A LATE NEOLITHIC SITE AT RACKHAM

By E. W. Holden, F.S.A., and R. J. Bradley

The site is on Sparrite Farm 3.2 kilometres south of Pulborough in West Sussex, within the parish of Rackham at TQ 04901520. It lies towards the edge of the Weald on a low tongue of Sandgate Beds belonging to the Lower Greensand series, which projects into a wide bend of the River Arun 2.4km. west of the site. Some 550m. to its south-west and flanking the river is an extensive tract of waterlogged alluvium and peat, the two areas separated from one another by a low sand ridge capped by gravel and flint rubble and rising to a little over 30m. Six undated round barrows are known from its area[1]. The village of Rackham lies about 1.5km. further south at the foot of the downland escarpment which here attains a height of 194m. (Fig. 1).

Until 1970 the northern part of the area had long been under woodland and it was when birch trees were being uprooted in land clearance that worked flints were first discovered. As work proceeded and more material came to light it was possible to mount a small salvage excavation which lasted intermittently from July to December, 1970. Two nuclei were almost totally excavated in this time, between them containing over 13,000 worked flints. Meagre traces of associated features were also recorded. A small quantity of worked flints was found in the disturbed soil on the north-east side of an ancient stream bed, in line with area I; also two other scatters some 50 and 100m. south-east, still on the north-east side of the old stream bed. These flints are of similar character to those excavated and it is possible that other flint-working nuclei exist in addition to areas I and II. The whole field is now pasture.

The excavation was the responsibility of E. W. Holden; discussion of the artifacts and their significance that of Richard Bradley. Pollen analysis was kindly undertaken by Professor G. W. Dimbleby, a shortened version of the results appearing on p. 100[2]. The excavated material is deposited in the museum of the Sussex Archaeological Society at Barbican House, Lewes.

THE EXCAVATION (FIGS. 2-8)

Owing to restriction of manpower the site was cleared upon a uniform 5ft. (1.52m.) grid and only limited areas were left open at one time. The area immediately north of the excavation was taken by a waterlogged, reedy hollow, considered to be a former stream course and this gave rise to intermittent flooding of the site, while extensions in other directions were limited by the presence of large tree stumps. The soil profile is interpreted by Professor Dimbleby as a podzol with a leached A horizon of brown sand extending to 28cm. The soil included a sprinkling of small, cream coloured, angular gravel and rarer fragments of brown sandstone of similar size. This material was cleared entirely by hand in uniform 12mm. levels and all worked or burnt flints were retained. Limits of time made sieving impractical. Although the area had been wooded, tree roots had caused little serious disturbance below the immediate surface soil.

[1] E. W. Holden, " Sussex Barrows ", *Sussex Notes and Queries* vol. 15 (1959), 126-7.

[2] The full report and discussion of the pollen analysis is in *Journal of Archaeological Science* 2 (1975), 179-86.

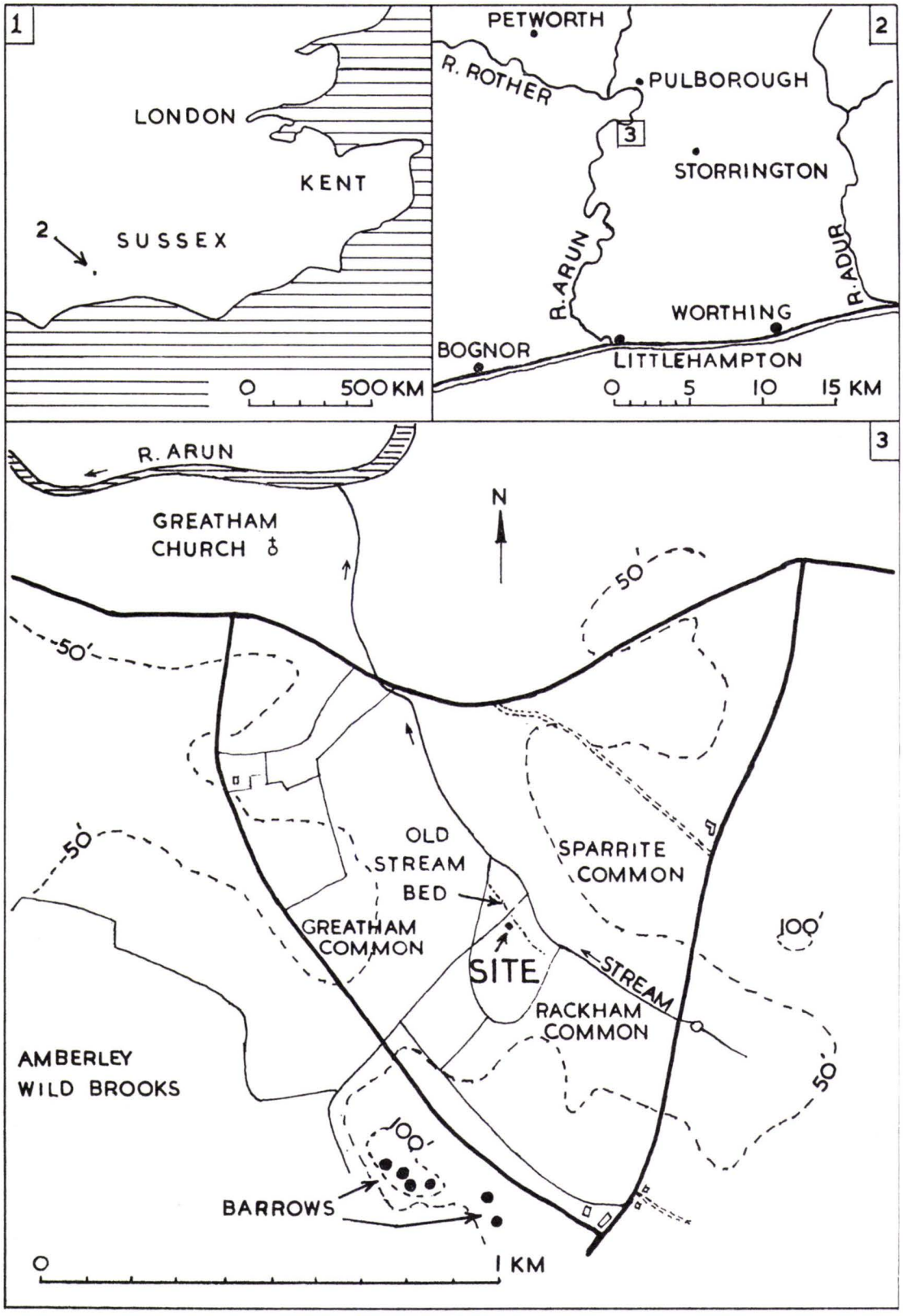

FIG. 1. Location plans

The majority of the worked flints occurred within the A horizon at depths between 15 and 20 cm. (Figs. 5-7) as did the bulk of the charcoal on the site (Fig. 4), although a few flecks could be found up to 7.5cm. below the artifacts. The flints included a high proportion of burnt material and were accompanied by pieces of red burnt sandstone of the type natural to the site (Fig. 3). Pottery and faunal remains did not survive, and so most information must be drawn from the changing density of worked flint about the excavated area. This suggested two adjacent but separate nuclei. In *area I* the possible hearth was recorded as discoloured sand at the same level as the artifacts, although this lacked burnt flints or sandstone (Fig. 2). A rough line of irregular hollows some 18cm. deep could be seen running from north-east to south-west across this area. These were filled with darker sand and included occasional worked flints; but there is no decisive evidence that they were in fact post holes and not the result of root penetration. This nucleus occupied some 700 square feet (65 sq. m.) and is unlikely to have extended much further in any direction.

In *area II*, two hearths of the same type were recorded, as well as three slight hollows filled with blackened sand which seem to have served the same purpose. Six circular intrusions, similar to those already described, were found within this nucleus, in addition to other more poorly defined examples (Fig. 2). These do seem to have been stake holes, some 5 to 7cm. in diameter and 15 to 23cm. deep. They were not well defined in section but contained dark sand with a particular number of charcoal flecks Three also contained worked flints. They seemed to lie in an approximate line. One pointed stake hole 6cm. in diameter and 23cm. deep accompanied the largest hearth. Its filling was again of darker sand. This area could not be totally excavated and covered at least 625 square feet (58 sq. m.).

In area I the line of possible post holes was not reflected by any decisive change in the density of artifacts; but in the other nucleus this was the case. In neither area can any permanent structure be envisaged. In each part of the site the hearths were peripheral to the main concentrations of worked flints. The distribution of burnt flakes and burnt sandstone was virtually the same, but surprisingly they were independent of that of the charcoal and all but one of the hearths. In each area the burnt and unburnt flints showed the same pattern. In area I, cores and waste had much the same distribution; but in the other nucleus the cores were mostly found at the edges of the main concentration of flakes. In both areas they were associated with hammerstones. The finished implements were distributed together with the unretouched flakes and they too avoided the areas with hearths. In area II implements were most frequent about the stake holes (Figs. 2 and 7).

The contents of each grid square were recorded and weighed on excavation with the result that the average weight of flint flakes about the site could be calculated. This was then used as an index of the changing size of the debris (Fig. 8). It appeared that in area I the size of flakes generally decreased from south to north with most of the largest flakes about the edge of the nucleus and with the greatest concentration of debris within the area where these occurred. A lesser concentration to the north included many smaller fragments. Each area had a number of cores but most of the hammers were in areas with the large flakes. By contrast, the densest area of the other nucleus was made up of many small flakes and the lower numbers of large flakes were found only about the edges of the group. In this case cores and hammers were mostly linked with the smaller classes of flakes. The reasons for this will be suggested when the contents of the industry have been reviewed.

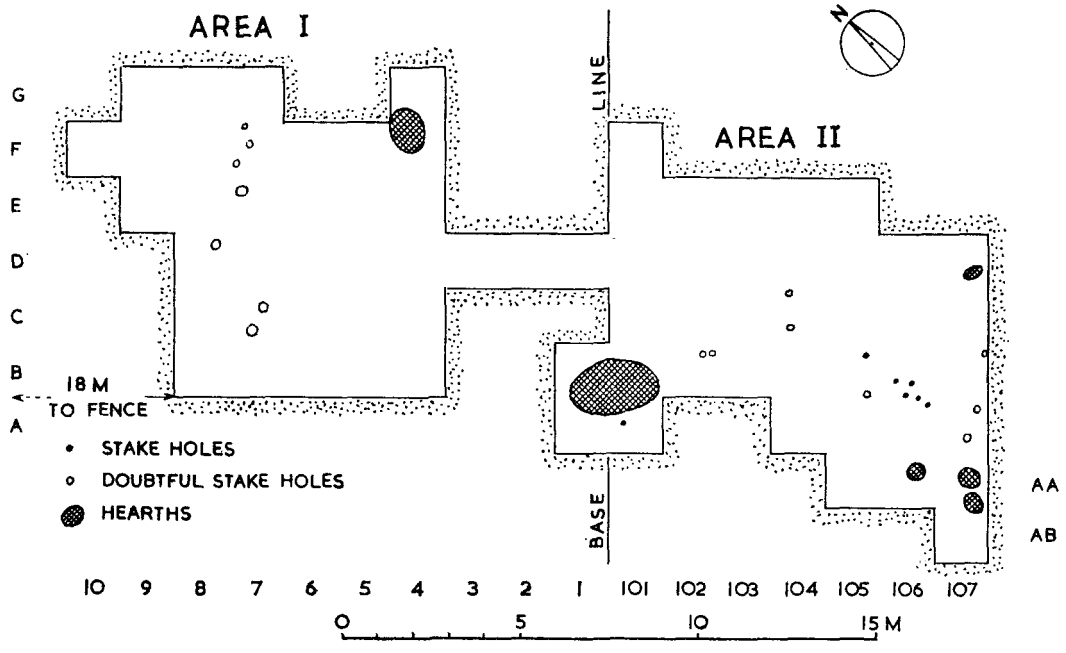

FIG. 2. Rackham. Plan of features

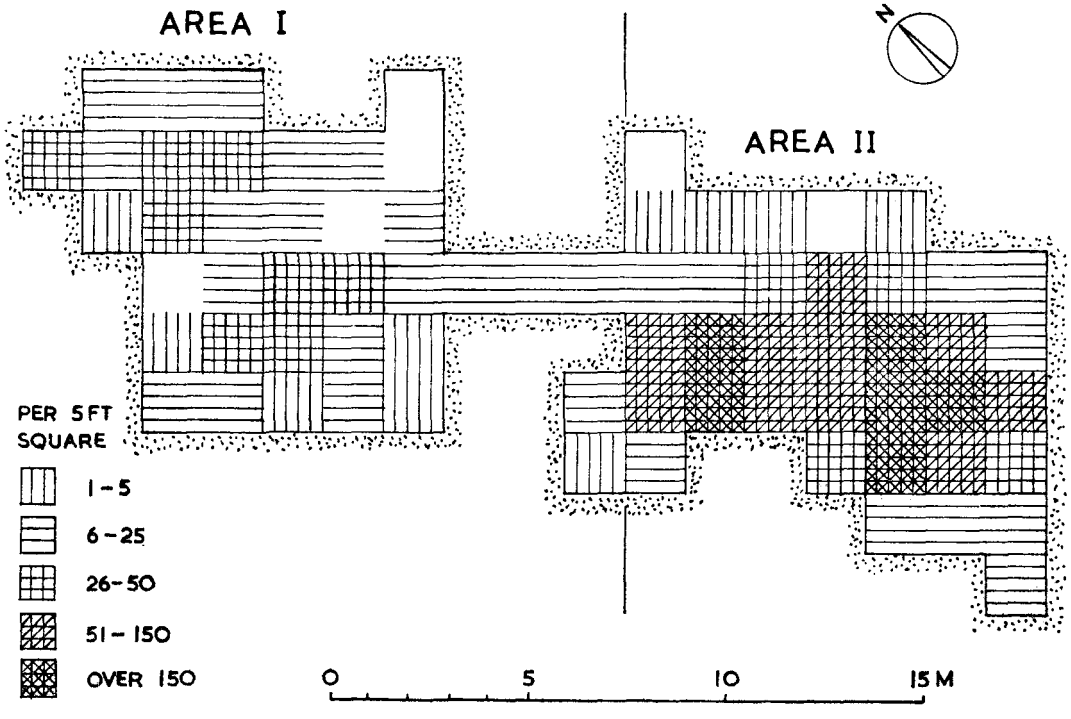

FIG. 3. Rackham. Distribution of burnt flints

THE FLINT INDUSTRY

13,062 humanly modified flints were recovered in excavation, 3,932 from area I and 9,130 from area II. No attempt has been made to exclude smallest flakes from analysis. The industry made use of large, sometimes angular, flint gravel, which can be distinguished from chalk flint by its rather rough, often dark grey, cortex. When struck these nodules were grey, black or occasionally honey coloured and a few showed ochreous inclusions or reddish streaks in the body of the flint. All these varieties could be matched visually among the unstruck nodules in the same field as the site.

Cores. 170 regular cores were recorded in the excavation. They have been classified following the system set out by Clark *et al.*[1]:

Type		*Area I*	*Area II*
A	One platform:		
(i)	flakes struck all round	9	10
(ii)	flakes struck part way round	23	47
B	Two platforms:		
(i)	parallel	8	12
(ii)	at an oblique angle	5	5
(iii)	at right angles	5	14
C	Three or more platforms:	6	8
D	Keeled—struck from two directions	9	6
E	Ditto—but with one or more platforms	2	1
	Total	67	103

The majority of these cores were small and reflected the poor quality of the available material. Maximum dimensions ranged from 2.8 to 7.5cm. in area I and from 3.2 to 7.5cm. in area II. The types in the two nuclei are broadly the same although the more elaborately prepared cores are slightly more common in area II. Statistical comparison of the two groups by the number of platforms and the proportion of keeled cores show a 76% probability that the variation between the two areas is significant ($x^2=4.25$ at 3 degrees of freedom). This variation is largely caused by the keeled cores and if these are omitted there is only a 25% probability that the differences are significant ($x^2=0.58$ at 2 degrees of freedom). In some cases the sharp edges of the platforms had been trimmed, perhaps for easier handling; but there is no certain evidence that any were used as scrapers. Five cores in area I and four in area II had been re-used as hammers. In addition to these regular forms, area I produced 47 roughly broken or struck nodules which had not been further used and another 53 came from area II.

Flakes. 11,855 flakes were recovered, of which about 30% showed some signs of burning. There is, of course, evidence from some cultures that flints can be heated before detailed working; but there is no clear evidence of this here. 3,400 flakes came from area I and 8,455 from area II. A sample of 1,000 unburnt flakes, 500 from each area, was examined in detail with the following results:

[1] J. G. D. Clark, E. S. Higgs and I. H. Longworth, " Excavations at the Neolithic site at Hurst Fen, Mildenhall, Suffolk, 1954, 1957, 1958 ", *Proceedings of the Prehistoric Society*, (hereafter *P.P.S.*) 26 (1960), 216.

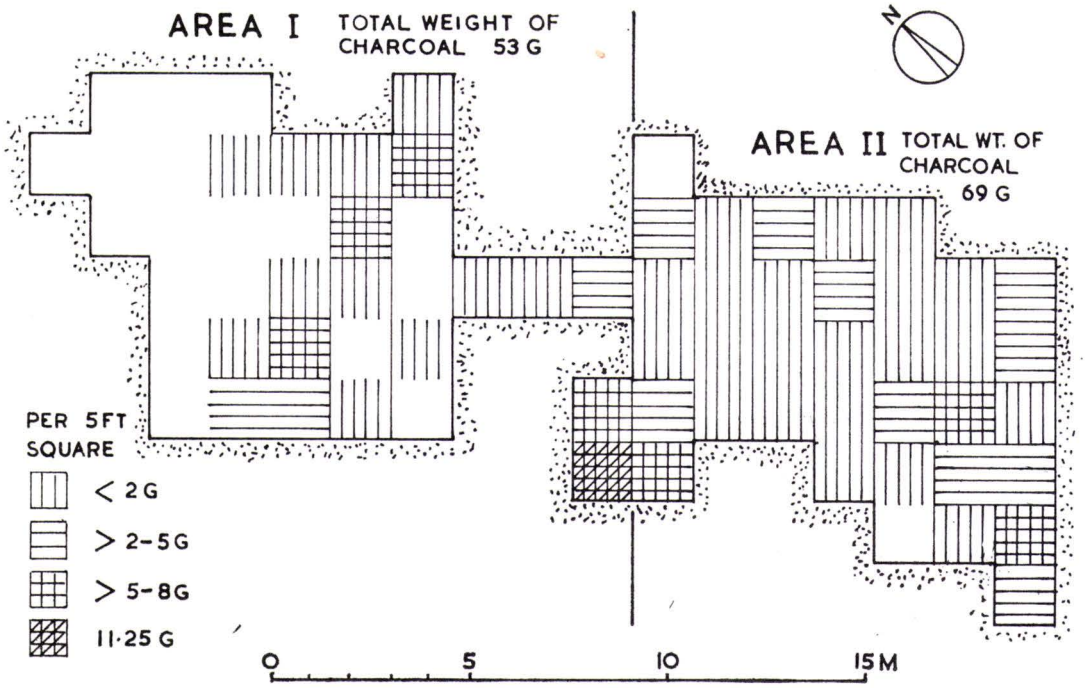

FIG. 4. Rackham. Distribution of charcoal

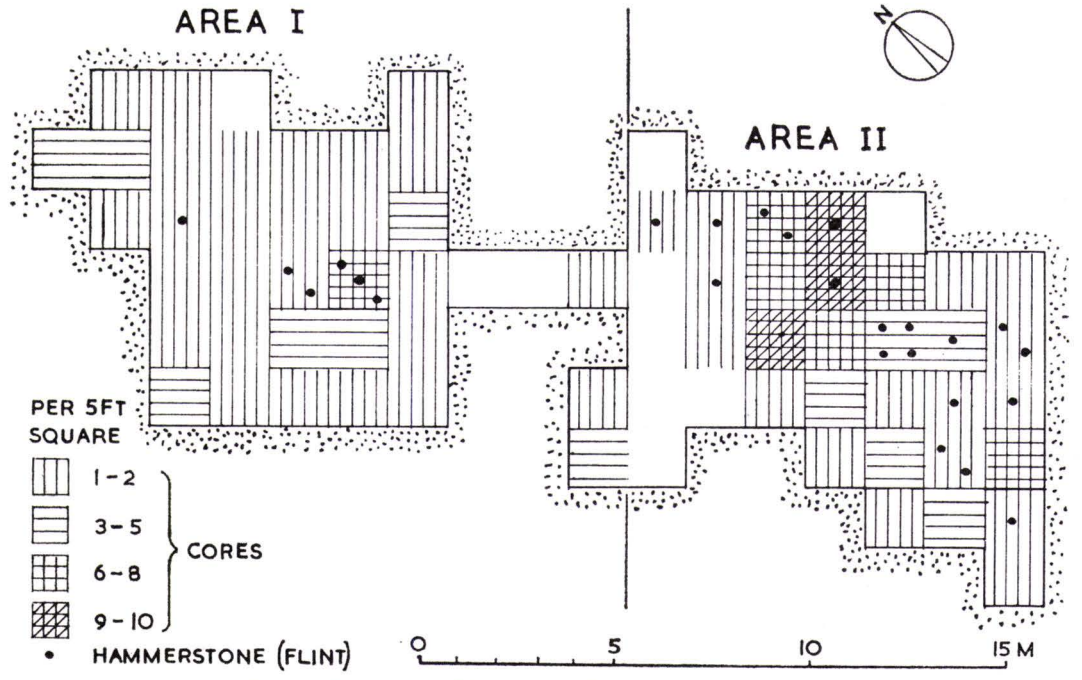

FIG. 5. Rackham. Distribution of cores and hammerstones

Length	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	mm.
Area I ..	—	4	34	32	18	8	4	—	%
Area II ..	—	16	43	26	9	4	1	1	%
Breadth									
Area I ..	—	17	39	26	14	3	1	—	%
Area II ..	1	33	44	17	4	1	—	—	%

Breadth: length	0:5-1:5	1:5-2:5	2:5-3:5	3:5-4:5	4:5-5:5	>5:5		
Area I ..	—	4	17	30	22	27	%	(11% wholly cortical)
Area II ..	—	6	22	24	21	27	%	(17% wholly cortical)

These figures seem to suggest that, while the shape of the flakes in each group was much the same, there were real differences of size. This is confirmed by statistical testing which shows a 99.2% probability that these variations were in fact significant ($x^2=13.68$ at 4 degrees of freedom). For this calculation the very few length measurements over 59mm. were omitted.

In each nucleus a large proportion of the flakes showed signs of slight edge chipping or wear consistent with utilisation. In area I these amounted to 30% of the flake sample and in area II to 32%. Accordingly, the dimensions of the used and waste flakes have been considered separately.

Length	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	mm.
Area I									
Used ..	—	2	14	39	28	10	7	—	%
Unused ..	—	5	40	28	15	8	4	—	%
Area II									
Used ..	—	5	37	33	14	7	2	2	%
Unused ..	—	22	46	22	7	3	—	—	%
Breadth									
Area I									
Used ..	—	16	40	25	16	2	1	—	%
Unused ..	—	20	46	21	10	2	1	—	%
Area II									
Used ..	—	33	40	16	9	2	—	—	%
Unused ..	—	32	45	17	5	1	—	—	%

Breadth: length	0:5-1:5	1:5-2:5	2:5-3:5	3:5-4:5	4:5-5:5	>5:5	
Area I							
Used	—	4	25	37	19	15	%
Unused ..	—	3	13	26	23	35	%
Area II							
Used	1	10	28	23	18	20	%
Unused ..	—	5	17	23	23	32	%

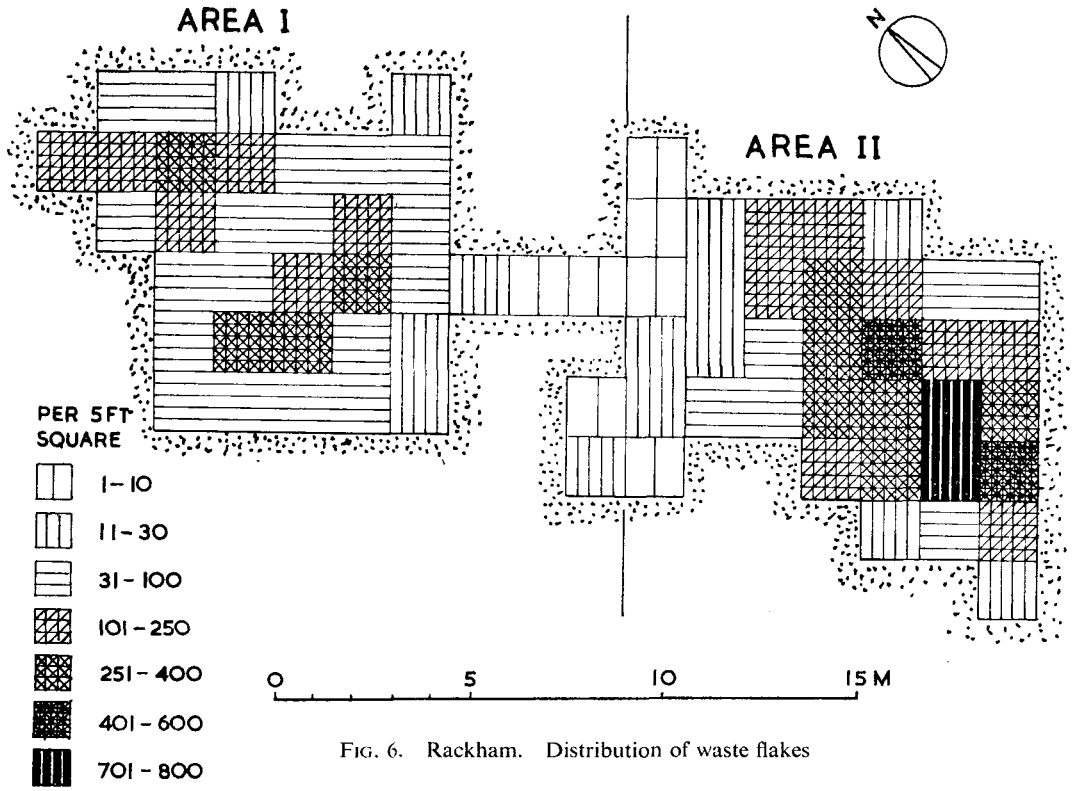

FIG. 6. Rackham. Distribution of waste flakes

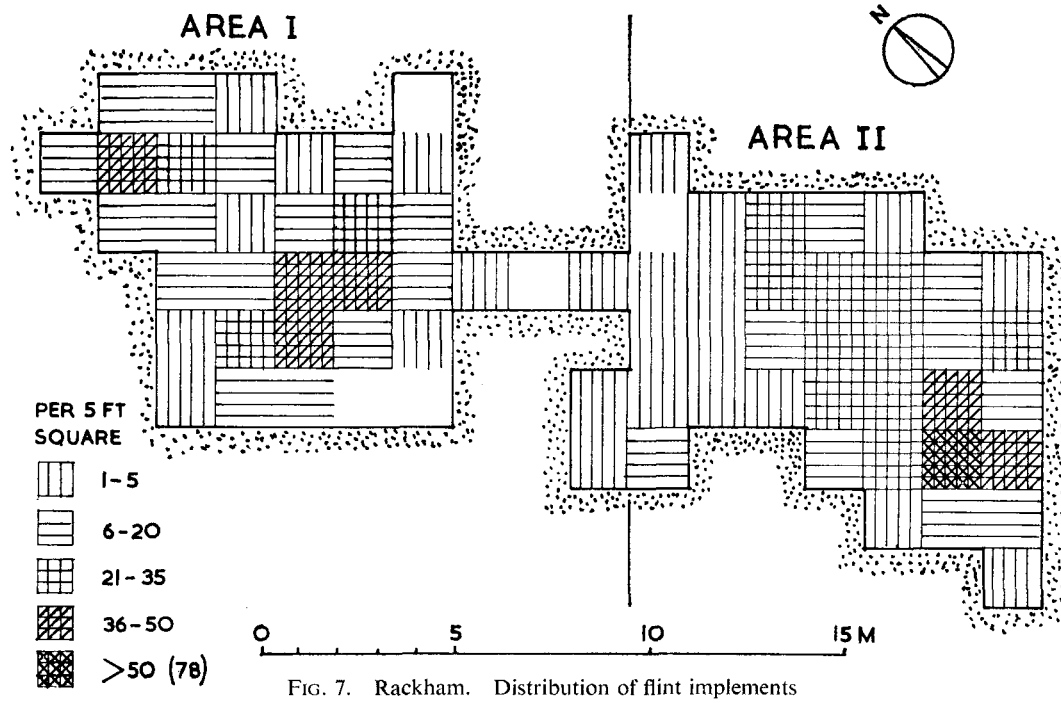

FIG. 7. Rackham. Distribution of flint implements

In each area there was apparently a preference for used flakes in which length exceeded breadth, presumably to ensure a reasonably long working edge. More blades were used in area II than in area I. In each case the flakes selected for re-use were rather larger than the average, although this tendency was more marked in area I than in area II. Both classes of flake were larger in area I, although the unused flakes were of much the same shape over the whole site.

Implements

Scrapers (Fig. 9, 1-13). 397 convex scrapers were excavated from area I and 479 from area II. The majority were roughly worked by direct percussion and retained large areas of cortex. In area I only 20 (5%) showed faceted platforms, and in area II there were only 29 (6%). The majority of the implements were roughly symmetrical and so a simple shape classification, incorporating types defined by Clark *et al.*, Smith and Wainwright,[1] may be appropriate. Illustration numbers follow descriptions.

				Area I	*Area II*
Aa	End scrapers	(i) Long*	(1)	20 (5 %)	23 (5 %)
		(ii) Short	(2)	43 (11 %)	39 (8 %)
		(iii) Broad	(3)	8 (2 %)	1 (¼%)
Ab	End and sides retouched	(i) Long	(4)	25 (6 %)	15 (3 %)
		(ii) Short	(5)	54 (14 %)	89 (18 %)
		(iii) Broad	(6)	—	2 (¼%)
		(iv) Round	(7)	16 (4 %)	37 (7 %)
B	Side scrapers	(i) Long	(8)	21 (5 %)	13 (2 %)
		(ii) Short	(9)	44 (11 %)	69 (14½%)
C	Disc scrapers†		(10)	2 (½%)	4 (1 %)
D	Double ended		(11)	2 (½%)	7 (1 %)
E	On small cortical flakes		(12)	70 (18 %)	96 (19 %)
F	On small irregular flakes		(13)	63 (16 %)	71 (15 %)
G	Broken scrapers			29 (7 %)	31 (6 %)
				397	479

* Defined by a minimum length:breadth ratio of 3:2

† Distinguished from the round scrapers by the presence of retouch along the whole perimeter.

All the unbroken scrapers have been measured with the following results:

Length	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	mm.
Area I ..	—	5	34	38	19	3	1	—	%
Area II ..	—	10	43	34	11	1	1	—	%
Breadth									
Area I ..	—	14	46	27	11	1	1	—	%
Area II ..	—	17	50	27	5	1	—	—	%

Thickness	0-3	3-5	5-7	7-9	9-11	11-13	13-15	15-17	17-19	19-21	mm.
Area I ..	—	7	18	22	29	13	6	2	2	1	%
Area II ..	—	10	18	21	25	9	10	4	2	1	%

Angle of retouch	30-39	40-49	50-59	60-69	70-79	80-89	degrees
Area I	1	12	46	32	8	1	%
Area II	4	15	40	27	11	3	%

[1] Clark, op. cit., 217; I. F. Smith, *Windmill Hill and Avebury, Excavations by Alexander Keiller, 1925-1939* (1965), 107; G. J. Wainwright, "The excavation of a Neolithic settlement on Broome Heath, Ditchingham, Norfolk," *P.P.S* 38 (1972),. 1-97, see 61.

The scrapers are of the same forms in each area and their sizes are more closely related than those of the flakes. Even so, area II again includes some rather smaller items than the other group, perhaps an indication that they were made and used in the same place. Statistical testing shows a 76% probability that these size differences as reflected by the length measurements, are significant ($x^2 = 4.26$ at 3 degrees of freedom). For this calculation the few examples longer than 49mm. were omitted. Of the incomplete scrapers about 40% have broken longitudinally and 60% have snapped across the bulbar axis. The working edges show two characteristic types of wear, neither of which is confined to any particular size or shape of tool. In the first type wear was limited to tiny chips along the retouched edge. This edge was usually shallow. This first type accounted for 42% of the scrapers in area I and 39% of those in area II. The second type was characterised by a rather crushed working edge in which individual flake beds had been fused together by an abrasive action. The working edge was generally blunted and showed many very small deep chips apparently pressed off in use and frequently hinged or stepped. This accounts for the remaining examples. Very few scrapers showed silica lustre.

Knives (Fig. 9, 14-21, Fig. 10, 22-28). Four types of knife are represented:

(a) *Retouched flake knives* (14-19). These usually consisted of the larger flakes, often of rough blade proportions, with shallow retouch along one or both edges. Two examples from each area show invasive scale flaking along one edge and cortex on the other. The same pattern with faint or marginal retouch appears in two flakes from area I and six from area II. In another two cases flakes from the latter area were retouched along both edges. Nine much broader flakes from area I were adapted in the same way and so were three non-cortical flakes from area II, each of which had a roughly pointed outline. Two similar flakes from area II also gave evidence of scale flaking extending to the bulbar surface.

(b) *Blunted-back knives* (20-21). Two examples, both on long flakes, come from area I.

(c) *Plano-convex knives* (22-26). Two broken examples were found in area II. Both show shallow scale flaking about the edges which did not cover the whole dorsal surface. Another four very small flakes, three pointed at the end, show similar, if more intensive, scale flaking over parts of the dorsal surface. All are from area I.

(d) *Discoidal knives* (27-28). Parts of two discoidal knives came from area II. Both were unpolished and showed shallow scale flaking confined to parts of the dorsal surface.

Arrowheads (Fig. 10, 29-32). Three fragmentary barbed and tanged arrowheads were excavated, one from area I and two from area II. All show bifacial scale flaking. One small retouched fragment from area I may be a transverse arrowhead.

Fabricators (Fig. 10, 33-35). Three fabricators of varying cross-section were all found in area II. The edges of all three are bruised by use.

Burins (Fig. 10, 36-37). Three flake gravers are represented, one from area I and two from area II. All show signs of wear on the working edge.

Axe (Fig. 10, 38). The working end of an axe of pointed oval section was found in area II. It was unpolished and may have broken in manufacture.

Miscellaneous (Fig. 10). (a) Two pointed ? core fragments were found in area II (39-40). Both possess one flat face with steep invasive retouch on the dorsal surface. They had been snapped across, but neither shows distinct wear patterns.

(b) The bulbar end of a flake snapped across the striking axis was found in area II (41). It showed shallow inverse retouch and was roughly pointed towards the bulbar end. The broken edge retained wear possibly consistent with hafting, but the implement seems too thick and blunt for use as a projectile point.

The composition of the two groups is summarised in the table below:

	Area I	*Area II*
Scrapers	397	479
Retouched flake knives	13	15
Blunted-back knives	2	—
Plano-convex knives	4	2
Discoidal knives	—	2
Arrowheads	2	2
Fabricators	—	3
Burins	2	1
Axe	—	1
Miscellaneous	—	3
Total	420	508
Flakes : cores	51:1	82:1
Scrapers : flakes	1:8	1:18
All implements : flakes	1:8	1:17
Implements as % of all flakes	11%	6%

Statistical testing shows a 99.7% probability that the different ratios of cores to flakes are significant ($x^2=8.9$ at one degree of freedom). The probability that the different ratios of implements to flakes are significant is even higher ($x^2=113$ at one degree of freedom). Finally there is only a 32% probability that the ratios of scrapers to other tools are significantly different between the areas ($x^2=0.173$ at one degree of freedom).

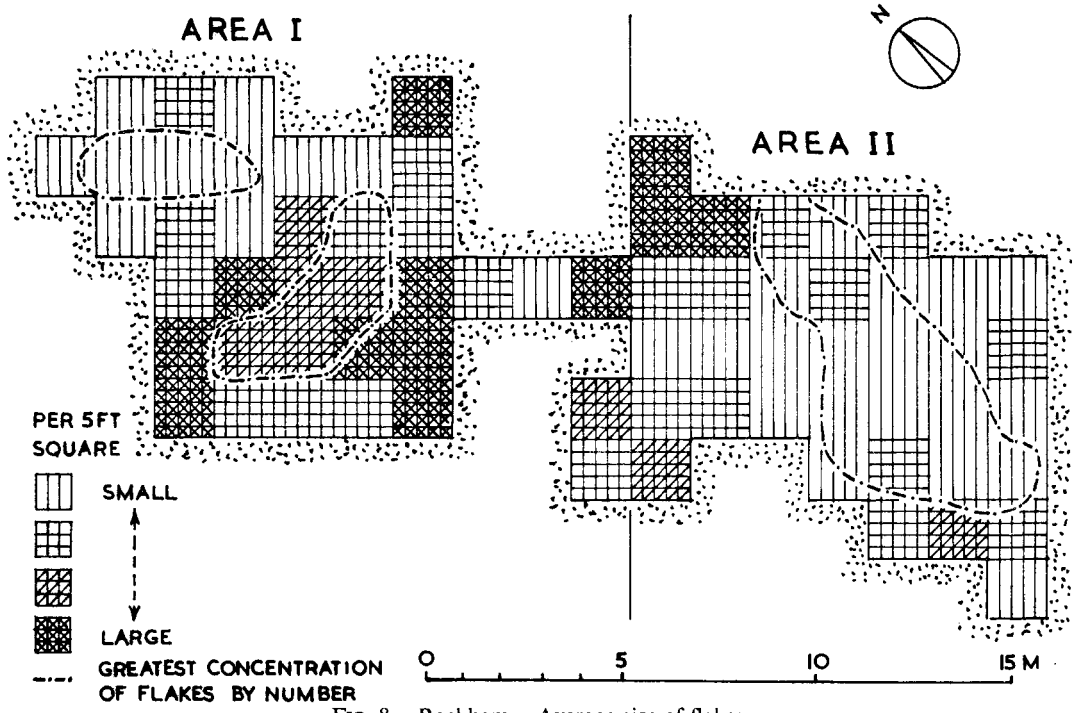

FIG. 8. Rackham. Average size of flakes

CHRONOLOGY

No pottery was found on the site and conditions were not suitable for its survival. The affinities of the industry therefore depend upon its internal typology. Despite the consistent range of the associated tool types, the two nuclei have shown rather different characteristics on metrical analysis and for this reason it is clear that detailed measurements of flakes can be a very crude cultural index. Similar measurements for other British Neolithic and Bronze Age industries show only the most general trend from narrow to broad flakes and no exact correlation with associated pottery styles or absolute chronology. On the other hand the broad flakes on this site are consistently linked with Late Neolithic artifact types. The scrapers are very similar in style and dimensions to the Beaker groups from Plantation Farm and Peacock's Farm as well as Broome Heath and Windmill Hill,[1] and it is possible to distinguish these five measured groups from those with different associations. The retouched flake knives are of types closely matched in a purely Beaker context at Belle Tout, again in Sussex,[2] while the discoidal and plano-convex knives could support a similar date for the group. Such a conclusion finds further support from the three barbed and tanged arrowheads, which are another purely Beaker type. The remaining items have more diffuse associations but need not suggest that more than one industry is represented.

[1] J. G. D. Clark, "Report on an Early Bronze Age site in the South-eastern Fens", *Antiquaries Journal* 13 (1933), 266-96; idem., "Report on recent excavations at Peacock's Farm, Shippea Hill, Cambridgeshire", *Antiquaries Journal* 15 (1935), 284-319; G. J. Wainwright, op. cit.; I. F. Smith, op. cit.

[2] R. J. Bradley, "The excavation of a Beaker settlement at Belle Tout, East Sussex, England", *P.P.S.* 36 (1970), 312-79.

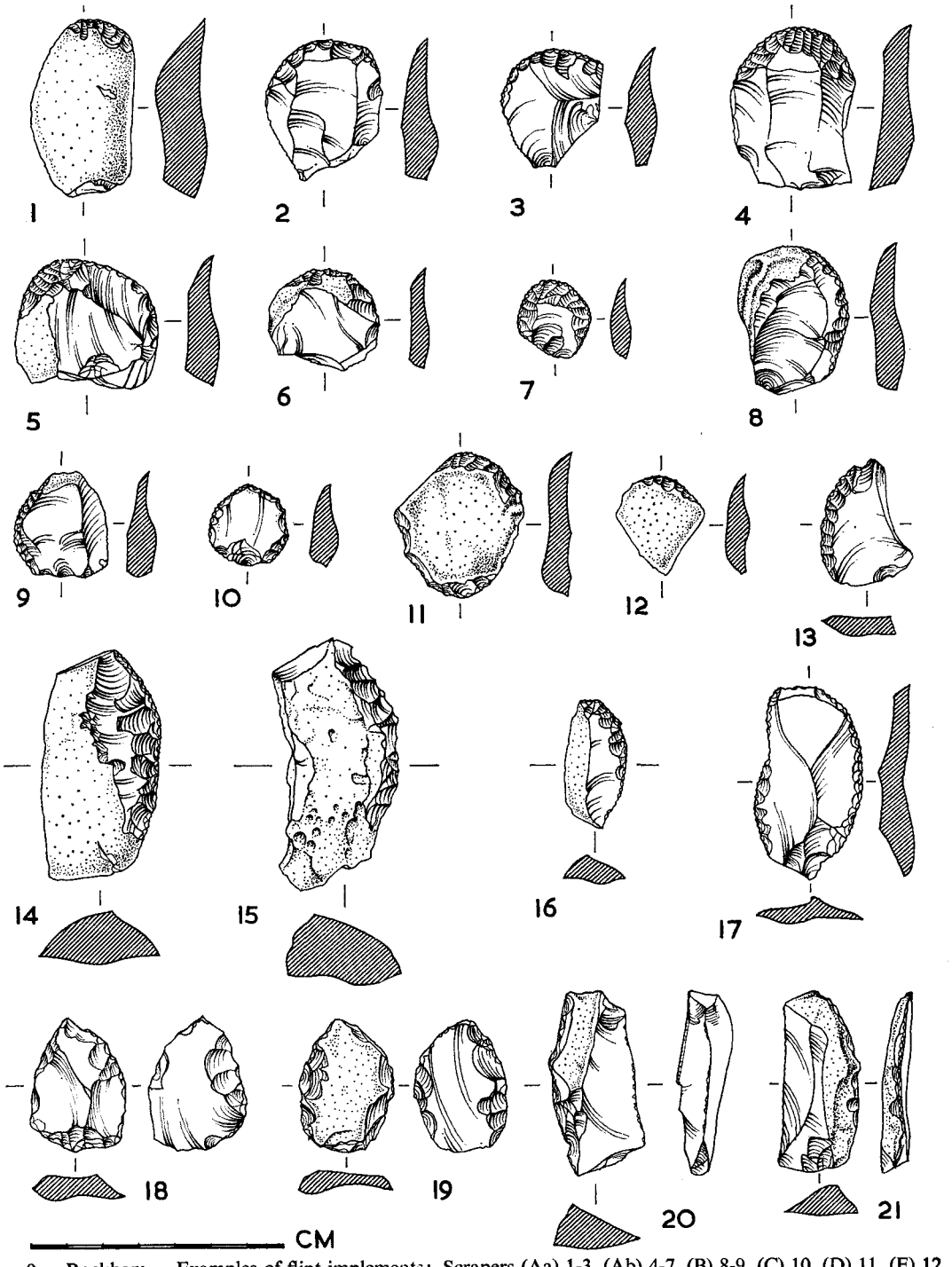

FIG. 9. Rackham. Examples of flint implements: Scrapers (Aa) 1-3, (Ab) 4-7, (B) 8-9, (C) 10, (D) 11, (E) 12, (F) 13; knives (a) 14-19, (b) 20-21

This general dating takes a measure of support from the pollen analysis (p. 100), and especially from a radiocarbon date for charcoal from area II. Two dates were in fact obtained. The first was for a very small bulked sample of charcoal from area I and gave a date of 350 ± 100 bc (HAR-359). This sample was not well sealed and might reflect later land use or even undetected contamination by tree roots and humic acids. The second date, however, was for a slightly larger bulked sample of charcoal taken only from the hearths in area II. This gave a date of 2000 ± 140 bc (HAR-360), entirely compatible with the Beaker context suggested for this industry as a whole.

OTHER FINDS

Stone Rubber (Fig. 10, 42). A small piece of mica-schist, a rock foreign to Sussex, was found at the side of the possible hearth in area I. One end had been ground smooth, probably by rubbing, but the exact purpose of the object is unknown. We are indebted to Mr. S. E. Ellis for the following report:

> The stone is a cleavage fragment of a soft dark mica-schist: to be exact, a tourmaline-bearing quartz-biotite-schist with traces of garnets. By far the nearest and most likely provenance for this type of rock is north-eastern Brittany, east of St. Malo, where the pre-Cambrian (Brioverian) greywackés have been metamorphosed and tourmalinised. The nearest alternative source is the southern Scottish Highlands, by way of glacial drifts of the East Midlands, but this seems very unlikely indeed. This schist has no connection with or similarity to the common medieval 'schist hones' which have been traced to southern Norway (Eidsborg).

There can be no certainty that the schist was dropped by the flint-knappers, for Mr. Ellis informs us that hones made of rocks from the same ultimate source are known in later times, e.g., from the Middle Bronze Age barrow at Itford Hill[1] and from the Saxon site of *Hamwih* (Southampton).[2] Nevertheless, the total absence of finds from any other period suggests that it might have been associated with the Late Neolithic flint site.

A larger piece of mica-schist, with one end bevelled on each face so that the two flattened surfaces meet at an obtuse angle, is recorded from the Bronze Age(?)—Iron Age site on Wolstonbury Hill, Sussex.[3]

Charcoal. Considerable difficulties were encountered while endeavouring to make identifications owing to the fragmentary nature of the charcoal. We are most grateful to Miss Joan Sheldon of the Institute of Archaeology, London, for undertaking this difficult task. It proved to be impossible to name charcoals as found in the different transects (Fig. 4) and the only practical way of presenting the results is to say that *oak*, *hazel*, *birch*, *poplar*, and probably *Crataegus* types were present.

[1] E. W. Holden, "A Bronze Age cemetery-barrow on Itford Hill, Beddingham, Sussex", *Sussex Archaeological Collections* (hereafter *S.A.C.*), vol. 110 (1972), 91.

[2] S. E. Ellis, "The petrography and provenance of Anglo-Saxon and Medieval honestones, with notes on some other hones", *Bulletin of the British Museum* (Natural History), Mineralogy 2 (1969), 165, type IIc (8).

[3] E. C. Curwen, "Wolstonbury", *S.A.C.* 71 (1931), 237-45.

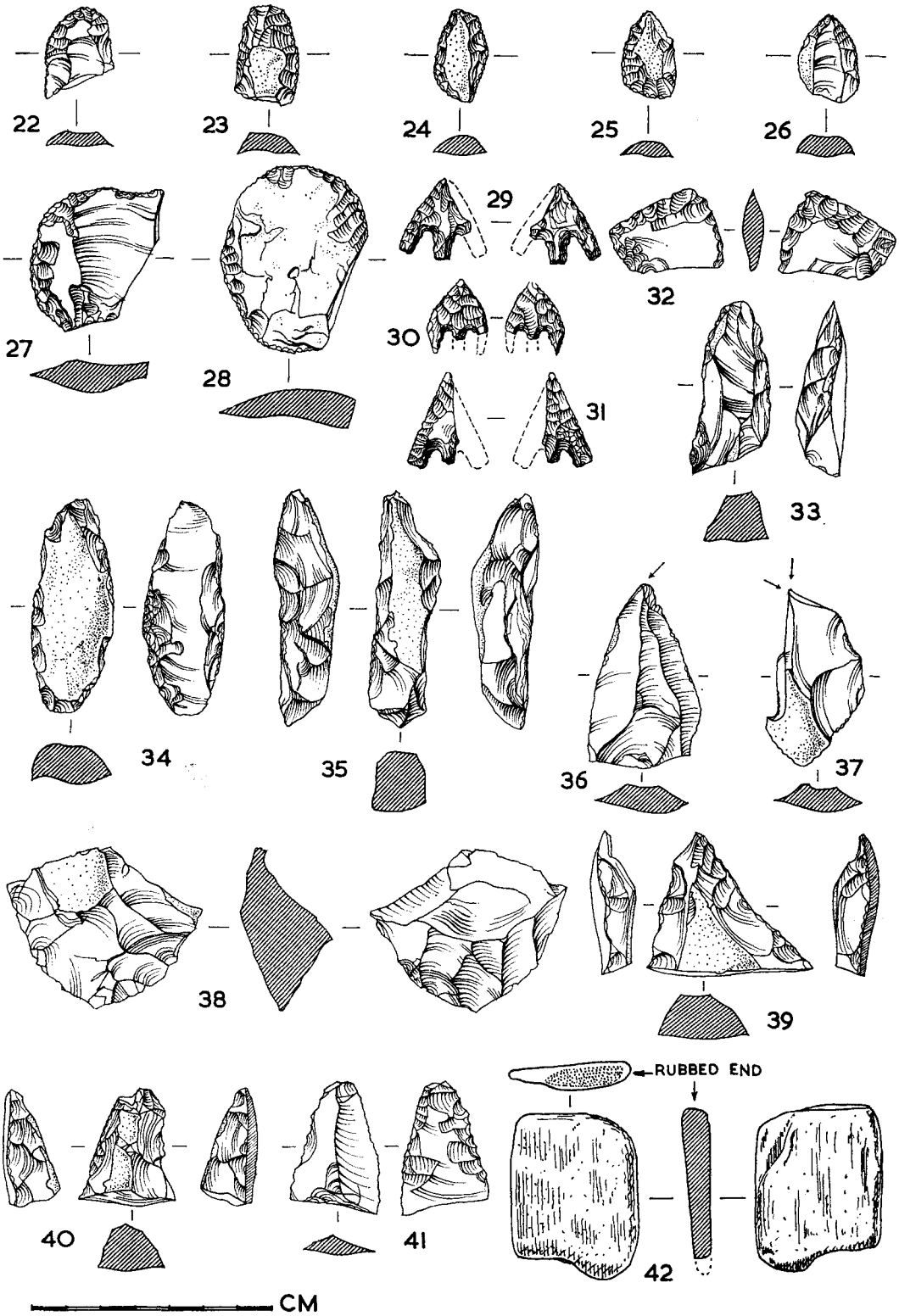

FIG. 10. **Rackham.** Examples of flint implements: Knives (c) 22-26, (d) 27-28; arrowheads 29-32; fabricators 33-35; axe 38; miscellaneous 39-41. Mica-schist rubber 42

Pollen Analysis by G. W. Dimbleby

The pollen diagram (Fig. 11) shows a dramatic change from a woodland flora at the base, to heath in the upper layers. This represents a chronological sequence, into which must be fitted the zone of charcoal and artifacts lying at about 6-8in. depth (15-20cm.).

It cannot be assumed that the pollen at the 6-8in. (15-20cm.) level is coeval with the hearths. There is no indication in the pollen diagram of a buried surface at that level; indeed the pollen curves seem clearly to be derived from the present surface of the mineral soil. In order to explain the relative distribution of pollen and artifacts two factors need to be appreciated. Firstly, the forest phase represented by the lower layers of the pollen, in which oak (*Quercus*), alder (*Alnus*) and hazel (*Corylus*) are the chief components, is a forest which would probably be associated with a brown soil with earthworms in it, contrasting strongly with the present podzol. The worms would progressively bury objects deposited on the surface, and it is reasonable to believe that the deep position of the hearths is due to their prolonged action.

The second factor of importance is that under these conditions pollen is only effectively preserved in acid soils; that is, with pH below about 5.5. Acidity also affects the earthworm population and as it increases the important soil-mixing species of worm will be eliminated.

On poor sandy parent material such as this Lower Greensand progressive soil acidification may be a slow natural process, but it is accelerated by disruption of the forest cover. It is perhaps significant that the lowest and therefore oldest samples in the pollen series contain traces of pollen of grasses (*Gramineae*), heather (*Calluna*) and ribwort plantain (*Plantago lanceolata*) which may signify an early clearance phase of limited extent.

The detailed interpretation of this pollen diagram is argued more fully elsewhere[1] but for the present purpose the following sequence seems the most probable. In the Sub-boreal period the site was under deciduous forest, but in the late Neolithic minor clearance was made, with which the present hearths were probably associated. The occupation of the site was temporary and the forest returned. The episode of clearance had led to increased soil acidification sufficient to allow the preservation of small quantities of pollen, but not to eliminate the soil-mixing earthworms. In the regenerated forest the latter continued to work, burying the artifacts to the level at which they are now found, a processs which may have taken a century or more.

Then followed a period of more general and permanent clearance, probably still within the Sub-boreal, perhaps Bronze Age; the forest gave way to heath with heather an important element. Under these conditions the soil would rapidly acidify and earthworms would be eliminated. One effect of this would be that the cessation of soil mixing would permit the development of the pollen stratification which is seen in the top half of the profile. At the same time the soil would be converted from an acid brown soil to a podzolized one, culminating in the mature podzol of to-day.

The intermittent occurrence of cereal pollen in the upper part of the sequence shows that arable agriculture was being practised at this time, but the pattern of pollen distribution in the profile makes it clear that this site itself was not cultivated and therefore the agricultural elements in the pollen would be derived from adjacent areas, probably on more fertile soils.

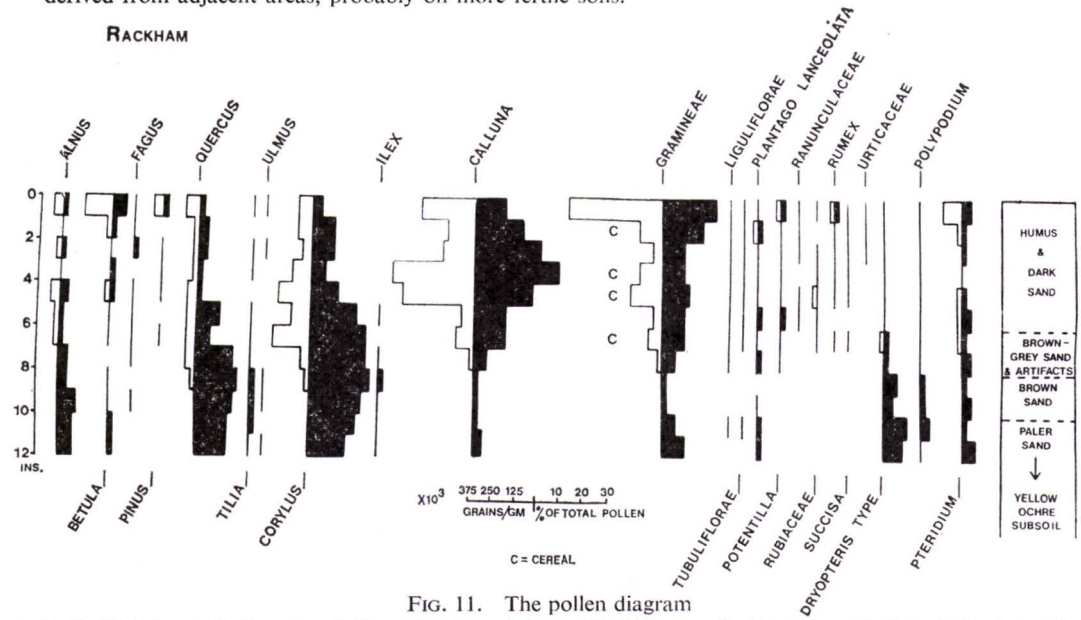

FIG. 11. The pollen diagram

1 G. W. Dimbleby and R. Bradley, " Evidence of pedogenesis from a Neolithic site at Rackham, Sussex ", *Journal of Archaeological Science* 2 (1975), 179-86.

INTERPRETATION

Interpretation of this site is probably more helpful in functional than in directly cultural terms. In each area two stages of activity may be recognised. In neither case are the two nuclei close enough to one another to be taken together while they do not seem to have been wholly complementary. Both areas had initially served as knapping floors making use of nodules collected in the immediate vicinity of the site. In area I the flakes were rather larger than elsewhere and were more directly associated with cores and hammers, perhaps suggesting that intensive core preparation was one function of this nucleus. In area II the greatest density of debris occurred in an area where the smaller flakes predominated, possibly indicating that more implements were made or resharpened there. The shallow angle of retouch on most scrapers suggests that resharpening was not frequently practised. Such a pattern takes support from the wider ratio of cores to flakes in this nucleus and from differences in the size of the measured waste. All the fabricators were found in area II. On the other hand, it is unlikely that the two nuclei served completely different purposes, since the higher proportion of cortical flakes in area II should indicate some preliminary knapping in this area. One possible sign that tools were made in both groups is that the sizes of scrapers in the two areas slightly reflect the different dimensions of the flakes. On the other hand, the proportion of finished implements is higher in area I and some of those made in the other nucleus could have been removed from the site. What is clear is that knapping was organised in an orderly manner with different stages of manufacture taking place in different parts of each floor. This could suggest the participation of several individuals.

The high proportion of utilised flakes in each area makes it clear that flint knapping was by no means the principal activity on the site. In fact the distributions of flakes and finished tools were virtually the same in each area and suggest that many implements were made for use on the spot. The abnormally high proportion of implements on the site strengthens this conclusion. The structural evidence from the excavation on the other hand gives no indication of permanent settlement and suggests no more than a series of windbreaks and open fireplaces.

The dominant characteristic of this industry is the very high proportion of scrapers. When this pattern has been discussed previously it has been suggested that these were merely made together, but here the evidence for wear on both implements and flakes rules out this line of argument. A close comparison might be with the Late Neolithic flints incorporated in the Bishop's Waltham Great Barrow in which 89% of the implements were scrapers and these accounted for 6% of the whole industry.[1] It is known that a scraping action can blunt a flake especially rapidly[2], but this does little to explain the imbalance on this site. Nor does it appear that this is a characteristic feature of the Late Neolithic. In fact it seems that the ratio of scrapers to other implements is consistently between 1:1 and 4:1 on the more permanent Neolithic occupation sites with pits and houses, and this is also true of causewayed enclosures.[3]

Early Neolithic. Hazard Hill 1.5:1; Whitehawk 1.5:1; High Peak 2:1; Haldon 2:1; Hembury 2.5:1; Windmill Hill (primary levels) 3:1; Broome Heath (buried soil) 4:1.

[1] P. Ashbee, " The Great Barrow at Bishop's Waltham, Hampshire ", *P.P.S.* 23 (1957), 137-66, see 154-6.

[2] C. M. Keller, " The development of edge damage patterns on stone tools ", *Man* (N.S.) 1 (1966), 501-11.

[3] R. J. Bradley, " Prehistorians and pastoralists in Neolithic and Bronze Age England ", *World Archaeology* 4 (1972), 192-204.

Middle Neolithic. Broome Heath (pits and postholes) 1:1; Abingdon 2.5:1; Trundle 2.5:1; Hurst Fen 3:1.

Late Neolithic. Kennet Avenue 1.5:1; Avebury G55 3:1; Honington 3:1; Broome Heath (earthwork) 4:1.

Beaker. Beacon Hill 1:1, Easton Down 1.5:1; Belle Tout 2.3:1. At Rackham, however, the ratio is 17:1 in area I and 16:1 in area II. Several other sites, all of Late Neolithic or Bronze Age date, seem to share this characteristic and in most cases evidence of continuous or permanent settlement is absent. The Bishop's Waltham barrow overlooks an area of seasonally flooded land, while nine similar sites in Langstone Harbour, Hampshire[1], occupy areas which may have been marshland in the Neolithic. At Mildenhall,[2] associated faunal remains indicated possible seasonal use of a similar site and at Broome Heath no features accompanied the groups of Beaker scrapers. At Stockbridge in Hampshire a similar Bronze Age industry was found within an isolated chalk-cut pit.[3] On the present site there was no evidence for structures or storage pits and there is a possibility that it had occupied a minor forest clearing (see pollen analysis), apparently peripheral to the main density of contemporary settlement. Most of the industries mentioned above, like Rackham, have been found close to round barrows which may also lie towards the margin of contemporary land use or in areas of seasonal pasture. There are hints in older accounts of similar industries in East Anglia[4] and in Sussex an occupation site with comparable material may have been in seasonal use at Playden.[5]

The precise function of these scrapers is of course uncertain and the severe wear on some edges suggests that they had been used on bone as well as skins.[6] If they were employed on animal products there is no evidence on this site whether these were from domestic stock or from game, and similar problems are posed by the ' cooking places ' or ' boiling mounds ' of the period which may also be found in regularly flooded positions close to barrow groups.[7] The location of this site by a former stream and the unusually high proportion of fire-damaged flints add weight to this connection.[8] The only site of either group to have produced suitable faunal remains is the Bronze Age industry at Mildenhall where the animals were nearly all cattle which had possibly been exploited on a seasonal basis.

The use of these sites is also difficult to decide. If the scrapers were used on hides, it is not immediately apparent why this should take place away from the parent settlement, unless the usefulness of forest products in primitive leatherworking was the main consideration.[9]

[1] R. J. Bradley and B. Hooper, "Recent Discoveries from Portsmouth and Langstone Harbours: Mesolithic to Iron Age", *Proceedings of Hampshire Field Club*, 30 (1974), 17-27.

[2] T. Kelly, "A series of Late Middle Bronze Age sites, Wilde St., Mildenhall", *Proceedings of the Suffolk Institute of Archaeology* 31 (1969) 47-56.

[3] J. F. S. Stone and N. Gray Hill, " A Middle Bronze Age site at Stockbridge, Hampshire ", *P.P.S.* 4 (1938) 249-57.

[4] H. H. Hall, " Implements from a station at Cranwich, Norfolk ", *Proceedings of the Prehistoric Society of East Anglia* (hereafter *P.P.S.E.A.*) 1 (1908), 454-7; H. Dixon Hewit, "A Neolithic site near Thetford ", *P.P.S.E.A.* 2 (1914), 42-5.

[5] R. J. Bradley (forthcoming).

[6] For a fuller discussion of the interpretation of similar wear patterns see R. Tringham, " The function, technology and typology of the chipped stone industry at Bilany, Czechoslovakia, *Alba Regia* 12 (1972), 143-8.

[7] The best account is in M. J. O'Kelly, " Excavations and experiments in ancient Irish cooking places ", *Journal of the Royal Society of Antiquaries of Ireland* 84 (1954), 105-55. For sites on seasonally flooded land in Norfolk, see H. Apling, " Bronze Age settlements in Norfolk ", *P.P.S.E.A.* 6 (1931), 365-70.

[8] Francis Pryor (personal communication) has discussed a similar problem in examining the Grooved Ware flint industry at Fengate.

[9] R. Reed, *Ancient Skins, Parchments and Leathers* (1973).

If domestic stock were being used, it is equally unclear why such intensive culling should have taken place, especially since meat products are not usually the mainstay of a 'pastoral' economy. If the site were associated with hunting on the other hand, it is hard to see why it should have been so intensively used in comparison with the hunting camps of the Mesolithic. Indeed one characteristic of this group of sites is that the proportion of arrowheads is actually less than on ordinary domestic settlements. Only at Stockbridge can these arguments be amplified. Here the flint industry was associated with a distinctive narrow oval pit, 3.3m. long at the base and 2.5m. deep. This was completely unsuitable for domestic use and greatly resembles a class of pit well known in European Neolithic contexts where there are strong reasons for linking them with the tanning of hides.[1] A similar pit, possibly of Bronze Age date, is also recorded from Havant in Hampshire where it is certain that no permanent settlement had existed.[2] Otherwise Mildenhall provides the only useful information. Here the flint scrapers were accompanied by a bronze knife and a series of bone awls, none of which would survive on a site like Rackham, although flint knives were found here and could be supplemented by utilised flakes. Another bone awl and 'many splinters' of ox bone were found in the pit at Stockbridge. The implements at Mildenhall could all have been used in leatherworking and the fact that so many inedible parts of the animals were left on the site there suggests that this may have been combined with butchery. Whether this pattern extends to other members of this group must await excavation in a more generous environment. For the moment it may be enough to raise the possibility of a new class of Neolithic and Bronze Age site.

One final implication must also be noted. If the site really had a specialised function then it is likely that the associated flints were characteristic only in that particular type of situation. The close similarity of the scrapers to those measured from other Beaker sites permits no general conclusion, since all of these sites seem to share a disproportionate number of these implements. By contrast, at Belle Tout, the one settlement site where metrical analysis was attempted, they were rare. In the same way the flint waste in different parts of this one site possessed quite different attributes on analysis and, unless the stage of manufacture is confidently known, it seems unwise to build dogmatic schemes upon the characteristics of waste flakes.

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[1] P. Van der Velde, "Rituals, skins and Homer: the Danubian tan-pits", *Analecta Praehistorica Leidensia* 6 (1973), 50-68.

[2] R. J. Bradley and E. Lewis, "A Mesolithic site at Wakefords Copse, Havant", *Rescue Archaeology in Hampshire* 2 (1974), 5-18.