

Iron-working residues from Bulmore

Material

27kg of material classified by the excavators as slag were examined. The majority of this material comprised smithing hearth cakes, vitreous hearth slags, fragments of vitrified hearth lining and iron pan derived from smithing debris. The material was derived from 71 contexts (4.4kg 75; 0.3kg 76b; 5.6kg 76c; 15.9kg 76f; 1.2kg 76g; 0.04kg bnf83). The interpretation of the material is complicated by the uneven level of retrieval of residues during the various excavations on the site. Although the bulk of the collection derives from second-century contexts, this may be biased by the nature of the archive. In particular a large deposit of iron-working debris (Context 039) from the area to the west of Building is virtually unrepresented in the archive, nor are there any samples from the lens of hammerscale, slag and charcoal which predated building 7 (un-numbered context). Most of the material appears to come from residual contexts and it remains unclear whether any of the smithing activity took place after the mid-2nd century. Only the deposit of hammerscale is probably a primary smithing deposit, and little is known about its nature.

Residues

Smithing hearth cakes of plano- or concavo-convex shape, made of dense fayalitic slag, often with a vitreous or charcoal rich upper surface, comprise approximately 60% (by weight) of the assemblage, and were recovered from 37 of the 71 contexts yielding iron-working residues. Additional cake fragments are probably concealed in some of the iron-pan material. Most of the reasonably complete cakes fell within the range 125 - 470g, with outliers at 570g and 770g, with an overall mean of 270g. A fragment representing approximately 25% of a large cake weighed 310g.

Vitreous, vesicular slags not associated with wall material ("clinker") are present in 12 contexts. Particularly dark-coloured vitreous materials are commonly associated with embedded fragments of coked coal.

Vitrified furnace lining with adhering fired clay was recovered from 30 contexts. Three fragments showed evidence of possible blowholes. One of these was a typical vitreous clinker mass attached to the wall below the blowhole, which showed a 22mm diameter semicircular notch in the upper part of the attachment area. The other two fragments were less typical, showing a vitrified surface bearing part of a hole in the hearth wall with a 90° corner. In the larger fragment the hole was at least 40mm in width.

Iron pan material is of two broad types. The first includes a dominantly sandy substrate, often slightly pinkish in colour and often carrying a superficial calcareous coating, and containing small pebbles. The second category is distinguished by the presence of abundant small mineralised plant debris (grass/reeds?). Some 29 contexts produced iron pan material, of which 14 contained the mineralised plant material. Both categories commonly contain slag fragments, hammer scale, charcoal, and more rarely coal and slag spherules. In many cases the iron pan is a thin coating present over substantial discrete smithing hearth slag pieces. This material is probably dominantly derived from the smithy floor, but whether it constitutes the floor itself, or simply sweepings from a smithy is not clear. In some cases the iron pan includes small fragments of pottery, glass and pieces of iron. Most of these iron pieces are complete or fragmentary nails with square sectioned shanks. These nails occur in 4 contexts, and it is not known whether these are discarded/lost smithy products or fortuitous inclusions.

Non-ferrous metalworking is only suggested by rare finds. One fragment from 76c/252 superficially resembles vitrified furnace lining, but the vitrification is on a convex surface and the fabric bears organic temper. This fragment may represent a sherd from a crucible. Context 76/232 includes iron-pan bearing a small fragment of corroded iron associated with corrosion products of a copper alloy. 76f/698 yielded a small piece of, probably partly roasted, lead ore.

Iron-making is only evidenced by a single piece of Forest of Dean iron ore (76g/865) associated with the road and a water-worn ore pebble (76f/714). Two small flows of dense slag from 76f/719 could have been produced in a smelting furnace, but small flows of this kind (these two pieces only total 65g) can be produced in smithing hearths too.

Discussion

Smithing debris is widespread on the site, but with particular focus in the areas of the 75 excavations (Building Group 1 and area to west) and of 76 trench f. (Building Group 4) There are indications of some non-ferrous metalworking, but these must have only been a very minor activity. The presence of iron ore may be due to material dropped by road traffic, rather than being indicative of iron making in the immediate area.

The dominant activity indicated by the residues would have been blacksmithing. The preserved hammerscale is of a fairly small size and the iron pan deposits contain few slag spheres. The hearth cakes are small and no bloomsmithing is indicated. This assemblage is indicative of light blacksmithing rather than substantial forge welding.

The fuel employed in the smithing operations was dominantly charcoal, but small amounts of coal and coal-containing smithing residues occur. The small scale use of coal for smithing is common on sites in this area.

Appendix: The archive

Site	Context	Weight (g)	Notes	Coal	Smithing cakes	Iron pan with plants	Other iron pan	Hearth lining	Nails
2nd Century (or earlier)									
76f	693	10							
76f	694	245				x			
75	10	260			x				
76c	252	10	crucible fragment						
76f	664	2990	Square blowhole		x			x	
76b	137	20							
76b	139	45							
76b	140	175			x		x		
76f	635	275			x		x		
76f	714	205				x			
76f	719	220				x			
76f	722	170		x			x	x	
76f	730	190					x	x	
76f	742	925		x	x		x	x	
76c	230	100			x			x	
76c	232	255	Cu alloy associated with iron fragment		x				
76c	250	235			x				
76c	250	50	crucible lid			x			x
76c	251	35					x	x	
76c	253	310		x	x		x	x	x
76c	261	1620			x	x			
76f	250	620			x	x			x
76f	738	1215			x	x			
76f	740	1460			x				
76c	248	70			x				
76f	705	120			x			x	
76f	713	90			x		x	x	
76f	643	340	Square blowhole			x		x	
76g	809	45			x				
76g	810	10							
76g	855	55						x	
76g	865	70	Dean iron ore						
2nd - 3rd Century									
76c	246	1300			x	x		x	x
76f	607	160			x				
76f	671	0	rock						
76f	624	10						x	
76f	637	155						x	
3rd Century									
76f	721	45						x	
76f	675	45							
76f	710	165							
76g	857	985		X	x		x		
76f	636	440		X	x			x	
76f	650	10						x	
76f	657	310			x				
75a	32	1290		x				x	
3rd - 4th Century									
76f	698	180	includes 50g of roasted(?) lead ore with galena and barytes		x		x		
76f	661	160			x				
4th Century									
bmf83	29	5						x	
75	20	465		x	x	x			
Post Medieval, modern, unstratified									
76f	708	195			x				
76c	234	155			x		x	x	
76c	245	1250			x	x		x	
76c	258	170			x				
76f	302	20							
76f	611	70							x
76f	655	50		x	x				
76f	683	230			x		x		
76f	744	185						x	
76f	634	140							
76f	669	2400			x	x		x	
76f	638	50				x			
76f	699	80		x			x		
76b	104	35							
76f	746	5							x
76f	629	45			x				x
76f	677	150					x		
76f	692	1415			x		x		x
76f	651	125			x				x
75a	39	600			x				x
75c	32	1800			x	x			
76b	107	10							x
76f	653	5							
bmf83	R pl soil, W end	0	rock						
bmf83	u/s EW Rd	30							

27380 total weight