragment, which terminates in an unpointed feather edge, all these could be small fragments of Châtelperron points.

11. Naturally backed tools. Thirteen tools in the assemblage sample are considered to be naturally backed knives (couteaux à dos naturel). Nine of them, seven on lames à crête, are of the size and general morphology of Châtelperron points, but they are completely unretouched. The natural back is formed by the steep surface of the crête or dorsal facet, giving most of them a cross-section identical to that formed by heavy backing. All but one bear utilization damage on the edge opposite the natural back, and it seems quite likely that they were used in the same way or ways as Châtelperron points (whether or not the morphology was created deliberately in the process of débitage). 15 11, 9

The other four naturally backed knives are made on flake blanks, some of them quite large. All have utilization damage on the edge opposite the natural back. As reported earlier (Bricker and Laville 1977:509), the presence of such pieces is one of the few ways in which the Tambourets:1 assemblage is reminiscent of the Mousterian.

12. Perforators and becs. Four tools (one blade, three flakes) in Tambourets:1 have points well enough degaged to be called perforators (Fig. 19, 2704, 3987); two of the extreme tips are broken off, and one of the remaining points bears the obverse/inverse wear pattern typical of hand-held chipped stone piercing tools. Becs (Fig. 18, 1601; Fig. 19, 3900) are more numerous--18 singles, 1 multiple, and 1 in combination with a break burin. Flake blanks are again dominant (14 of the 18 single tools). The obverse/inverse wear pattern appears on 8 points, and 5 others are more heavily modified, the tip having been rounded and polished by wear.

13. Truncated pieces and related tools. The retouched tools that are included as truncated pieces in the 92-type inventory are described here in three separate categories. On "truncated pieces" proper, a line of steep, heavy retouch extends completely or nearly completely across the width of one extremity in such a fashion as to truncate (significantly diminish) the original length of the blank. On two other categories of tools, technologically related to truncated pieces proper, the modification of the blank is less patterned or less extreme. "Pieces with partial and/or irregular truncated ends" are blades or flakes with miscellaneous retouch at one end. Often a very partial, sometimes inverse truncation extends for a short distance across a broken surface or a pre-existing dorsal facet. On "pieces lightly retouched across an extremity", the retouch is regular and continuous but very fine, like fine marginal retouch at an end of the piece. It has not really truncated the blank.

There are 17 truncated pieces in the Tambourets:1 assemblage sample, 8 complete (truncated at one end only) and 9 broken. The truncating retouch extends completely across the end, most often the distal (n = 10), on 14 examples; the truncation is almost always (n = 15) obverse. On only 3 of 16 tools* is the truncation mounted squarely on the end (Fig. 17, 2970), at a right angle to the working axis (orientation angle of 90^o); 9 of the truncations are canted to the right (Fig. 17, 3706, 1595) and 4 to the left (Fig. 16, 1500). The mean orientation angle is 66.88 ± 17.40^o. The asymmetrical mounting means that most truncations have a high end and a low end. Half the truncation shapes are simple (four concave, three straight, one convex), and half are complex, with a break in line and perhaps a change in shape betwen the high and low ends of the truncation. The high side of complex truncations is, like on simple ones, predominantly concave. The margins of the blank frequently bear macroscopic signs of utilization damage at or near their intersections with the truncation (Fig. 16, 1500; Fig. 17, 2970).

Truncated pieces are most often made on blades (11 blades, 6 flakes, 0 chunks). Estimates of blank dimensions are as follows:

complete length: $\bar{X}$ = 44.38 mm., s = 18.24 mm., n = 8

width: $\bar{X}$ = 19.63 mm., s = 5.95 mm., n = 16

thickness: $\bar{X}$ = 6.63 mm., s = 2.33 mm., n = 16

Three of 16 pieces have marginal retouch, predominantly fine and partial (Fig. 17, 2970).

The series of truncated pieces, with generally very oblique truncations on small, thin, often blade blanks, is very unlike the series of truncation burins in Tambourets:1. There is little reason to suppose that any significant number are "unstruck burins", and none is a retruncated burin. Because the series is morphologically heterogeneous, it is not possible to suggest any generally applicable functional interpretation (e.g., piercing tools, concave scrapers, knives, etc.).

Sixteen objects (seven blades, nine flakes) are counted as <u>pieces with partial and/or irregular truncated ends</u>. In this series, all are partially truncated, some very partially. There are six <u>pieces lightly retouched across an extremity</u> (one blade, five flakes); the blade is retouched across both extremities, partially at the distal end and completely at the proximal end.

14. <u>Marginally retouched pieces</u>. There are 29 pieces in the Tambourets:1 assemblage sample that are counted as marginally retouched pieces. Eight are complete or almost complete (Fig. 14, 2698, 3658, 1717); the rest are broken and may well represent fragments of other tool classes. Detailed study of the 20 pieces found in 1975 indicates that marginal retouch is most

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*Attribute data are incomplete for one truncated blade excavated in 1973.

likely to occur in the middle third of the blank rather than toward either extremity; it is far more likely to occur on the right margin (P = .650) than on the left margin (P = .189). Fine marginal retouch is most common at all locations, accounting for 75% of occurrences; heavy, scaled, and "Aurignacian" (Fig. 16, 1587) retouch also occur.

The six marginally retouched pieces that are complete enough to consider tools themselves are heterogeneous in size (length ranges from 45 to more than 71 mm.) and morphology. The distal extremities are pointed (Fig. 14, 3658), bluntly pointed, spatulate (Fig. 14, 1717), or very irregular; the margin opposite the retouched one usually bears macroscopic traces of utilization damage (Fig. 14, 1717; Fig. 16, 1587). Although some of the tools were probably used as knives, no generally applicable functional explanation can be offered.

15. <u>Notched pieces</u>. The 93 notched pieces are made most often on flake blanks (blades = 27.96%, flakes = 66.67%, chunks = 5.38%), frequently cortical (22.58%). Tools in the 1975 series are enumerated, for purpose of brief description, in four categories:

Category A (22.67%), fragments of blades bearing small marginal notches;

Category B (4.00%), blades or elongated flakes or fragments thereof with a single notch at one extremity, not on a margin;

Category C (50.67%), flakes, complete or broken, with one or more small notches somewhere on the periphery; and

Category D (22.67%), blanks of any kind bearing a large retouched notch.

Only Category D can be considered with some confidence to have been created deliberately as a notched tool.

16. <u>Denticulate pieces</u>. Denticulate pieces are less frequent (n = 26) than notched pieces; blanks are again predominantly flakes (blades = 11.54%, flakes = 80.77%, chunks = 7.69%). Only three of the objects (Fig. 18, 3891; Fig. 19, 4551; Bricker and Laville 1977:510, Fig. 5, 510) are heavily and regularly modified such that they are quite likely to have been deliberately manufactured as tools. The rest of the series (e.g., Fig. 18, 2733) bears minimal modification, much of which could well be accidental damage.

17. <u>Splintered pieces</u>. Splintered pieces are numerous in Tambourets:1—47 individual tools (10 of which are quite fragmentary) and one combination tool combining a splintered piece with a dihedral burin. The blanks are predominantly flakes (72.34%) and chunks (12.77%), and over one-quarter (28.57%) are cortical. Of the 34 tools from the 1975 sample complete enough to study, the great majority (76.47%) bear the splintering modification on two <u>opposed</u> margins (Fig. 15, 1985); the rest are modified on one margin only. The extent of modification varies greatly, from light splintering (20.59%)—a few short

removals, perhaps on one face only—through medium (44.12%) to heavy splintering (35.29%)—many overlapping removals that have removed all or most of the original dorsal and ventral surfaces of the blank (Fig. 15, 1985). On about one-third (35.29%) of the studied sample, splintering near one or both margins of the piece has detached one or several burin-spall-like removals from the margin (Fig. 15, 1985); there is, however, no true burin edge.

18. Chamfered pieces. Among the tools inventoried as Type 92 are two chamfered pieces. The clearest example (Fig. 17, 2210) is a complete flake, both margins of which have macroscopic utilization damage, bearing three chamfering removals at the distal end that extend across the entire ventral surface. On the other example, a cortical *lame à crête*, again with both margins utilized, there is a single chamfering removal.

19. Nuclei. A total of 163 nuclei have been recovered from Archaeological Level 1—14 fragmentary examples, 19 rough-outs (*ébauches*), and the 130 studied examples described here. The most frequent shapes are prismatic (45.38%) (Fig. 20, 3533, 3361, 2771) and flat (22.31%) (Fig. 20, 3341, 1676), very similar shapes that probably reflect only the extent of working. The remainder of the nuclei are tabular (12.31%) (Fig. 21, 2144, 2738) or irregular (20.00%) (Fig. 21, 4729; Fig. 22, 2252). About half (45.76%) of the prismatic nuclei have only one striking platform, and the same is true of flat nuclei (55.18%); all the other prismatic and flat examples have two platforms, almost always located at opposite ends of the core in such a fashion that the removals from each meet and/or overlap on a single, common core face. Tabular nuclei most commonly (11 of 16 examples) have only one platform. As would be expected, irregular (including globular) nuclei are usually multi-platformed, 50.00% with two platforms and 19.23% with three. The multiple platforms are most commonly located so that removals from one platform cross those from others at a high angle; there are often two or more different core faces.

Although the Tambourets:1 nuclei can be described in terms of the standard shape categories employed in the preceding paragraph, there are some distinctive variants the description of which helps to characterize the industry. Among the prismatic nuclei is a series of 11 so-called "hump-backed" nuclei (*nucléus bossués*). They usually have two platforms, and the back of the nucleus is bossed or angulated—in general, humped. Extreme examples are wedge-shaped, with the two opposed striking platforms nearly meeting at the back (Fig. 20, 4035; Fig. 21, 1958; Fig. 22, 2745). On others, working the core back to a cortical protuberance has produced a rounded boss. Hump-backed nuclei should probably be regarded as a non-significant variant of the prismatic shape, resulting from the small size of the mass employed (or at least remaining). If these pieces were longer, they would be very similar to the "bidirectional opposed angular" blade cores described by Bordes (Bordes and Crabtree 1969:

2 and 14, Fig. 1d) from the Upper Périgordian of Corbiac in Dordogne.

Five of the tabular nuclei have some special characteristics that merit brief description. By definition, all tabular nuclei have a face-to-back dimension that is greater than its side-to-side dimension. Many (9 of 16 in the studied sample) are made on flakes (Fig. 21, 3454; Fig. 22, 3013, 3371), and because the platforms are small, they have usually been created by a single, transverse/oblique "truncating" blow or by truncation-like retouch from one surface, often the ventral surface of the flake. On the special tabular nuclei, the back of the nucleus has been regularized by a line of retouch, unifacial or bifacial (Fig. 22, 3326). Although this could be considered a normal crête, it can closely resemble a side-scraper if the retouch is not abrupt (Fig. 21, 4798, 3454), and some could well be considered scrapers (in addition to whatever else they are). Like all tabular nuclei, the smaller examples could have been used as burins. Some (Fig. 21, 4798; Fig. 22, 3371) show crushing and/or resharpening attempts that may indicate they were so used. In general, however, the widths of the putative burin edges are too great to be credible, and the pieces are best seen as nuclei.

The angle between the striking platform and the core face ranges from 50° to 90° (slightly obtuse angles are tabulated as 90°). Mean platform angles, which do not differ significantly by shape (1-factor analysis of variance, $P > .20$), range from $72.62 \pm 10.83°$ for flat nuclei to $76.93 \pm 9.87°$ for irregular ones.

As discussed in greater detail elsewhere (Bricker and Laville 1977:510-511), the striking-platform/core-face junction is frequently modified in the Tambourets:1 series. The kind of small fracturing and crushing of the face that originates from the platform occurs in about half (56.16%) the cases. Much more common is the presence of faceting on the platform itself, produced by removals originating from the core face. When the faceting removals are very small (occurring on 33.50% of platforms), it is probably a result of minor rectification of the platform-face junction prior to blank removal. When, however, the faceting removals are few but large, they are probably evidence of the technique of platform preparation and rejuvenation—the creation of the more-or-less flat surface using smaller multiple removals rather than the larger, single, across-the-top, truncating blow common in Middle and Upper Périgordian contexts. In the Tambourets:1 series, the large-facet striking platforms occur least often (38.10%) on tabular nuclei, the shape with the smallest platforms. Frequencies for other shapes range from 55.10% on irregular nuclei to 65.93% on prismatic nuclei. It is possible that the creation of the striking platform by a single blow was usually impossible at Les Tambourets because of the low quality of the raw material.

Rectification of the core face by means of a crête occurs on 31.54% of the nuclei; there are no significant frequency differences among the shapes (chi-square = 3.15, df = 3, $.50 > P > .25$).

The maximum length of a nucleus is defined as "...that dimension parallel to the proximal-distal length of the longest removal or set of removals on the nucleus"; maximum width is "...the greater dimension at a right angle to the maximum length", and maximum thickness is "...the lesser dimension at a right angle to the maximum length, measured also at a right angle to maximum width" (Bricker 1973:906-908). Size estimates for the Tambourets:1 nuclei are as follows:

		Prismatic (n = 59)	Tabular (n = 16)	Flat (n = 29)	Irregular (n = 26)
Max. L.	$\bar{X}$	49.05 mm.	47.50 mm.	48.83 mm.	48.23 mm.
	s	9.03	7.73	7.80	11.58
Max. W.	$\bar{X}$	35.76	38.69	40.38	44.35
	s	7.22	7.09	6.83	10.77
Max. Th.	$\bar{X}$	29.10	26.69	24.62	33.35
	s	5.14	4.74	4.38	5.93

Although the conventions for measuring nuclei yield very generalized data, it is clear that the Tambourets:1 nuclei are small (length means for the different shapes are nearly identical). The maximum length of a nucleus is a minimum estimate of the maximum length of blanks produced from it. It is, therefore, interesting to note that the length means for the Tambourets:1 nuclei are virtually identical to the mean length of end-scrapers on complete blanks (49.45 ± 9.57 mm.).

The nine pieces tabulated in the inventory as Type 43, nucleiform burin, could have been used as such, but they are included here in the nucleus sample, as are the four nucleiform scrapers and the three *rabots*.

It was noted above (in section V-D-1) that the majority of tools occur on flakes, flakes apparently produced from the nuclei just described. The overall design of the nuclei is that of Upper Palaeolithic blade cores; the prismatic, flat, and tabular shapes are morphologies that in other assemblages are used to produce blades and bladelets, and irregular nuclei are found in predominantly blade industry assemblages as well. Without presenting here a detailed comparison, it can be said that the Châtelperronian nuclei of Tambourets:1 differ from "Gravettian" nuclei of classic Upper Palaeolithic aspect (as sampled by the later units of Level 5 at l'Abri Pataud, Dordogne) in two major ways:

a) the Tambourets nuclei are shorter, with maximum length means of 48 to 49 mm. compared to the means of 61 to 73 mm. in later Pataud:5 (Bricker 1973:921, Table 25-8); and

b) the striking platform of the Tambourets nuclei is frequently multifacetted rather than simple. These two differences are quite likely due in large measure to the nature of the raw material available—the small and often flawed nodules available in Haute-Garonne vs. the larger and better flint nodules, often of Maestrichtian "Bergerac" flint, available in Dordogne. It is apparent, however, that the extent to which the nature of the Tambourets industry reflects raw material limitations rather than a Middle-to-Upper Palaeolithic transitional status can be investigated only by using comparative data on Châtelperronian nuclei from various parts of France and northern Spain. These data are not yet at hand.

20. Débitage products. The frequencies of waste flakes and other products of débitage are shown in Table 1. The high proportion of chunks in the sample (15.06% of all flint artifacts) is a measure of the low quality of much of the raw material available to the Tambourets artificers. The majority (61.10%) of the unretouched blades show macroscopic signs of utilization damage; utilized flakes are relatively much less common (32.24%). These data suggest again that blades, although they were produced relatively infrequently, were used as tools selectively and preferentially whether or not they were modified by retouch.

In the preliminary report on the 1973 sondage, data were presented concerning the varieties of flint used by the Tambourets artificers (Bricker and Laville 1977:511-512). More recently, research has begun into the source areas of the raw materials and the culture-geographical significance of the distribution pattern. Because this work is still in progress, any further discussion of flint varieties is deferred until new data are available.

21. Non-flint stone tools. Most of the tools made of stone other than flint are hammerstones or other objects used in the manufacture of flint tools. One classic hammer (Fig.23,1807) is a roughly triangular cobble, ca. 60 mm. on a side and weighing ca. 170 g., with the characteristic bashing and crushing on two of its three corners. Another piece (Fig. 23, 4579) is probably a fragment of a much larger hammer (complete weight would have been at least 400 g.); one end is shattered and pitted, and both lateral edges have flay facets created by battering. Two smaller fragments may also be parts of hammerstones.

A series of six ovoid to sub-rectangular cobbles with patterned modifications of ends, edges, and faces are objects usually described as anvils or flaking tools (retouchoirs) (Fig. 23, 1492; Fig. 25, 4797). The two complete examples are 97 x 53 x 13 mm. and 88 x 50 x 19 mm. respectively. These objects (plus several similar ones from Couche B and the Ditch Fill) were most likely used as specialized hammers for retouching by percussion and, possibly, for detaching blanks from nuclei. A fuller study of their modification pattern will be presented elsewhere. Two other flaking tools (Fig. 23, 3750) are on long narrow cobbles.

A small (greatest dimension = 38 mm.), sub-trapezoidal piece of very hard, black rock has been modified by abrasion or grinding that created 15 to 20 facets on its surface (shown at twice actual size in Fig. 24, 3788). The largest and clearest of the facets are absolutely flat. The object may be called an abrading stone, but its original function is quite unclear. Finally, a large (100 x 85 x 75 mm.) wedge-shaped fragment of granite bears two flat facets that were almost certainly produced artificially (Fig. 24, 3382). It may have been some kind of milling or large abrading stone, but this cannot be determined from the remaining fragment.

22. Lateral distribution of artifacts. The 1975 excavations greatly increased the data available for a study of lateral distribution. Study of these data combined with those from the 1973 sondage confirmed some aspects of the 1973 results, failed to confirm others, and raised specific questions that can be answered satisfactorily, if at all, only by further excavation.

The results of the sondage (Bricker and Laville 1977:513) can be summarized briefly as follows:

a) the base of Archaeological Level 1 in Square V-B was more irregular than in Square V-A, but the reason for this was not clear;

b) a pooled sample of all catalogued objects from the excavated area was non-randomly distributed; and

c) several individual artifact classes (burins, nuclei, scrapers, utilized débitage products, and unmodified débitage products) had non-random distribution patterns, each independent of the overall pattern, that suggested that the southern zone of the sondage (V-A) could have been an area used particularly for the manufacture of flint and perhaps organic tools whereas the northern zone (V-B) was an area in which a wider range of activities took place.

The differential regularity in the base of Archaeological Level 1 (= surface of Couche C) seems to be without cultural significance. Irregular relief like that reported originally in Square V-B was found in most of the area excavated in 1975; only in Squares IV-C(NE), V-C(NW), and V-D was the surface of Couche C relatively smooth. The ragged, shallow depression in Square V-B (Bricker and Laville 1977:512, Fig. 6) probably results from a tree-fall or other post-Würm disturbance; all three potsherds found in Archaeological Level 1 comes from V-B, in or immediately adjacent to this depression.

The lateral distribution of artifacts was investigated first using the several statistical techniques discussed by Dacey (1973). These depend in one way or another upon counting artifact frequencies within a series of grid units. The size of the grid units or cells chosen has an important effect upon test results; "...it is quite possible that the variance-mean statistic for one size will support the hypothesis of a random pattern but the ratio for a different size of cell will not" (Dacey 1973:321). The variance-mean ratio test for randomness was run on different artifact classes using two different grid unit sizes—32 units of 1.00 square meter each and 132 units of 0.25 square meters each. The disturbance caused by the modern ditch in Trenches VI and VII necessitated the exclusion of eight square meters of the excavated area from the larger grid and seven square meters from the smaller grid. Test results for the different grid unit sizes differed appreciably for all but the most frequent artifact classes. Comparison of these results with subsequent, different test procedures suggested that grid units of 0.25 square meters were too small to be useful; grid unit frequencies for most artifact classes rarely exceeded two and were commonly zero. The 1.00 square meter grid unit, better attuned to the tool densities at Les Tambourets, was therefore used in the tests discussed below.

A pooled sample of all catalogued artifacts is non-randomly distributed within the excavated area (variance-mean ratio test, $P < .0001$). The same is true of nuclei ($.0005 > P > .0001$), unmodified débitage products ($P < .0001$), splintered pieces ($.025 > P > .01$), and a combined sample of infrequently occurring "other tools"* ($.05 > P > .025$). The hypothesis of random distribution is upheld for burin spalls ($.50 > P > .40$), backed tools ($.60 > P > .50$), and hammerstones ($.50 > P > .40$). The tests on both scrapers and cracked cobbles produce intermediate probabilities ($.10 > P > .05$).

Non-random distributions, once discovered, must of course be interpreted if they are to contribute to the understanding of prehistoric cultural behavior. An obvious question is whether the non-random patterns of any individual artifacts classes simply reflect (are significantly associated with) the overall non-random patterns of the pooled sample of all catalogued objects. This question was investigated using the two tests of association discussed by Dacey (1973), the contingency table test and the contiguity test.** Because the grid units used (1.00 square meter) are relatively large, it seems likely that the contingency table test, dealing only with items within a grid unit, would be more useful in this case than the contiguity test, dealing with minimal units that can be up to five square meters in area. The test results using the two techniques

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*"Other tools" include truncated pieces, marginally retouched pieces, perforators or becs, notched pieces, denticulate pieces, combination tools, and miscellaneous retouched pieces.

**The contiguity test of association presented by Dacey in his 1973 article requires a regular lattice of grid units or cells. Slightly different techniques appropriate to an irregular lattice (Dacey 1968:482-483) were used for the irregularly shaped excavated area at Les Tambourets.

are summarized below:

All Catalogued Objects vs.	Contin. Table P	Contiguity P
Nuclei	$.60 > P > .50$	$.50 > P > .40$
Unmod. déb. products	$P < .0001$	$.40 > P > .30$
Util. déb. products	$.50 > P > .025$	$.90 > P > .80$
Burins	$.60 > P > .50$	$.05 > P > .025$
Splintered pieces	$.70 > P > .60$	$.30 > P > .20$
"Other tools"	$.005 > P > .001$	$.50 > P > .40$

These test results are too contradictory to be explanatory. Although non-random artifact distributions are clearly present, the geometric units based on the excavation grid are apparently too crude to provide interpretable data, and a different analytic technique was subsequently employed.

The general plan of all catalogued objects in Archaeological Level 1 (Fig. 27) shows a distinct pattern of artifact occurrence in Squares III-B and IV-B. A linear arrangement of objects, sometimes double, trends northeast in III-B toward a right-angle corner in IV-B, runs southeast to what is perhaps another corner, and then runs southwest to the southern margin of IV-B. The feature is probably rectangular, with its longer axis trending southwest-northeast. Other linear arrangements of artifacts can be seen in the plan, but all are less distinct than this feature. Frequencies of nuclei and selected tool classes in this zone of the excavated area (II-B, III-B, IV-B, and the western half of IV-C) were tabulated in two subsamples: objects lying within the limits of the distributional feature and those lying outside it. There is a significant difference in the composition of the subsamples so defined (Chi-square = 11.48, df = 5, .05 P .025). Scrapers, burins, splintered pieces, and hammerstones occur preferentially within the feature, whereas nuclei and cracked cobbles occur preferentially outside it. Using as a guide the clustering of scrapers within this most clearly defined feature (Feature I), the rest of the general distribution plan was examined to see whether other scraper clusters occurred within the limits of linearly bounded artifact patterns. Four such other features were defined (Fig. 28), as discussed below.

Feature II is the least certain of the five, primarily because very little of it occurs in the excavated area. From a corner in V-B, one linear boundary runs southwest into V-A and another runs northwest eventually to intersect with the southwest corner of Feature I. Its orientation is indeterminate. If Feature II has any reality, it must overlap with Feature I; because the latter is much more distinct, it may well be of slightly more recent date.

The long axis of Feature III trends northwest-southeast.

It occurs in Squares V-B, V-C, VI-B, and VI-C, and its eastern portion was removed by the post-Palaeolithic ditch in Trench VI.

Feature IV, in Squares IV-C, V-B, and V-C, appears to be complete. It is a rectangle, approximately 2.35 m. long and 1.55 m. wide; the long axis trends northwest-southeast.

Feature V, in Squares V-C, V-D, and VI-C, is nearly complete. It too is a rectangle (ca. 2.10 x 1.50 m.), trending northwest-southeast.

All artifacts lying within Features I through V were combined into a single subsample the composition of which was tested against a second subsample of all artifacts lying outside any feature. The results of this test (Table 3) indicate significant

TABLE 3.—Les Tambourets, Main Area, Archaeological Level 1. Chi-Square Test of Association for Two Artifact Subsamples. For each Entry, the Observed Frequency is Shown Above the Expected Frequency.

Artifact Class	Within Features	Outside Features
Utilized *débitage* objects	296 283.61	393 405.39
Scrapers	65 46.10	47 65.90
Splintered pieces	24 19.35	23 27.65
Backed tools	20 20.58	30 29.42
Marg. retouched pieces	17 12.35	13 17.65
Hammerstones, etc.	10 6.59	6 9.41
Unmodified *débitage* objects	605 617.86	896 883.14
Nuclei	50 70.39	121 100.61
Burins	23 27.99	45 40.01
Notched/denticulate pieces	48 48.98	71 70.02
Cracked cobbles	35 41.16	65 58.84
Truncated pieces	16 16.47	24 23.53
Perforators/*becs*	10 9.47	13 13.53

Misc. ret. pieces/spalls	55 53.10	74 75.90

Cumulative Chi-square = 35.79

Degrees of freedom = 13

$.001 > P > .0005$

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differences in composition. The greatest contributions to the cumulative Chi-square value are made by eight artifact classes: scrapers, marginally retouched pieces, hammerstones, splintered pieces, and utilized débitage products occur preferentially within the features; nuclei, burins, and cracked cobbles occur preferentially outside them. The other artifact classes make very little contribution to Chi-square and may be considered randomly distributed with respect to the features. There is no significant difference among features in frequencies of three kinds of artifacts* (Chi-square = 5.99, df = 8, $.70 > P > .60$).

The interpretation of the five distributional features is fraught with uncertainty. Their definition of the general plan (Fig. 28) is, with the exception of Feature 1, extremely tenuous, but the artifact distribution differences argue for some underlying reality, masked perhaps by the palimsest-like traces of multiple, sequential occupations. It is difficult to suggest geological or other natural processes that could have created the observed distributional anomalies. The linear arrangements of artifacts defining the features are found at varying angles to the slope of the land surface at the time(s) of occupation (approximated by the surface of Couche C), from parallel to slope to perpendicular to it. A cultural explanation seems most likely.

The activities that may have occurred preferentially within the confines of the features include cutting, scraping, skin preparation, and perhaps woodworking (scrapers, marginally retouched pieces, and utilized flakes). The function of splintered pieces is not well understood, and the fact that hammerstones are distributed differently from the nuclei with which they were presumably used is anomalous. The areas outside the features are likely to have been used preferentially for flint tool manufacture or, perhaps, just the disposal of the larger by-products thereof (nuclei) and the fabrication of objects of bone, antler, and wood (burins). Because the cracked cobbles do not bear the distinctive damage traces of hammerstones (pitting, crushing, etc.)

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*In order to overcome small cell frequencies, the 14 artifact classes of Table 3 were pooled into 3 categories: those associated with features, those associated with the areas outside them, and those randomly distributed.

and because some of them seem to have been reddened by heat, they may well have been cooking aids, but neither their numbers nor their size gives strong support to this hypothesis. Activities probably performed by tool classes not preferentially associated with either area include flint tool manufacture (unmodified débitage products), fabrication of organic tools and perhaps clothing (perforators and truncated pieces), cutting, butchering, and, perhaps, the replacement of broken weapon armatures.

The brief survey of the possible functional implications of features vs. the surrounding area is too vague to be very helpful; it does, however, suggest that the areas outside the features were used for a variety of tasks that produced larger debris, lithic and undoubtedly organic, than those carried out within the feature confines. This suggestion, combined with the apparently regular size and shape of the features, poses the question of whether the features could be habitation structures.

Several data argue against the habitation structure hypothesis. First, the features have no stratigraphic expression. The artifact scatter within their confines lies at the same level as the scatter just beyond them. There was no trace of post molds, wall trenches, or tent weights of any sort.* Second, there is no regular arrangement of the overall artifact scatter within the features such as to suggest the presence of walkways, sleeping areas, or entrances. Third, there is no discernible patterning of individual tool classes within the features (such as, for instance, the preferential occurrence of scrapers in the up-slope, left-hand quadrant), but because all but one of the features are incomplete, sampling error makes testing for this kind of patterning very difficult. Finally, there are no hearths within any of the features or, so far as is now known, in the immediately surrounding area.

There are, however, several reasons why the hypothesis that the features may represent habitation structures cannot yet be rejected on the basis of the evidence now available:

a) The use of some kind of artificial structures (skin tents, huts of branches, etc.) by the early Würm III inhabitants of Les Tambourets is highly probable, even if the occupation(s) occurred during the summer season. The linear arrangements of artifacts that define the Tambourets features could result from

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*A series of small, roughly circular concentrations of artifacts is shown on the general plan (Fig. 28), and most of these lie just inside the limits of features. At other sites, artifacts occur in such a context when they have become incorporated in the fill of large post holes, either accidentally or deliberately as shims for the posts. Although the location of these concentrations at Les Tambourets, especially in Features I, IV, and V, is suggestive of wall posts of some sort, the component artifacts do not occur at a lower stratigraphic level than the surrounding scatter and are thus unlikely to fill a hole.

the limitation of artifact scatter by either natural or artificial restraints, but the apparent regularity in feature size and shape makes the latter more likely.

b) The lack of stratigraphic expression must be regarded as inconclusive at Les Tambourets. The visual homogeneity of the loess of Couche B renders even the massive and relatively recent disturbance of the post-Palaeolithic ditch stratigraphically invisible. The irregularity of the surface of Couche C and the disturbance of the upper zone of that level by very numerous filled animal burrows meant that post molds, even if present, were not discovered during the previous excavation season.

c) The apparent lack of overall artifact patterning or specific tool-class patterning within the confines of the features probably results at least partially from the palimsest-like remains of successive occupations of the same area.

Any attempt to interpret the lateral distribution of artifacts within a rich* and relatively thick tool scatter like that of Archaeological Level 1 can very easily become an exercise in self deception. Bordes and others (Bordes et al. 1972; Bordes 1975) have recently discussed in detail the many reasons why such a tool scatter cannot be considered a simple "living floor" on which the material remains of a single, relatively brief occupation may be expected to reflect the patterned activities of a delimited prehistoric group. The size of the whole archaeological zone at Les Tambourets, several hectares, makes it virtually certain that we are dealing with the remains of numerous occupations of somewhat different ages and that many of those occupations must overlap spatially. Archaeological Level 1 is exactly the sort of situation about which Bordes et al. (1972:19) concluded "...qu'il serait vain de vouloir faire de la palethnologie dans des couches riches et épaisses, que ce soit en abri ou en plein air...". Surely, however, whether mixture of the sort certainly present at Les Tambourets totally obscures interpretable artifact patterning must be investigated, not just assumed.

The study of lateral distribution of artifact in Archaeological Level 1 produces some tentative conclusions and some suggestions about how to collect additional relevant data. Despite the undoubted presence of palimsest-like occupation traces, some activity-related non-random patterning is still discernible. Several distributional anomalies (Features I-V) appear to be artificially bounded. Except for Feature I, the bounding limits are often vague and may be erroneous, but they clearly have right angles. The features may be habitation structures—rectangular huts, over two meters in length and less than two meters in width, of unknown construction but placed on the surface of the ground rather than dug into it, and not containing hearths—but this cannot be satisfactorily demonstrated. At present, the archaeological research at Les Tambourets has

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*In the 32 square meters not affected by the post-Palaeolithic ditch, the average density of catalogued objects is $94/m^2$.

not yet necessarily discovered the habitation structures that are almost certainly present. Additional excavations of Archaeological Level 1 in the Main Area should start in Squares III-A and III-B and proceed eastward, away from the area of the most dense artifact scatter. The remainder of Feature I should be uncovered, and the upper zone of Couche C around the feature's remaining periphery should be examined more closely for post molds than was done in 1975. If a single text of the palimsest can ever be deciphered, Feature I offers the best key, and it is indeed fortunate that much of the feature is still unexcavated.

E. The Series from Couche C

Based on the excavation of less than one square meter in the 1973 sondage, Couche C was thought to be sterile (Bricker and Laville 1977:505), but such is not the case. A total of 96 catalogued objects were recovered from Couche C—88 flint artifacts and 8 cracked cobbles and manuports (Table 1). Twelve of the tools appear in the type list; these include a discoidal scraper and a double side-scraper similar to objects in Archaeological Level 1, but there are no backed tools. One of the nuclei is prismatic, and the other is of the special tabular type.

Although most of the artifacts found in Couche C are typologically indeterminate, none would be out of place in the Tambourets:1 assemblage sample. Some of the objects were found oriented vertically in anciently filled burrows, and it is likely that others not so noted specifically by the excavators had similar contexts. There is no typological evidence to suggest the presence here of a Mousterian occupation. It is most probable that the artifacts from Couche C are younger than the sediments in which they were found, that they were originally part of the tool scatter of Archaeological Level 1, that they were displaced downward by various human and non-human agencies (trodden into mud, disturbed by burrowing animals, etc.), and that they therefore represent a small sample, in a secondary context, of the principal Châtelperronian occupation.

F. The Series from the Ditch Fill

A total of 238 objects (Table 1) were recovered from the Ditch Fill—118 flint artifacts, 5 non-flint artifacts, 104 cracked cobbles and unmodified manuports, and 11 ceramic fragments. There are no Châtelperron points or other characteristically Châtelperronian flint pieces in the series, but there is one of the distinctive flaking tools or specialized hammers among the non-flint artifacts. None of the flint tools is characteristic of any other Palaeolithic or later tool-making tradition. For these reasons and because the ditch is known to have cut through and removed parts of Archaeological Level 1, it seems appropriate to regard the lithic tools as having originated primarily from Upper Palaeolithic contexts.

In addition to the specialized hammer mentioned above, non-flint artifacts include a lightly modified flaking tool and three unidentifiable fragments of pitted and/or ground stone objects. Cracked cobbles (27.31%), unmodified manuports (16.39%), and ceramic fragments (4.62%) are important components of this obviously mixed series.

VI. The Archaeological Materials from Test Pit Beta

As noted in the discussion of stratigraphy, the Châtelperronian occupation level in Test Pit Beta was so close to the modern surface that the overlying Couche B loess was virtually unrepresented. It yielded only two objects—a cracked cobble and an unmodified manuport.

A total of 83 catalogued objects (Table 4) were found in Archaeological Level 1—70 flint artifacts and 13 cracked cobbles

TABLE 4.—Les Tambourets, Test Pit Beta, Excavations of 1975. Typological Inventory of the Assemblage Sample from Archaeological Level 1.

A. Retouched tools appearing in the type list of de Sonneville-Bordes and Perrot

Type	n
1. End-scraper	1
5. End-scraper on retouched blade or flake	1
7. Fan-shaped end-scraper	1
43. Nucleiform burin	1
47. Atypical Châtelperron point	1
58. Completely backed blade	1
74. Notched piece	2
75. Denticulate piece	1
Total	9

B. Total sample

Listed retouched tools	9
Blades with miscellaneous retouch	0
Flakes with miscellaneous retouch	0
Burin and miscellaneous spalls	0
Nuclei	3
Unretouched blades	11
Unretouched flakes	41
Unretouched chunks	6
Non-flint artifacts	0
Unmodified manuports	8
Cracked cobbles	5
Ceramic fragments	0
Total catalogued objects	83

and manuports. Among the nine retouched tools appearing in the type list are one Châtelperron point and one backed blade fragment. All indications are that Test Pit Beta has sampled the eastern fringe of the same Châtelperronian occupation area that is encountered in the Main Area.

Approximately one square meter of Couche C was sampled in Test Pit Beta. In this small area, Couche C contained no archaeological materials.

VII. The Archaeological Materials from the Alpha Complex

A. Descriptive Typology

Frequencies of retouched tools and other archaeological material in the four series of the Alpha Complex are shown in Table 5. If all four series are pooled, the typological indices for the 50 tools appearing in the type list would be:

Scraper index (IG)	8.00
Aurignacian scraper index (IGa)	2.00
Perforator index (IP)	4.00
Burin index (IB)	8.00
Dihedral burin index (IBd)	4.00
Truncation burin index (IBt)	4.00
Périgordian group index (GP)	28.00

Although the sample is too small for such indices to be very informative, there are some significant differences between the Alpha series and Archaeological Level 1 in the Main Area. There are in the Alpha Complex more backed tools and fewer scrapers and burins (Chi-square = 12.22, df = 2, $P < .005$). That Alpha represents one or more Châtelperronian occupations is not in question—Châtelperron points are present, there are no objects characteristic of other Palaeolithic tool-making traditions, and the sedimentological analysis indicates broad contemporaneity with the occupation of Archaeological Level 1.

Although the <u>débitage</u> products from the Alpha Complex have not been studied in detail, it is apparent that the materials are generally very small, almost certainly smaller than those from the Main Area. Other differences between the Alpha sample and that from Tambourets:1 suggest that different techniques of <u>débitage</u> were in use. The amorphous chunks so prominent in the latter assemblage sample (17.81% of the chipping debris) are much less frequent in the Alpha series (5.79%). Frequencies of blades are similar in the two areas (18.80% in Alpha, 15.72% in Tambourets:1), but differences in flake and chunk frequencies render the overall patterns very significantly different (Chi-square = 43.64, df = 2, $P < .005$). It may be that these differences are related to raw material differences—smaller nodules or nodules of higher quality used by the artificers at Alpha. As previously explained, however, the question of flint differences is still under investigation.

TABLE 5 .—Les Tambourets, Alpha Complex, Excavations of 1975. Typological Inventory of Assemblage samples.

A. Retouched tools appearing in the type list of de Sonneville-Bordes and Perrot

Type	V.Hi Scat	High Scat	Main Scat	Low Scat
1. End-scraper	-	1	-	-
2. Atypical end-scraper	-	1	-	1
14. Flat nose-shaped or shouldered end-scraper	-	-	1	-
23. Perforator	-	-	1	-
24. Bec or Atypical perforator	1	-	-	-
28. Asymmetrical dihedral burin	1	-	1	-
36. Burin on concave truncation	-	-	1	-
37. Burin on convex truncation	-	-	1	-
46. Châtelperron point	1	2	-	-
58. Completely backed blade	1	1	-	-
59. Partially backed blade	1	-	3	-
60. Piece with straight, right-angle truncation	1	-	1	-
61. Piece with straight, oblique truncation	-	-	1	1
63. Piece with convex truncation	-	-	-	1
65. Piece with continuous retouch on one edge	-	1	3	-
66. Piece with continuous retouch on both edges	-	-	1	-
74. Notched piece	3	5	8	-
76. Splintered piece	-	-	3	-
84. Truncated bladelet	-	-	1	-
92. Other tools, not included in Types 1-91	-	-	1	-
Totals	9	11	27	3

B. Total sample

	V.Hi Scat	High Scat	Main Scat	Low Scat
Listed retouched tools	9	11	27	3
Blades with miscellaneous retouch	1	1	0	2
Flakes with miscellaneous retouch	2	0	12	0
Burin and miscellaneous spalls	0	0	2	0
Nuclei	1	0	4	0
Unretouched blades	10	23	54	4
Unretouched flakes	43	64	250	8
Unretouched chunks	4	7	15	2
Non-flint artifacts	0	0	0	0
Unmodified manuports	0	8	15	5
Cracked cobbles	0	5	3	5
Ceramic fragments	1	0	0	0
Total catalogued objects	71	119	382	29

Another difference between the Alpha series and Tambourets:1 concerns the proportion of débitage products bearing macroscopic signs of utilization. In Alpha, 41.76% of the blades and 18.36% of the flakes are utilized. Although the preferential utilization of blades is common to both areas, the Alpha utilization values are both significantly lower than the corresponding ones for Tambourets:1 (61.10% of blades, 32.24% of flakes; Chi-square = 11.00 and 27.11, df = 1, $P < .005$). The possible significance of these differences is discussed further below, in section VIII.

B. Lateral Distribution of Artifacts

As explained above (cf. section IV), artifacts from the eight square meters of the Alpha Complex have been grouped for analysis into four units or scatters. For purposes of investigating lateral distribution, the objects from the High Scatter have been pooled with those from the Main Scatter because their distribution patterns are extremely similar.

The general distribution plan of all catalogued objects in the pooled sample is shown in Figure 29. The distribution pattern is non-random (variance-mean ratio test, Chi-square = 82.39, df = 7, $P < .0001$), and it is obvious from the plan that there are two distributional anomalies (Fig. 30). In Test Pit Alpha itself, an irregular curvilinear boundary separates an area of denser artifact scatter to the north, northeast, and east from an area of somewhat sparser scatter in the remainder of the square. The boundary is a zone ca. 20 cm. wide that is nearly devoid of artifacts. The "empty" zone and the area to the southwest of it is referred to here as Feature VI. In the northern half of Extension-1 is another distributional anomaly, another zone virtually devoid of artifacts limited by two approximately rectilinear boundaries that meet in a slightly rounded-off right angle. This "empty" zone is referred to here as Feature VII.

Neither feature has any detectible stratigraphic expression, and there is no difference in the frequencies of broadly defined artifact categories* within and without their boundaries (Chi-square = 4.26, df = 3, $.30 > P > .20$). The right-angle corner of Feature VII is of potential interest in light of the shape of Features I-V in the Main Area, but too little of this feature has been exposed by excavation to attempt further interpretation. Because Feature VI occurs on an appreciable slope, it may be some natural erosional phenomenon. Additional excavation of the Alpha Complex would be necessary for the interpretation of the lateral distribution pattern.

VIII. Functional Differences Among Site Areas

A summary is shown in Table 6A of the general contents of

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*Nuclei plus unmodified débitage products; utilized débitage products; retouched flint tools; cracked cobbles.

TABLE 6.—A: Generalized Contents of Assemblage Samples and Other Series from Les Tambourets.
B: Distribution of Generalized Categories of Flint Artifacts in the Samples.

	MAIN AREA										ALPHA		BETA	
	c.B:Upper		c.B:Basal		Arch. Lv. 1		Couche C		Ditch Fill		All Units		Ar. Lv. 1	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
A.														
Flint artf.	221	44.02	259	91.20	3014	92.85	88	91.67	118	49.58	559	93.01	70	84.34
Non-fl artf.	6	1.20	-	-	14	0.43	-	-	5	2.10	-	-	-	-
Manuports	62	12.35	12	4.23	112	3.45	4	4.17	39	16.39	28	4.66	8	9.64
Cr. cobbl.	188	37.45	13	4.58	103	3.17	4	4.17	65	27.31	13	2.16	5	6.02
Ceramics	25	4.98	-	-	3	0.09	-	-	11	4.62	1	0.17	-	-
All catal.	502	100.00	284	100.01	3246	99.99	96	100.01	238	100.00	601	100.00	83	100.00
B.														
Ret. tools	56	25.34	59	22.78	593	19.67	18	20.45	33	27.97	68	12.16	9	12.86
Nuclei	4	1.81	5	1.93	163	5.41	2	2.27	5	4.24	5	0.89	3	4.29
Déb/spalls	161	72.85	195	75.29	2258	74.92	68	77.27	80	67.80	486	86.94	58	82.86
All flint	221	100.00	259	100.00	3014	100.00	88	99.99	118	100.01	559	99.99	70	100.01

the several assemblage samples or series from the Main Area, from the Alpha Complex (here pooled into a single sample), and from Test Pit Beta (Archaeological Level 1). It is apparent that the seven tabulated samples fall into one or the other of only two patterns. The first, represented by Couche B:Upper and Ditch Fill, contains 50% or fewer flint artifacts, over 10% manuports, over 25% cracked cobbles, and over 5% ceramic fragments. The second pattern, represented by all other samples, contains 80% or more flint artifacts, less than 10% each manuports and cracked cobbles, and much less than 1% ceramic fragments. A relatively high ceramic component plus stratigraphic evidence indicate that the first pattern is characteristic of series with a significant Palaeolithic/post-Palaeolithic mixture. Series with the second pattern represent almost exclusively one or more Upper Palaeolithic occupations.

High frequencies of cracked cobbles are a defining characteristic of the mixed series, but because such objects are present also in the Châtelperronian series (over 100 of them in Archaeological Level 1), it appears that they are integral components of both the Palaeolithic and the post-Palaeolithic assemblages. This observation is of unfortunately little interpretative value in the absence of an understanding of the function(s) of cracked cobbles in what must have been very different occupation types.

Table 6B summarizes the general composition of the flint industry of each series. Combining the series into one mixed sample (from the Main Area) and three Palaeolithic occupation samples (one each from the Main Area, Alpha, and Beta), it is possible to observe gross indications of site area function in the relative frequencies of the flint artifact categories. Samples of the Châtelperronian occupation in the Main Area (Couche B:Basal, Archaeological Level 1, and Couche C) have significantly more nuclei and retouched tools than expected but a deficit of *débitage* products (waste flakes, etc.) (Chi-square $= 57.64$, df $= 6$, $P < .005$). Both the Alpha Complex (all units) and Archaeological Level 1 in Test Pit Beta have an excess of *débitage* products and a deficit of nuclei and tools. The mixed series from the Main Area has, at first glance, an excess of retouched tools, but, as discussed further below, the raw counts are misleading.

The Châtelperronian data from the three areas suggest a very general functional interpretation. Excavation of the Main Area has sampled the principal, central portion of at least one occupation area, a place where blanks were produced from nuclei, the blanks retouched into tools, and the tools used and discarded. The density of artifacts within Archaeological Level 1 and their internal patterning (cf. section V-D-22) support this interpretation. The excess of retouched tools in the Main Area, compared to tool frequencies in Alpha and Beta, suggests further that tools manufactured elsewhere were used and discarded in the Main Area.

Test Pit Beta samples the fringe of an occupation area, almost certainly the same one whose center is seen in the Main Area. Artifacts of any kind are sparse, and there is an excess of chipping debris. Tool manufacture certainly occurred in this area, but it is likely that both the tools and the nuclei, perhaps not yet exhausted, were taken away to be used further closer to the center of the occupation area.

The samples from the Alpha Complex have the same characteristic as that from Beta—an excess of chipping debris and a deficit of tools and nuclei—and they too may represent the fringe of some occupation. Too little has been excavated to interpret the lateral distribution pattern, however, and it is quite possible that Alpha samples the principal portion of a different kind of occupation from that of the Main Area—perhaps smaller, shorter (e.g., the expedient utilization of fewer of the <u>débitage</u> products), and functionally more specialized (e.g., the excess of backed tools in Alpha). Clarification can come only from further excavation that enlarges the sample.

The excess of retouched tools in the mixed series from the Main Area is an apparent anomaly. In fact, however, the processes of mixture themselves have created some of the "tools". In the Palaeolithic sample (Couche B:Basal, Archaeological Level 1, Couche C), 35.37% of the retouched tools are either notched pieces, denticulate pieces, or pieces with miscellaneous retouch. In the mixed sample (Couche B:Upper and Ditch Fill), these minimally modified tool categories account for a majority (53.93%0 of the retouched tools. This difference is, of course, highly significant (Chi-square = 12.17, df = 2, $P < .005$). Notching and miscellaneous "retouch" are very common results of the movement of flint objects within an enclosing matrix of sediment. When the movement is caused by natural agencies (frost heaving, etc.), radically modified pseudotools (<u>pièces concassées</u>) may result. In the present instance, the movement was probably the work of man—digging the ditch and other modifications of the land surface—and the modification has been modest. Fortunately, however, because the disturbance is not ancient, the resultant subrecent damage is sometimes visible on the flint objects in the form of a <u>double patination</u>. In the pooled sample, 29.21 % of the retouched tools and 5.39% of the <u>débitage</u> products have a double patination. More importantly, 20.22% of the retouched tools (notched pieces, etc.) have been <u>created by</u> the subrecent damage made visible by the double patination. The figures cited must be regarded as a minimum estimate, because some lithic varieties do not patinate clearly. If, therefore, it is correct to regard the subrecent damage as an accidental result of disturbance, the apparent excess of retouched tools in the mixed series is without cultural significance. (It should be noted in passing that the phenomena of double patination and subrecent damage are absent from the tools of Couche B:Basal.)

IX. Paleoenvironmental Data

A. Relationship Among Sample Columns

During the course of the 1973 sondage, Dr. Laville removed 19 samples of sediment. Half of each sample was used for his own sedimentological analyses (the results of which are reported in Bricker and Laville 1977:513-516) and half was turned over to Mlle. Paquereau for palynological analysis (the preliminary results of which are reported here). Although this was not noted explicitly in the published report of the sondage, the 19 samples came, in fact, from two separate columns. Samples B1 through B8 came from Square V-B, whereas samples B9 through D3 came from Square V-A. There is, therefore, a question of column-to-column correlation that has not been dealt with heretofore; the implication of Figure 8 in Bricker and Laville (1977:516)--that sample B8 follows directly upon sample B9--is erroneous, albeit inconsequentially so. Additional correlation is needed to relate the two 1973 columns to the single 1975 column from Square V-C (samples Ba1 to M), and to relate all three Main Area columns to the single 1975 column from Test Pit Alpha.

The correlations for the Main Area columns are shown graphically in Figure 31. The relative thicknesses of the several samples are shown accurately, but the columns are not plotted with respect to absolute depth below site zero (because they come from different areas of a sloping land surface). Rather, the top of the dense artifact scatter of Archaeological Level 1 is plotted as a horizontal "horizon marker", and the other parts of the columns vary according to the true thickness of the samples.

The two solid heavy lines in Figure 31 enclose Archaeological Level 1. In the V-C column, this includes sample Bb4 only. In V-A, where the artifact scatter was thicker, it includes the lower portion of B9 and all of B10 and B11. In V-B, sample B8 barely penetrated Archaeological Level 1, and the "horizon marker" is therefore drawn near the bottom of that sample. Samples B8 and B9 are partially overlapping, not strictly sequential. That they have been treated previously as sequential samples has created no problems, however, because both the sedimentological and palynological analyses show that they belong to the same climatic phase.

Correlations below Archaeological Level 1 are not shown on the figure, primarily because the palynological results for the V-C column are not yet available. Laville's data (cf. Appendix A) suggest, however, the following correlations:

V-A (1973)	V-C (1975)
C1, C2	C2, C3
D1	C7

If this is correct, the implication is that much of what was called Couche D in the 1973 sondage is now included in Couche C.

The dashed heavy line in Figure 31 indicates in each column the beginning of Laville's minor stratigraphic discontinuity in Couche B—what the pollen data now allow us to call a less cold, more humid climatic oscillation.

Correlation between the Main Area sequence and that of the Alpha Complex must remain vague until such time as pollen data are available for Alpha. There is certainly no great difference in age between the principal archaeological levels in the two areas—on this point the sedimentology is clear (cf. Appendix A) and in perfect agreement with the typology. Laville's data cannot, however, demonstrate a close contemporaneity of the two occupation zones.

B. Results of Analysis

The currently available results of the paleoenvironmental research are presented in the reports of Dr. Laville (Appendix A; Bricker and Laville 1977:513-517) and Mlle. Paquereau (Appendix B), to which the reader is referred. Drawing on these reports, I attempt in this section to present a very generalized summary of the climatic history of the site as it relates to the occupational history.

Les Tambourets is located on a hilltop that is presently a saddle between the Garonne Valley, to the north, and the Volp Valley, to the south and east (Fig. 3a). Throughout much of the Pleistocene in this region, the Garonne drainage, including the valleys of its affluents, was mantled with gravels and other fluviatile deposits, and the valley sides were from time to time modeled by frost action and covered with solifluction deposits. Moreover, during times of glacial maxima, the aeolian deposition of silt formed bodies of periglacial loess, some small remnants of which have survived subsequent erosion.

The Tambourets hilltop, a bedrock core covered by a thick sequence of Pleistocene sediments, preserves evidence of many of these processes. It is not yet possible to interpret satisfactorily most of the deposits encountered in the excavation (those below Couche C), but they certainly record a long history of climatic fluctuation—solifluction and other cold-climate phenomena alternating with periods of chemical weathering and at least the beginnings of soil formation (pedogenesis). Such an episode of weathering and soil formation brought about the concretionment of Couche C (as redefined in 1975), itself composed of sediments deposited under conditions of fluctuating temperatures (never very cold) but constant humidity. Tree cover was sometimes extensive. The archaeological sampling of these early levels has been minimal, but there is as yet no evidence that the hilltop was occupied by man before the early Upper Palaeolithic (Châtelperronian).

The first documented human use of Les Tambourets coincided with the start of deposition of Couche B, a loessic sediment resulting primarily from aeolian deposition. The Châtelperronian occupation was, therefore, contemporaneous with the beginning of formation of a loess sheet, a time of cold and increasingly dry climate. There was little or no tree cover in the immediate vicinity of the site. Most of the arboreal pollen is that of Scotch pine (not necessarily from very close to the site), with some birch and willow. The disappearance of sedges (Cyperaceae) by the end of this climatic phase is noted by Paquereau as evidence of progressive dessication. With the few tress and shrubs probably concentrated in the more protected valley bottoms, it is likely that the hilltop on which the Châtelperronian occupation took place was covered with herbaceous vegetation only, especially grasses and Compositae. The faunal refuse that must have resulted from the occupation has disappeared, as a result, according to Laville, of the acidity of the sediment (Appendix A).

Unless the principal archaeological horizon in the Alpha Complex is significantly younger than that of the Main Area, the major Châtelperronian occupation of Les Tambourets came to an end during the cold, dry phase of loess formation (Paquereau's Phase V).

The climatic history of the site, as recorded in the sediments of Couche B, continued with a minor and probably brief climatic oscillation—an episode of warmer and more humid climate, with slightly more tree cover in the immediate vicinity of the site. Loess deposition ceased, and weathering of the previously deposited sediment began. The site was apparently not occupied at this time.

After an unknown period of time, climatic deterioration brought a return of cold, dry climate—perhaps even more severe than that associated with the Châtelperronian occupation—and loess deposition resumed. Tree cover in the region was virtually absent. Again, there is no evidence that the site was occupied at this time.

The remainder of the Pleistocene stratigraphic record on the Tambourets hilltop is missing; any sediments that were deposited later have been removed by erosion, exposing the late Couche B (Paquereau's Phase VII) loess body, upon which the modern soil has been developed. Occupation of the site and its immediate environs from Neolithic times to the present day is documented by ceramic and other artifacts.

C. Age of the Châtelperronian Occupation

The paleoenvironmental research is not yet far enough advanced to relate the Les Tambourets sequence, or even the upper part of it, to a standard paleoclimatic sequence for southwestern France with the requisite degree of confidence. The general outlines of the dating are, nevertheless, becoming clear and may appropriately be discussed in tentative fashion.

It has been clear for some years (Chauchat and Thibault 1968; Laville 1973, 1975) that Châtelperronian occupations in southwestern France date to the end of the Würm II/III interstadial and/or the beginning of the Würm III.* For this reason, we stated in the preliminary report that "...we can reasonably attribute Couche B and the archaeological remains it contains to the first moments of the Würm III stadial" (Bricker and Laville 1977:517). It is clear in a general way, also, that the weathering and pedogenesis registered within Couche C is related at least to the Würm II/III interstadial and possibly to the fluctuating climate that began the Würm III. It is, however, impossible at the moment to locate the beginning of the Würm III (temporally equivalent to Laville's "Périgord I" phase farther north [Laville 1975]) in the Tambourets sequence. Perhaps Paquereau's pollen phases I-IV or some of them represent this time (cf. the final paragraph of Appendix B), but this is not yet certain.

By the time the Tambourets sequence records the onset of a cold, dry climate associated with loess deposition (Couche B), it is highly probable that these sediments are correlative with those of Laville's "Périgord II" phase farther north. Although this obviously attractive correlation may yet prove to be erroneous (Les Tambourets is in the foothills of the Pyrenean chain, not in the Périgord), it is, I believe, the most reasonable working hypothesis consistent with presently available data.

If the principal Châtelperronian occupation at Les Tambourets (Archaeological Level 1 in the Main Area) is contemporaneous with Laville's Périgord II phase, it is somewhat younger than almost all other presently known Châtelperronian sites in France (dated, at the latest, to the Périgord I phase). That Tambourets:1 is a late Châtelperronian is a working hypothesis totally consistent with what is known about the typology and technology of the assemblage sample.

The radiocarbon dating of the Würm III sequence in the Périgord (and elsewhere) is fraught with problems, but the Périgord II phase is perhaps more easily dated than some other parts of the sequence. I have explained in detail elsewhere (Bricker, n.d.) how radiocarbon dating and sedimentological data from l'Abri Pataud (Les Eyzies, Dordogne) indicate that

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*The maximum or climatic optimum of the interstadial as known from the Périgord region was a phase of weathering and soil formation, not of sediment deposition, followed by a phase of erosion that removed, according to local variations, some or much of the soil zone thus formed. Sedimentation began again during a period of climatic instability preceding the first major cold of the Würm III; these sediments, which contain the earliest Châtelperronian materials in southwestern France, represent a time of fluctuating but clearly transitional climate, and authors differ in assigning them to the interstadial or the stadial (Laville 1972:1-5).

the Périgord II phase centers on the period from ca. 34,000 to 33,000 B.P. This, I suspect, is the age of the principal Châtelperronian occupation at Les Tambourets.

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APPENDIX A

Report on the Analyses Done on the Sediments from the Site of Les Tambourets in 1976 and 1977

The *sondage* done in 1973 penetrated a sandy-silty-clayey deposit about one meter thick (Couche B) at the base of which was located an archaeological level containing a Périgordian industry with Châtelperron points. This level rested on a more clayey formation (Couche C) about 0.25 m. thick. The *sondage* stopped within an even more clayey deposit containg very numerous ferromanganese nodules (Couche D). The granulometric study of 19 samples allowed us to infer a strong influence of aeolian action in the deposition of these sediments. A more detailed study of the results of analysis led to, among other things, the recognition of a minor stratigraphic discontinuity within Couche B located at the junction of the archaeological level strictly defined and the overlying zone containing more dispersed cultural material. The presence of ferromanganese concretions and the more clayey nature of the sediment immediately beneath the archaeological level allowed us to infer weathering processes before the occupation of the site by the Palaeolithic peoples.

New stratigraphic observations were made during the course of the 1975 excavations, and new samples were taken from sediments encountered near the 1973 *sondage* (Square V-C) and in Test Pit Alpha, located 52 m. to the east.

Square V-C

Thirteen different deposits were recorded from a section approximately 2 m. thick. The main characteristics of the 42 samples taken in continuous fashion from this square are found in the accompanying diagrams (Fig. 32), which summarize the results of the granulometric analysis of the sediment less than 2 mm. in diameter, as well as the distribution within the gravels (2-10 mm.) of ferromanganese concretions. This is joined with the results of two measures of pH—one in distilled water, the other in a normal solution of KCl.

We lack as yet comparative data for the valid interpretation of the textural variations found in Couches L to D; the ongoing stratigraphic and sedimentological study of the deposits that crop out in the vicinity of Les Tambourets should be of help.

The comparison of the results obtained for Squares V-A and V-B in the 1973 sondage and the present ones for Square V-C leads to the following remarks.

-The minor stratigraphic discontinuity recognized within Couche B in Square V-B is found as well in Square V-C. In the former, it is shown by a deficit of the clay fraction at a depth of approximately 130-135 [cm. below site zero, mainly sample B5], in the latter by a corresponding deficit at a depth of 140-145 [Bb2].

-The greater frequency of manganese concretions in the sediment immediately below the archaeological level appears in Square V-A at depth 163-181 [C1-C4]; it is shown, on the one hand, in the gravel category and, on the other hand, by an increase in the sand fraction. Analogous characteristics appear in Square V-C between 154-180 cm. [C1-C5].

The stratigraphic correspondence recognized during the excavations between the deposits of the 1973 sondage (Squares V-A and V-B) and those of the Main Area of 1975 (Square V-C) is thus confirmed by the sedimentology. Along the same lines, we are inclined to see as comparable the increases in the sand fraction occurring in V-A at 186-193 [D1] and 163-173 [C1, C2] and in V-C at 185-190 [C7] and 160-170 [C2, C3].

We note finally that the archaeological level, which corresponds to Level Bb in Square V-C, is immediately below a zone of light concretionment (depth 135-140). This detail, although unspectacular, should be recalled at such time as an attempt is made to correlate this stratigraphic sequence with that of Test Pit Alpha.

The pH values, measured in distilled water, vary slightly around 6. This acidity of the sediment obviously explains the absence of faunal remains at the site of Les Tambourets.

The preliminary results of the palynological analysis done on the deposits of Squares V-A and V-B indicate a succession of seven climatic phases between the time of deposition of the earliest sediments sampled and the latest.

It is interesting to note that the climatic phases thus defined coincide systematically with specific manifestations: increase in coarse sand in Phases II and IV characterized as "mild and humid" and corresponding doubtless to an increase in erosion, deficit in clayey material in B5-B4 (Phase VI, less cold and more humid).

Test Pit Alpha

The examination of the stratigraphic section brought to light by the excavations in this area permitted the recognition of five superposed deposits numbered from I to V. Compared to the stratigraphic succession represented in the Main Area, Squares V-A, V-B, and V-C, two differences deserve mention.

-The deposits above the archaeological level here reach a thickness of about one meter (as opposed to only 35 cm. in Square [V-C]), and they appear from visual inspection to be perfectly homogeneous. They contain at their base an archaeological level identical to that contained in the base of Couche B in Square V-C.

-Whereas in Square V-C the archaeological level rests directly upon a formation characterized by a high proportion of ferromanganese nodules (Couche C), in Test Pit Alpha, the archaeological level was found during the excavation to be separated from the concretion level by an intervening deposit that seemed to have characteristics of its own. The contemporaneity of the archaeological level in Test Pit Alpha and the archaeological level in the Main Area was thus called into question.

As a result, doubtless, of local conditions, the fine sediments of Test Pit Alpha have identical textural characteristics throughout the whole stratigraphic sequence: the percentages of sands, silts, and clays remain practically constant (Fig. 33).

The examination of the diagram of percentage variations of ferromanganese concretions furnishes additional information (Fig. 33). Specifically, the analysis makes clear that the archaeological level, between 110 and 125 cm., appears to be situated immediately below a zone of slight concretionment, as is the case in Square V-C at depth 135-140. The concretion horizon situated immediately below the archaeological level in Square V-C occurs here as well, with exactly the same characteristics, but offset to a lower position. A non-concretioned zone about 10 cm. thick separates the archaeological level from the concretioned horizon (as, indeed, was thought at the time of the excavation).

In my opinion, this slight offset has absolutely no implication concerning the stratigraphic relationship between the archaeological levels in the two sectors. In both sectors, the archaeological level is situated between two zones of concretionment. These zones of concretionment are not related to the sedimentation but rather are--in both cases--secondary phenomena. Their depth relative to the archaeological level is related not to the original stratigraphy of the deposit, but rather to local drainage conditions.

Thus, the stratigraphic and sedimentological data do not argue against the contemporaneity of the archaeological levels discovered in the two different sectors. In both cases, they were emplaced after an episode of concretionment of strong intensity, and they were followed by a new episode of less intense concretionment.

H. Laville
28 September 1977

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APPENDIX B

Les Tambourets. Palynological Analysis—1973 Sondage

The palynological analysis concerns Couches D, C, and B. The different levels, rather rich in pollen and spore material, permitted us to count, on average, 200 to 250 pollen grains per sample. The statistical results and the interpretations that follow from them are, therefore, very valid.

This stud shows the existence of seven successive climatic phases or oscillations.

Phase I—sample D3

A cool and humid phase; arboreal pollen represent 22% of the sample. Pinus silvestris [Scotch pine] is dominant, accompanied secondarily by willow, birch, and by rare hazel and alder. The NAP includes numerous Gramineae [grasses], Cyperaceae [sedges], and hygrophilous plants. One finds also, in lesser quantity, Compositae and various common heliophilous plants.

Phase II—samples D2 and D1

A very mild and humid phase; a very great increase in tree cover is shown by the arboreal ratio, 38% to 40%. Deciduous trees are numerous, especially hazel, which becomes dominant in sample D2. It is accompanied by alder, willow, oak (3 to 4%), and sporadically by elm and lime. Several shrubs (ivy, black alder) are also present. Scotch pine accounts for only 10 to 15% of the arboreal pollen. The NAP is dominated by Gramineae, Cyperaceae, hygrophilous plants, and secondarily by Rosaceae and Ericaceae. One finds also rather numerous spores of ferns that grow in humid habitats and under trees.

Phase III—samples C5 and C4

A cold, rather humid phase; the arboreal ratio drops to 18%, then to 16%. Scotch pine dominates, with some birch and willow, and sporadically hazel and alder. Among the NAP, the Gramineae are very numerous. One continues to find Cyperaceae in significant percentages, indicating the continued presence of a certain degree of humidity. The Compositae are numerous, as are the heliophilous plants, but they contain no steppic types.

Phase IV—samples C3, C2, and C1

A mild and humid phase; arboreal pollen increase again to a mean of 28%. This results especially from an increase in pollen of birch, willow, and Scotch pine. Hazel is rather abundant, accompanied by some alder and elm and by rare oak. Once again, the Gramineae, the Cyperaceae, and the hygrophilous plants are well represented.

Phase V—samples B11 through B6

A cold, rather dry phase; a sharp decline in tree cover is indicated by arboreal ratios of 13 to 12%. They represent principally Scotch pine, with some birch and willow. In the NAP, the Compositae and the Gramineae become dominant. Heliophilous plants increase, but here again they are not of steppic type. At the beginning of this phase, some Cyperaceae are present, but they disappear in later samples. This assemblage indicates a progressive intensification of dry conditions.

Phase VI—samples B5 and B4

A less cold and more humid phase; the arboreal ratio rises to 18% through an increase in Scotch pine and particularly in birch. Some willow is present, and some Cyperaceae reappear as well. The Gramineae dominate the Compositae.

Phase VII—samples B3 through B1

A cold and dry phase; the arboreal ratio here is the lowest in the whole sequence, a mean of 10%. Scotch pine is almost the only tree, with rare birch and willow. The very numerous NAP are dominated by the Compositae and very varied heliophilous plants (Cruciferae, *Plantago*, Chenopodiaceae...). The appearance of several steppic types (*Galium*, *Helianthemum*) must be noted.

In this sequence, the first four phases show no climatic episode that is either very cold or very dry. A certain degree of humidity continues constantly, as do some deciduous trees. The two climatically favorable episodes (Phases II and IV) are rich in temperate deciduous trees, especially Phase II, which seems to be very mild. The last three phases indicate the inauguration of a cold that was more marked and more dry. It is possible that these different episodes indicate the start of a climatic change that came about very gradually. Perhaps we have here the first stages of the glacial phase of the Würm III stadial.

M.-M. Paquereau
June 1977

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FIGURE CAPTIONS

Figure 1.—Les Tambourets. Excavation grid of 1973 (dotted shading) and 1975 (no shading), showing location of Main Area (Trenches II-VII), the Alpha Complex (left), and Test Pit Beta (right). The post-Palaeolithic ditch in Trenches VI and VII is marked "FOSSE".

Figure 2.—a: Participants in the field research at Les Tambourets as of 19 July 1975. b: View of the Main Area under excavation, looking southeast; the building in the left background, property of M. and Mme. Portet, housed the expedition's on-site laboratory.

Figure 3.—a: Removal of Couche A (the plough zone) from Squares IV-B and IV-C, looking northeast toward the confluence of the Garonne and the Volp Rivers. b: Measuring in the depth of artifacts below site zero.

Figure 4.—a: Excavation of Archaeological Level 1 in the Main Area. b: Test Pit Alpha during an early stage of its excavation, looking west.

Figure 5.—a: Wetting down the sun-baked surface with a portable sprayer. b: Numbering artifacts in the on-site laboratory.

Figure 6.—a: Geological test pit in the northern half of Square V-B, exposing the face of sediment column in the southwest corner of Square V-C from which a series of 42 sediment samples were removed. b: The western half of the post-Palaeolithic ditch in Square VI-C, looking north. The tape extends from the bottom of the ditch to the modern surface; the surface to the left of the ditch bottom is the surface of Couche C. Note that the west wall of the ditch cannot be traced through Couche B.

Figure 7.—Les Tambourets, Main Area. Stratigraphic section in Trenches V, VI, and VII, between Squares B and C, looking north. Shown are Couche A, Couche B, Archaeological Level 1 (in the base of Couche B), and the excavated upper portion of Couche C. Laville's V-C sample column, to the left of the diagram, shows the sequence below Archaeological Level 1 and the location of each of the samples removed. The post-Palaeolithic ditch is shown as "Fosse".

Figure 8.—Les Tambourets, Main Area, Square V-C. Stratigraphic sequence, Couches A through M, after the removal of the sediment samples from the V-C column (photomontage).

Figure 9.—a: Bottom of post-Palaeolithic ditch in Squares VI-B, VI-C, and VII-B, looking northeast. b: Same, but with ditch bottom moistened to restore visual contrast to sun-dried sediments. The bottom of the ditch is cut into Couche C; the surface of Couche C appears on both sides of the ditch bottom.

Figure 10.—a: Stratigraphic column in the northwest corner of Test Pit Alpha, looking north, from which sediment samples have been removed. b: Detail of part of the Alpha column, showing the very sharp but undulating contact between Ensemble III, above, and the concretion-rich Ensemble IV, below.

Figure 11.—Les Tambourets, Main Area, Square V-D (eastern half). Photomontage of the artifact scatter of Archaeological Level 1 after most of the objects have been exposed by excavation. The longer standing wall, bottom of the photo, is the eastern wall of V-D.

Figure 12.—Les Tambourets, Main Area, Couche B:Upper. Ceramic artifacts.

Figure 13.—Cumulative graph of the retouched tools in the assemblage sample from Les Tambourets, Main Area, Archaeological Level 1 (1973 and 1975 excavations); N = 512.

Figure 14.—Les Tambourets, Main Area, Archaeological Level 1 (= Tambourets:1). Châtelperron points: 1599, 4850, 1388, 3449, 1609, 1493, 4020, 2276. Marginally retouched blades: 2698, 3658, 1717.

Figure 15.—Tambourets:1. End-scrapers: 1706, 1881, 1957. Splintered piece: 1985. Discoidal scraper: 1295+2244. Side-scraper: 3219.

Figure 16.—Tambourets:1. End-scrapers: 2714, 1627, 2711. Side-scrapers: 3711, 4057. Marginally retouched blade: 1587. Truncated blade: 1500.

Figure 17.—Tambourets:1. Discoidal scrapers: 2776, 2045. Truncated blades: 2970, 3706, 1595. Burin on unretouched edge: 3870. Chamfered piece: 2210.

Figure 18.—Tambourets:1. Dihedral burin: 3249. Truncation burins: 1853, 4852. *Bec*: 1601. Denticulate pieces: 3891, 2733.

Figure 19.—Tambourets:1. Denticulate piece: 4551. *Bec*: 3900. Perforators: 2704, 3987. Dihedral burin: 1545.

Figure 20.—Tambourets:1. Nuclei.

Figure 21.—Tambourets:1. Nuclei.

Figure 22.—Tambourets:1. Nuclei.

Figure 23.—Tambourets:1. Hammers and flaking tools.

Figure 24.—Tambourets:1. Faceted stone objects.

Figure 25.—Tambourets:1. Specialized hammer or flaking tool.

Figure 26.—Les Tambourets, Main Area, Square V-C (eastern half), looking east. The artifact scatter of Archaeological Level 1 after most of the objects have been exposed by excavation.

Figure 27.—Les Tambourets, Main Area. Distribution map of all catalogued objects in Archaeological Level 1.

Figure 28.—Same map as Figure 27, but with the approximate boundaries of distributional Features I to V drawn in.

Figure 29.—Les Tambourets, Alpha Complex. Distributional map of all catalogued objects in High Scatter and Main Scatter.

Figure 30.—Same map as Figure 29, but with the approximate boundaries of distributional Features VI and VII drawn in.

Figure 31.—Correlation of three sample columns (V-C, V-A, V-B) from the Main Area at Les Tambourets. The fourth column (extreme right) relates the pollen analysis to the sediment analysis. (See text for additional explanation.)

Figure 32.—Les Tambourets, sample column in Square V-C (1975). Left: Stratigraphic sequence and depths below site zero of each sample. Middle: Granulometry of the sediment smaller than 2 mm. Right: Percentage frequency of ferromanganese concretions in the gravel fraction. (H. Laville)

Figure 33.—Les Tambourets, sample column in Test Pit Alpha (1975). Left: Stratigraphic sequence and depths below site zero of each sample. Middle: Granulometry of the sediment smaller than 2 mm. Right: Percentage frequency of ferromanganese concretions in the gravel fraction. (H. Laville)

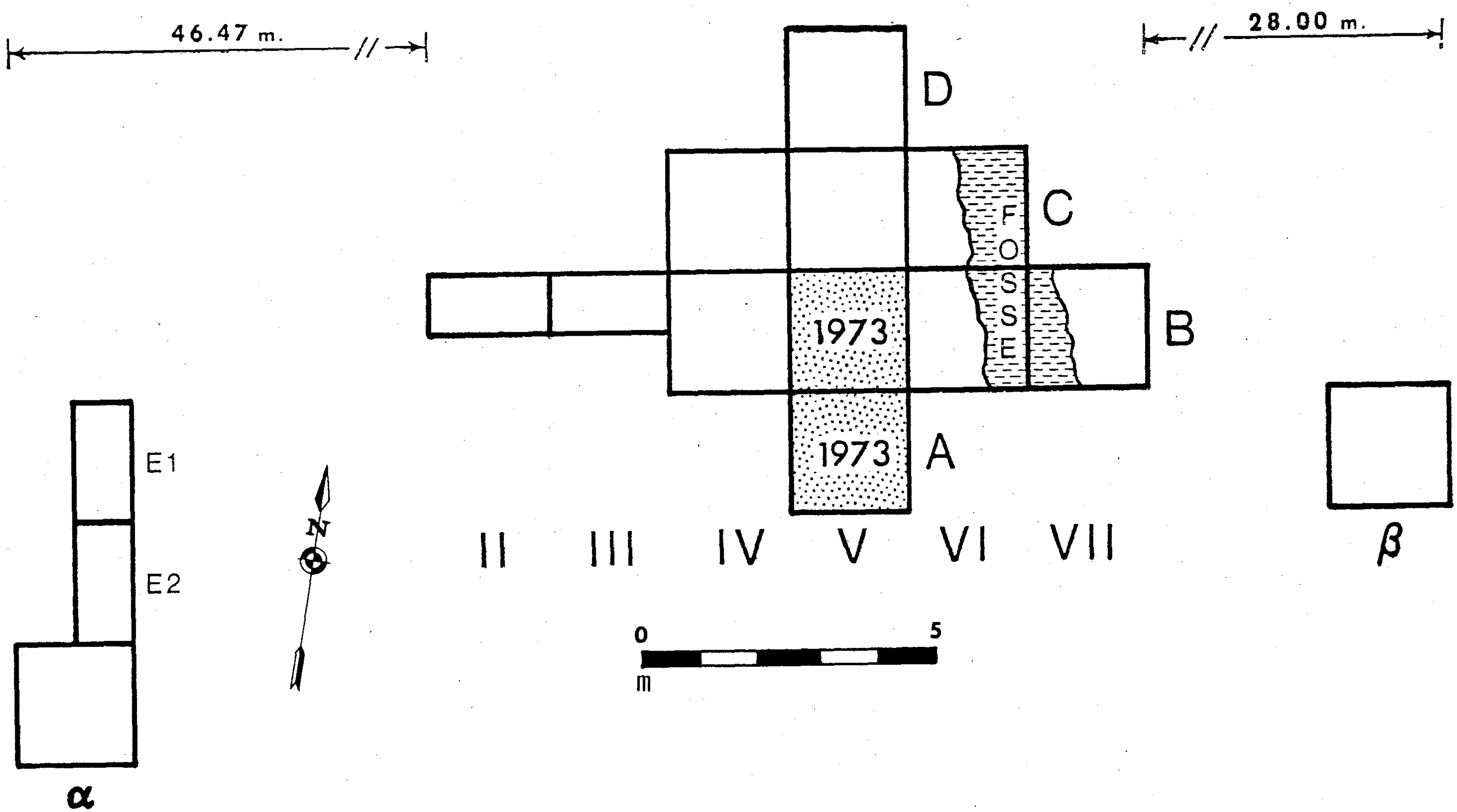
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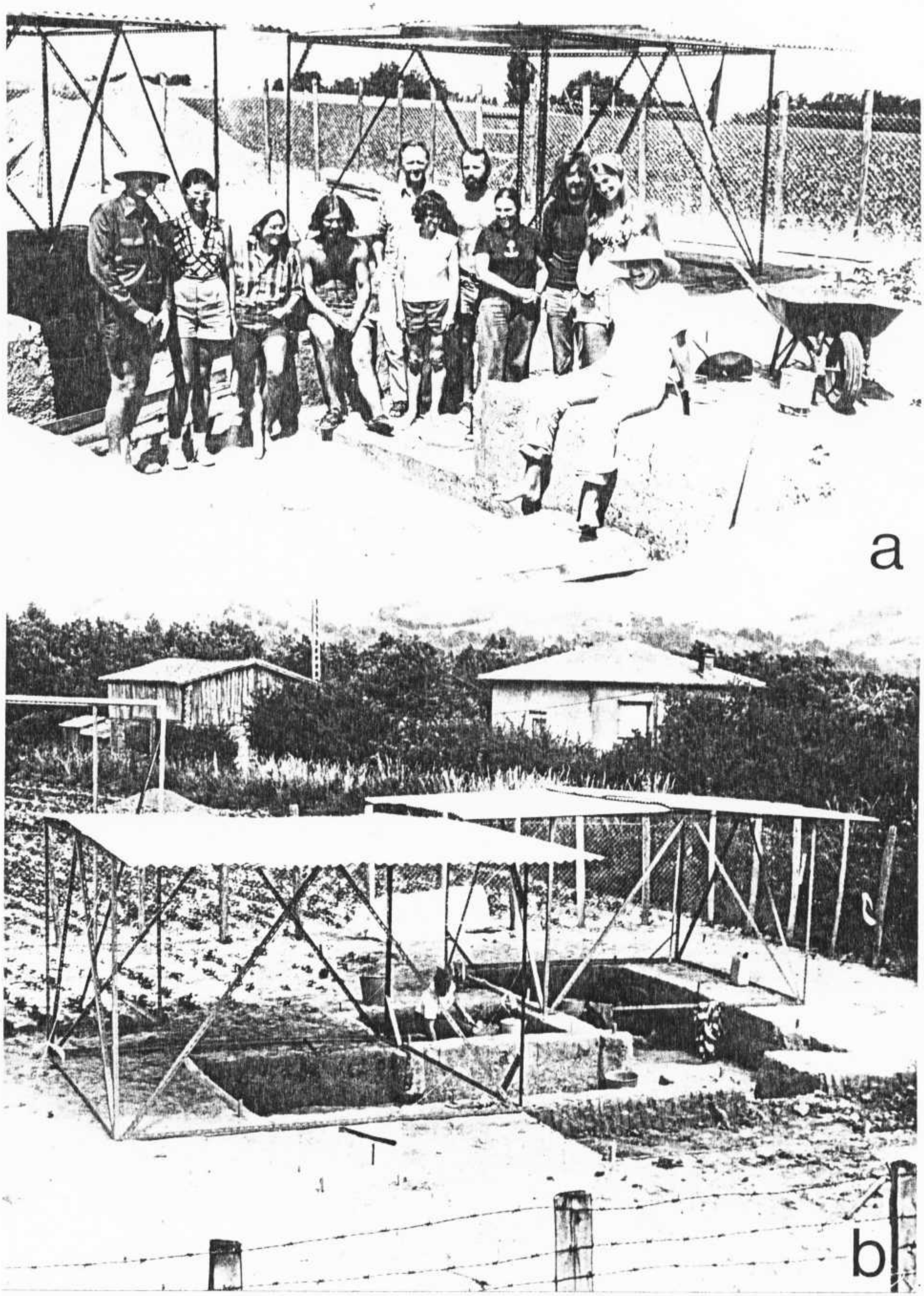
FIGURE 1



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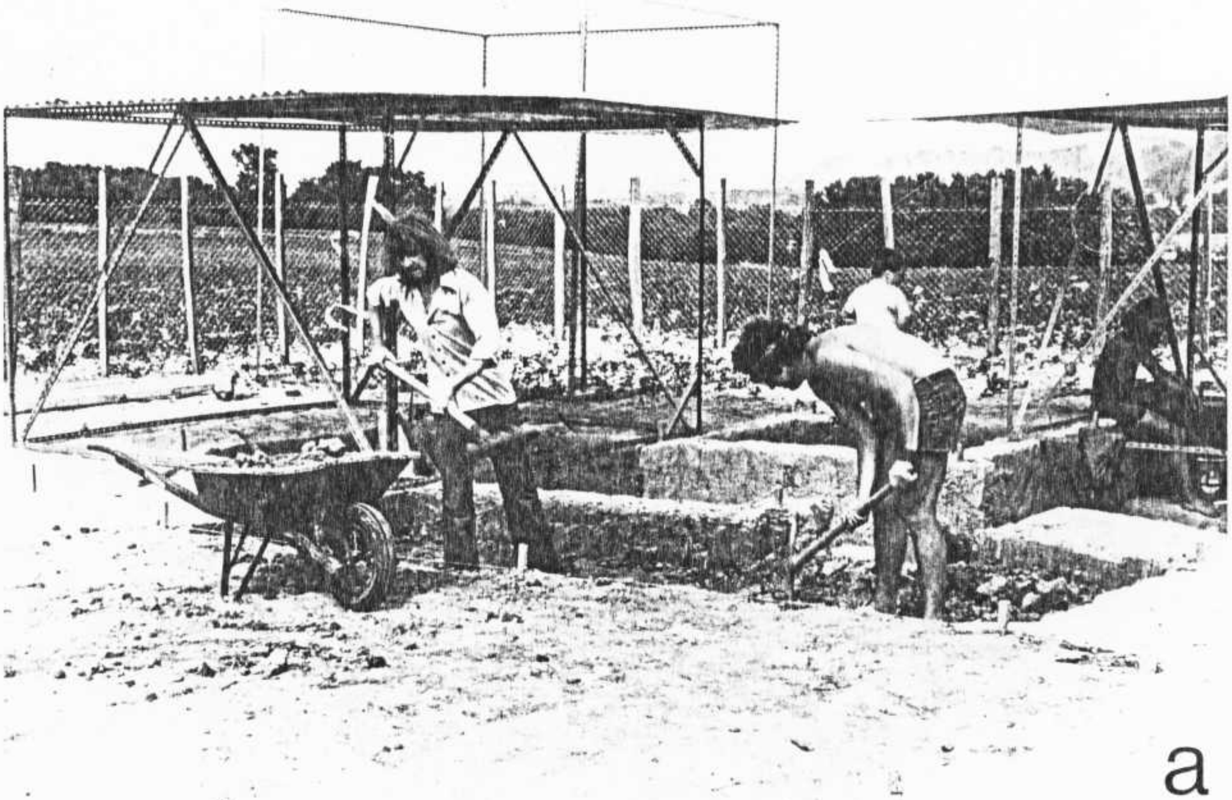


FIGURE 3

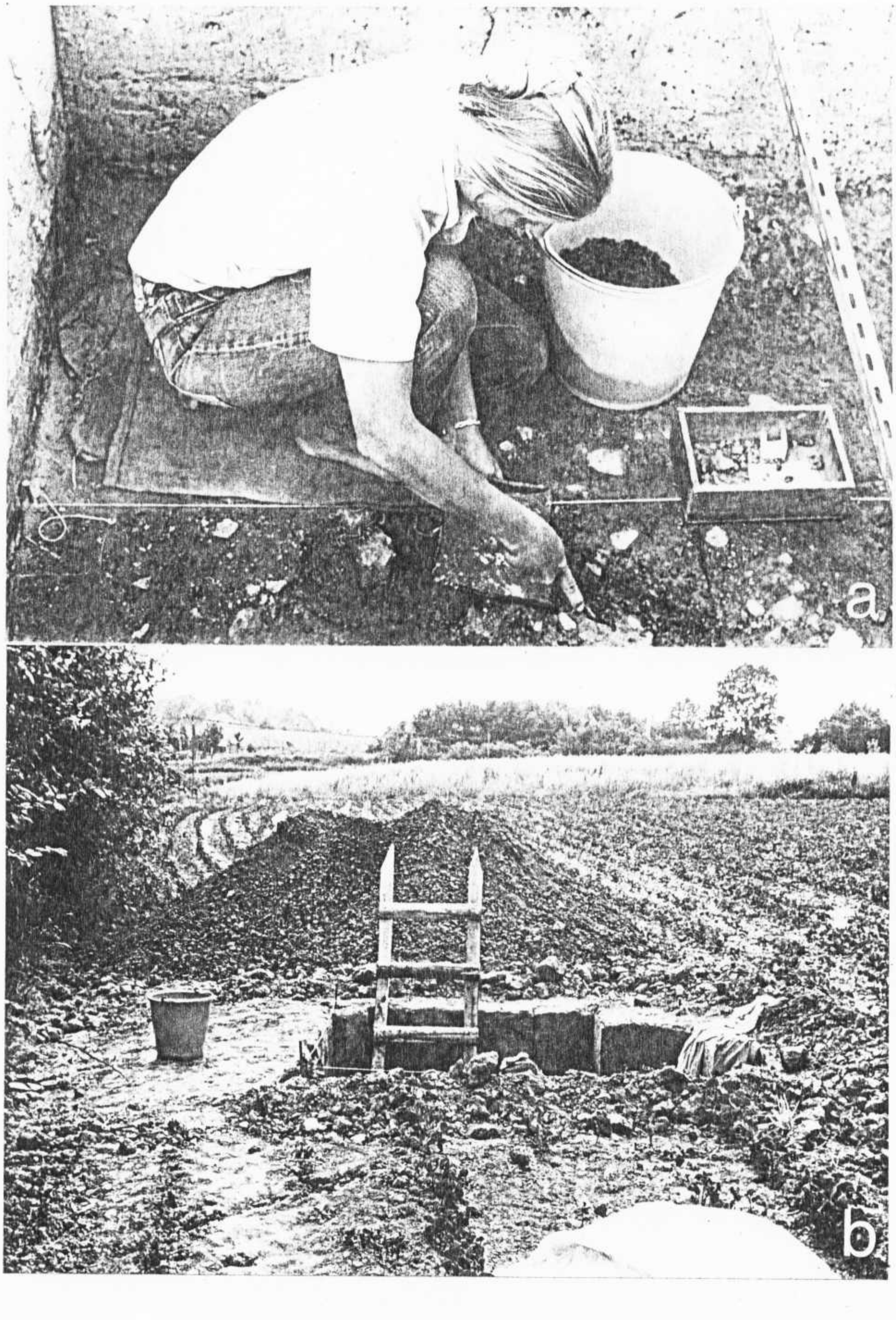


FIGURE 4

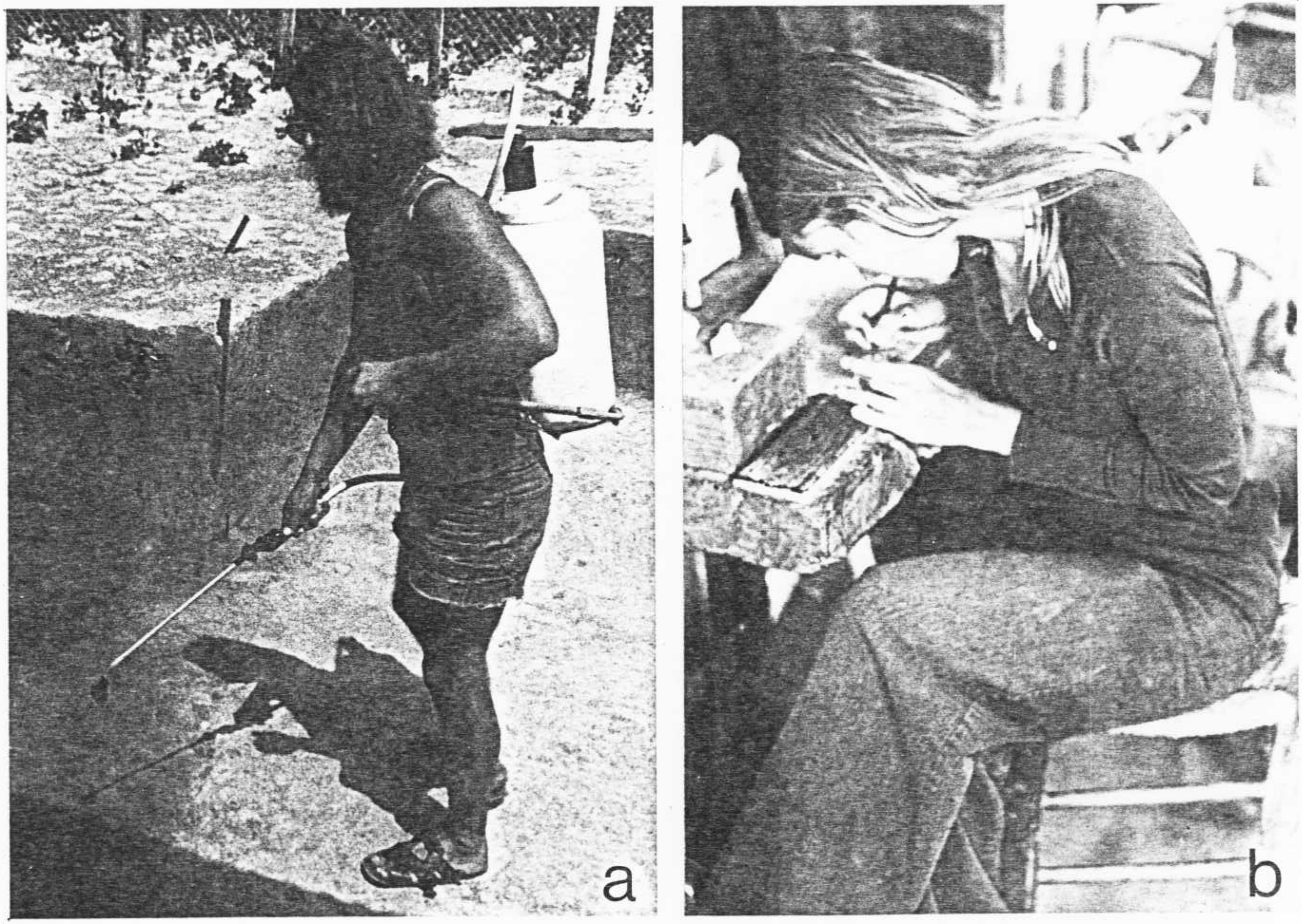


FIGURE 5

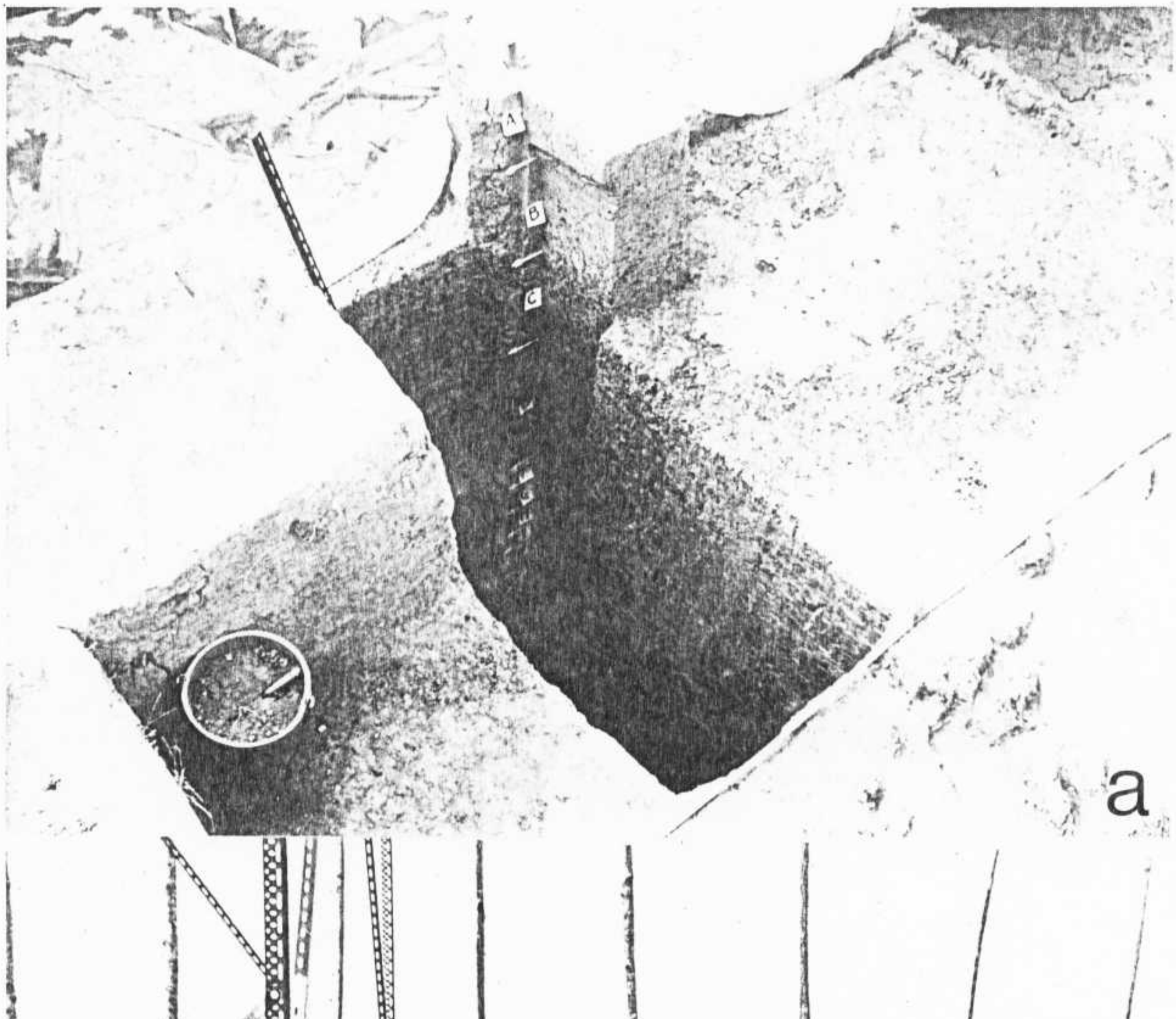
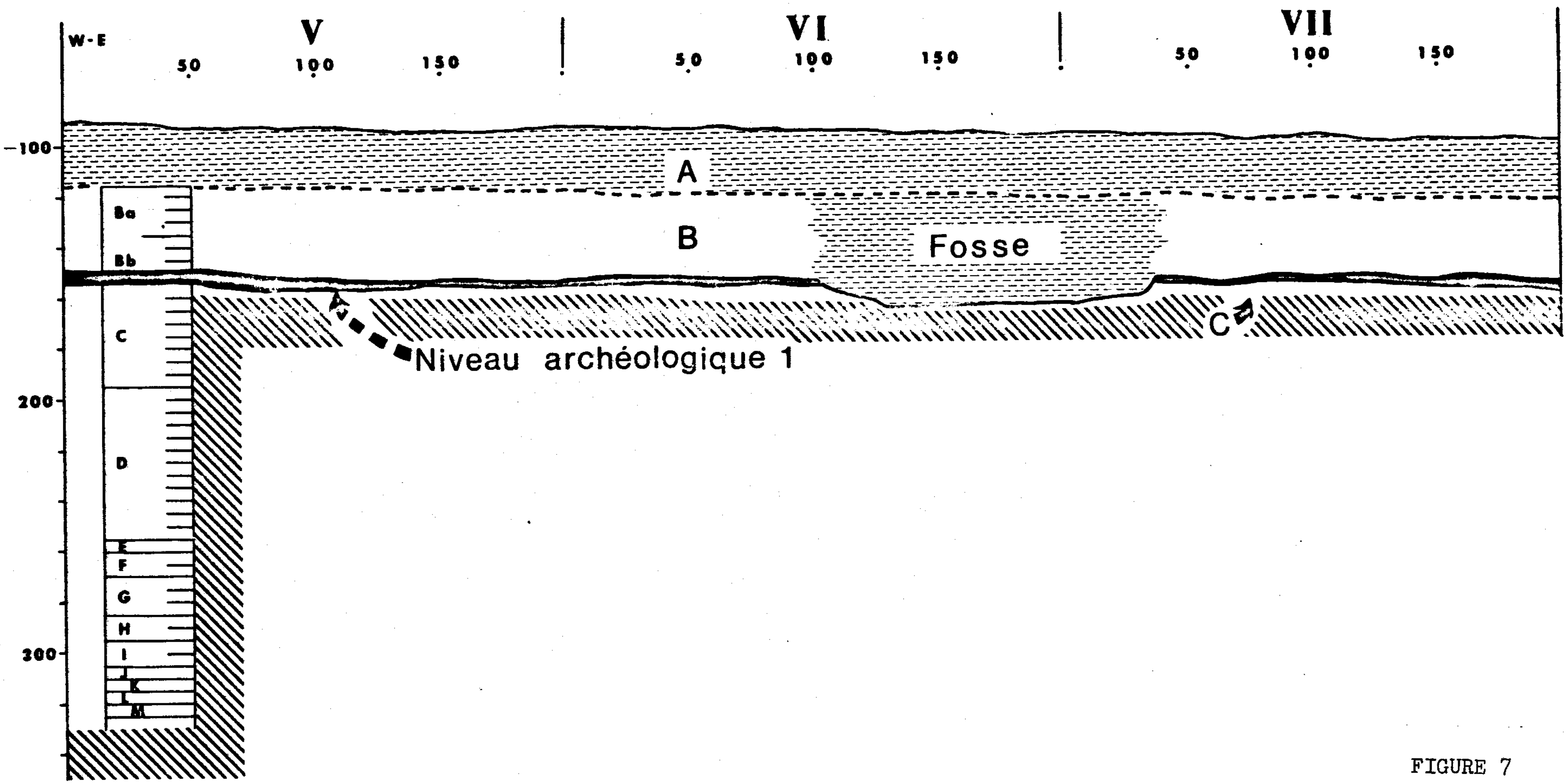


FIGURE 6


W-E
V
VI
VII
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100
150
-100
200
300
A
B
Fosse
Ba
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M
Niveau archéologique 1

FIGURE 7

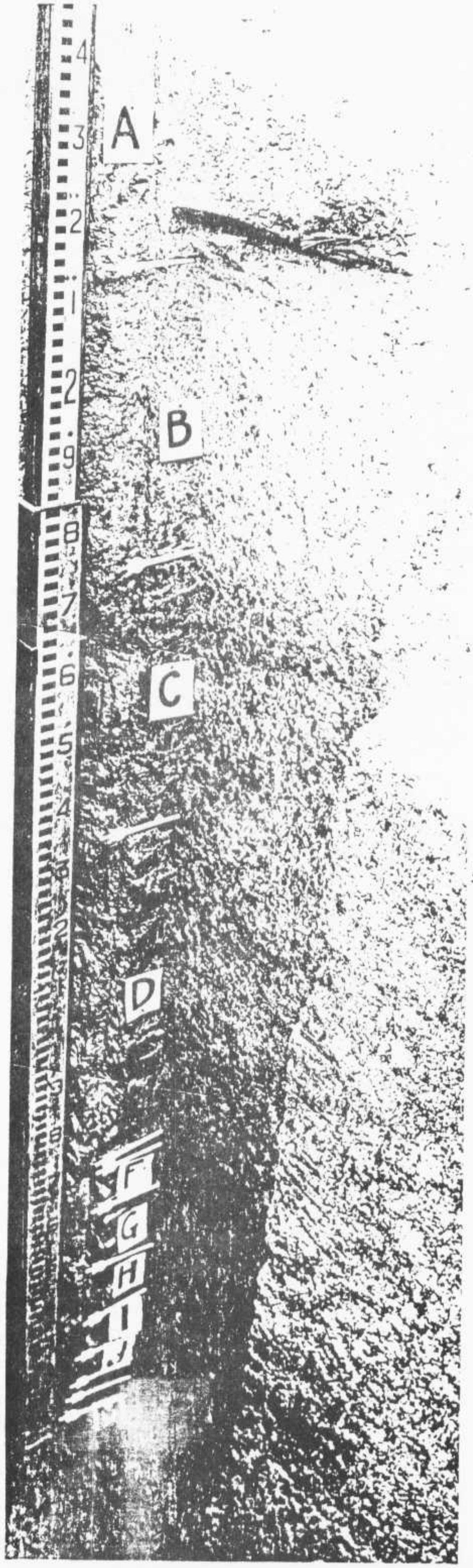


FIGURE 8

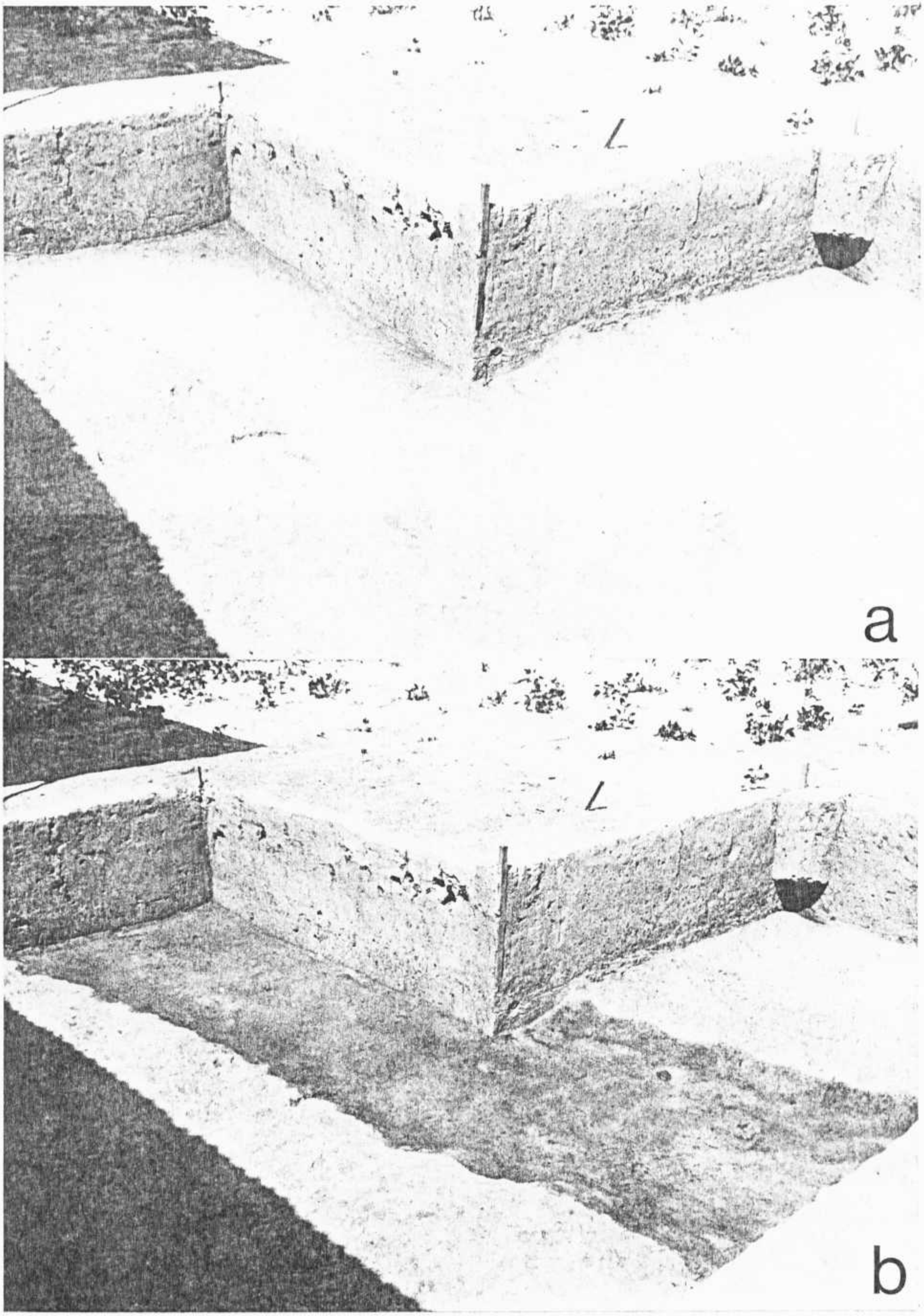


FIGURE 9

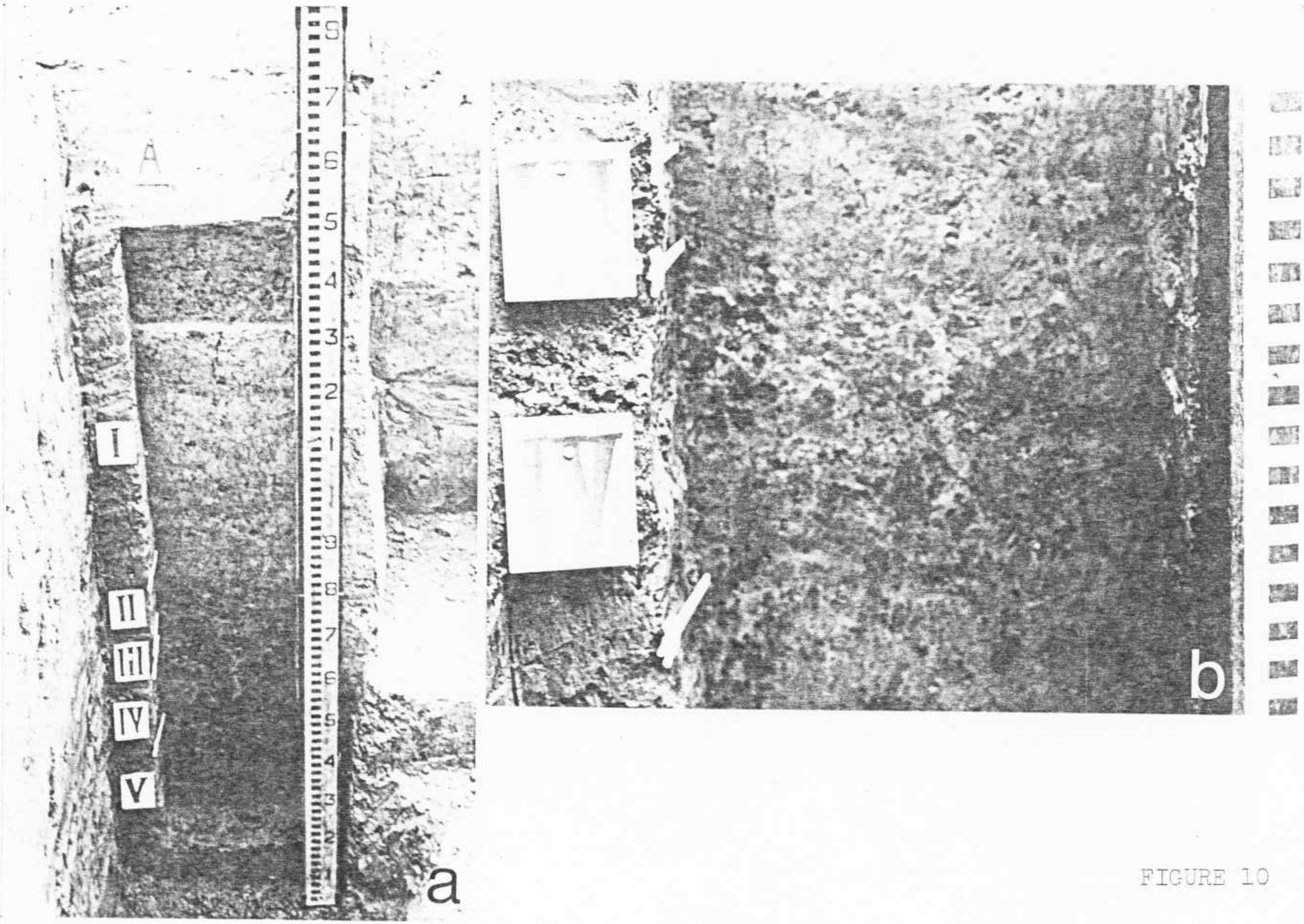


FIGURE 10

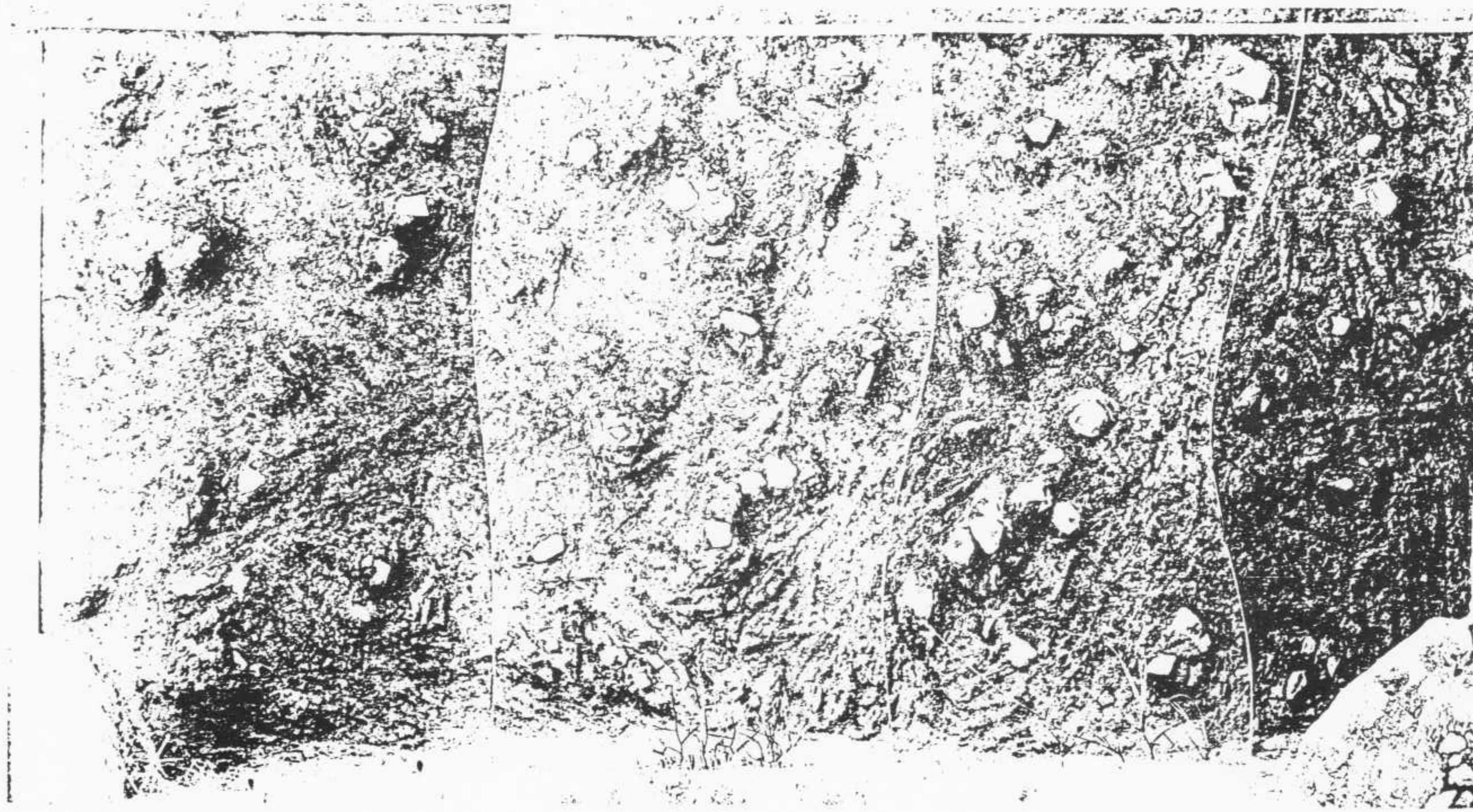


FIGURE 11

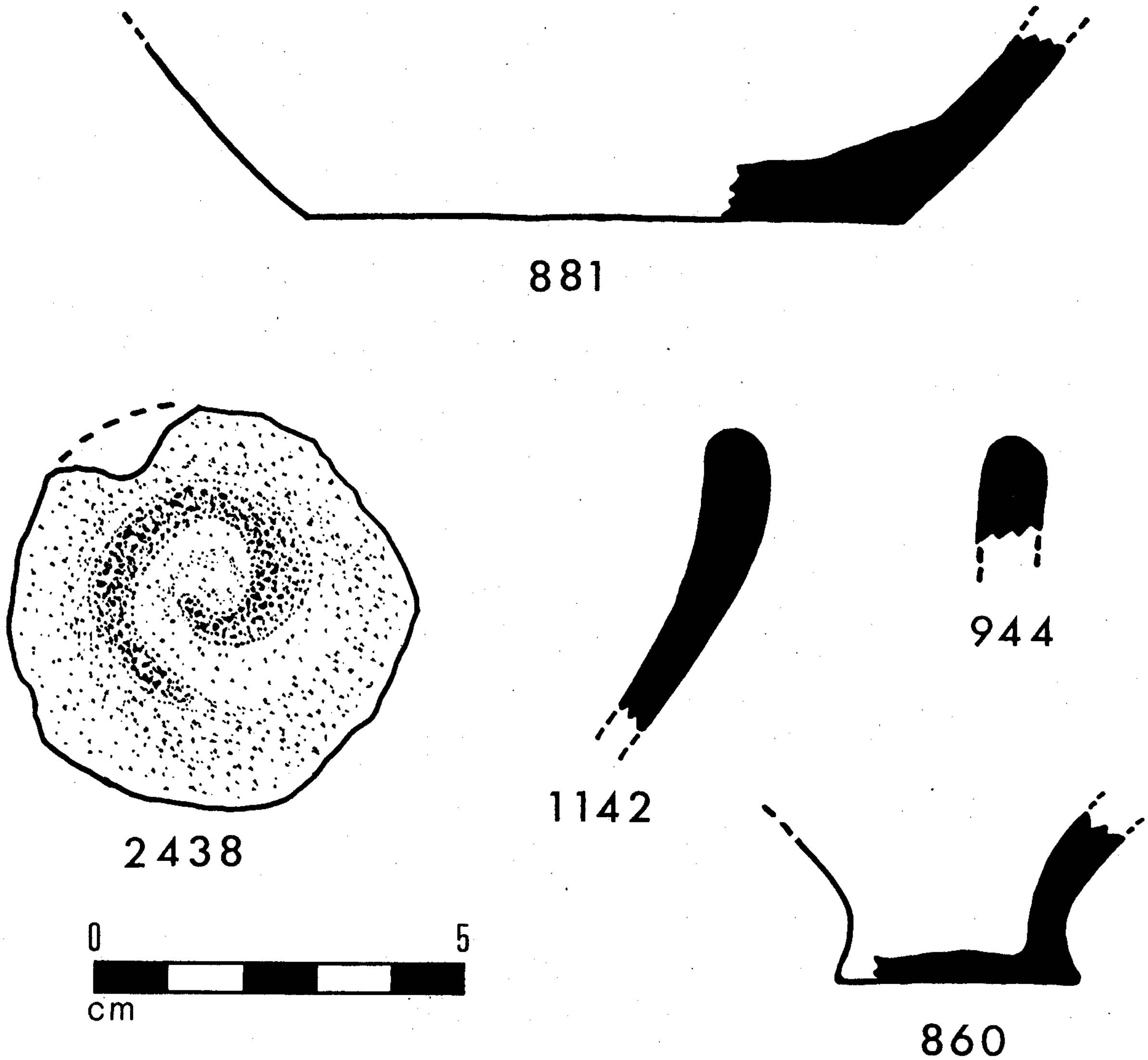
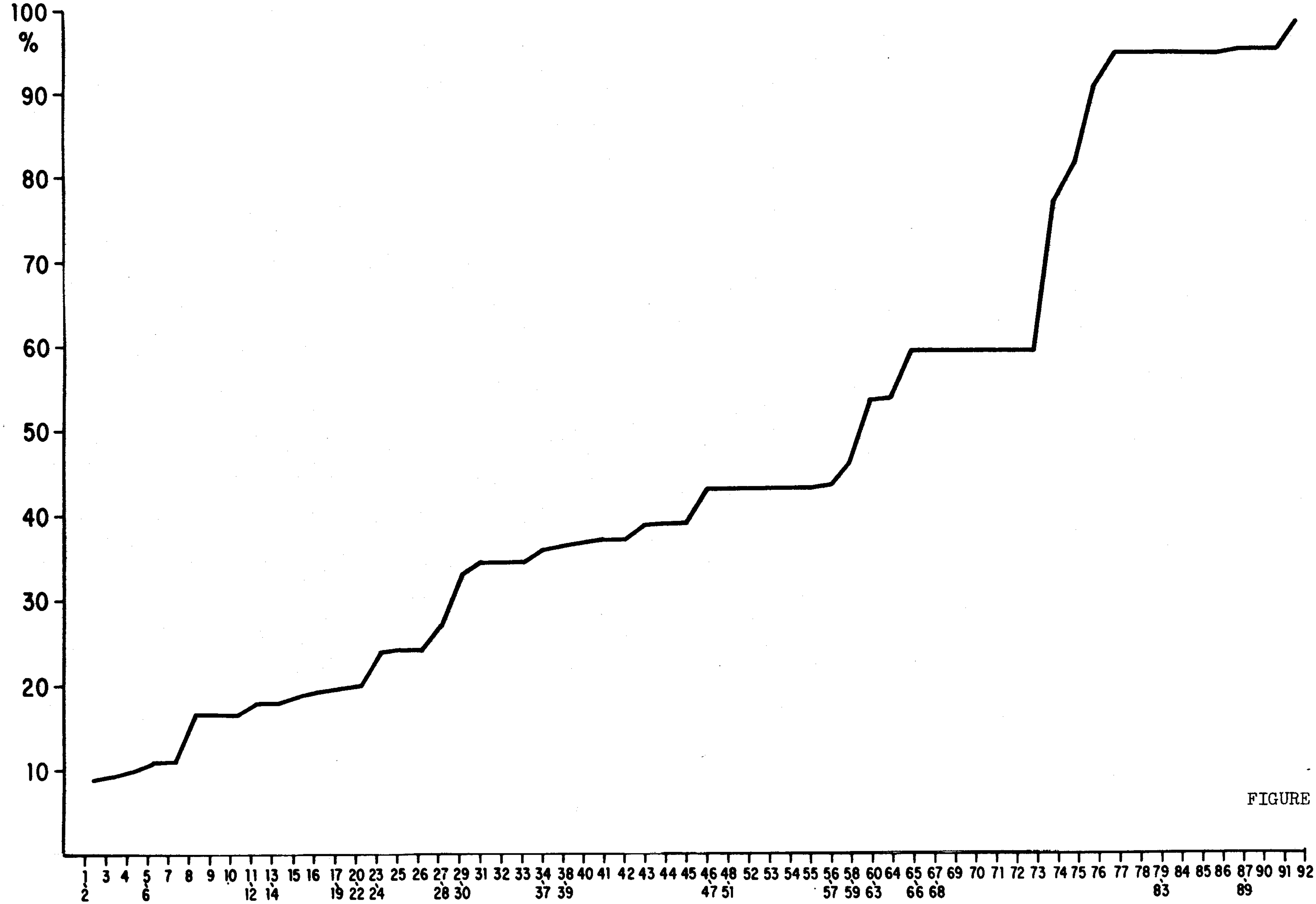


FIGURE 12



100
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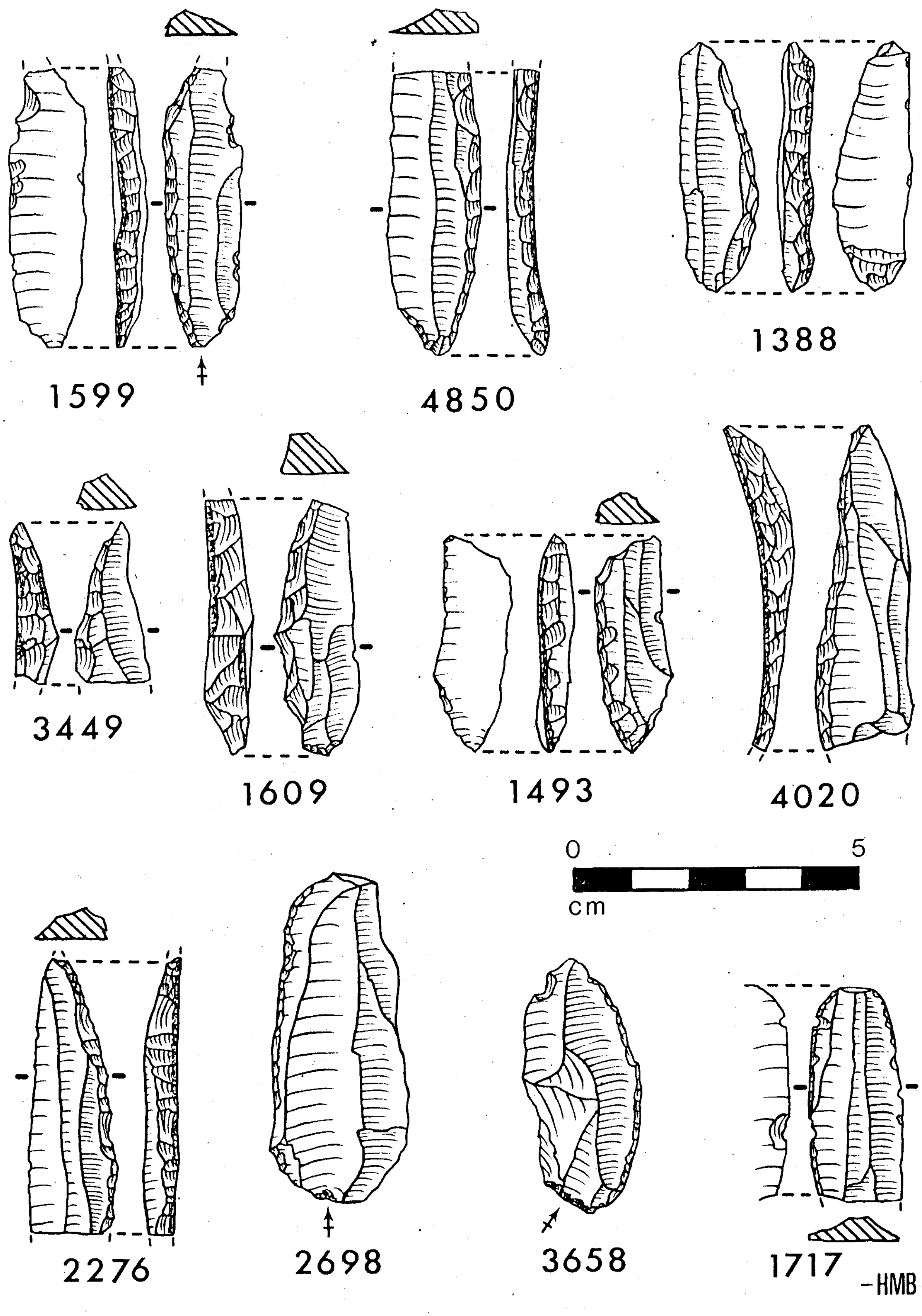
FIGURE 13


1599
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1388
3449
1609
1493
4020
0
5
cm
2276
2698
3658
1717
-HMB

FIGURE 14

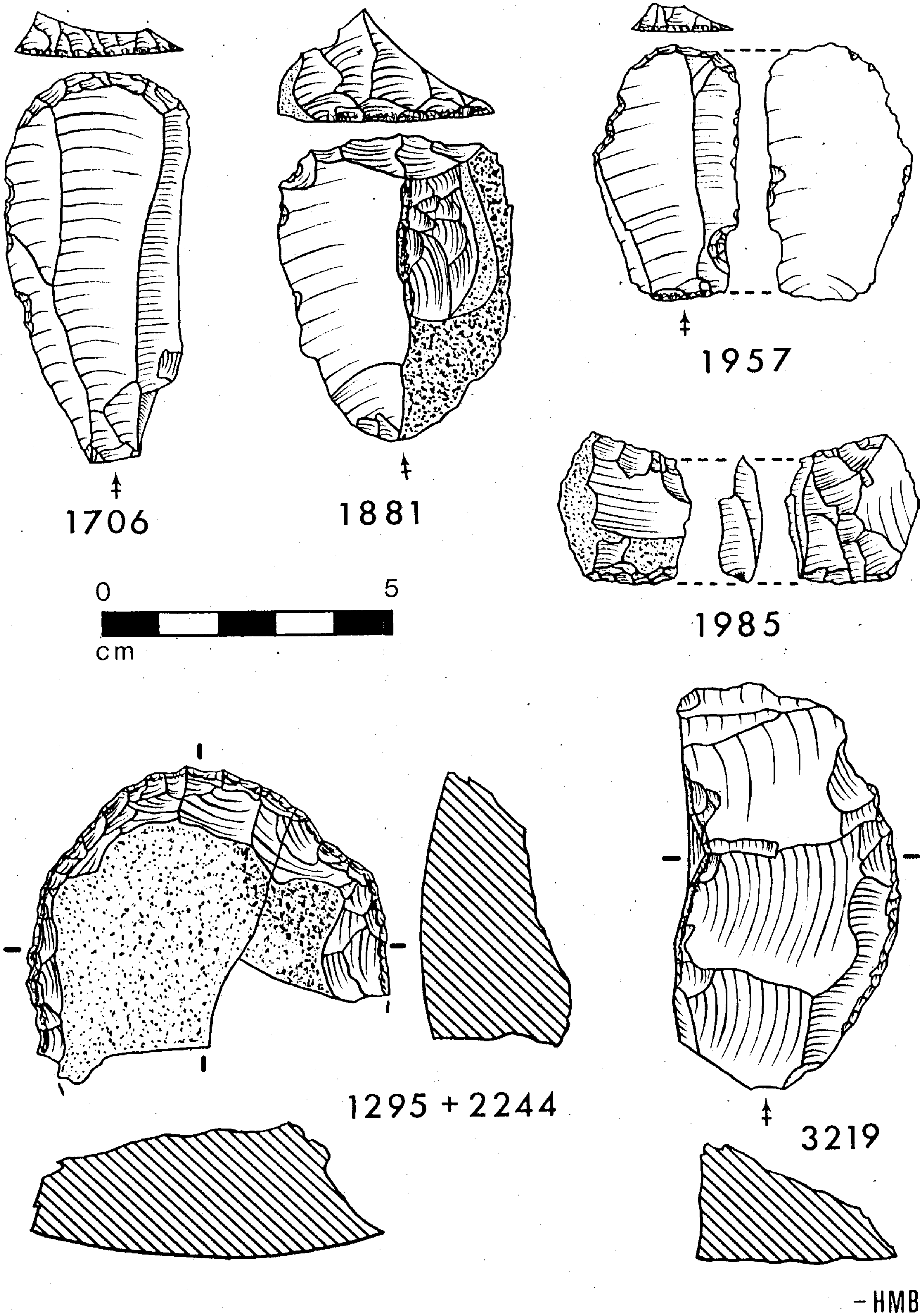


FIGURE 15

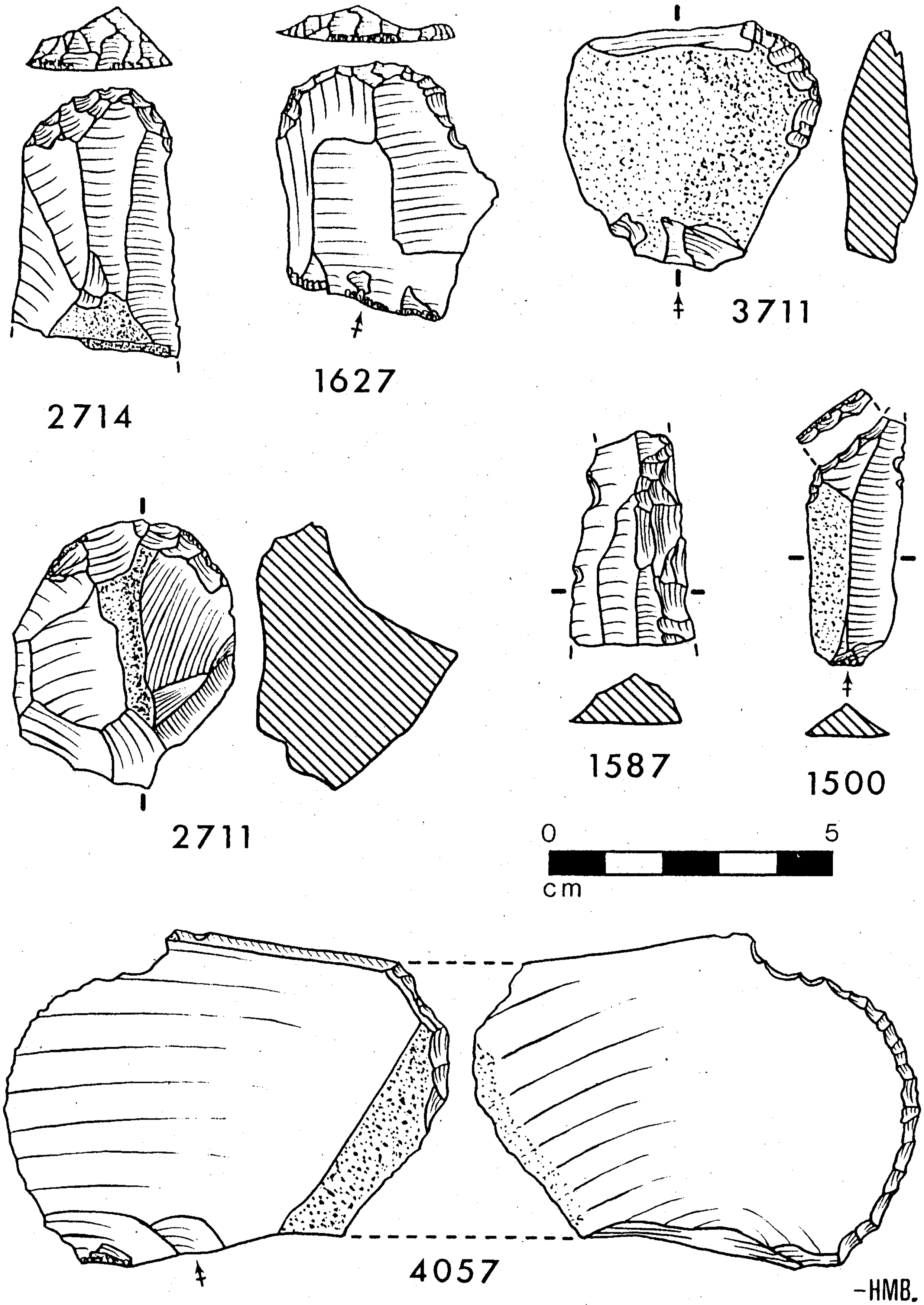


FIGURE 16

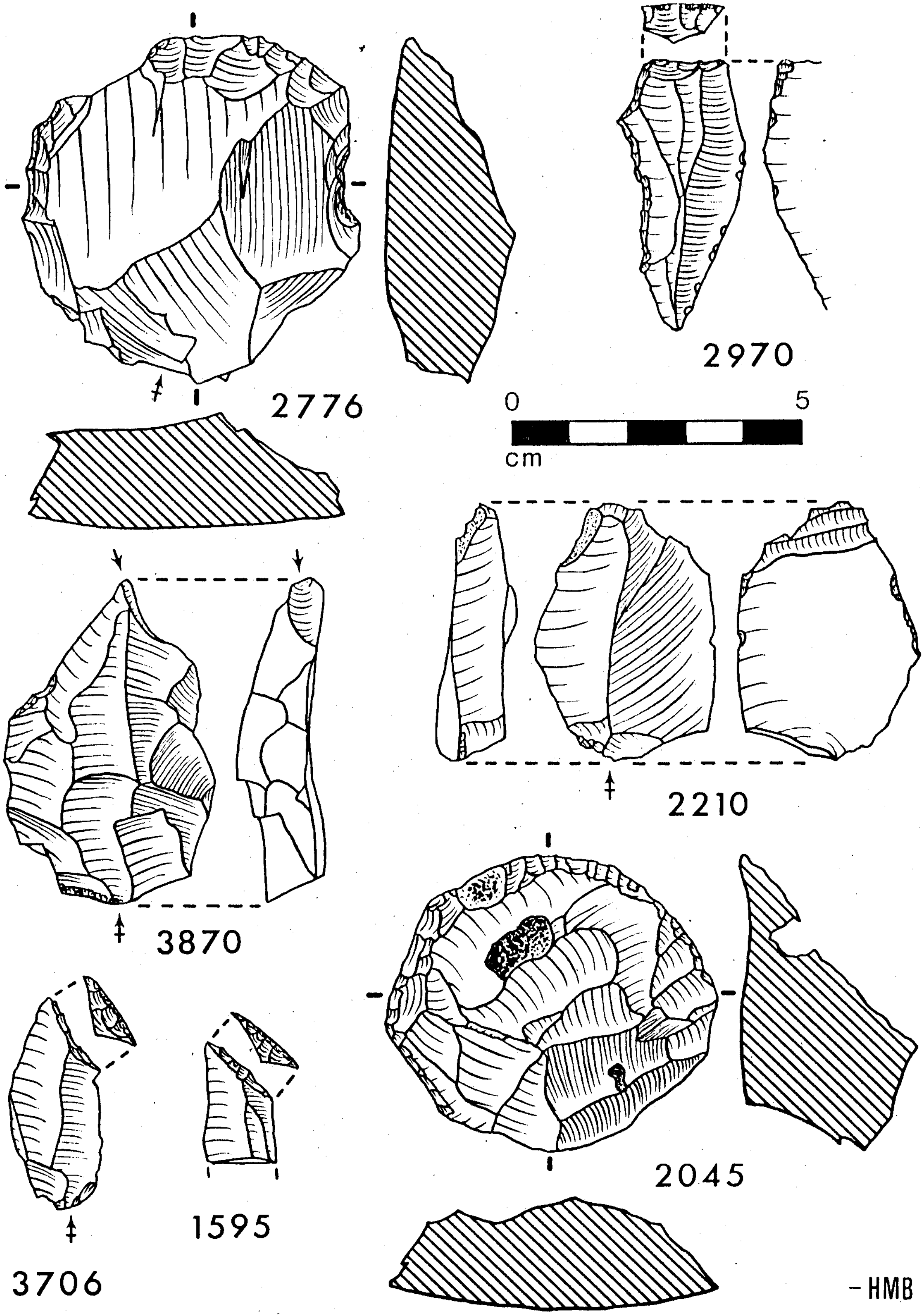


FIGURE 17

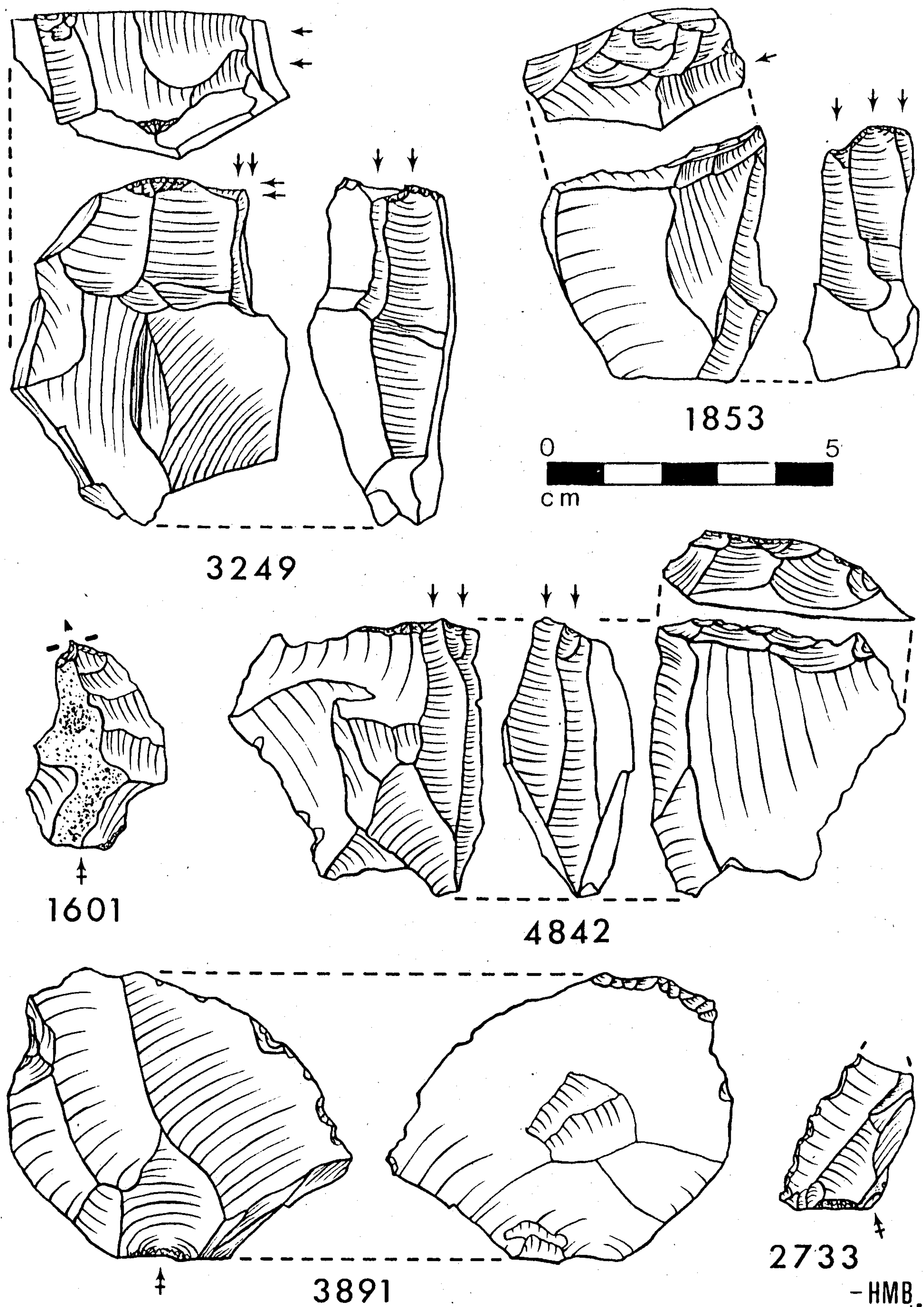


FIGURE 18

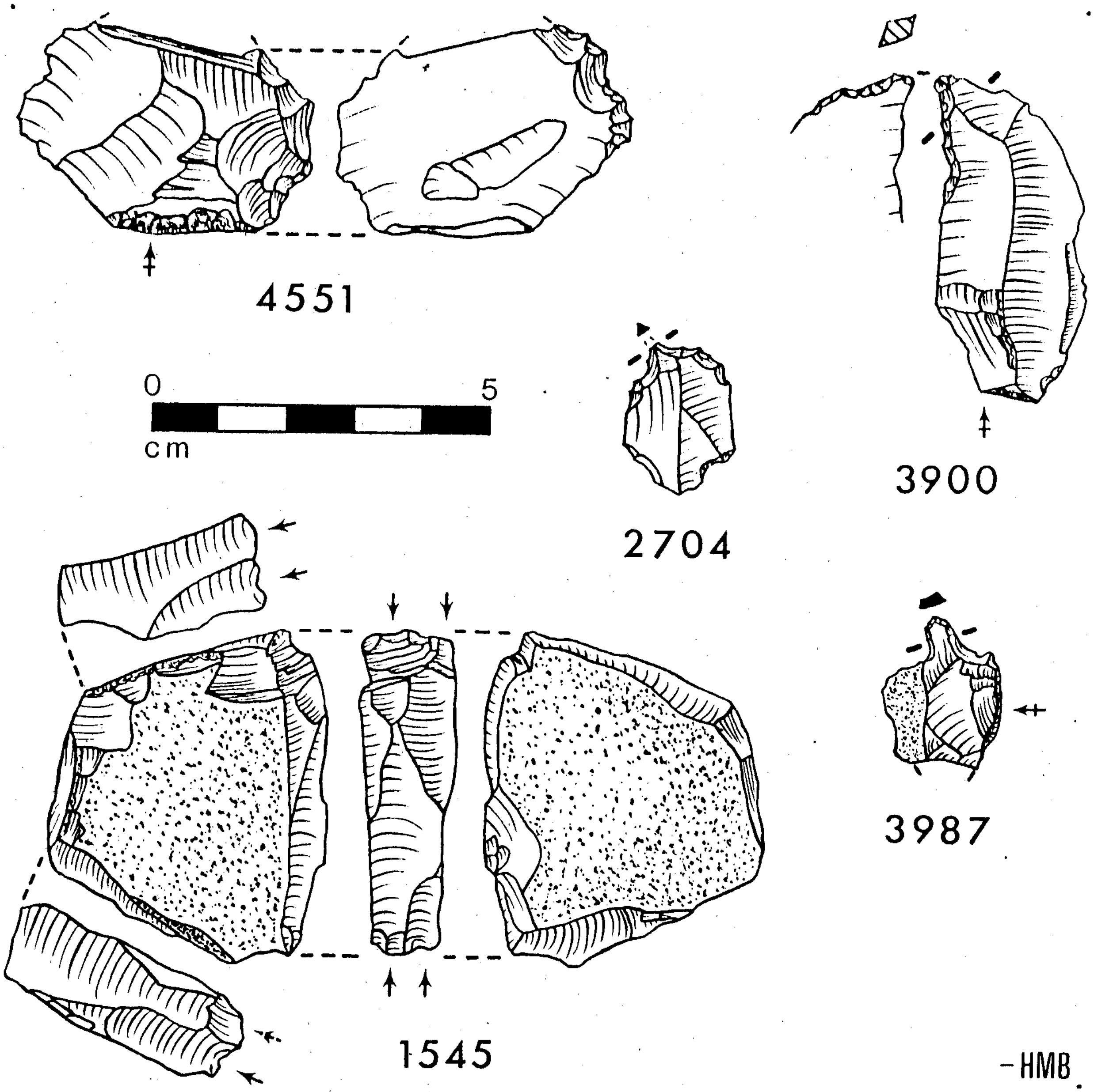


FIGURE 19

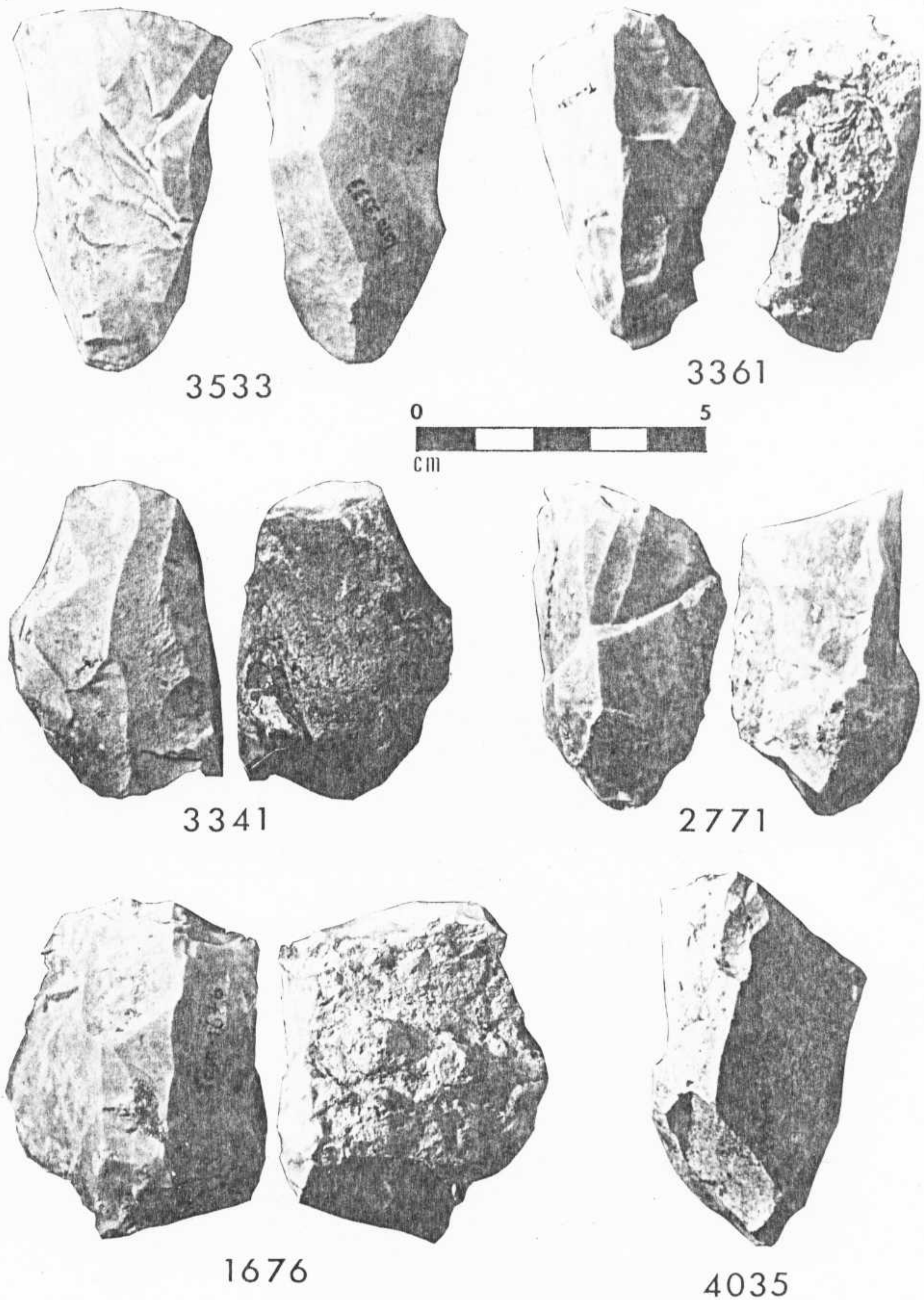


FIGURE 20

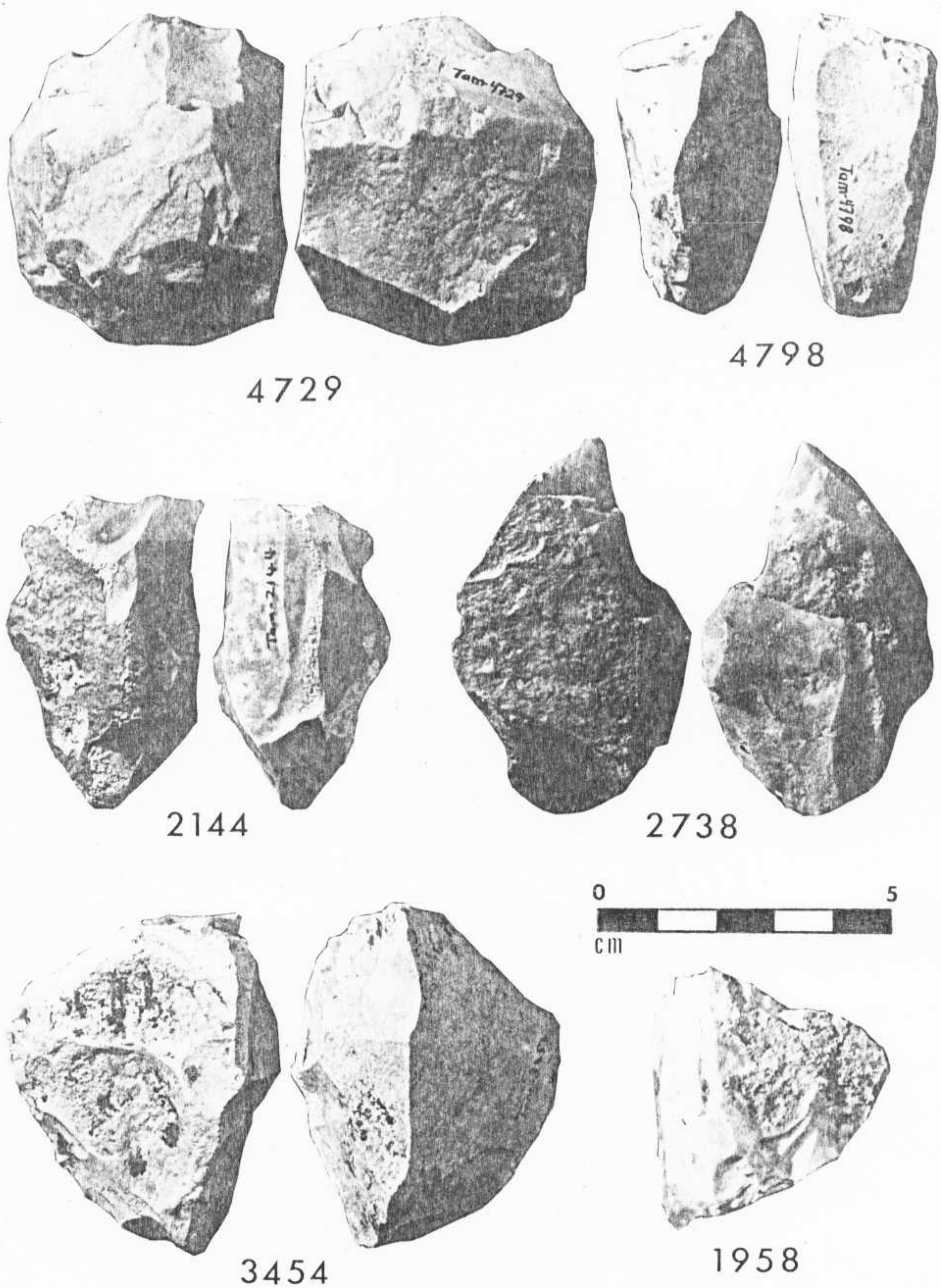


FIGURE 21

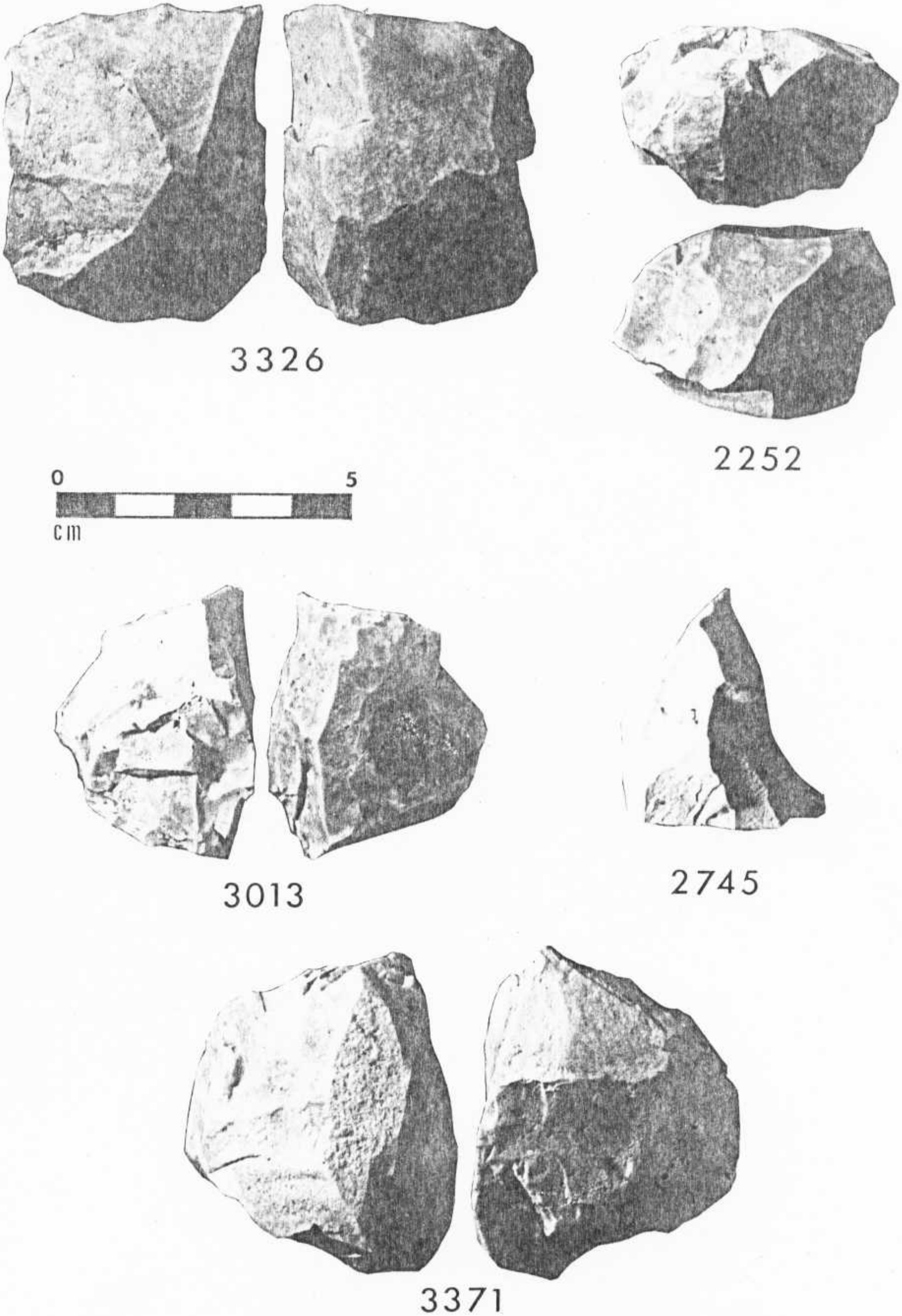
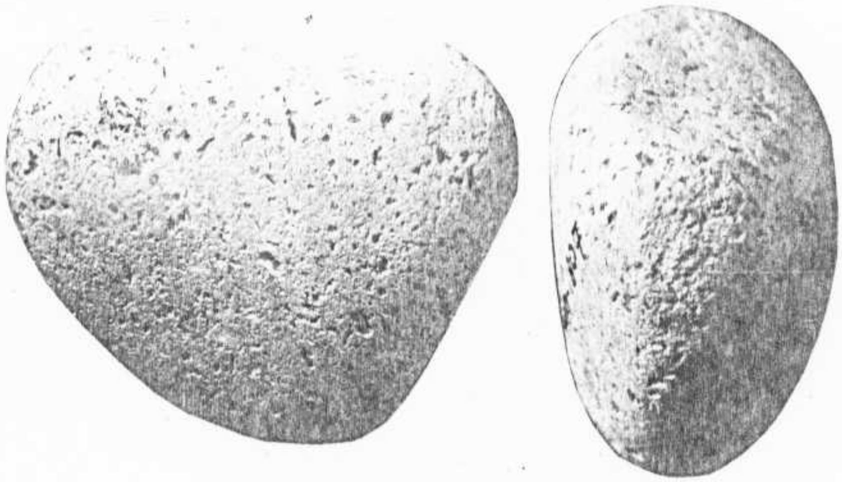


FIGURE 22



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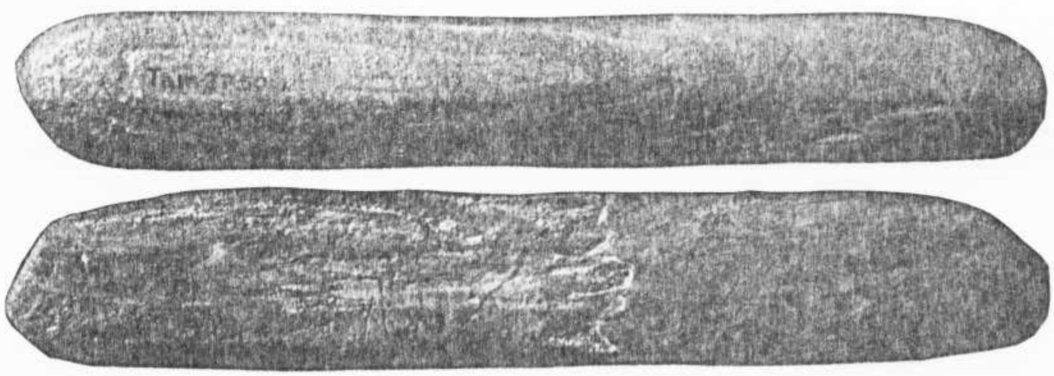
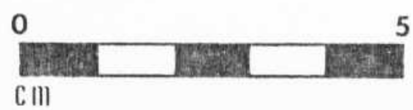
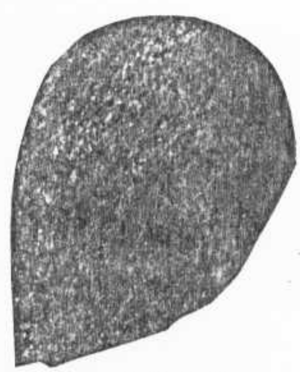


3750

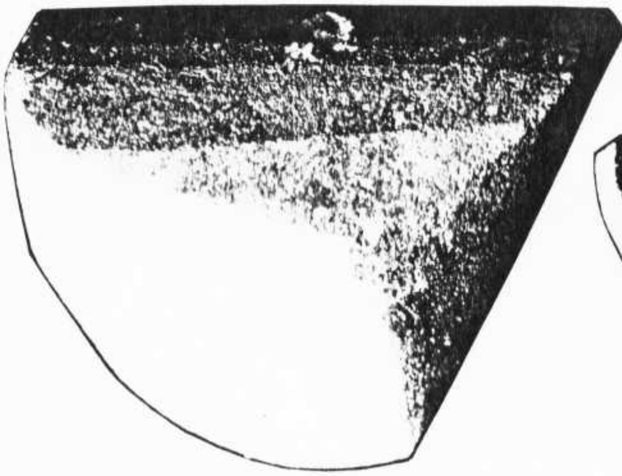


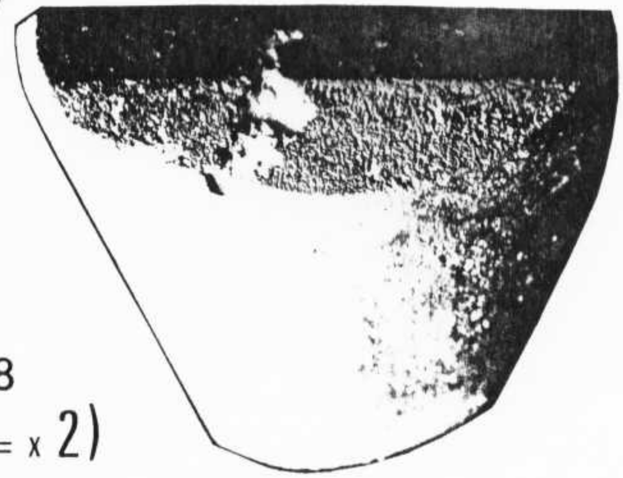
4579



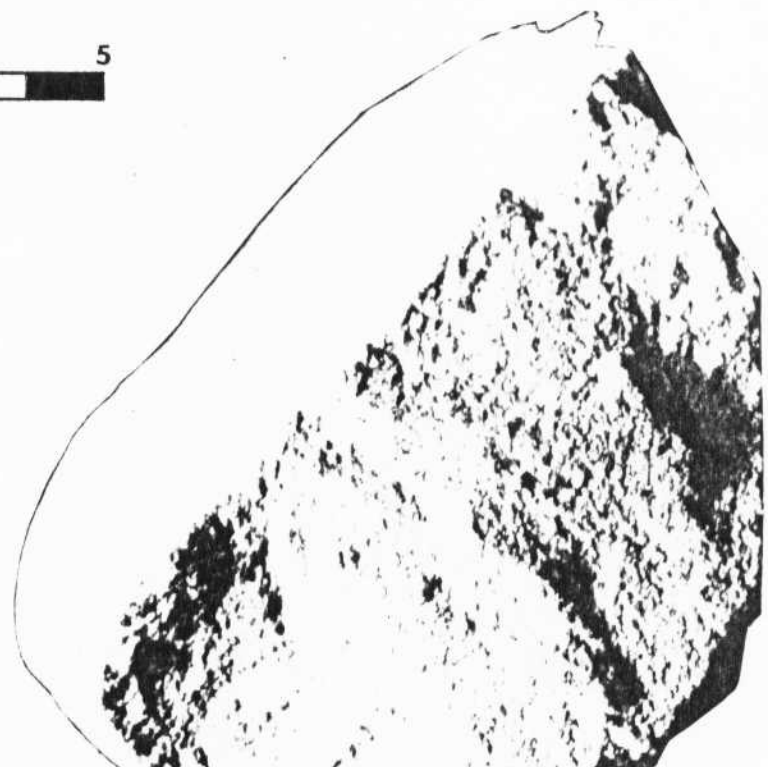
1492

FIGURE 23





3788
(gr = x 2)



3382

FIGURE 24

FIGURE 25

FIGURE 26

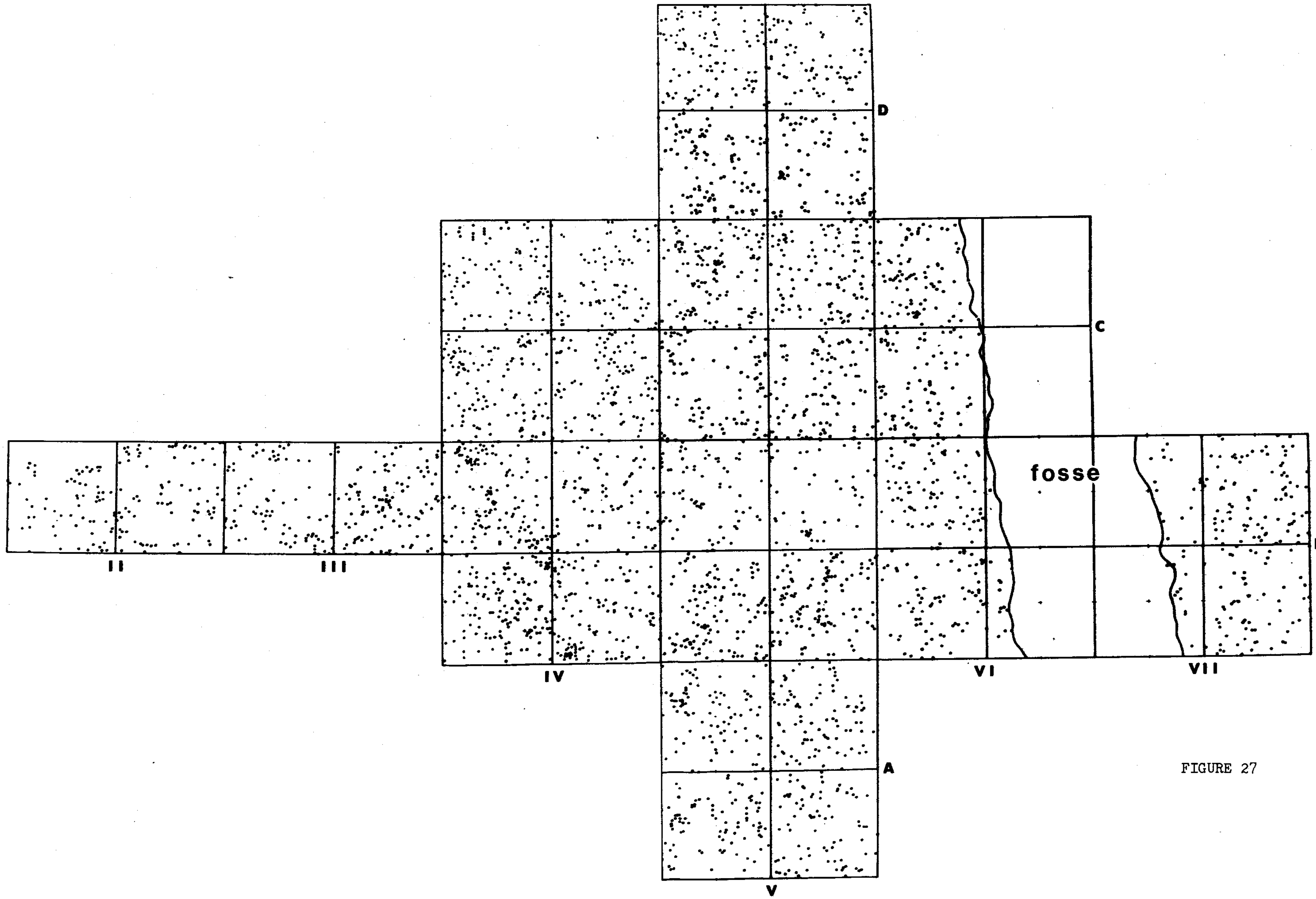


FIGURE 27

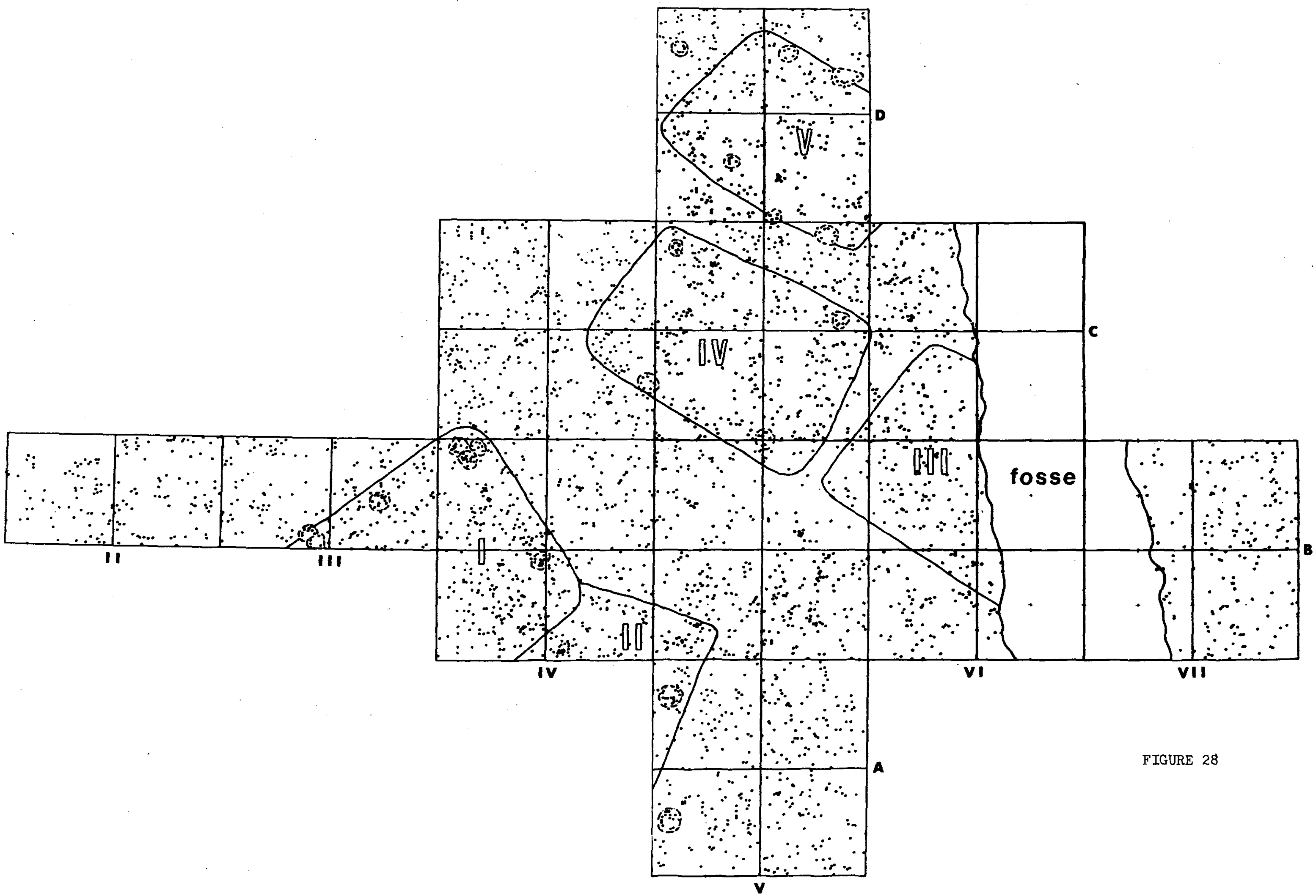


FIGURE 28

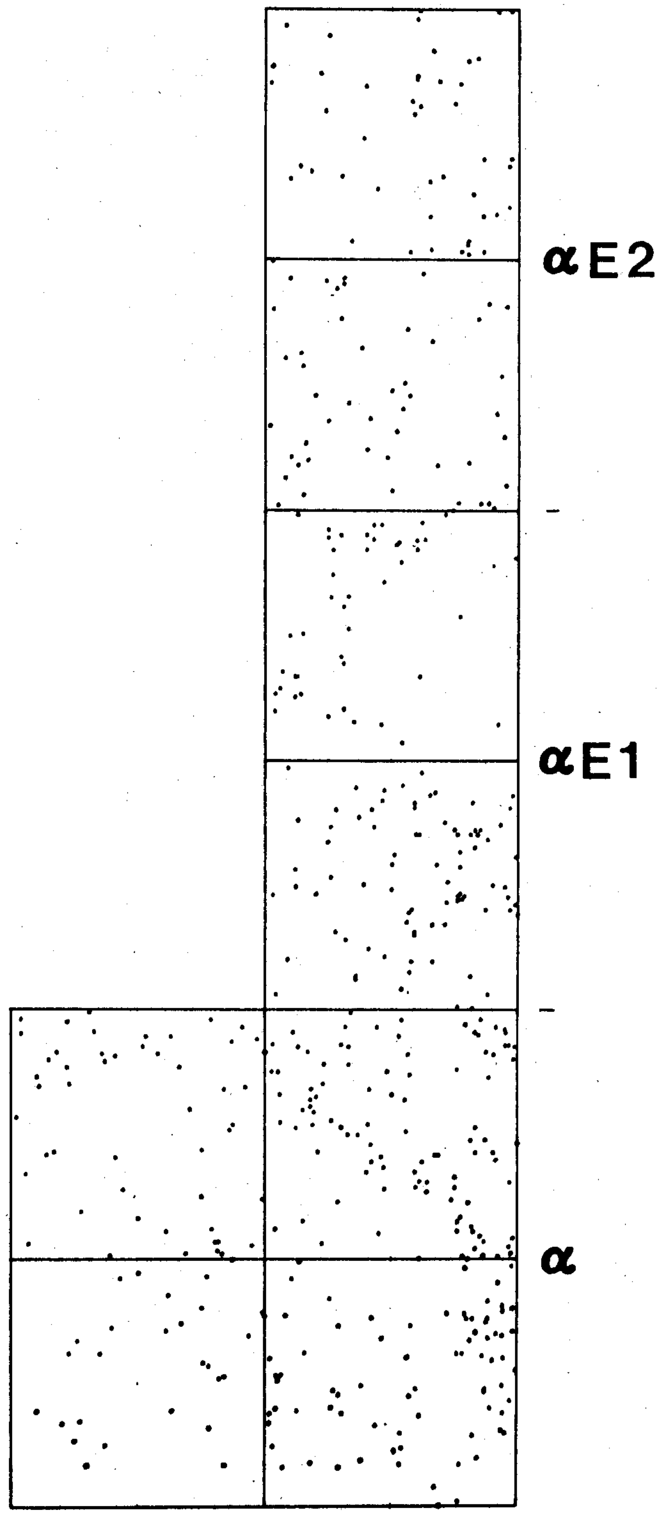


FIGURE 29

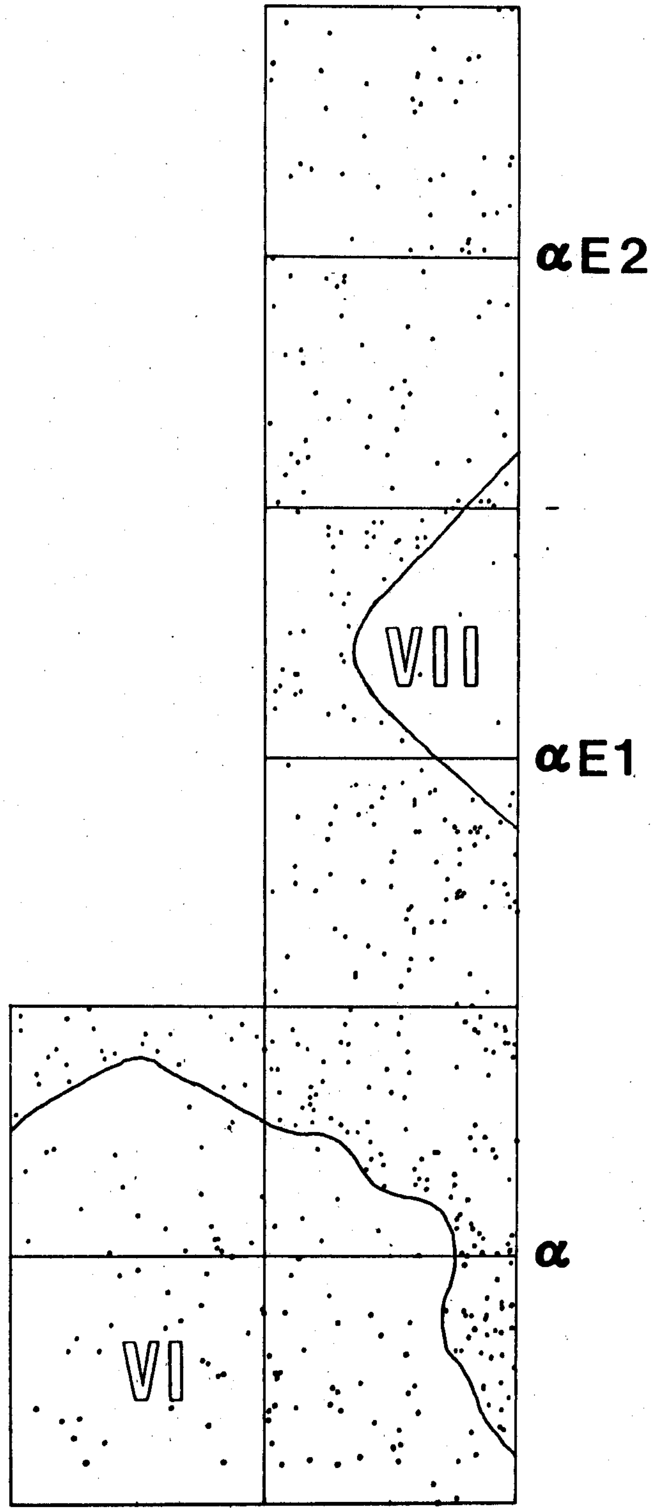
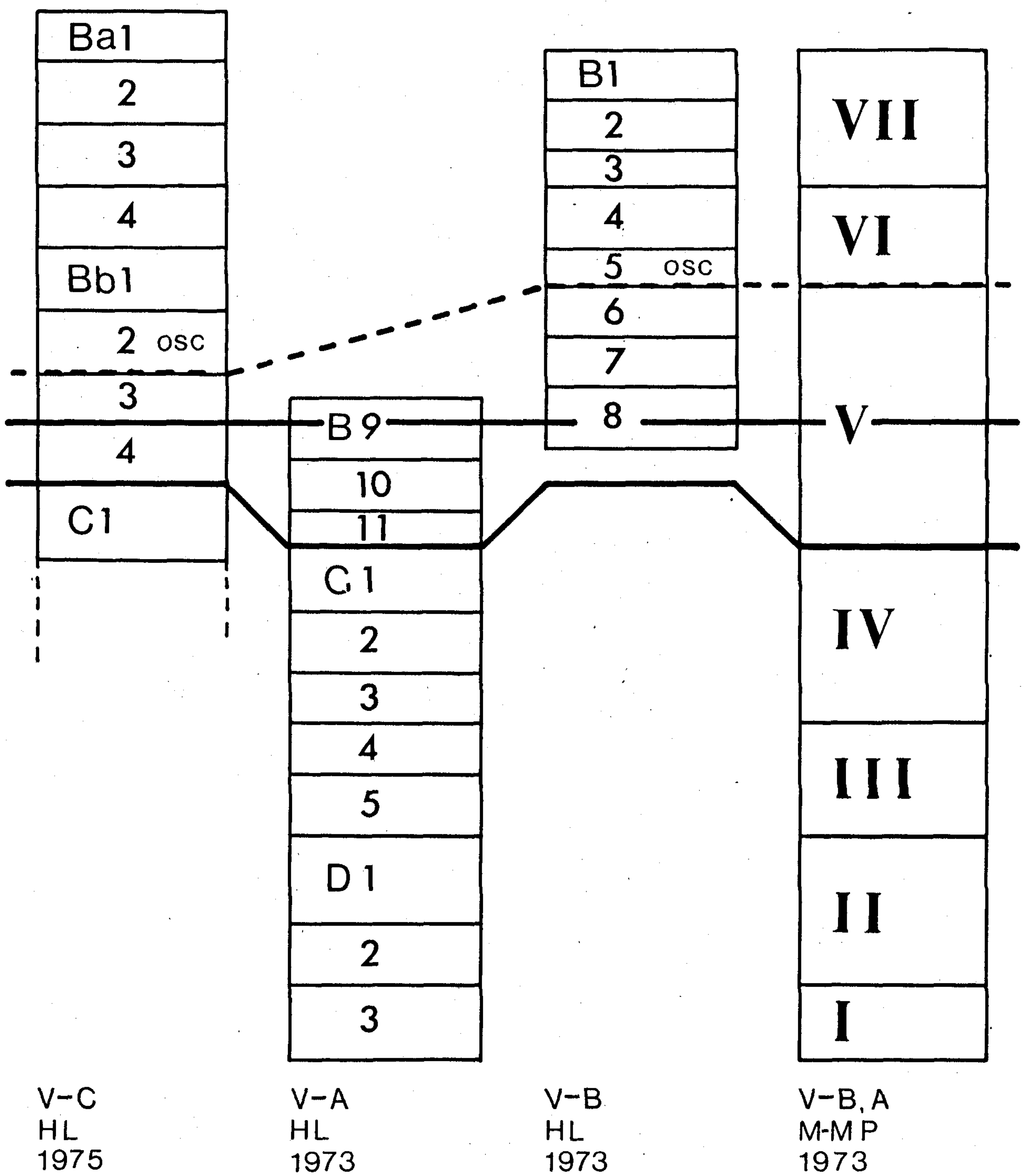


FIGURE 30


Ba1
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Bb1
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C1
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D 1
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3
B1
2
3
4
5 osc
6
7
8
VII
VI
V
IV
III
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V–C
HL
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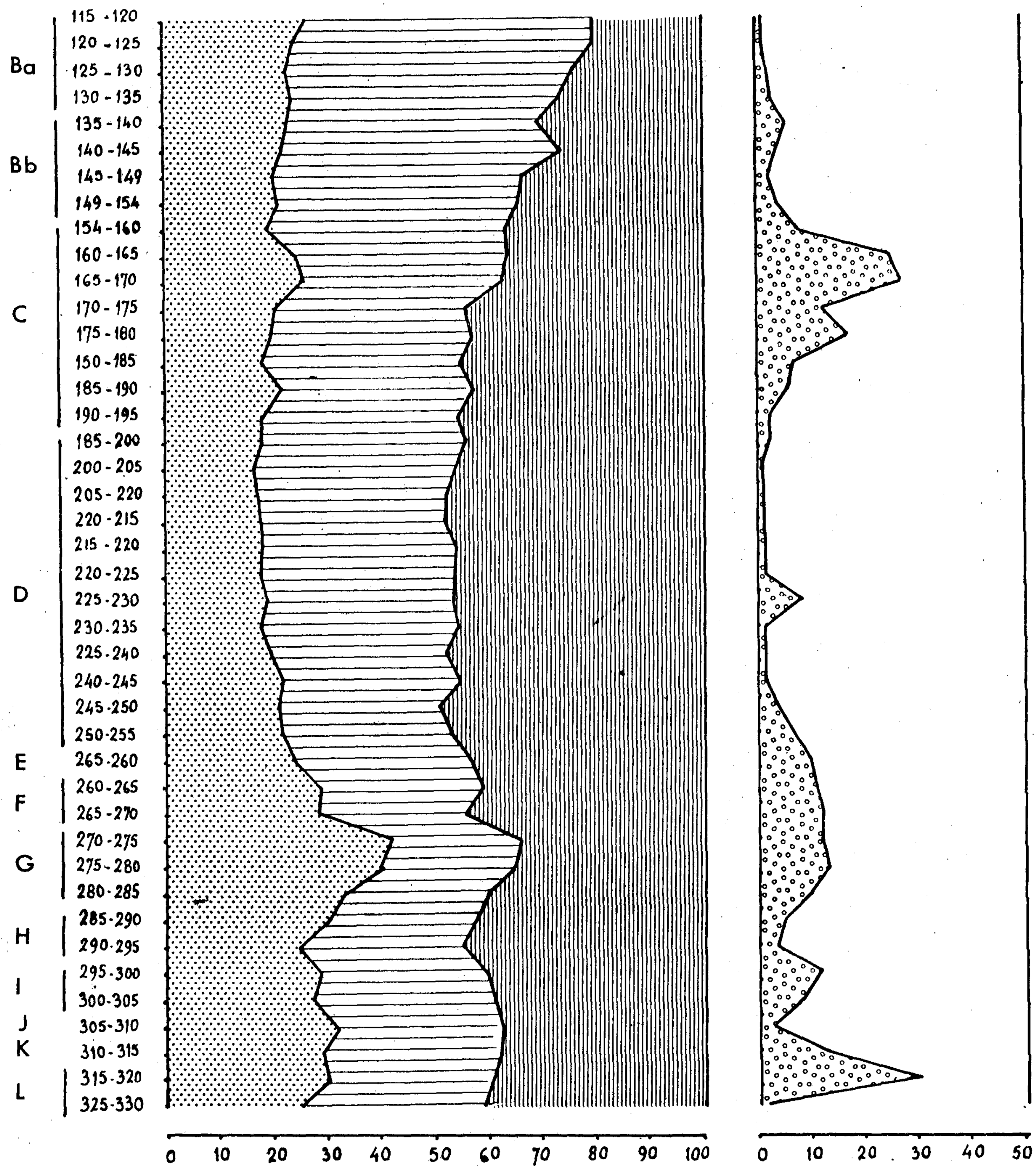
V–A
HL
1973
V–B
HL
1973
V–B, A
M-M P
1973

FIGURE 31


Ba
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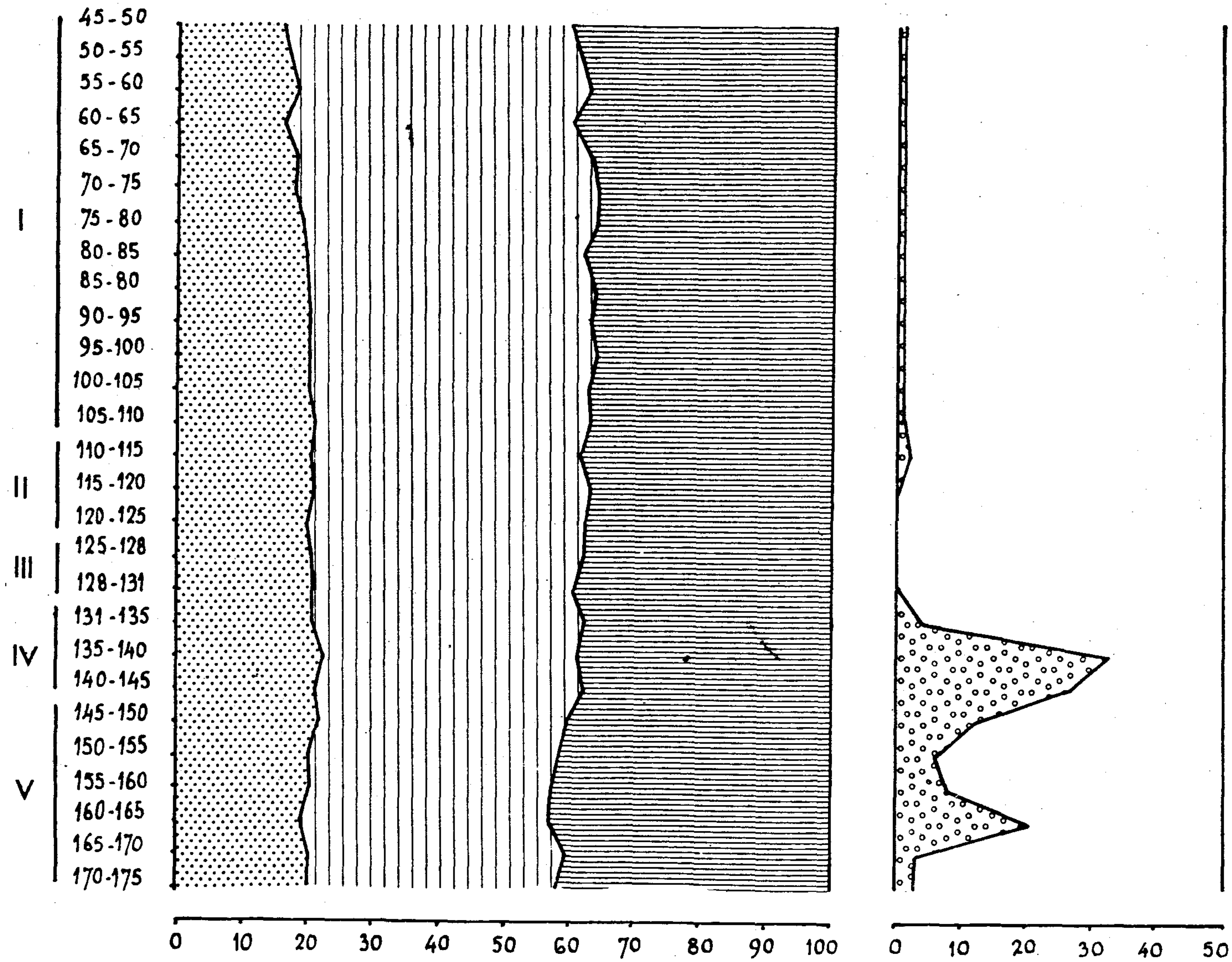
0 10 20 30 40 50

FIGURE 32



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110-115
115-120
120-125
125-128
128-131
131-135
135-140
140-145
145-150
150-155
155-160
160-165
165-170
170-175
I
II
III
IV
V
0 10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50

FIGURE 33