It is sad to relate that Professor F. W. Shotton died on 21st July 1990, only three weeks after returning the final draft to me of the joint paper which precedes this note. He was in poor health physically, but, with occasional lapses, as mentally sharp as ever. This note in our modest Newsletter is the last thing he wrote. He had placed in the Proceedings of the Prehistoric Society of East Anglia, the palaeoliths found in the Midlands; his first was sixty years before: 'Palaeolithic implements found near Coventry', in the Proceedings of the Prehistoric Society of East Anglia.

Fred Shotton's health had been failing for some time. A very tall, impressive man, he had become unsteady on his legs and could no longer walk round the local pits and observe the sections, but would relish others driving him to the site, so that he could see as much as possible and maintain contacts with the workers and managers. It was thus that the hand-axes were recovered from Waterley Wood Para Pit. This discovery of such hand-axes made of andesitic tuff from beneath 'Wolstonian' till was something of a culmination of his long research on the Palaeolithic period in the Midlands and brought him much pleasure. So to end, he maintained that these 'Wolstonian' tills were not the same as the Anglian Stage tills of East Anglia, as the British Geological Survey had concluded. Whether this is so or not, his work on the Quaternary sediments and terraces of the Midlands has been a major contribution to Quaternary studies in Britain.

As Professor of Geology at the University of Birmingham from 1949, he witnessed the gradual growth of Quaternary studies, hitherto neglected by so many academics, and in many respects he was responsible for it. He was from 1971 Chairman of the British Section of the IUGS International Geological Correlation Programme Project 24 Quaternary Glaciations in the Northern Hemisphere. I met him frequently at these meetings and he usually had some plastic bags containing flint or quartzite Palaeolithic to show me. He would ask me to suggest a date for various hand-axes and I think I finally convinced him that they could only be placed in a span of time that covered the whole of the Palaeolithic.

He was a Fellow of the Royal Society. There was only one archaeologist with a special interest in the Palaeolithic period who was once F.R.S. He did not inspire confidence in his fellows on the scientific content of his observations on palaeoliths or archaeology in general. F.W. Shotton has hopefully removed any such impressions from this august establishment.
terminology, a *tranchet flake* having been removed to sharpen the tip. As regards a date for the implement, flake scars are shallow and were thus produced by the soft-hammer flaking technique, once thought to be a feature of the more developed Acheulian industries in Britain (Roe 1975, 3). Indeed the survival of cortex on one face and the unworked butt would also have been thought characteristic of a later date. Recent finds from Boxgrove, Sussex, from probably pre-Anglian deposits (Wymer 1988, table 2), suggest, however, that an earlier date may be just as plausible.

1. **Hand-axe collected from Rainbow Bar 1990**

   The flakes include one recovered from the beach (Fig. 2:a) and two (Figs 2:b, c) from a spit at NR6 SU53050210, described by Admiralty Charts as between -1.07 and -1.06m OD. The former is a primary flake, apparently soft-hammer struck, heavily rolled and patinated and derived from a flint pebble. The latter are larger flakes, both with pronounced bulbs of percussion, characteristic of reduction by hard stone hammer (i.e. in contrast to the soft-hammer node suggested for both the axe and the flake recovered from the beach). The larger unpatinated flake (Fig. 2:b) is particularly crude and its cortex suggests that it is chalk-derived and probably local. The remaining flake (Fig. 2:c) is tertiary and, although rolled, has clear evidence for retouch at the tip. The final artefact recovered (Fig. 2:d) was a large flint core, possibly used as a chopper. This is heavily patinated.

2. **Flakes and a core collected from Rainbow Bar, January 1990**
but had not been rolled to the same extent as the flakes described above. Bulbar depressions are pronounced and cortex on the butt end suggests a large pebble as the source. Opposite the butt is a roughly pointed tip formed by the apparently deliberate removal of three flakes.

The collection made early in 1990 therefore has much in common with the 'very rolled . . . Acheulian . . . pieces' recovered from the site by Draper (1951, 147). The patination is the same as he described, at least for the pieces found on the beach, while the dimensions appear to correspond with those presented in Draper's article. He described the ten hand-axes as being between 3" and 6" long and the large flakes as 4" across. He also described pebbles or boulders selected for their natural handgrip, on which a cutting edge had been worked. All three classes of artefact are represented in the small collection described above.

Technology, Fluvial Displacement and Site Formation

Two points can be made about the flint collections from Rainbow Bar. First, it would appear from the level of technology and the nature of the raw material that flint was being obtained locally, either on an ad hoc basis in the area of the Solent river now submersed, or as part of an embedded procurement strategy from the chalk ridge 20km to the north-east. The second point relates to site formation and concerns recent experimental work by Schick (1986) on the effect of fluvial action on archaeological sites. Her premise, following on from that of Shackley (1978) and Fahnstock and Haushild (1962), is that the behaviour of archaeological material in a fluvial context will depend on a combination of factors. These include flow characteristics (velocity, depth, duration), bed conditions (particle size, bed form) and the physical characteristics of the archaeological material (size, shape, density). For example, with velocity at 2.3'3/sec., flake and cores less than 150mm long will exhibit continuous or near-continuous movement. Indeed, in some cases cores of considerable size may display transport rates equivalent to or even greater than smaller flakes of less weight (Schick 1986, 49). This is due to the fact that larger artefacts extend further upward into the turbulent boundary layer where higher flow velocities help compensate for their greater mass.

Two points made by Schick are particularly relevant to understanding site formation at Rainbow Bar. First, that at all levels of fluvial disturbance, larger artefacts will display better rates of recovery. Indeed for flakes and debitage recovery rates tend to diminish with size (Schick 1986, 81), while recovery of large flakes will equal or exceed that of heavier cores. Thus in an assemblage of known proportions, the recovery of large flakes and cores may be magnified several times over, while the proportion of smaller flakes will be severely reduced, often to less than half their original number. This is a discrepancy related to Rainbow Bar but to this extent of Lower Palaeolithic sites. Indeed, Shackley has observed that over 95% of Lower Palaeolithic artefacts in northern Europe have been found in fluvial deposits (1978, 55). The second point concerns what Schick describes as 'additive distortion' (1986, 85). This involves the mixing by fluvial action of two or more separate sites which have occurred within the same stream system. A variety of artefact classes have been recovered from Rainbow Bar, and it is clear from the collections that a number of cultural episodes are represented.

To appreciate fully both the extent of additive distortion and the extent of visibility of archaeological material, the depositional history of the Solent river should be understood. Obviously sea level fluctuations have occurred during the period under investigation, and various stages of occupation will have been buried during the periods of deposition which accompany rising sea levels. Thus material appearing on Rainbow Bar was incorporated into silts and gravels below Mean Low Water Level, possibly representing the surface of a buried Pleistocene channel (Roe 1981, 149). This has been disturbed by storm action and erosion of a type prevalent within any active river system, although possibly enhanced in this case by wave action caused by the large vessels which frequent the Solent estuary. As for a date, Jacobi (1981, 21) has observed identical patination and staining on Clactonian material, blades, blade cores, a core adze and a barbed and tanged arrowhead from the gravel spit at Rainbow Bar. He thus argues for a late submersion, possibly in the later prehistoric period. Indeed, a date of 3689 ± 120 BP for a peat sealed beneath estuarine clay at -2.75m OD at Fawley (Godwin and Swinton 1960, 394) may be a useful comparison.

The lessons to be learnt from this are straightforward enough. Lithic collections from fluvial sites may bear little relation to the original assemblage in terms of density and composition, irrespective of how recently the assemblage became incorporated into a fluvial context. Thus two interpretative problems might arise:

1. The high proportion of large artefacts may not be representative of the assemblage as a whole, a point of particular relevance to the collection of Mesolithic material from Rainbow Bar.
2. Additive distortion may merge chronologically and/or spatially disparate distributions. The latter may be overcome by incorporating the likely extent of fluvial displacement and the tidal regimes into the interpretative framework. The former is a straight case of archaeological problem-solving and may be overcome by using patination, density and other indices. It is interesting, for example, that the two artefacts recovered from the beach in 1990 display the characteristics of soft-hammer reduction, while those from the spit are distinguished by prominent bulbous and bulb scars, a feature of hard stone hammer production.

Heavy storms therefore have the velocity to erode the silts/gravels in which artefacts have been deposited and move...
large particles rapidly and sometimes over long distances. That Draper's (1951) collection and that made by the author in 1990 both followed heavy storm events combined with the fact that, from the recent collection, artefact clusters with distinct technological traits were separated by a distance of some 200m, suggests that discrete artefact concentrations are present within the fluvial environment of this part of the Solent estuary. It also suggests that, provided fieldwork is conducted to coincide with optimal visibility and following periods when the widest range of size and shape classes will be represented, sites eroding below Mean Low Water can produce meaningful results. The value of these results can, however, only be fully understood when the nature of the fluvial regime is known and the likely effect on an archaeological assemblage is documented.

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REFERENCES

Draper, J.C., 1951, 'Stone industries from Rainbow Bar, Hants', Archaeol. Newsletter 3, 147-149


