

## APPENDIX 1 - SLAG AND METALWORKING DEBRIS

### 1.1 Assessment of the Slag and Hammerscale

*by Lynne Keys*

#### *Introduction*

- 1.1.1 Slag and hammerscale were recovered during excavation works at Thurnham Roman Villa (ARC THM 98).
- 1.1.2 A quantity of material identified as iron slag was recovered by hand excavation. This slag was collected to determine the type of metalworking which had produced it, and, in the case of Room 20000 within the villa, to determine whether iron smithing was carried out there.
- 1.1.3 A total of 184 soil samples were taken from two successive phases within Room 20000 of the villa in order to determine whether hammerscale (a micro-slag produced by iron smithing) was present.
- 1.1.4 The recovery and study of the material was undertaken in accordance with the Fieldwork Event Aims for the site, which are set out in section 2 of the main report, above. The recovery of this material was undertaken to aid the establishment of a dated occupation sequence for all phases of the villa's development, and in particular for the apparent decline of the villa, associated with the onset of metalworking, during the later Roman period. The recovery of evidence for metalworking was also designed to address wider CTRL research aims relating to the rural economy, natural resource exploitation and early industrialisation.

#### *Methodology*

- 1.1.5 Approximately 80% of the whole assemblage of slag was assessed in order to achieve a more accurate quantification of material likely to prove of value for further work. The slag was categorised on the basis of morphology and colour.
- 1.1.6 Most contexts contained only small amounts of slag, suggesting that these represented scattered residual material in fills of ditches, tree-holes and similar, and would not repay detailed quantification at this stage. The slag from the main villa house contexts, however, forms a considerable part of the total assemblage. As hearths had been excavated in the central room, particular consideration was given to these contexts.
- 1.1.7 Each type of slag from each context examined was weighed and recorded. Smithing hearth bottoms were individually weighed and each was measured to obtain its length, width and depth.
- 1.1.8 A total of 40 soil samples with hammerscale were selected from the villa room, to provide a broad overview of the area and the two phases. Most were opened and examined for hammerscale and other micro-slags by running a magnet through the contents.

#### *Quantification*

- 1.1.9 The total amount of slag examined and quantified was almost 14kg. The breakdown by context of each type and its total weight is given in Table 5.1.
- 1.1.10 From Table 5.1 it will be seen that much of the slag has been allocated to the *undiagnostic* category. This could have been produced by either smelting or

smithing, and was broken to such a size that the original form could not be determined.

- 1.1.11 Smithing hearth bottoms are a type of slag highly diagnostic of smithing activity. Some were found in features of different dates across the site but were virtually absent from the assemblage in the villa room where smithing activity is thought to have taken place. Three were found in the layer (20058) overlying the hearths. This absence of large slags from a smithy is not unusual, since smiths usually removed them in order not to trip over them as they worked. Often the hearths were dumped just outside the building or in other nearby features open at the time of the activity.
- 1.1.12 In this case, however, unusually the dumps have not been located. One possible explanation is that they were taken some distance away for dumping, which is rare, or they were taken off the site for a specific use elsewhere, such as road metallurgy.
- 1.1.13 Hammerscale is a micro-slag not visible to the naked eye when in the soil. However, it is highly diagnostic of smithing activity, often remaining in the area around the anvil and near the hearth when macro-slags have been cleared out of the smithy and dumped elsewhere. It consists of two types: flake (resembling silver fish scales) and sphere (tiny balls). Each type is diagnostic of different types of smithing. Since hammerscale is generally highly magnetic, its detection while excavating can allow the spatial relationship of the anvil to the hearth to be recorded and can pinpoint the smithing activity more precisely (Mills and McDonnell 1992).
- 1.1.14 The presence of hammerscale, mainly broken flake, in the soil samples from Thurnham reveals the smithing activity consisted mainly of simple hot hammering of pieces of iron to produce objects, or for the repair of objects. Very little high temperature welding was taking place. This implies the smith may have been catering to the requirements of a rural community where the manufacture and repair of agricultural implements, knives and tools would have formed most of the work carried out.
- 1.1.15 Very little material which could represent a hearth superstructure was present amongst the assemblage examined. There was a small amount of vitrified hearth lining and some cinder (formed at the interface between the alkali fuel ashes and siliceous materials and usually the lighter portion of vitrified hearth lining). More material may be present in other assemblages such as fired clay.
- 1.1.16 The hearths most often seen in Roman sculptures and illustrations have a raised fire bed on a stone or tile superstructure and these would produce little in the way of vitrified clay. This may be the case for Thurnham. The plans provided at assessment to facilitate study of the slag from Room 20,000 have indications of tile and tufa in some areas immediately near the hearths. It was not clear whether the features designated as "hearth" were actually hearths at floor level or whether they may be burnt areas beneath raised hearths.
- 1.1.17 A smith relies very much on being able to see the variations in the colour of the metal and therefore the work has to be carried out in a covered, often quite dark, building or room. The implication must be that the roof of Room 20000 was still on and the room was dark, possibly without light from outside. This may be why a central room was chosen for the smithing activity.
- 1.1.18 Context 20158 contained one piece of stone which could be an iron ore, but this single piece is insufficient to demonstrate smelting activity, and is therefore not likely to affect the interpretation of the most important elements of the assemblage.

### *Provenance*

- 1.1.19 Undoubtedly, the most useful group is the assemblage from the villa room (Room 20000, phase 7). With evidence of hearths to back up the slag evidence and hammerscale samples, this group will repay further work.
- 1.1.20 Groups from elsewhere will probably not merit as much attention, although their contexts need to be examined in more detail.
- 1.1.21 It is interesting to note that much of the earlier slag is from contexts spot-dated to the Late Iron Age and very early Roman period, for example in fills of the Late Iron Age/Early Roman enclosure ditch 10840, which was levelled with clay before the construction of the proto-villa (for example, contexts 11468, 11475, 12066 and 12320), and in an indeterminate feature cut by postholes of the Roman post-row 11500.

### *Conservation*

- 1.1.22 The slag, although unwashed, is stable and unlikely to be affected by any factors of preservation. Iron slag, being fayalitic, requires no special storage conditions and is unlikely to be affected by further analysis. Decisions as to whether the assemblage can be discarded should await final decisions about the analysis and post-excavation stages of the CTRL projects, when other relevant CTRL sites with iron slag have been examined and assessed.

### *Comparative material*

- 1.1.23 Until very recently very few smithies of any period had been identified. This picture is now changing as techniques to recover more diagnostic evidence become better known. Iron working evidence from the Roman small town of Asthall, Oxon, has recently been published (Booth 1997). However, most examples are not yet published but it appears that Roman smithies can vary greatly in type of building and layout. The two Roman smithies on a site from Borough High Street, Southwark, London (forthcoming in the publication of work along the Jubilee Line) varied in size, type of building, and hearth type. One was a ground level hearth, whilst another was a raised hearth. A villa site, although with iron making rather than iron working, has been published (Fulford and Allen 1992) together with further references. Extensive iron working evidence has been found recently in OAU excavations at Westhawk Farm, Ashford.
- 1.1.24 The CTRL excavations have made a major contribution to our knowledge of early metalworking sites in the region. An iron smelting kiln was identified at South of Snarkhurst Wood. This is of considerable interest, because the pottery suggests a very close date range for the activity, in the years immediately following the Roman conquest (URS 2000). The presence of a number of Late Iron Age and Roman kilns, ovens and hearths is reported at Northumberland Bottom, although it is not clear whether these are definitely known to have been associated with metalworking. No slag is noted in the archive index (URS 1999). A substantial medieval metalworking site was discovered at Mersham, which may provide useful material for technological comparisons.

### *Potential for further work*

#### CTRL Landscape Zone Priorities and Fieldwork Event Aims

- 1.1.25 The following section discusses potential for further work in the light of the Landscape Zone Priorities and Fieldwork Event Aims.

- 1.1.26 The smithing evidence has considerable potential for further study. From the stratigraphic evidence and the hammerscale distribution, it may be possible to reconstruct the form of the smithy. For example, it may be possible to discern where the anvil, bellows and quenching containers were located, and it may be possible to determine more information on the superstructures of the hearths. Hilary Cool notes the presence of a large and varied assemblage of iron objects from the smithy (Appendix 4.4, above), and this provides valuable evidence for the type of objects being repaired or manufactured. Although it is very uncommon, some tools, particularly punches or whetstones, may also have been left behind by the smiths. This suggests considerable potential for integration of evidence from different assemblages.
- 1.1.27 The Thurnham material therefore presents an excellent opportunity to study a very important industry in a rural context. In this respect, it is interesting to note that there is a suggestion of Late Iron Age metalworking (see 5.1.21, above) as well as the more extensive Roman material. This directly addresses CTRL Landscape Zone Priorities regarding change in the rural economy, patterns of natural resource exploitation and early industrialisation. Evidence may be anticipated for the scale and duration of ironworking activity on site, the periods during which it was taking place, and the type of objects being worked.
- 1.1.28 There is also the potential to look more closely at the evidence for change in the use of the villa associated with the onset and cessation of ironworking. There is evidence for ironworking on the site in the Late Iron Age, as well as in the later Roman period. The provisional phasing suggests that the smithy was in use for a limited period of time during the late 3rd century to early 4th century. Cross-assemblage study will be extremely valuable as an indicator of the social and economic status of the villa at this time, and this will provide crucial evidence for the perceived decline in the villa's status in the later Roman period.
- 1.1.29 It should perhaps not be taken for granted that the ironworking was a low status activity reflecting abandonment of the villa. Perhaps access to smiths had become difficult at this time, and the villa owners felt the need to convert one room into a smithy, or it may imply that a smith was so important to the area that one or more acquired the villa buildings and turned the central room into a workplace.
- 1.1.30 In order to obtain the maximum value from the evidence, the rest of the assemblage not quantified should be examined, together with the remaining samples taken for hammerscale.
- 1.1.31 The distribution of larger residues, in particular hearth bottoms, may provide evidence for the character of occupation of the main villa house during the late 3rd century. It is normal for residues to be discarded immediately adjacent to the working area. The fact that larger residues were not discarded elsewhere in the villa house may suggest that some rooms remained in use for other purposes, or alternatively that the metalworking activity was of short duration.

#### *Bibliography*

Booth, P M, 1997 *Asthall, Oxfordshire: Excavations in a Roman 'Small Town'*, Thames Valley Landscapes Monograph No. 9, Oxford

Fulford, M G and Allen, J R L, 1992 Iron-making at the Chesters villa, Woolaston, Gloucestershire: survey and excavation 1987-91, *Britannia* 23, 159-215

Mills, A & McDonnell, J G, 1992: The identification and analysis of the hammerscale from Burton Dassett, Warwickshire. *Ancient Monuments Laboratory Report 7/92*

URS 2000 South of Snarkhurst Wood, Hollingbourne, Kent. Draft detailed archaeological works assessment report prepared by OAU for URS.

URS 1999 Northumberland Bottom (ARC WNB 98). Archaeological excavation interim report prepared for URS by the Museum of London Archaeology Service.

Table 5.1; ARC THM 98: Context and identification of assessed slag

Context	Sample	Identification	Weight g	Length	Width	Depth	Comments
10276	10276	undiagnostic	522				
10510		smithing hearth bottom	424	95	70	50	
10510		undiagnostic	110				
10528		smithing hearth bottom	2218	140	130	90	poss. not Roman?
10657		smithing hearth bottom	214	80	60	25	
10657		undiagnostic	70				
10788		undiagnostic	14				
10832		fayalitic run	4				
10832		vitrified hearth lining	92				
10935		undiagnostic	114				not ironworking?
10968		undiagnostic	18				
10968		undiagnostic	230				poss. smelting
11303		undiagnostic	54				
11318		smithing hearth bottom	318	70	70	40	
11336		undiagnostic	32				
11392		undiagnostic	74				not ironworking?
11405		undiagnostic	120				
11451		cinder	98				
11468		undiagnostic	180				
11475		smithing hearth bottom	292	80	65	40	
11564		smithing hearth bottom	262	80	75	30	
11564		undiagnostic	98				
11652		smithing hearth bottom	292	80	75	30	
11652		undiagnostic	42				
11961		tap slag	248				
11961		undiagnostic	18				
12066		smithing hearth bottom	440	110	80	25	
12279		undiagnostic	170				
12291		undiagnostic	182				
12320		smithing hearth bottom	306	90	70	40	
12378		smithing hearth bottom	210	70	60	30	
12378		undiagnostic	250				
12434		smithing hearth bottom	190	60	55	40	
15062		smithing hearth bottom	128	80	70	20	
15177		smithing hearth bottom	198	75	65	35	
15178		smithing hearth bottom	94	65	55	25	
15179		smithing hearth bottom	150	65	55	25	
15179		undiagnostic	188				
20045		vitrified hearth lining	110				mixed with undiagnostic
20056	10090	flake	0				
20056		hammerscale in soil	0				
20056		undiagnostic	886				
20056		vitrified hearth lining	410				
20058	10070	some broken flake	0				
20058	10072	flake and some spheres	0				
20058	10075	broken flake	0				
20058	10076	broken flake	0				
20058	10078	some broken flake	0				
20058	10079	a little flake	0				
20058	10082	some broken flake	0				
20058	10088	no hammerscale	0				
20058		smithing hearth bottom	80	75	45	25	
20058		smithing hearth bottom	126	90	50	30	
20058		smithing hearth bottom	174	75	60	30	
20058		undiagnostic	1730				
20058		vitrified hearth lining	364				
20074	10174	magnetic pebbles?	0				

<b>Context</b>	<b>Sample</b>	<b>Identification</b>	<b>Weight g</b>	<b>Length</b>	<b>Width</b>	<b>Depth</b>	<b>Comments</b>
20074	10187	very, very little	0				
20074	10191	very little hammerscale	0				
20074	10229	a little flake	0				
20074	10240	flake	0				
20096	10152	flake and some spheres	0				
20096	10183	a little broken flake	0				
20098	10111	a little broken flake	0				
20106	10122	very little hammerscale	0				
20107	10126	a little broken flake	0				
20107	10137	some broken flake	0				
20109	10210	some broken flake	0				
20109	10236	very little hammerscale	0				
20111		undiagnostic	198				
20112	10180	flake	0				
20112	10195	a little flake, some spheres	0				
20112	10195	very little hammerscale	0				
20112	10246	a little flake	0				
20118	10148	a little flake	0				
20129		undiagnostic	162				
20129		vitriified hearth lining	56				
20158		pot?	4				
20158		stone (ore?)	100				
20158		undiagnostic	228				
20282		smithing hearth bottom	350	125	75	40	
<b>Total examined</b>			<b>13642 g</b>				