DONCASTER

EXAMINATION OF THE SHIELD AT THE ANCIENT MONUMENTS LABORATORY

When the find was first reported to the Laboratory, with a request for assistance, Mr. M. C. Corfield (then at the Laboratory) joined the excavation team in further uncovering and recording it. The aim was to consolidate and lift the shield but it had clearly been burnt in situ and survived only as a relatively thin skin of charred wood, in some places even as no more than a silhouette. The only practical course, therefore, was to lift the area on which the shield lay - after minimum consolidation - as a substantial soil block and bring it back to the Laboratory in London for detailed examination.

Visual examination

After re-exposure, a plan of the surface was made by Mr. Corfield and Mrs. D. J. Ridgway, showing the position of all the visible charred remains and metal fittings. It was then X-rayed and micro-excavated by them to locate the precise edge of the shield board, expose any fittings not lying on the surface and determine the thickness of the organic residues. All fittings and residues were finally removed for further detailed examination. It was not practicable to preserve the surface of the block as a long-term exhibit.

The organic remains consisted of charred wood and a 'bubbly char' associated with it in places; there were also traces of what appeared to be leather. The metal fittings, apart from the iron boss and grip, comprised iron and copper-alloy studs and all the fittings had areas of organic material texture preserved on surfaces which had been in direct contact with the shield board.

The results of visual examination suggested the shield had been constructed from three-ply wood (deduced from the observed grain directions) glued together (hence the 'bubbly char') and perhaps covered with leather (as indicated by possible traces on the undersurfaces of studheads). A detailed specialist examination of the organic residues was therefore undertaken in the hope of confirming and amplifying these observations.

Examination of the organic residues

(a) Charred wood

Compact pieces of charcoal were present in various places within the area of the shield. Generally there were two well-defined grain directions. These were mostly at right angles to each other and will be referred to as 'horizontal' (i.e. across the width of the shield) and 'vertical' (aligned with the long axis). There was also charred wood on the undersurface of the grip and the back of the boss, in both cases with horizontal grain. This reinforces the probability of three-ply construction, with the grain of the inner ply vertical and both surfaces horizontal. There was, however, no convincing evidence of full overlap although vertical and horizontal grains were seen clearly in juxtaposition, and precisely at right angles, in at least two places. In many other cases they were only slightly displaced, as they might easily have been by the stresses of burning and (relatively slight) soil disturbance during burial. Charcoal was also present on the undersurfaces of the iron studheads, but appeared to be separated from them by ? leather.

Owing to the thinness of many of the significant specimens, botanical identification proved difficult but was aided by the use of a scanning electron microscope. This work was initially supervised by Dr. J. F. Levy at the Department of Botany, Imperial College of Science; additional identifications were later made by Mrs. C. A. Keepax of this Laboratory. It is clear that two principal kinds of wood are present and these correspond to the different grains observed. All those examples with vertical grain that were identified were of Oak (Quercus sp.). Others, with horizontal grain, were all of Alder (Alnus sp.). In three cases, small pieces of softwood charcoal (Pinus sp.) were seen; these were all aligned randomly and could well have resulted from a more general fire of which the shield formed part.

(b) 'Glue'

Some of the charcoal had a discrete layer of black, glossy 'bubbly char' attached to one side. Under the microscope this char was seen to be composed of many blisters, both broken and unbroken, in a smooth matrix - indicating the escape of vapours from the molten surface.

Samples were examined at the Laboratory of the Government Chemist by infrared analysis, thin-layer chromatography and in the amino-acid analyser. The aim was to demonstrate the presence of the amino acid hydroxyproline which would indicate a protein/polypeptide residue of animal origin.

Infrared analysis of a water extract of the crushed material showed the presence of only a relatively small amount of organic material but there was some evidence for a polypeptide degradation product. Examination by thin-layer chromatography, and in the amino-acid analyser, of solutions prepared by hydrolysing scrapings from the charred surface with 50% hydrochloric acid, confirmed by the presence of many amino acids in reasonable quantity, but no hydroxyproline could be seen. The level of detection of the analytical procedures is such that they would indicate as little as one part in five hundred of any original glue. At the same time, the amino acids present were found at an order of magnitude so low that bacterial and/or vegetable contamination from the ground cannot be ruled out.

To sum up, if it is assumed that the microcellular structure was formed as a result of heat effects on glue, then that glue was possibly derived from protein but there is insufficient evidence to confirm that this was of animal origin.

(c) leather

It is not possible to prove beyond doubt that the residues which looked like leather are, in fact, charred leather. In a sense there is a family likeness between leather and animal glue, due to their common origin, and leather could behave similarly on charring. Any distinction in the present context must rest ultimately on any presence of 'leather' in positions which are significant from the structural point of view.

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