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Castle Gotha, Cornwall : A metalworking site?

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The material submitted for examination comprised samples of deposits including some charcoal and slag, ores and copper alloy scrap and objects and drawings of two moulds. The metal objects and scrap and the ore were all analysed qualitatively by x-ray fluorescence (XRF) and the results are given in Table 1. The samples were all examined and they are descibed in table 2.

It can be seen from the sample descriptions that very few of them are definitely metallurgical in origin. Pit 293 produced some probable smithing slag and hammer scale - indicators of small scale iron working. There is no evidence though to suggest that the iron ore (?haematite) found on floor 161 was intended for smelting on site.

There is widespread evidence for fire. Most of the features (see Table 2) produced charcoal, ashy deposits and/or red-burnt clay. A few, eg Pit 293, produced overheated clay which was vesicular and vitrified on one surface from contact with a fire. This was probably hearth lining. Other pieces of fluxed material are described as fuel ash slags as they were produced by the ash from the fuel reacting with silica-rich materials such as rock, sand or clay at high temperatures. Fuel ash slags are often found in association with metal working but can be produced in any hot enough fire. On their own they cannot be taken as positive indicators of metallurgy. All the deposits examined except the smithing slag and ?hammer scale from Pit 293 and the copper-rich fuel ash slag (SF 9) could have been produced in domestic hearths.

The metal finds present problems in interpretation. Some (eg 617,650) are definitely finished objects; some are scrap metal (eg GA ①) which may be part of a finished object or a piece of manufacturing waste. The blobs (nos. 286, 438 and 610) were probably spilt molten metal though they could be scraps of metal that fell into a fire and were remelted accidentally. The variable composition of the metal finds suggests a variety of sources rather than one local industry. The presence of arsenic at the sort of levels detected is a little surprising in Roman period metalwork. It may be though that this represents the use of a local arsenic-rich copper source. The total lack of any crucibles is a little surprising if this really was a site where copper or its alloys were worked.

The composition of the bow brooch (no. 617) is comparable with similar types excavated at Nornour in the Isles of Scilly. Penannular brooches are known in a wide variety of alloys; the composition of no. 650 is in no way exceptional.

One of the moulds (no. 242) does indeed appear from the drawing to be intended for use as a piece mould for casting, as a definite in-gate can be seen. The larger stone 'mould' (no. 477) is more of a problem. My initial reaction is that it was not intended to be used for casting metals. The lip or spout would make it impossible to use as an open one-piece mould and its size would require a larger opening if it were one bit of a two-piece mould. I can suggest no other metallurgical use for it.

Table 1 : Metal analyses

Excavation number	Description	Analysis
GA(1)	Sheet fragment	Bronze containing a little lead and arsenic
9	Fuel ash slag containing copper	Copper with a small amount of arsenic and a trace of lead
286	Odd shaped blobs (largest piece analysed)	Bronze containing a little lead and arsenic
438	Blob	Only copper detected
602	Fragment	Brass
610	Blob	Bronze containing some arsenic
617	Brooch with hinged pin. The enamel in the lozenges on the bow is red	Heavily leaded bronze
627	Sandy ?stone with green copper corrosion products on the surface	Only copper detected
630	Possible bow brooch and brooch pin fragments	All gunmetal containing some lead; the 'brooch' fragment has relatively less tin and lead than the 'pin' pieces
631	Fragment with adhering glass, some of which appears translucent blue (possibly a ring bezel)	Leaded bronze containing a small amount of zinc.
646	'Tin stone pebble'	Tin and iron detected. Probably cassiterite (tin ore)
650	Penannular brooch	Ring and pin are very similar in composition. Both are bronzes containing some zinc but no lead.

Table 2 : The samples

Feature	Sample No.	Description
Pit 293	642	The three bags contained white, unfired clay; red burnt clay; charcoal; an iron object, possibly a nail shank; a small amount of fuel ash slag and soil containing flattish, dark grey magnetic particles which may be hammer scale.
	660	These three bags contained a) fire-reddened clay lumps held together with mud (ie not found in situ) one of which had been heated strongly enough to produce a vesicular structure. These could all be part of a hearth lining. b) a few very small pieces of slag, probably smithing slag and c) fuel ash slag.
Pit 224	474	Charcoal of twigs and larger timbers.
Pit 238/356	667	Soil sample with stones. The 'soil' includes much fine-grained material; possibly an ashy deposit.
	807	Similar to 667 but slightly paler in colour and containing less fine material.
Pit 354	811	Dark soil containing some charcoal; not very fine-textured.
"	813	Unfired buff/grey clay and sand.
Pit 355	810	Very fine dark soil of similar texture to 667. May also be ashy.
	812	Yellowish-brown clayey soil with small pebbles.
Hollow 202	471	Darkish brown ?clayey soil with occasional charcoal flecks
	472	Charcoal, mainly from largish timbers.
	478	Charcoal
	482	Charcoal, mainly from largish timbers, in a fine grey (? ashy) 'soil' with occasional flecks of red-burnt clay.
Layer 387	620	Roundish lump of pink-fired clay. It had no smooth surfaces and its shape appeared totally accidental. It was rather crumbly (not well fired).
Gully 163	425	Fuel ash slag.
Lower topsoil	476	Charcoal (twigs) and a shapeless piece of red-fired clay which was vesicular on one surface. Probably a piece of hearth lining.
Floor 161	453	Type of fuel ash slag - laminar, soft shale or mudstone (Is this your 'shillet'?) that had been overheated. Also two fragments of iron ore, almost certainly haematite.