GeoArch

Report 2010/26

Evaluation of residues from M1 Northern Motorway (J2009): Lagavooren 7 (00E0914)

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November 15th 2010

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Abstract

This site has yielded a relatively small slag assemblage from a series of large (0.8 to 0.9m diameter), sub-circular burnt pits. The slags are the residues of iron smelting in a non slag-tapping slagpit style of furnace. Such furnaces are now relatively well known from the 4th to 1st centuries BC, with their bases preserved as 0.4-0.6m diameter pits. The present examples may be larger and earlier furnaces (for which there are parallels in Britain, but not yet in Ireland) or, alternatively, the slags may be fortuitously within pits burnt by another process.

The identification of iron smelting at such an early date has been claimed elsewhere in Ireland before, but often without such clear identifying slag morphology or such a good quality date.

This site is therefore of considerable significance and importance.

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Background

This report is an evaluation of archaeometallurgical residues from Lagavooren 7 (00E0914) on the M1 Northern Motorway development, excavated by E. Stafford on behalf of Irish Archaeological Consultancy Ltd.

Methods

All materials were examined visually and using a low-powered binocular microscope where necessary. As an evaluation, the materials were not subjected to any high-magnification optical inspection not to any other form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

It should be noted that after washing the overall weights of the material submitted in many cases differs significantly from those originally recorded.

Description

The catalogue for this site is presented in Appendix 1 of this report.

The submitted material comprised 2.5kg of slag all of which was uncovered from the northern pair of 'hearths' in the NW of the site. The slag fragments included a wide variety of flow slags, ranging from large dense blocks, to smaller individual flows (c140) and also a large possible burr (the region immediately below the blowhole in a hearth or furnace; c163).

The slag assemblage is limited, but typical of the slag blocks which occur in the basal pit of a slagpit iron smelting furnace. In this style of furnace the slag descends during the smelt into a pit which has an organic packing, usually of wood in Ireland.

Discussion

All of the slag was found associated with a series of features at the north-west of the site.

Four different 'hearths' were recorded in relatively close proximity to each other. There were two round, flat based 'hearths': hearth [c71] was 0.91m diameter and 0.21m deep, and hearth [c143] which was 0.80m diameter and 0.26m deep. They were both described as having clay linings with in-situ burning. Unfortunately the large blocks of slag described in the prelim report as occurring in fill c143 were not present in the submitted assemblage. No further detailed comment can therefore be made on the origin of this pair of features.

Approximately 11m north-west of these were a similar pair of 'hearths' [c141 and c164] with more rounded bases and similar dimensions (average 0.9m diameter). Both of these also showed evidence for in-situ burning and contained significant amounts of charcoal and slag in their respective fills – (c140 had

1.7kg and c163 had 721g) which may possibly have been in-situ.

It was noted that further metalworking features may have lain beyond the limits of the excavation.

Although the evidence for these structures being directly associated with the iron smelting slags in their fills is not unambiguous, their large size and early date (see below) mean that their full discussion is desirable.

The largest collection of iron-smelting slag came from context c140, which yielded a 14C date on hazel of Cal. BC 520-380. This date is very significant for it suggests activity in the period 600-400BC which Carlin (2008) discusses as a possible 'dark age' with a distinct lack of activity (metallurgical or otherwise) in the area investigated during the mitigation for the M4 Kinnegad-Kilcock scheme.

The major sites claimed for early iron working on the M4 are Kinnegad 2 and Rossan 6 (Carlin 2008).

At Kinnegad 2 the evidence for early metalworking rests on a small quantity of fayalitic slag, probably from ironworking, present in the fill of a domestic hearth dated to Cal BC 810-420 and containing many sherds of prehistoric pottery. A much later date of Cal BC 400-340 and Cal BC 320-210 was returned for one of the two furnaces, interpreted by Carlin as a bowl furnace, but classifiable as the basal pit of slagpit furnace (with dimensions of 0.38m by 0.40m by 0.30m deep).

At Rossan 6, the metalworking activity was associated with three pits, two of which were dated to date ranges of Cal BC 820-780 (F87) and Cal BC 370-50 (F84). Unfortunately neither date is a single particle date nor was either identified to species, just being quoted as 'charred material'. The earlier date derives from large pit F087, which may have been for charcoal production and the later date from a pit (F84) which may have been the base of furnace (it contained a large quantity of slag) and which measured 0.78 by 0.76m and 0.42m deep.

At best, therefore, the evidence from the M4 for the earlier part of the Iron Age is weak. The remaining evidence from the scheme could be held to support a widespread development of iron smelting after 400BC, which has been seen elsewhere in the country. There is a growing body of evidence that moderately large furnaces (with basal slag pits of 0.4 to 0.6m diameter) may characterise the period between 400BC and 50BC. Sites with furnaces of this size with 14C dates to this period include:-

Ballydavid (Co. Tipperary; Young 2009b),
Ballykeoghan (Co. Kilkenny; Young 2009d)
Cherryville (Co. Kildare; Young 2008a)
Cloncollig (Co Offaly; Young 2008b)
Clonrud (Co. Laois; Young 2008e)
Derryvorrigan (Co. Laois; Young 2008d).
Leap 1 (Co Laois; Young 2009a)
Lismore-Bushfield (Co. Laois; Young 2008f)
Morrett D (Co. Laois;Young 2005)
Newrath Site 35 (Co. Kilkenny; Eogan pers. comm.)

Other large furnaces which are undated but believed to be early include those at *Adamstown 1* (Co. Waterford; Young 2006) and ,closer to the present example, at *Tullyallen* 6 (Co. Louth; Young 2003).

Furnaces in Ireland as large as the present possible examples have often proved to be misidentifications or to have alternative interpretation as, for instance, charcoaling pits. However, very large slagpit furnaces are known elsewhere and may reappear in Ireland in the later first millennium AD. A particularly pertinent example from Britain may be the furnaces at Hartshill Copse, southern England. Young (2005a) described the two large slagpit furnaces as being cuts of 1.00m by 0.78m by 0.35m deep [3525] and 0.95m by 0.75m by 0.2m deep [3579]. The first of these contained a slag cake weighing 38.25kg. Neither of these furnaces is directly dated, but they are associated with a settlement closely dated to the 6th/5th centuries BC.

Although there are too few known sites of this age to know if such a size was typical, it may be relevant that on Iron Age sites in the Humber wetlands (Clogg 1999, Halkon 1997) "furnace bottom" slag masses had weights of 12-60kg, implying large furnaces.

In summary, although the possible furnaces are larger than early iron smelting furnaces known so far in Ireland, there are similarly-sized furnaces in southern Britain in the 6th/5th centuries BC. The better-known earlier Iron Age furnaces in Ireland are rather smaller (less than 0.6m diameter), but their existence prior to the 4th century BC has not yet been demonstrated.

Alternative interpretations would be that none of the slag was *in-situ* and the large burnt pits are examples of charcoaling pits (usually significantly larger) or smithing hearths (but there is apparently no smithing slag in the assemblage).

Evaluation of potential

This site of great significance, for the early occurrence of iron smelting and the possible undertaking of that smelting in particularly large furnaces, for which parallels could be sought in Britain, but not, yet, in Ireland.

In view of this significance, it is recommended that further detailed analytical investigation of the slags could be undertaken, to establish the nature of the iron ore resource being exploited and to provide comparison with residues from a related technology later in the Iron Age.

The scale of such an investigation would necessarily be limited by the amount of the available material, and by the lack of some of the components of the smelting system. It is unlikely that the results would be able to construct a full mass balance. but would none the less be well worth undertaking.

The material from this site should be considered high priority for permanent retention.

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Appendix 1. Summary catalogue of material

Site: Lagavooren 7 (00E0914)

context	*sample no*	*weight (g)*	*quantity*	*description*
140	391	1749	48	Dense flow slag, ranging from large stalactitic blocks down to small individual prills. Good moulds of large wood/charcoal pieces seen. Some piece grade into more sintery material with possible ore debris. Some fragments show mixing with highly vitrified quartz-rich sediment/lining similar to that seen in sample 163 below.
163	390	721	7	fragments of slag, some with rather sintery appearance, rusty in areas - the largest piece is very dense with embedded pebbles and slightly maroon tinged pendent lobes, this may be a burr. Other pieces are rich in moderately large charcoal inclusions and two show interaction with a coarse sandy lining slag..
199	99	10	4	fragments of chert and quartz-replaced fossils (*Syringopora*; Carboniferous coral) - natural
409	395	6	7	tiny fragments of fired clay
409	395	12	5	fragments of fired clay, gravelly and rich in charcoal
409	395	35	5	lightly oxidised fired clay
409	395	51	1	irregularly shaped fragment of lightly fired clay, slightly oxidised, contains small stone
total		*2584*		

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