Ancient Monuments Laboratory
Report 50/95

THE EXAMINATION OF INDUSTRIAL DEBRIS FROM GREAT WITCOMBE LATE ROMAN VILLA, GLOUCESTERSHIRE

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Summary

Industrial debris totalling 3.7 kg, recovered from a late Roman villa site at Great Witcombe, was examined visually to determine its technological origin. Only a small proportion of the debris was diagnostic of iron smithing. The origin of the remaining materials is unclear.

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The examination of industrial debris from Great Witcombe late Roman villa, Gloucestershire

Thomas Finney

Introduction

Great Witcombe Roman Villa (NGR SO901144) was discovered in 1881 and subsequently largely uncovered by Samuel Lysons and Sir William Hicks. Modern excavations were carried out on behalf of the Inspectorate of Ancient Monuments by Mrs E.M. Clifford in 1938-39 and latterly by Mr E. Greenfield from 1961-73[1].

A number of hearths (or ovens) were identified within the building, some of which were believed to have an industrial purposes. A small amount of industrial debris was recovered which was widely dispersed spatially and temporally[2].

Industrial debris from Witcombe Roman Villa

Phase	Period	Quantity (g)
1/2	Pre-villa/mainly C3rd	312
2	Mainly C3rd	1033
3	Mainly C4th	972
4	Post Roman	1170
5	Post Roman	138
Unknown/Unstratified		87
Total		**3712**

Assessment of industrial debris

The visual examination of metalworking debris allows it to be classified into various categories based on its morphology, density, colour and vesicularity. Of these categories only a small proportion are diagnostic of a particular metal working process. Others can only be assigned to the working of a particular metal, whilst many can be produced by a wide range of high temperature processes.

All the debris from Witcombe was individually weighed, visually examined and classified to type. Without knowing the original excavation strategy it is impossible to say how complete recovery of industrial debris was, but with the very small amount of debris recovered the question arises of how representative the assemblage is.

Summary of industrial debris from Witcombe Roman villa

Context	Area	Phase	Weight (g)	Interpretation	Comments
F13	41a	5	31	Iron object	
584	41	4	100	Vitrified hearth/ furnace lining	Brick?
548	41	4	184	Vitrified hearth/ furnace lining	Roman type tile
647	l.b.	2	37	Mineral block	Geological
620	l.b.	3	1	Vitrified material	Green glaze
649	61	4	26	Vitrified hearth/ furnace lining	Green glaze
651	61	?	17	Vitrified hearth/ furnace lining	Green glaze
639	61	3	161	Vitrified hearth/ furnace lining	Roman type tile
944	15a	3	523	Smithing hearth bottom	Dense
650	61	4	14	Vitrified material	Green glaze
650	61	4	395	Vitrified hearth/ furnace lining	Roman type tile
653	60	1/2	37	Vitrified material	Green glaze
653	60	1/2	18	Vitrified material	Green glaze
654	50	5	18	Vitrified material	Green glaze
700	34	2	8	Dense slag	small run
700	34	2	202	Vitrified hearth/ furnace lining	
F22	39	3	140	Vitrified hearth/ furnace lining	Green glaze
F22a	34	3	39	Undiagnostic ironworking debris	
759/864	65	5	41	Vitrified material	Black glaze
777	64/66	3	21	Vitrified material	Green glaze
U/S	U/S	U/S	48	Vitrified hearth/ furnace lining	Green glaze
797	28	3	87	Undiagnostic ironworking debris	
747	64/66	1/2	129	Smithing hearth bottom	
747	64/66	1/2	128	Smithing hearth bottom	
868	65	4	221	Smithing hearth bottom	
864	65	4	67	Undiagnostic ironworking debris	

Context	Area	Phase	Weight (g)	Interpretation	Comments
866	65	4	4	Cinder	
885	71	4	8	Vitrified material	Green glaze
893	71	2	404	Smithing hearth bottom	
893	71	2	27	Vitrified hearth/ furnace lining	Green glaze
898	71	5	48	Dense slag	
868	65	4	3	Vitrified material	Green glaze
793	65	2	105	Vitrified hearth/ furnace lining	
793	65	2	50	Vitrified hearth/ furnace lining	Green glaze
793	65	2	60	Vitrified hearth/ furnace lining	Green glaze
878	72	4	148	Undiagnostic ironworking debris	
856	67	2	140	Undiagnostic ironworking debris	
?	?	?	30	Vitrified material	Green glaze
?	?	?	57	Fired clay	

Explanation of Results

Evidence for iron smithing is present in the form of **smithing hearth bottoms**. These are formed during the smithing (hot working) of iron due to a high temperature reaction between the iron, iron-scale, and silica from either the clay furnace lining or the sand used as a flux. They are plano-convex in form, characteristically having a rough convex base and a smoother vitrified upper surface, which can sometimes be slightly hollowed due to the downwards blast of air from the tuyère.

Undiagnostic ironworking slag is similar in density to smithing hearth bottoms, but has an irregular morphology and could have been produced by smithing or smelting. **Dense slags** are similarly non-diagnostic, but in the presence of other smelting evidence are usually thought to have been produced by this process. In the absence of this evidence however, and with the relatively high density of some of the smithing hearth bottoms, they are considered to be the product of smithing activities.

Vitrified hearth/furnace linings are produced by a high temperature reaction between the clay lining of a hearth or furnace, and the alkali fuel ashes or fayalitic slag. They can be formed by iron smelting, iron smithing, non-ferrous metal working or other pyrotechnical processes. This material may show a compositional gradient from un-modified clay on one side to an irregular cindery material on the other. Some of the pieces from Witcombe showed a particularly vitrified surface that had a green glaze to it. This surface was well consolidated which is not usual in hearth/furnace linings arising from ironworking. Associated with these green glazed hearth/furnace linings were lumps of **vitrified material** which had a similar green glaze which, in some cases, extended to cover the entire surface.

Cinder is also produced by fuel ash or slag attack of the clay lining of a hearth or furnace. It resembles the more heavily reacted surface of a hearth/ furnace lining.

Fired clay can be produced by any high temperature process. This includes industrial processes, domestic processes, and accidental burning.

Quantities of the various types of debris from Witcombe	
Slag type	**Total Weight (g)**
smithing hearth bottoms	1405
undiagnostic ironworking debris	481
dense slag	56
cinder	4
iron object	31
vitrified hearth/ furnace lining	1515
vitrified material	191
geological mineral block	37
fired clay	57

XRF Analysis

Three selected sample were analysed qualitatively by X-ray fluorescence to investigate the possibility of them being related to non-ferrous metal working.

XRF analysis of selected debris from Witcombe

Context	Lab. Number	Object	Elements Present
548	615045	Vitrified Roman type tile	Si Ca Ti (Mn) Fe Zr
647	635007	Mineral block	(Ca) (Mn) Fe
868	732274	Vitrified material (green glaze)	Si K Ti (Mn) Fe

Key:
XX elements strongly detected*
XX element moderately detected*
(XX) element weakly detected*

*Based on the peak height in the fluorescence spectrum, and not necessarily proportional to concentration of the element in the original sample.

Mn = Manganese, present in soil or sample fabric.
Fe = Iron, present in soil or sample fabric.
Ti = Titanium, from sample fabric or soil contamination.
Ca = Calcium, from sample fabric or soil contamination.
K = Potassium, from sample fabric or soil contamination.
Si = Silicon, from sample fabric or soil contamination.
Zr = Zirconium, from sample fabric.

Discussion

The quantity of debris recovered from Witcombe is small, and of the assemblage only a fraction is diagnostic of a particular industrial process. Smithing hearth bottoms are evidence of smithing, and one would expect smithing would have taken place on the villa site. However, the amount of this slag recovered from Witcombe could have been produced by a single day's blacksmithing, so does not represent evidence for a smithing industry. Like other metalworking debris smithing hearth bottoms are often found used as hardcore, and these examples may have been transported to Witcombe for this use.

Other iron slags are present in such small quantities that they do not support a case for any ironworking industry at Witcombe. They could have come from either smithing or smelting of iron, and may have been brought to the site

as hardcore. If they were produced at Witcombe than smithing is their most likely origin, as there is no diagnostic evidence for smelting.

The hearth lining and vitrified material with the green glaze seems to have originated from the same high temperature process. XRF analysis did not show the presece of non-ferrous metals which might have indicated the working of copper alloys.

The mineral block, although being iron-rich, is unlike any iron slags encountered before. Given only one example was recovered, its origin is likely to be geological rather than industrial.

Conclusions

Several factors make it difficult to identify solid evidence for any industry at the Witcombe villa site. Firstly the amount of debris recovered is very small, with only a fraction diagnostic of a particular activity. This may be the result of the excavation strategy, but if this is the whole assemblage, not much information can be drawn from it. The amount of smithing slag recovered, together with its temporal and spatial distribution does not indicate that iron smithing was an activity that was regularly carried out on the site. It may be that smithing was carried out infrequently, or that the origin of the slag is outside the excavated area.

The vitrified material could have come from ferrous or non-ferrous metalworking, or another high temperature process. The lack of traces of non-ferrous metal on the samples examined by XRF does not support a non-ferrous metal working origin, though this cannot be ruled out.

In conclusion the evidence does not support or rule out a case for industry at Witcombe. All of the debris is of the kind that could have been brought to the site as building material (iron slag) of have been produced by a non-industrial high temperature process (vitrified material), and so while some of the evidence is diagnostic, none is conclusive.

Potential for further work

Given the limited significance and size of the industrial debris assemblage from Witcombe, further work examination and analysis of the debris is not justifiable.

Storage of industrial debris

Ironworking slag, being predominantly fayalitic, is not prone to deterioration and requires no special storage conditions. Vitrified material also does not require special storage treatment. Iron objects must be stored in desiccating condition to inhibit corrosion. It is recommended that the debris are saved.

References

1. R.C.H.M. (1976) *Iron Age and Romano British monuments in the Gloucestershire Cotswolds,* p60-61.

2. P.J. Leach pers comm.