

be welcomed, but sadly it cannot be considered the norm. Some university departments have managed successfully on limited funding; Reading University's work under the guiding hand of Richard Bradley, first in Cranborne Chase and now in the Lake District, is a good example. Likewise HBMG has on occasion taken a broad view of landscape studies and funded such fieldwork/excavation projects as the Stonehenge Environs Project and, more recently, that at Raunds, Northamptonshire. But, even where there is a considerable input of government funds into fieldwork, there is not necessarily a guarantee of further funding for backup excavation. Thus with the Fenland Project, which must be the most extensive survey ever financed by HBMG/DOE, - five fieldworkers employed over a seven year period - there is no indication, as yet, that any of the multitude of questions raised by our work will be pursued by excavation.

The vast majority of fieldwalking projects, both amateur and professional, will never be followed up, but there is always the hope that the ploughsoil finds can be put to some use other than adding dots to the map. In concentrating on integrated projects the symposium papers avoided this aspect - hence the disappointment! Yet there is obvious potential in such survey data as is well demonstrated by the recent publication of Archaeology from the Ploughsoil (Haselgrove, Millett, and Smith (eds.), 1985), as well as as several isolated papers in journals. However, a cursory glance at these would suggest that, with one or two exceptions, lithic specialists are not in the forefront of this developing study. Perhaps the subject for a future symposium?

REFERENCE

Haselgrove, C., Millett, M., and Smith, I. (eds.), 1985, Archaeology from the ploughsoil (Sheffield, Department of Archaeology and Prehistory)

THE 'ASDA FACTOR': CORE REDUCTION, RESOURCE STRESS AND THE NATURE OF LITHIC ASSEMBLAGES IN CENTRAL-SOUTHERN ENGLAND

by John Schofield

Introduction

This paper is intended as a summary of work carried out between 1984 and 1986 as part of my postgraduate research. The idea has been to investigate the relationship between earlier prehistoric settlement and certain ecological variables in the landscape of central-southern England. Data were collected by fieldwalking in two survey areas and the main characteristics of the various flint collections were recorded. It soon became apparent through this analysis that a clear relationship existed between the size and form of flint collections on the one hand and the location and nature of flint as a raw material on the other.

In order to clarify the nature of these relationships it was assumed that flint is generally derived from one of two sources and that the source used may have depended on the importance attached to flint by the societies concerned. On the one hand, flint may be obtained from non-localised, usually derived sources. Such locations cannot be mapped nor accurately predicted by archaeological detection and were probably only important for the manufacture and use of 'instant tools', made and discarded on site. It is this uncertainty and lack of organisation which necessitates the exclusion of this class from the discussions which follow. Localised sources or quarries, on the other hand, can be mapped and imply a degree of planning and premeditated activities. Hayden has suggested that in such cases large amounts of debris are generated and that quarries in general are recognised by prehistorians for what they are and do not pose a major interpretative problem (1978, 192). In the ethnographic record, observers have noted a tendency for groups to visit such sites, apply crude core-reduction techniques, and return with prepared nodules to the settlement (Gould 1980, 126). Such a degree of organisation should, as Hayden suggests, generate specific patterns or signatures in the archaeological record, and it is with these signatures that this paper is primarily concerned.

In order to investigate the nature of these relationships and to test the validity of applying general models to this area of human activity, a bimodal research strategy was adopted; this involved:

1. Examining in detail the flint collections from the Middle Avon valley (Schofield forthcoming) and East Hampshire (Gardiner and Shennan 1985) survey areas.
2. Comparing those results with a number of excavated assemblages to see if the same relationship existed between assemblage form and size and the location and nature of raw material.

The idea behind the model, borrowed initially from Foley's work (1981), is that, where continuity is displayed in any aspect of human land-use strategies, then steep gradients may be identified between high- and low-density scatters and between aspects of assemblage composition. Where that continuity does not exist, 'blurring' will occur in the form of mixed assemblage characteristics. In terms of resource stress, it was my expectation that this would occur in those areas where flint as a raw material was either absent or where good quality flint was in short supply. In such areas, we may expect to see a degree of 'conscious preservation' displayed in the archaeological record (Bamforth 1986, 39), represented, for example, by a high proportion of retouched material, a high incidence of core rejuvenation flakes, small size classes, small cores, and a larger overall assemblage size. All these characteristics would be the result of resource stress and the constant 'knapping down' of material, a policy which would avoid more trips being made to a source area than were absolutely necessary. Munday (1984) noted exactly these characteristics in a flint-poor area in the central Negev. In this case, Mousterian flint knappers were strongly motivated in an attempt to use time, effort and flint resources to their best economic advantage and this was reflected in the assemblage characteristics described above. The problem of distance, in other words, was overcome by increasing preparatory input into the core reduction process.

Exactly the opposite may occur in those areas where good quality flint is locally abundant. Overall assemblage size may not be so large, but the proportion of retouch should be less and the average flake size greater. It was this suggestion that led me to a further point: assuming that blade manufacture is possible from almost every type of flint and that it implies a greater degree of preparatory input and technological precision, then the abundance of blades in an assemblage could reflect resource- or flint-poor contexts; an abundance of short, squat flakes, on the other hand, perhaps displaying hinge fractures and hence often considered to represent a lower standard of knapping associated with later prehistoric contexts, may reflect the idea, 'What the hell! There's plenty where this came from.' In other words, an argument based on the availability of raw material in relation to areas of settlement may be an equally plausible explanation for assemblage variation and the difference in flake shape ratios as one geared wholly to the cultural sequence.

Regional Analysis

To examine these ideas at a regional scale, I decided initially to use a collection comprising 7000 units collected from the Middle Avon valley, West Hampshire, between 1978 and 1984 (Fig.1). The area was divided into six zones defined on the basis of specific ecological characteristics (Table 1), one of which is the source of chalk-derived flint to the north of the study area. For this interpretation, the ecological zone was taken as the unit of analysis rather than the individual field, as it was felt that overall patterns would be more easily recognisable at this scale. The various figures regarding density and size characteristics are displayed in Tables 2 and 3. Two factors are immediately apparent:

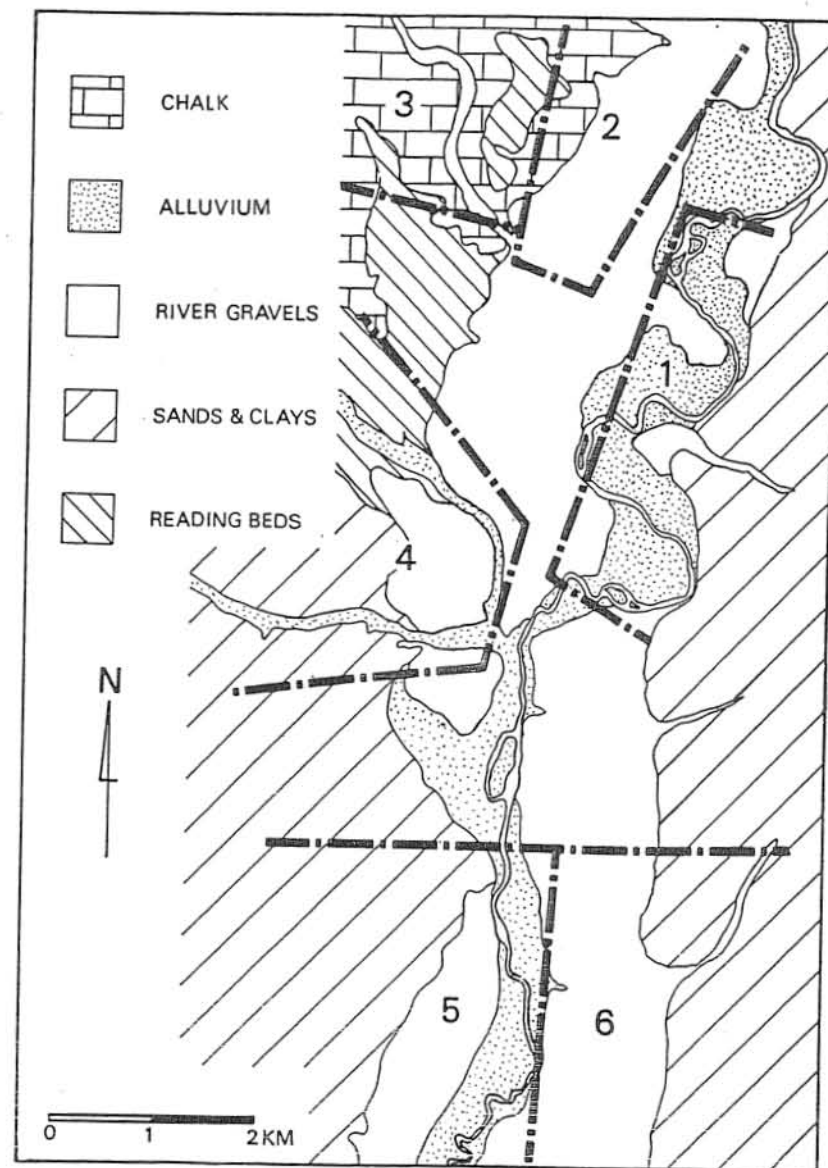


Fig. 1. The Middle Avon valley survey area.

1. Clear gradients exist between the various zones, both in terms of density and assemblage composition. It is therefore possible to suggest a degree of continuity in the settlement of the area throughout the prehistoric period.

2. Mean flake size decreases from north to south, with smaller flakes becoming more numerous with distance from the chalk. The range of flake sizes also decreases, while the percentage of core rejuvenation flakes increases. All suggest an increasing tendency towards preservation and standardisation as flint becomes less abundant.

It may also be the case that the proportion of retouched material is greater in those areas away from localised sources of flint, but as the exact location of source areas within the region is difficult to establish, other parameters must be sought. In the case of the Avon valley, it is possible to locate areas where primary flakes are predominant, suggesting the first stages of core reduction (Gould 1980, 123). It is also the case that such areas tend to form a strong negative correlation with areas of retouch and high waste densities, possibly representing settlement or 'home-range' locations. While this only represents a preliminary statement regarding the nature of settlement systems, it may signal a way forward in the interpretation of flint scatters within the region (Schofield forthcoming). This relationship will be discussed further in the following section and is illustrated in Fig. 2.

To confirm this general regional model, I decided to consider data from the East Hampshire Survey (Gardiner and Shennan 1985) from the same perspective, in this case taking the area of chalk and clay-with-flints to the south and west of the study area as representing the most likely source of raw material (Gardiner and Shennan 1985, 54). In this case two clear relationships were again noted:

1. Overall collection size increased from south to north, i.e. outwards from the area where clay-with-flints is predominant. (Gardiner and Shennan 1985, fig. 5.3)
2. Flake size, along the same trajectory, showed a marked decline (*ibid.*, fig. 5.5).

Flake size, then, is one factor which seems to relate to the structure of the environment and the location of raw material within it. That overall assemblage size corresponds in the latter case and not in the former may well be a function of the roles of the respective areas in the overall settlement system, the 'preferred' habitats of the Avon valley promoting a density and continuity of settlement which never existed in the East Hampshire area and which, as a consequence, 'blackened out' any density variation which may otherwise have existed (Schofield 1986). This notion is given support by the results of excavations at Downton (Higgs 1959; Rahtz 1962), just to the north of the Middle Avon valley survey area, as well as at sites in the Kennet valley (Froom 1972) and Avebury (Smith 1984) regions. In these cases, continuity of settlement has clearly redressed the balance with a sequence of on-site discard greatly outweighing any factors which might serve to identify technological variability or resource management in the archaeological record.

Site Analysis

Having reached several conclusions which I considered rather significant, I thought it worthwhile to reconsider some of the data used by, for example, Pitts and Jacobi (1979) in their now

familiar arguments relating debitage to the various cultural episodes. This represents only a preliminary analysis and must be regarded as such at this stage.

The assemblages from a number of Mesolithic, Neolithic and Bronze Age sites were considered, in relation both to their assemblage characteristics and to their distance from naturally occurring flint (Table 4). The aim, as before, was to establish the extent to which a relationship existed between the variables and whether it agreed with the relationships discussed above. Two main themes were considered:

1. The relationship between 'tools' and waste, based on the expectation that the proportion of 'tools' (including retouched flakes) would increase with distance from the source area.
2. The idea that flake size would decrease with distance from the source area, suggesting a greater level of preparatory input.

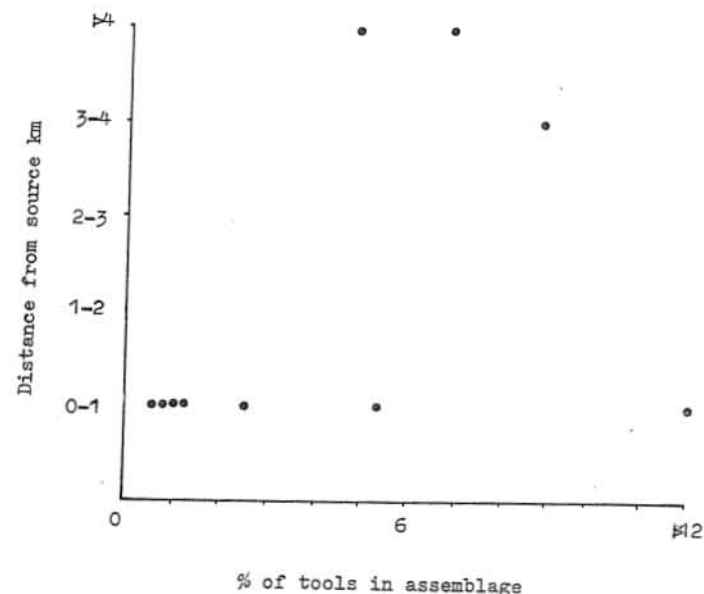


Fig. 2. Percentage of tools in assemblage against distance from source.

The availability of data varies enormously, depending on how it is presented in the excavation report. Despite this, however, a cross-section of Mesolithic, Earlier and Later Neolithic and Bronze Age sites was achieved and a number of observations made. The conclusion regarding tool frequency was that a clear relationship exists but that a lot more data are required to this effect (Fig. 2). The general tendency is for sites located close to raw material source areas to display very low proportions of tools within the assemblage, for example at Bury Hill (Drewett 1981, 77); the only exception to this being the Winterbourne

Stoke G45 round barrow (Saville 1980). In this case, retouched material represents 12.65% of the overall assemblage, substantially greater than the 5.27% and 2.60% represented at the Amesbury barrows (*ibid.*) The explanation for this may lie in the nature of the raw material on which the Winterbourne site is located; Saville suggests that the local clay-with-flints deposits are of poor quality, the evidence being the frequent thermal and shattered surfaces which occur in the assemblage. If this is the case then the use-life of the various functional components would be substantially reduced, at least from the point of view of rejuvenation. It would be more practical in such cases to make a fresh tool than attempt to change an existing one.

A relationship also appears to exist between flake size (Fig. 3), scraper size (Fig. 4), and the location of raw material, although again more data are required to support it. The relationship is most clearly apparent in the cases of Windmill Hill and West Kennet, where distance from source is clearly the distinguishing factor between two broadly contemporary assemblages. Another example is Amesbury G71. Saville makes the point that the percentage of flakes broader than a 4:5 ratio is high (43%), and that this clearly aligns the assemblage with a post-Middle Neolithic date (1980, 7). I suggest that a more plausible explanation is that such a flake shape suggests an absence of resource stress and that local raw material was in this case used for flake production, possibly derived during the construction phases of the monument. This is supported by the fact that scrapers are also relatively large in size, in total contrast to those of other sites farther from source areas.

Other factors too appear to vary as a function of distance. The abundance of knapping products at Windmill Hill, for example, suggests that flint was brought to the enclosure in the form of nodules and a degree of resource stress is suggested by the fact that old cores were collected and reused: they were flaked systematically and were invariably worked down to a small size (Smith 1965). In addition, cores are in some instances used as functional components within the assemblage. This was the case both at Oakhanger (Rankine *et al.* 1960), and at Windmill Hill (Smith 1965), where 5.7% and 29.2% of cores were used. Again these represent those sites farthest from source areas, and it may be significant that no such instances are recognised at either Offham (James 1977) or Bury Hill (Drewett 1981).

In all these cases therefore, the expectations are upheld and agree with those conclusions obtained from the two Hampshire study areas. There are, I suggest, grounds for arguing that a resource stress model (defined here as the 'ASDA Factor' for reasons which will become apparent), based on the notion of human activity within a mosaic environment is as good an explanation for assemblage variation as the cultural or temporal arguments put forward by Pitts and Jacobi (1979). It must also be emphasised, however, that models suggesting simple linear relationships always have exceptions and that such relationships as those presented here should not be viewed in total isolation; other factors may hold equal weight in other cases. The end in lithic technology often determines the means; for example, where the production of microliths or arrowheads is concerned, a highly specialised and standardised blade or flake assemblage would

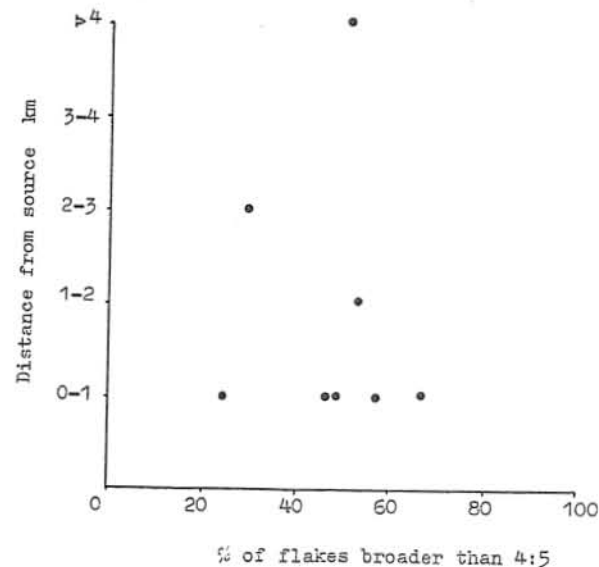
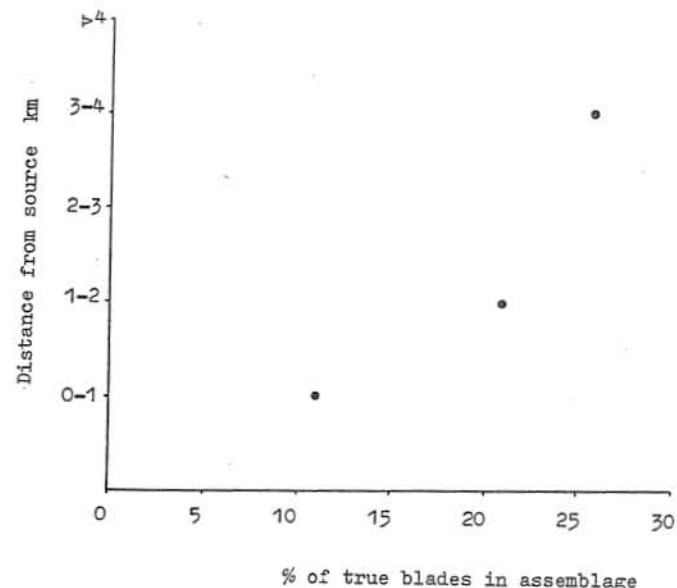


Fig. 3. Percentage of true blades in assemblage and percentage of flakes of breadth:length ratio >4:5, both against distance from source.

result, whereas for the manufacture of a scraper this may not necessarily be the case.

Therefore, while resource stress and availability are not the only factors governing the nature of an assemblage, they are factors which clearly deserve more attention in the context of British prehistory. It is true to say that observations have followed a general line of enquiry; Woodman (1982, 114), for example, has suggested that we should expect to see a linear relationship between the size and extent of recycling in flint industries and the distance from source; Care (1982, 277) has suggested that the narrow flakes which predominate in the industries of Devon and Cornwall result from the need to use raw materials efficiently; while Healey and Robertson-Mackay (1983, 22) suggest that the high proportion of wide flakes at the Staines causewayed enclosure can be explained by its close proximity to a virtually inexhaustible supply of gravel flint. Such general observations have brought to our notice the potential of examining assemblages in this way; what we require now is the specific analytical and quantitative analysis combined with accurate spatial and geological information which can lead us to a more detailed level of enquiry.

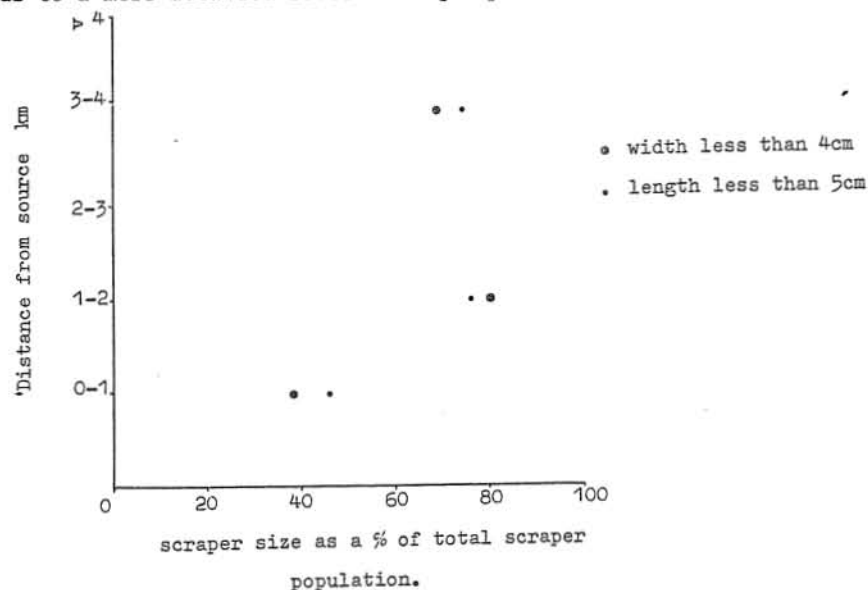


Fig. 4. Scraper size as a percentage of total scraper population, against distance from source.

Conclusion: the 'ASDA Factor' considered

It is a fact of life that we in the present day must practice resource management, maintain energy and so allow time for more important and socially significant activities. It is not so much a question of minimizing risk in this case, as the resource is not mobile and is unlikely to become exhausted in the short term. It is rather a question of maintaining an

effective timetable by which activities are combined and arranged in the most cost-effective and economic way. In other words it is a scheduling of activity in order to achieve cost-reduction and optimal efficiency. We therefore tend to plan our 'resource schedule' so that visits to the shops or supermarket take up a minimum amount of time. We make the journey as few times as possible, bring as much food home as we can carry and while we are at home we make the most of what we have bought. I suggest that prehistoric communities would have had to react to the same pressures in a very similar way, with the collection of raw material forming one part of what Binford has described as an 'embedded procurement strategy' (1979), obviously in this case substituting flint nodules for food and the source area or quarry for the supermarket. Motivated by what is casually termed the 'ASDA Factor', groups would have incorporated the collection of raw material into their list of essential activities. After returning from the quarry with sacks of nodules, probably with some of the primary flakes removed and knapped to regular shapes for ease of carriage (Gould 1980, 124), further on-site core reduction would have taken place and the important tasks of tool preparation, manufacture and maintenance could be executed.

Flint therefore is one resource which can be mapped, raw material types related to each other, and the whole process related in time and space to the nature of human settlement and activity. It is clearly the case that we need to pay far more attention to such factors as those described above, and for that to be possible we need a far more detailed knowledge of the nature and distribution of flint as a raw material (for example, Young 1984, Henson 1985). Only when these requirements are met will we be able to examine the activities of prehistoric communities in the way that Munday (1984) has achieved for the Mousterian. Until then the so-called 'ASDA Factor' must remain at its hypothetical stage and its significance to the interpretation of British prehistoric settlement must remain a speculative venture into a theoretical domain.

Acknowledgements

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Table 1. Ecological subdivisions of the middle Avon valley survey area (Fig. 1)

Zone	Geology	Topography	Soil Type
1	chalky gravel & river alluvium	low spurs projecting into river valley	shallow calcareous and non-calcareous loam
2	valley gravels	first river terrace	well-drained fine silty soil
3	Lower Chalk with areas of Reading Beds	chalk downland, rising to 100m O.D.	shallow, well-drained calcareous silty soil with patches of clay-with-flints
4	complex mosaic of sands, clays & gravels with a narrow strip of alluvium	two tributary river valleys at a point entering the main river system	mosaic of silts & loams
5	valley gravels, plateau gravels & sands	on & below first river terrace; little topographical variation	poorly-drained soil subject to water-logging & flooding
6	valley gravels	below first river terrace; little topographical variation	poorly-drained soil subject to periodic flooding

Table 2. Quantity and density of struck flint from individual zones of the middle Avon valley survey area

Zone	Total ha walked	Total flints recovered	Mean numbers per ha			
			Total flint	Retouched	Scrapers	Other 'tools'
1	28.0	566	20.21	7.18	1.54	0.50
2	76.9	2425	31.53	5.38	0.82	0.23
3	39.9	652	16.34	3.08	0.30	0.08
4	48.8	669	13.71	3.52	0.57	0.12
5	141.8	1992	14.05	3.21	0.47	0.02
6	73.3	738	10.07	2.78	0.35	0.05

Table 3. Mean flake size, range of flake size and frequency of core rejuvenation flakes for individual zones of the Middle Avon valley survey area

Zone	mean flake size (mm)		range of flake size (mm)		% of core rejuvenation flakes in total collection
	length	breadth	length	breadth	
1	37.78	28.66	53.3	76.5	0.5
2	36.36	29.02	62.5	42.8	1.4
3	32.43	27.35	51.7	38.3	0.7
4	32.08	25.60	50.9	38.1	0.9
5	29.14	27.35	35.1	33.3	1.7
6	29.85	26.06	25.6	24.1	2.9

Table 4. Assemblages employed in site analysis

Site	Date	Distance from source	Source character	Reference
1. Oakhanger	Meso	over 4km	chalk, clay-with-flints, river gravels	Rankine et al. 1960
2. Windmill Hill	Neo	2-3km	chalk	Smith 1965
3. Offham	Neo	on-site	chalk	James 1977
4. Bury Hill	Neo	on-site	chalk	Drewett 1981
5. Alfriston	Neo	on-site	chalk	Drewett 1975
6. Carn Brea	Neo	over 4km	various	Saville 1981
7. West Kennet Avenue occupation site	Neo	0-1km	chalk	Smith 1965
8. Durrington Walls	Neo	on-site	chalk	Wainwright & Longworth 1971
9. Amesbury G70	E-MBA	on-site	chalk	Saville 1980
10. Amesbury G71	E-MBA	on-site	chalk	Saville 1980
11. Winterbourne G45	E-MBA	on-site	clay-with-flints	Saville 1980

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