

# GeoArch

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Evaluation of archaeometallurgical  
residues from the N53 Milltown Rd  
realignment, Co. Louth [11E208]

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# Evaluation of archaeometallurgical residues from the N53 Milltown Rd realignment, Co. Louth [11E208]

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## Abstract

*The submitted materials included samples from two contexts.*

*The material from Philipstown 1 included separate samples of fired clay and slag from c4. The slag was dominated by examples of pale, brittle, flow slags in various prills and blebs. Rather more vesicular slag was present as moulds around large wood or charcoal fragments. Such an assemblage would be typical of a deposit from the bottom of the basal pit of a non slag-tapping, slagpit, furnace. Unfortunately, this technology was very long-lived in Ireland and might be anything from early Iron Age to early post-medieval in age.*

*A sample from Philipstown 2 contained a collection of fines from iron smithing. These included flake and spheroidal hammerscale, slag droplets, slag flats and small concretions formed around corroding iron particles. The concretions were rich in fine charcoal debris. This material is indicative of smithing, using charcoal as fuel and is again not indicative of age, with charcoal continuing as a fuel, locally, into the 20<sup>th</sup> century.*

*The close spatial association of Philipstown 1 and Philipstown 2 (they were 20m apart) raises the possibility that the two sites are related, with Philipstown 2 representing a site where iron produced at Philipstown 1, or other similar nearby furnaces, was worked.*

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## Methods

All materials were examined visually with a low-powered binocular microscope. As an evaluation, the materials were not subjected to any high-magnification optical inspection, not to any form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional. The summary catalogue of examined material is given in Table 1.

This project was undertaken for the Irish Archaeological Consultancy Ltd.

## Results

### *Philipstown 1, C4 sample 1*

This material was a small assemblage (252g) of approximately 35 slag spheroids, approximately 20 pieces of flow slag prills, approximately 20 pieces of vesicular flow slag forming moulds around charcoal/wood fragments and a quantity of fine slag debris associated with the major pieces.

The slag spheroids were 2 to 8mm in diameter, often rather irregular in shape with an extended 'tail' or a dimple (a 'coffee bean spheroid'). They formed a continuum with blebby prills, some of which formed partial moulds of wood/charcoal. More substantial moulds tended to be formed by a lower density, vesicular slag. All the pieces of moulds around wood/charcoal were too small to give a useful measure of the size of the organic materials.

Fired clay from the same sample showed a gravelly texture, indicating little preparation. The material was dominantly oxidised-fired, although the surface was a thin, bloated, vesicular ceramic with a pale grey colour. The documentation of the context yielding these residues can be supplemented by inspection of the photographs (particularly Kyle & Walsh 2011, plates 11 and 12). Contrary to the written description these show a dark deposit resting on largely unburnt natural, with the fired clay above, not around. These deposits are bounded by a rather disturbed stone arrangement. The overall size of the feature is described as 1.1m x 1m and 0.29m deep in the text, but the plan shows a more elongate outline, of approximately 1.1m x 0.6m.

A second feature, C5, filled with deposit C3, was smaller and shallower, and although the text of Kyle & Walsh (2011) suggests it contained slag, none was submitted.

*Philipstown 2, C8 sample 5*

This sample formed a small collection (127g) of fines. The dominant particle type (by number rather than weight) was flake hammerscale. There was a more modest quantity of spheroidal hammerscale and also some larger slag spheroids (coffee-bean spheroids). There was a small proportion of slag flats (tabular slag particles that formed on the surface of iron).

Alongside the microresidues there were a few pieces of macroresidue. One piece was a fragment of dense iron slag in a sheet-like form about 8mm thick. The lower face was dimpled. There were also several pieces of glazed stone.

The assemblage also contained a number of concretions cored on corroded iron. The iron particles were presumably small (to judge by the concretion size). The concretions were rich in charcoal debris.

The field records (Kyle & Walsh 2011), show that C8 was the fill of a very shallow pit, C7, 0.46m x 0.37m and 0.06m in depth.

## Interpretation

*Philipstown 1*

This material is characteristic of the finer-grained residues found in the bottom of the pit below a non slag-tapping, slagpit, iron smelting furnace.

Slagpit iron furnaces are common in Ireland from the early Iron Age into the post-medieval period and, to date, no firm criteria have been established for dating the residues within this broad range. The slagpit was filled with a combustible organic material before smelting – usually, as was the case here, a packing of wood. Wood packing is known throughout the period of use of slagpit furnaces. The detailed morphology of the slagpit residues probably depend on two main factors – the slag fluidity and the pit depth. If the pit was relatively deep then there was space for the accumulation of small slag prills and flows, below the base of the main ‘furnace bottom’ slag. A fluid slag would enhance the likelihood of the formation of small slag drips – as seen here.

The feature yielding the residues is interesting. The site photographs clearly show the burnt clay (presumably corresponding to the supplied sample) overlying the burnt dark deposit, not surrounding it. Both deposits are surrounded, at least partially, by what appears to be a disturbed stone setting. These relationships indicate the fired clay is most likely to be the poorly preserved remains of the collapsed superstructure to the furnace. The pit margins themselves do not appear to be particularly heated-affected. This is commonly the case with slagpit furnaces where the reddening of the substrate does not, typically, extend far below the original ground surface. The apparent stone setting for the pit is unusual. Stone lined slagpits are extremely rare, and may possibly represent a local adaptation to pit margin collapse. An example of stone construction associated with slagpit furnaces was seen at Tonybaun, Co Mayo (Cal. 477-210 BC; Wallace & Anguilano 2010) and stone sides to metalworking features were also seen at Camlin 3, Co. Tipperary (probably 6<sup>th</sup>-7<sup>th</sup> century AD; Young 2011), although there is some doubt as to whether the main structure here was a furnace or, more likely, a smithing hearth.

*Philipstown 2*

These residues are typical of the microresidues generated when smithing with charcoal fuel. The flake hammerscales produced by surface oxidation of hot iron in air, with the oxide layer spalling from the iron as the metal is hammered or as it cools. Spheroidal hammerscale is mainly produced when the iron is taken to very high temperatures for welding; the oxide layer melts and is squirted out of the weld, cooling in flight as spheroidal droplets. Slag flats are accumulations of slag or melted scale in localised areas of the workpiece surface, or on the smith's tools. The slag droplets are formed mainly from molten slag dripping down through the fuel bed of the smith's hearth.

The small assemblage does not permit discrimination of blacksmithing (the end use of iron) from bloomsmithing (the working down of a raw bloom). The assemblage is also not diagnostic of age.

The small pit or scrape yielding the residues might be the bottom of a hearth, but smithing fines will also accumulate across the floor of the smithy and may be preserved in hollows on the floor, or in associated structural features (stakeholes, postholes...).

*General*

Isolated smithing hearths, with no preserved surrounding structure, are a feature particularly associated with the medieval and post medieval periods in Ireland. Many examples have been found on recent road schemes including Coolamurry, Co. Wexford (12<sup>th</sup>-13<sup>th</sup> century; Young 2008a), Garryleagh, Co. Cork (13<sup>th</sup> – 14<sup>th</sup> century; Young 2009c), Moycarky, Co. Tipperary (14<sup>th</sup> -15<sup>th</sup> century; Young 2009b), Clonfad, Co. Westmeath (17<sup>th</sup> or 18<sup>th</sup> centuries; Young 2009a) and Mucklagh, Co. Offaly, (18<sup>th</sup> – 19<sup>th</sup> centuries; Young 2008b) Isolated smelting furnaces range from the early Iron Age through certainly until the late medieval period and possibly later. Examples where both smelting and smithing occur, but without associated settlement, are extremely rare.

## Evaluation of potential

The occurrence of an apparently isolated iron smelting and smithing operation is interesting and adds to local knowledge. It is likely that the operation was involved with the smelting of a local bog iron ore (further analysis could confirm a bog iron ore source). The overall significance of the site is however rather dependent upon its date – and it is to be hoped that 14C dates will be forthcoming.

The rather limited amount of residues, and the lack of large pieces, from both sites somewhat limits their potential for further investigation. It is likely that other residues were deposited off site, or in surface dumps that have now been destroyed. The rather limited physical remains should not be taken as any indicator of the scale of the operation or of its efficiency. Well operated slagpit furnaces, used many times, may leave rather scant remains at this level of truncation – and this perhaps even more true of the very slight remains of the smithing side of the activity.

Because of the limited residue assemblages available, it would not normally be recommended to take these materials for further analysis. However, it is possible

that further work might be desirable if dating of the activity showed it to be of an unusual age (particularly if it were to be especially early, or especially late, in the history of this style of iron production).

## References

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Table 1: summary catalogue

Context	Sample	Weight	Notes
11E208 Phillipstown 1			
	4	1	104 fired gravelly clay. Localised zones of intense heating are represented by laminae of grey bloated clays. The overall impression of the assemblage is of oxidised fired materials, but at least some of the bloated zones are somewhat reduced fired.
	4	1	252 assemblage dominated by rather pale grey flow slags. Some of these form elongate prills, small blebby prills and individual slag droplets (coffee bean spheroids). These materials are hard, brittle and typically of low vesicularity. Some more vesicular materials are also present - particularly as moulds of large wood fragments. In addition there are small fragments of a laminated greyish glass (probably fractured from the furnace walls).
11E208 Philipstown 2			
	8	5	127 A collection of flake hammerscale, spheroidal hammerscale, slag droplets, slag flats, fuel ash slag, glazed stones and concretions cored on corroding iron. The loose sediment and concretions are rich in charcoal debris. At least one slag fragment is a slightly denser, vesicular, with a dark coloured dimpled base and a slight trace of glass on the upper surface. Such a piece might be a fragment that formed attached to the wall/tuyère (equivalent to a tongue).

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