

ANCIENT MONUMENTS LABORATORY REPORT NO 4352

Analysis of 'Lead' Objects from Coppergate, York

Paul Wilthew

Ancient Monuments Laboratory

September 1984

About 155 'lead' small finds (AM 841159) were analysed qualitatively using energy dispersive x-ray fluorescence. The results of the analysis of each object are given in the appendix below, which also includes the results of analyses of 'lead' objects from Coppergate carried out previously.

The great majority of the objects analysed were fairly pure lead. The exceptions included two samples of iron slag (I-1731 and I-7771), 4 pieces of galena (lead sulphide) (II-9043, V-3001, ?-8227 and ?-10428), 3 examples of waste products from non-ferrous metal working (the exact process involved could not be determined at this stage) (II-7409, II-8667 and V/S-10324), one leaded bronze ring (II-10300) and several tin or lead-tin alloy objects. The identifications of galena were not confirmed by x-ray diffraction, but were based on the appearance and physical properties of the samples.

Almost all the dribbles, or run offs, of molten metal, undecorated sheets and strips, lumps, ingots, fragments, weights, whorls, discs, nails, pencils, window leads and tacks were fairly pure lead. Apart from one tin sheet (IV-14102), the only exceptions were essentially lead, but also contained low levels of tin. This was probably due to the use of remelted scrap lead which accidentally contained some pewter, rather than the deliberate use of a (low tin) lead-tin alloy. The exceptions were a nail (I-7847), a strip (II-4726), a fragment (II-11344) and a sample of molten waste (III-5845).

In contrast many of the decorative objects, which included rings, mounts, pendants and brooches were pewter (a lead-tin alloy) (I-324, I-1520, I-7989, I-8500,

II-2705, II-3409, II-3657, II-4067, II-8323, II-8502, V-2742, V-4192 and ?-7548), tin (IV-10242 and ?-9728), or lead with a small amount of tin (I-8062). Fairly pure lead examples were also common (I-1071, I-2361, ?-1897, I-4958, I-8032, I-9317, II-1932, II-9280, II-9726, I-7523, ?-9449 and II-2705). Two tin bars (IV-219 and IV-9908), a pewter bell (V-4324), a pewter pin (V-2827), a pewter vessel rim (IV-1290), a pewter wire, or earring, (I-7602), a lead dish (II-9376) and a lead bracelet (II-9366) were also present. Apart from the brooches, rings and possibly pendants, too few of these types of object were analysed to enable general conclusions to be drawn concerning their usual composition. Further conclusions about the pattern of alloy usage for the brooches, rings and pendants might be possible when the analytical results are considered in terms of the archaeology of the site and a detailed typology of the objects.

The results suggest that the dribbles, ingots, partially worked lumps of metal and the simpler objects, such as undecorated sheets, strips, whorls, weights, and nails were almost invariably lead, although low levels of tin were occasionally present. The tin was probably introduced accidentally through the use of melted down scrap which included pewter. One tin sheet was found, but nevertheless it would seem unnecessary to analyse at present any more examples of these types of objects. A few of the lumps were galena rather than lead, but these should be identifiable by their hardness, brittleness and sharply angular form, which contrasts with the softness and ductility of lead. Although galena is a lead ore the presence of a few lumps does not, in itself, prove that lead smelting was being carried out. Other non-metallic objects should also be identifiable through their appearance or physical properties. The composition of the brooches, rings and pendants was variable and therefore, unless the variations are explicable in terms of the typology of the objects or their context dates the compositions of other examples could not be assumed with confidence without analysis. Too few examples of some types of object, such as bars, wires, bells, mounts, bracelets and vessels, were analysed to enable conclusions about the

composition of further examples of these objects to be drawn and therefore any other examples should be analysed.

Appendix - Analytical results

Small Find No	Description	Major Elements Detected	Composition
<u>Area I</u>			
144	Fragment	Pb	Lead
206	Dribble	Pb	Lead
324	Cross Brooch	Pb, Sn	Pewter
404	Dribble	Pb	Lead
1031	Perforated sheet	Pb	Lead
1071	Brooch with suspension rings	Pb	Lead
1399	Twisted strip	Pb	Lead
1415	Strip	Pb	Lead
1423	Hemispherical lump	Pb	Lead
1520	Brooch	Pb, Sn	Pewter
1531	Fragment (worked)	Pb	Lead
1601	Strip	Pb	Lead
1731	Porous dribble	Fe	Iron slag
2262	Worked bar	Pb	Lead
2361	Brooch	Pb	Lead
2362	Disc	Pb	Lead
2926	Plano-convex lump (worked)	Pb	Lead
2940	Clench nail	Pb	Lead
4707	Sheet	Pb	Lead
4958	Twisted wire finger ring (two wires)	Pb	Lead
5044	Lump (worked)	Pb	Lead
5046	Nail	Pb	Lead
5645	Seamed cylinder	Pb	Lead
6032	Dribble	Pb	Lead
7523	Pendant	Pb	Lead
7602	Bent wire (?earring)	Pb, Sn	Pewter
7672	Twisted strip	Pb	Lead
7762	Weight or whorl	Pb	Lead
7765	Stud or vessel leg	Pb	Lead
7771	Porous lump	Fe	Iron slag
7847	Nail	Pb, Sn	Lead, with some tin

Small Find No	Description	Major Elements Detected	Composition
7873	Whorl	Pb	Lead
7989	Disc brooch	Pb, Sn	Pewter
8032	Ring	Pb	Lead
8048	Whorl	Pb	Lead
8062	Brooch	Pb, Sn	Lead, with some tin
8070	Whorl	Pb	Lead
8406	Weight or whorl	Pb	Lead
8485	Whorl	Pb	Lead
8494	Lump (worked)	Pb	Lead
8500	Ring (decorated)	Pb, Sn	Pewter
8585	Whorl	Pb	Lead
9157	Disc with central hole	Pb	Lead
9317	Wire finger ring	Pb	Lead
9725	Two pronged object	Pb	Lead
10111	Dribble	Pb	Lead
10516	Whorl	Pb	Lead
11332	Rod (worked)	Pb	Lead
11393	Lump (worked)	Pb	Lead
11742	Whorl	Pb	Lead
12697	Strip	Pb	Lead
13563	Nail head	Pb	Lead
13597	Folded sheet	Pb	Lead
14250	Fragments	Pb	Lead
<u>Area II</u>			
134	Sheet	Pb	Lead
575	Dribble	Pb	Lead
1101	Folded strip	Pb	Lead
1257	Dribble	Pb	Lead
1639	Lump (worked)	Pb	Lead
1932	Ring	Pb	Lead
2161	Sheet, perforated	Pb	Lead
2187	Rivet + sheet	Pb	Both lead
2705	Ring, decorated mount	Pb, Sn	Pewter
2841	Weight	Pb	Lead
3184	Pencil	Pb	Lead
3409	Annular brooch	Pb, Sn	Pewter (both ring and pin)
3429	Ingot (worked)	Pb	Lead

Small Find No	Description	Major Elements Detected	Composition
3459	?Stylus	Pb	Lead
3549	Disc	Pb	Lead
3657	Ring, decorated	Pb, Sn	Pewter
4067	Annular brooch	Pb, Sn	Pewter
4726	Perforated strip	Pb, Sn	Lead with a small amount of tin
4727	Perforated strip	Pb, Sn	Lead with a small amount of tin
4813	Window lead	Pb	Lead
4833	Textile worksheet	Pb	Lead
4869	Nail	Pb	Lead
4950	Brooch	Pb	Lead
4968	Weight	Pb	Lead
5130	Object	Pb	Lead
5264	Perforated triangular object	Pb	Lead
5273	Counter or weight	Pb	Lead
5566	Disc	Pb	Lead
5628	Sheet	Pb	Lead
5897	Dribble	Pb	Lead
5925	? Nail head	Pb	Lead
6179	Disc	Pb (?Sn)	Lead
6339	Ingot	Pb	Lead
6486	Sheet	Pb	Lead
6517	Strip	Pb	Lead
6828	Perforated strip	Pb	Lead
7306	Strap end, decorated	Pb	Lead
7409	"Ingots"	Cu, Pb	Non-ferrous metal working waste
7609	Strip	Pb	Lead
7687	Weight	Pb	Lead
8145	Lump from ingot	Pb	Lead
8323	"Runic" pendant	Pb, Sn	Pewter
8502	Ring	Pb, Sn	Pewter
8513	Thin sheet	Pb	Lead
8667	"Ingots"	Cu, Pb	Non-ferrous metal working waste
9043	Galena	Pb	Galena
9280	Wire or ring fragment	Sn	Tin
9366	Bracelet	Pb	Lead

Small Find No	Description	Major Elements Detected	Composition
9376	Small dish	Pb	Lead
9726	Finger ring	Pb	Lead
9777	Run off - possible to ingot mould	Pb	Lead
9856	Rod	Pb	Lead
10300	Ring	Cu, Pb, Sn	Leaded bronze
10348	Fragment	Pb	Lead
10559	Clamp	Pb	Lead
10847	Whorl	Pb	Lead
10994	Folded sheet	Pb	Lead
11306	Cylinder, hollow	Pb	Lead
11344	Fragment (?of dribble, ?of nail)	Pb, Sn	Lead with a small amount of tin
11942	Lump	Pb	Lead
12095	Disc	Pb	Lead
12802	Nail	Pb	Lead
13785	Perforated sheet	Pb	Lead
<u>Area III</u>			
927	Sheet	Pb	Lead
1007	?Tack	Pb	Lead
3338	Nail	Pb	Lead
4717	Clench nail through a folded sheet	Pb	Lead (both nail and sheet)
5845	Molten waste	Pb, Sn	Lead with a small amount of tin
6809	Molten waste	Pb	Lead
8622	Object	Pb	Lead
9705	Sheet (offcut)	Pb	Lead
11166	Dribble	Pb	Lead
<u>Area IV</u>			
219	Bar	Sn (Pb, Cu)	Tin (possibly with a small amount of lead)
235	Perforated sheet	Pb	Lead
494	Offcut from an ingot	Pb	Lead
934	Dribble	Pb	Lead
1195	Lump	Pb	Lead
1210	Disc	Pb	Lead
1248	Bar. Possibly a window lead	Pb	Lead

Small Find No	Description	Major Elements Detected	Composition
1267	Ingot	Pb	Lead
1283	Object	Pb	Lead
1290	Vessel rim	Pb, Sn	Pewter
1853	Disc	Pb	Lead
1908	Sheet	Pb	Lead
2141	Sheet	Pb	Lead
3208	Strip	Pb	Lead
5156	Rod	Pb	Lead
8627	Dribble	Pb	Lead
9353	?Failed casting	Pb	Lead
9860	Dribbles	Pb	Lead
9908	Bar	Sn	Tin
10051	Strip	Pb	Lead
10242	Ring	Sn (Pb)	Tin (possibly with a small amount of lead)
10346	Clench nail	Pb	Lead
11770	Rod	Pb	Lead
13286	Bar	Pb	Lead
13738	Whorl	Pb	Lead
14102	Thin sheet	Sn (Pb, Cu)	Tin (with some lead)
<u>Area V</u>			
2671	Sheet	Pb	Lead
2681	Window lead fragments	Pb	Lead
2742	Decorated mount or terminal	Pb, Sn, Cu, Au	Pewter, gilded
2775	Disc or weight	Pb	Lead
2827	Pin	Pb, Sn	Pewter
3001	Lump	Pb	Galena
3561	Sheet	Pb	Lead
3909	Lump	Pb	Lead
4192	Ring, decorated	Pb, Sn	Pewter
4324	Bell	Pb, Sn	Pewter
4446	Dribble	Pb	Lead
5132	?Nail head	Pb	Lead
6017	Whorl	Pb	Lead
6041	Rod (?pencil fragment)	Pb	Lead
6348	Clench nail	Pb	Lead
6973	Perforated strip	Pb	Lead



Small Find No	Description	Major Elements Detected	Composition
11448	Wire	Pb	Lead
12820	Cylinder, seamed	Pb	Lead
13692	Lump	Pb	Lead
<u>U/S</u>			
945	Disc	Pb	Lead
2025	Dribbles	Pb	Lead
4765	Thin disc	Pb	Lead
5954	Folded sheet	Pb	Lead
6013	Thin disc	Pb	Lead
9052	Whorl	Pb	Lead
9069	Strip	Pb	Lead
10324	Plano-convex object	Pb, Cu, Ag	Non-ferrous metal working waste
13781	Cylinder, seamed	Pb	Lead
<u>Area Unknown</u>			
1897	Brooch	Pb	Lead
7548	Disc brooch	Pb, Sn	Pewter
8012	Weight	Pb	Lead
8227	Lump	Pb	Galena
8475	Weight	Pb	Lead
8658	Ball, perforated	Pb	Lead
9354	Dribble	Pb	Lead
9449	Pendant	Pb	Lead
9728	Pendant	Sn, Pb	Tin with a small amount of lead
10428	Lump	Pb	Galena
10688	Dribble	Pb	Lead
11133	Trial piece	Pb	Lead
13450	Weight	Pb	Lead
31906	Whorl	Pb	Lead