A. M. Lab Report No 3838

TECHNOLOGICAL SAMPLES FROM PRUDHOE CASTLE, NORTHUMBERLAND

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The material (AM 819845-73 and 819904-57) consisted of slag, iron and bronze fragments, lead, coal and samples of ash and clay from hearths. It was not possible to determine whether the lead was from the same source, as this would require isotope analysis which the Laboratory is not able to do. Similarly, the source area of the coal could not be determined.

Two types of slag were amongst the samples examined; fuel ash slag and iron smithing slag. Fuel ash slag forms when the heat of a fire causes the alkaline fuel ash to react with silicate materials such as sand or clay. The clay in the hearth takes on a spongey, dark appearance, often with a glassy surface. Metals being melted in the hearth may become trapped in the fuel ash slag. Examples of this are AM 819936 and AM 819946, both have a high iron content. Many of the other pieces of fuel ash slag are very iron-stained eg AM 819942 and AM 819950.

There are several corroded iron fragments amongst the slag. In some instances, the corrosion products have preserved pieces of wood which were in contact with them. The ironsmithing slags have pieces of charcoal adhering to them which indicate that charcoal was the fuel used for ironsmithing on the site. Smithing slags are formed in a blacksmith's hearth. They are accumulations of small droplets of iron silicates which collect at the bottom of the hearth. Large lumps often have a characteristic plano-convex shape. Examples of iron smithing slags are AM 819939-41, 819945, 8199478, 819854-62, 819864 and 819866. AM 819851 is an example of a typically dished shape piece of smithing slag, with fragments of charcoal incorporated in the surface.

The iron and slags from 411 and 1023 are associated with iron smithing. There was no evidence for iron smelting. The material is all fairly similar, the fuel ash slags either being iron stained or containing iron, the others being iron smithing slags or corroded iron fragments. The iron fragments may be offcuts or possibly scrap which was being reused.

AM 829868-73 were also associated with iron smithing. AM 819868 is a smithing slag, 819869 is a fuel ash slag and 819870 is a corroded iron object or scrap. 819873 is also a lump of smithing slag, whilst the other two samples are burnt clay from a hearth, with hammer scale mixed in. Hammer scale is fragments of the oxide film that forms on the surface of heated iron, and is shaken off as the metal is hammered.

The hearths and ash of (1032) and (1018) are the products of iron smithing in this area. The slags and fuel ash from the midden deposits of (411) and (1023) are probably contemporary with the ironsmithing; so 1018 was used for ironsmithing and is likely to be contemporary with the laying down of midden [411]. The midden deposits are the waste products from the smithing.

[1023]

The ash and sand samples from the bronze casting pit all contained tiny fragments of copper alloy. X-ray fluorescence (XRF) analysis detected copper, tin and lead in the metal, indicating that the alloy was a lead-containing bronze.

Together with the metal fragments were sand, ash, charcoal, coal-dust and burnt clay. The content of the samples indicates that the pit was being used for casting bronze.

The bronze fragments examined were of a similar composition to the fragments in the ash samples; they contained copper, tin and a small amount of lead. The bronze scraps were dribbles of molten ~~lead~~ metal and pieces of scrap sheet bronze, indicating that the bronze was being worked on the site.

The other samples of ash and sand contained no domestic material (grain, bone etc) and only a few fragments of corroded lead. Samples AM 819916-9 all contained charcoal and lead. An industrial process is likely to have been carried out, but the samples contain such a low amount of lead that it is impossible to be certain that metal was worked in these hearths. The small fragments and lumps of lead indicate that the metal was being melted and worked somewhere at Prudhoe Castle. There are dribbles and droplets of lead which has been spilt whilst molten, as well as offcuts of sheet lead.

Lead samples AM 819845-7 are all pieces of lead which have been melted, and have run into the spaces between bricks or tiles, cooling in the "honeycombed" shape they are in. AM 819845 shows the shape of the bricks around which the lead has flowed particularly well. The material was then dumped into the pit after the lead had cooled. The clay has been burnt, but this was prior to its being dumped in the pit, together with the lead. The quantity of lead suggests that it may have been lead roofing which was melted by a fire. As was mentioned above, isotope analysis cannot be done at the Laboratory, so the source of the lead has not been determined.

Similarly, the source of the coal cannot be determined by the Laboratory. All the samples sent (AM 819929-35) were coal, and probably came from a local source. It is impossible to say whether the part-burnt coal was used industrially or domestically, but the charcoal fragments on the iron smithing slag and absence of coal in these samples, suggests that coal was not used for

smithing. However, it may have been used for melting lead, since some coal dust was found in sample AM 819918. The majority of fuel in the ash samples was charcoal.

The paint sent for identification is a red cinnabar paint (mercury sulphide) over a white lead primer or undercoat. The matrix in which it was found had not been burnt.

The object AM 819910 was made from jet.

Technological Samples from Prudhoe Castle

AM Lab No	Identification and Comments
	IRON SLAGS
819848	Fuel ash slag; 1 piece with imprints of charcoal. Vitrified hearth lining and red baked clay.
819849	3 frags of fuel ash slag and 4 frags of very corroded iron. One is possibly a concretion around a nail.
819850	2 frags of very corroded iron; 2 frags of fuel ash slag and 1 frag of iron smithing slag.
819851	Iron smithing slag with typically "dished" shape and fragments of charcoal incorporated.
819852	Corroded iron object and fuel ash slag.
819853	Iron smithing slag.
819854	Fuel ash slag and iron smithing slag.
819855	1 frag of fuel ash slag and several frags of iron smithing slag.
819856	Iron smithing slag.
819857	Iron smithing slag and charcoal fragments.
819858	1 frag of fuel ash slag; 2 frags iron smithing slag.
819859	1 frag fuel ash slag and 1 frag iron smithing slag.
819860	Iron smithing slag.
819861	Iron smithing slag and preserved wood.
819862	Iron-stained fuel ash slag and iron smithing slag; fuel ash slag with preserved wood on one surface.
819863	Fuel ash slag.
819864	Iron smithing slag and fuel ash slag stuck together; also some charcoal in it.
819865	Fuel ash slag; iron smithing slag and a corroded iron nail.
819866	Fuel ash slag and a very corroded iron object.

AM Lab No	Identification and Comments
819864	Fuel ash slag.
819868	Iron smithing slag.
819869	Fuel ash slag.
819870	Corroded iron object.
819936	Fuel ash slag; high iron content.
819937	Very "spongey" fuel ash slag.
819938	Fuel ash slag; black and glassy on one side; burnt red clay on the other side.
819939	Iron smithing slag.
819940	Iron smithing slag, with charcoal and fuel ash slag on one surface.
819941	Iron smithing slag, with charcoal.
819942	Very corroded iron object and 3 frags of iron-stained fuel ash slag.
819943	Fuel ash slag; vitrified clay which has become molten and "run".
819944	Corroded iron; wood preserved in corrosion products and lump of stone.
819946	Fuel ash slag; wood preserved in it.
819947	Iron smithing slag (mud covered).
819948	Corroded iron, with bone, charcoal and stone in the concretion.
819949	Fuel ash slag.
819950	Corroded iron and fuel ash slag.
819951	Fuel ash slag (with iron).
819952	Fuel ash slag.
819953	Iron smithing slag.
819954	Iron smithing slag.

AM Lab No	Identification and comments
819955	Fuel ash slag - a vitrified brick.
819956	Iron pan which as formed around roots of plants to form "tubes".
819957	Fuel ash slag and a corroded iron nail in a large concretion.
819910	A jet object
	Hearth bricks and other material
819911	A stone which has become virified due to heating and a chemical reaction; an accidentally formed fuel ash slag.
819912	Natural stone tile and red, burnt clay with patches of mortar. The very smooth surface of the fired clay due to contact with another tile or brick. Baking due to proximity with fire, and hence the charcoal fragments in the clay, but it was not heated enough to become vitrified. No traces of metals.
819913	Natural stone with fuel ash slag of vitrified mortar; there are tiny flecks of charcoal in the mortar. Also a lump of corroded iron with bone and stone in the concretion; a piece of natural stone; charcoal and the corrosion products of lead (red and green/white areas); fuel ash slag and traces of corroded copper on the slag, giving patches of red colour.
819871	Burnt clay and hammerscale, indicating iron smithing.
819872	Burnt clay and hammerscale, indicating iron smithing.
819873	Iron smithing slag.

AM Lab No	Identification and Comments
	ASH SAMPLES from "Lead Furnace"
819916	Sand, small pieces of charcoal, some tiny pebbles and corroded lead. Also some lead "dribbles". Lead the only metal present.
819917	Sand, small frags of charcoal, tiny pieces of fuel ash slag; a few very small pieces of burnt red clay; corroded white lumps of lead. No other domestic or industrial waste present; lead the only metal.
	ASH SAMPLES from "hearth or furnace"
819918	Sand, with a few pieces of charcoal and minute frags of coal (almost coal dust). No sign of any domestic material, but two very small pieces of corroded lead which may indicate industrial use, but it is not certain.
819919	Ash (no sand present). Tiny frags of charcoal, small pieces of burnt red clay, some little bits of fuel ash slag and a few small pieces of white, corroded lead. No domestic material, so this may be industrial, but again the amount of lead present is very small and so industrial use of the hearth is not certain.
	Samples from Mould and possible casting pit
819920	Mainly part-burnt coal and dust. Also small bits of shale from the coal, which will not burn. Tiny pieces of fuel ash slag and burnt clay. "Specks" of a Cu alloy and one tiny fragment [XRF - Cu, Pb, Sn (Leaded bronze)].
819921	Pieces of burnt red clay, fuel ash slag, some tiny bits of coal. Also specks of a copper alloy, but they were too small for XRF.

AM Lab No	Identification and Comments
819922	Sand, ash and tiny pieces of fuel ash slag; small pieces of burnt red clay, flecks of charcoal and flakes of a Cu alloy [XRF - Cu, Pb and Sn (Leaded Bronze)].
	Clinker and dross etc
819923	Burnt bone, flecks of charcoal and ash. Also a corroded iron object, probably a nail. The whole sample iron stained.
819924	Part burnt coal and the shale which does not burn.
819925	One large piece of part-burnt coal (cinder/clinker).
819926	Possibly part of the hearth structure; consists of clay or mud and sand which has been burnt.
819927	Part-burnt coal; lime and sand grains on the surface from contact with mortar or a cement.
819928	3 frags of part-burnt coal.
	Paint
81914	Flakes of red paint, with white undercoat and small pieces of white plaster. Mixed together with charcoal fragments, small pebbles and a clay matrix. The matrix has not been heated. XRF of Paint; white paint is lead paint. Red paint is Mercury and lead; so it is probably cinnabar (mercury sulphide) over a white lead undercoat.
819915	The same type of red paint as in 819914 over a white lead undercoat (XRF - Hg and Pb). In a matrix of clay and charcoal which has not been burnt.

		BRONZE FRAGMENTS	Elements detected by XRF
819904	A.	Tiny Bronze frag	
	B.	"Dribble" of Bronze	
	C.	Droplet of Bronze	Cu, Sn, Pb
	D.	Tiny Bronze frag	
	E.	Tiny Bronze frag	Cu, Sn, Pb
	F.	"Dribble" of Bronze	
	G.	Corroded Bronze lump	Cu, Sn, Pb
	H.	Frag of sheet Bronze	
	I.	Frag of sheet Bronze	
	J.	Droplet of Bronze	Cu, Sn, Pb
	K.	Droplet of Bronze	
	L.	Corroded fragments of Bronze	
	M.	Corroded fragments of Bronze	
	N.	Fuel ash slag, charcoal and Bronze	
	O.	Bronze object? An ornamental plate?	Cu, Sn, Pb
	P.	Fuel ash slag and Bronze	Cu, Sn, Pb
	Q.	Offcuts of sheet Bronze	Cu, Sn, Pb
	R.	Corroded Bronze	
	S.	Corroded Bronze sheet	
	T.	Frag Bronze	
	U.	Corroded Bronze	Cu, Sn, Pb
	V.	Corroded Bronze and stone	
	W.	Corroded Bronze	Cu, Sn, Pb
	X.	Offcut of sheet Bronze	
	Y.	Corroded Bronze and stone	
	Z.	Part-burnt coal, stained by Bronze	

AM Lab No		Identification and Comments	XAF
819905		Sheet metal and a blob of bronze	Cu, Sn, Pb
819906		Frag of sheet bronze	
819907		Fuel ash slag, corroded bronze and a stone	Cu, Sn, Pb
819908	AA	Corroded dribble of bronze	
	AB	Bronze frag	
	AC	Corroded dribble of bronze and a stone	Cu, Sn, Pb
	AD	Bronze frag	
	AE	Bronze frag	Cu, Sn, Pb
	AF	Corroded bronze and charcoal	
	AG	Stone, a dribble of bronze and a few frags	Cu, Sn, Pb
	AH	Corroded bronze frags and charcoal	
819909		Bronze flecks and some charcoal. Also a bronze dribble, and a frag of corroded bronze.	

Lead Samples

Bag 32	Phase XII	Scraps of lead which have been hammered together, to seal a corner?
37	XII	Offcut of sheet lead.
209	XII	Offcut of sheet lead and large piece of "molten" lead, some shaped by a brick etc.
232	XII	Offcut of lead and a lump of scrap lead.
303	XII	Offcut sheet lead.
726	XII	Offcut sheet lead.
1071	XII	Dribbles "molten" lead.
1436	XII	Offcuts sheet lead.
1439	XII	Dribbles of lead.
1232	XI	Offcut of lead rod.
2197	XI	Offcut of fairly thick sheet lead.
250	X	Dribbles of lead.
1214	X	Offcuts of sheet lead.
274	X	"Dribble" lead.
1251	X	Two lead bars and scraps of lead.
1403	X	Dribble of lead.
53	IX	Offcut of sheet lead and a "dribble".
1068	IX	Dribbles of lead and some fuel ash slag.
1069	IX	Offcut of sheet lead.
1084	IX	Rolled up offcut sheet lead.
1195	IX	Offcut sheet lead.
1557	IX	Offcut of sheet lead.
1558	IX	Offcut of sheet lead and some charcoal.
1611	IX	Dribbles of lead.
2274	IX	Dribble of lead.
2308	IX	Scraps of "molten" lead.

2499	IX	Scrap of sheet lead.
1556	VIII	Folded offcut sheet lead.
1623	VIII	Dribble of lead and charcoal fragments.
1647	VIII	Corroded offcut of lead.
390	VII	Corroded frag of lead.
553	VII	Dribbles of lead.
1233	VII	Offcuts of sheet lead.
1553	VII	Scraps "molten" lead.
1555	VII	Dribbles of lead.
2220	VII	Dribble of lead.
105	VI	Scraps very thin sheet lead.
1135	VI	Folded up offcuts sheet lead.
1194	VI	Offcuts of sheet lead.
1518	VI	Piece of sheet lead.
1559	VI	Lead "dribbles".
1628	VI	Dribbles of lead.
1674	VI	Scraps of molten lead.
1810	VI	Scraps of "molten" lead.
2199	VI	Offcuts sheet lead.
2244	VI	Offcut sheet lead.
2322	VI	Offcuts sheet lead.
1255	V	Dribble of lead and charcoal fragments.
1554	V	Offcuts sheet lead.
1574	V	Offcuts sheet lead and scraps of "molten" lead.
1578	V	Lumps "molten" lead (waste).
1582	V	Scraps "molten" lead and some charcoal.
1610	V	Dribble of lead.
1670	V	Dribble of lead.
2195	IV	Offcut of thin sheet lead.

220	III	Offcut sheet lead.
2310	III	Scrap of "molten" lead and a stone.
2219	I	Rolled up scrap sheet lead and fuel ash slag.
2309	I	Scraps/dribbles of lead.
2500	I	"Molten lead" which has shaped over a brick/tile.
2240	?	Corroded iron object (possibly a nail). A lump of very corroded lead.