Contents.

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List of plates.

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Synopsis.

The Puckeridge assemblage is placed in its local context, and it is demonstrated that the Braughing/Puckeridge Late Iron Age settlement is the largest known centre for the production of coin pellets in Europe. It is noted that the circumstances and precise location of the find site are uncertain.

The assemblage is then examined in terms of each category of a standard coin mould recording protocol, highlighting both features unique to the assemblage and those held in common with other finds of coin mould. The presence in the assemblage of a new tray form is demonstrated, and evidence is presented that it is linked with a particular range of hole diameters. The broad implications of observed variability in elaboration, edge profile and edge marking are explored.

It is concluded that the link between the new tray form and a particular hole diameter range may well be a rare example of differentiation which was significant to the makers and users of coin mould. It is further concluded that minor variation in tray form, elaboration, edge profile and edge marking probably signify that the material comprising the assemblage was produced by more than one hand. Finally, it is concluded on the basis of minor formal and stylistic similarities between the Puckeridge mould and other locally occurring material that this assemblage is firmly linked to a tradition of coin-pellet production in the Braughing/Puckeridge area.

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Acknowledgements.

It is rare that a piece of research such as this should be the product of a single, isolated toiler, and this work is no exception to the general rule. Without the generosity, patience in the face of importunity, support and guidance of many kind people neither this report, nor the larger work of which it forms a part, would have been possible.

All of the people listed below deserve my thanks, and recognition for the contribution their information, advice, practical help and encouragement have made to this report.

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To anyone I have inadvertently omitted, I offer my humblest apologies. With so much illustrious assistance, any errors that remain are entirely my own fault.

Finally, I would like to give special thanks to my wife, Sue, for not complaining too loudly about the unreasonable quantities of muddy bits occupying large areas of our house; and to my father and mother, Nick and Liz Landon, who have had to wait an awfully long time for their son to show that the years of education they worked so hard to provide were not wasted.

Mark Landon
April, 2009

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1. Introduction.

The Puckeridge coin mould assemblage comprises some 30 kg. of coin mould fragments, 17 kg. of associated pottery, around 2 kg. of bone, and some fragments of white stone. It is the second largest single find of coin mould ever made.

It was found, allegedly in 1999, by an anonymous amateur under circumstances that remain unclear. An unknown quantity of the material was sold on eBay, but the bulk of the assemblage was purchased from the finder by Chris Rudd, who commissioned the study of which this interim report is the first fruit.

It is important to note that this may be the largest find of coin mould from the Braughing/Puckeridge Iron Age settlement area, but it is by no means the only find. The first assemblage, the Henderson Collection, was unearthed at some point between 1935 and 1960. It comprises 64 fragments of coin mould, many of them small and abraded. A brief account, together with a short report by Craddock and Tite on the XRF analysis of the fragments for metal residues, is included in Partridge, 'Skeleton Green', 1981, Britannia Monograph 2.

Two small deposits of coin mould were discovered during the course of rescue excavations at Wickham Kennels (Partridge, 'Braughing, Wickham Kennels 1982', Herts. Archaeology 8 , 1982, pp. 40 - 59), with a report on scientific testing by Cowell and Tite; and Gatesbury Track (Partridge, 'Excavations at Puckeridge and Braughing 1975 – 1979: Gatesbury Track 1979', Herts. Archaeology 7, 1979, pp. 97 - 132). It has proved impossible to locate this last assemblage. Other finds from this excavation are held at Hertford Museum, but the mould is no longer with them: it has been suggested that it may have been retained by the British Museum following metal residue testing by Freestone.

In 2006, the author of this report discovered a large deposit of mould eroding from a river bank in one of the Scheduled Areas south of Braughing. The find was reported, and funding was provided by English Heritage for a two-day, single-trench evaluation in advance of bank stabilization work (J. Hunn, 'Remedial Excavation: River Rib, Ford Bridge, Braughing, Herts.' ASAC Ltd., 2007). In all, nearly 10 kg. of mould was recovered, together with 6 kg. of pottery, bone and furnace debris. Since the deposit of coin mould was increasing in thickness as it disappeared into the trench section, it is clear that much still remains in situ. Funding was also obtained for a programme of Energy Dispersive Spectroscopy and electron microscopy (Longden, 'Coin moulds from the Iron Age Oppidum of Braughing: An investigation of Celtic coinage production techniques – Scientific Report', 2009, University of Liverpool).

Since 2006, three isolated surface finds of mould have also been made in the Braughing/Puckeridge area, all at some distance from known mint sites.

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Taking all of these assemblages together, the Braughing/Puckeridge settlement becomes the largest known centre for the production of Iron Age coin flans in the whole of Europe, surpassing even Old Sleaford.

2. Methodology.

The study adopted a non-invasive, non-destructive approach, preserving intact all remaining in situ taphonomic material.

Each fragment of coin mould was examined using a hand lens, then measured and classified according to a standard protocol which has already been used for the surviving assemblages of coin mould from the Braughing/Puckeridge area. This protocol is set out in full in Landon, 2009, 'On Recording Coin Mould', which accompanies this report.

Each fragment with more than three classifiable aspects under the protocol was given a separate record card, and all fragments with traces of more than six holes were drawn as accurately as possible. Note was made of any significant or unusual features on a fragment. Fragments with three or fewer classifiable aspects were sorted by the extent to which they exhibited signs of heating (Burn Category) and the number of partial holes on each, and then bagged by tens, and a record card created for each bag.

The data obtained from all these assemblages form the basis of a book, 'Making a Mint: Comparative Studies in Iron Age Coin Mould', which will appear as part of the B.A.R. series.

The full analysis of this data is a work in progress: with over 30,000 data entries for the Puckeridge assemblage alone, it will be some months before the statistical work can even begin.

This, then, is an interim report, for the most part listing features of interest, with little analysis and few conclusions. However, even within this narrow compass the Puckeridge assemblage has answered some existing questions about the way in which coin mould was used, and set new questions for consideration.

3. The Assemblage.

i. General observations.

The assemblage comprises 2600 fragments ranging in size from 5 mm. to 106 mm. Their condition ranges from poor (very abraded or weathered, no surface finishes remaining) to excellent (no abrasion or weathering, surface finishes and coatings intact). It should be noted that few fragments show signs of recent breakage. One of the salient characteristics of the assemblage is the very high number of conjoining fragments. These have been reassembled by

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the finder using an unknown clear adhesive. This has mostly been carried out accurately and carefully.

ii. Tray Forms.

There is firm evidence for two tray forms in the assemblage.
The standard Verulamium form, a pedimented square bearing 7 x 7 + 1 holes, appears to predominate, although this may be a function of the easily recognized oblique corners that characterize this form. There are two subtypes present, a high-peaked variant and a barely-peaked variant. Unfortunately this was only recognized very late in the data-collection process, and so precise quantification will not be possible without additional data-collection, but the impression was gained that the high-peaked variant is associated with trays bearing smaller diameter holes (less than or equal to 10mm. average diameter), while the barely-peaked variant is associated with trays with an average hole diameter greater than 10mm.

Plate 1: Verulamium form tray

The second form is a rectangular tray with 25 holes. The fragment that fully proves this form is no longer with the assemblage. It has three sides, and five holes in both row and column. A photograph of this fragment forms the basis for a reconstruction of a full tray of this form included in Rudd, 'Coin Moulds Found in Herts.', Coin News, Nov. 2008. The best fragment of this form remaining with the assemblage (PUC/Box 2/0008) has only two corners, with five holes along its one complete side. It has a hole diameter range of 15.8 mm.

– 18.5 mm., and it was noticed that no fragments in the assemblage with holes of the same diameter range exhibited characteristics associated with the presence of a pediment: all corner fragments were right-angled. Given the quantity of fragments in the assemblage with holes in this diameter range, it is highly unlikely that the absence of traces of pediments could be the result of an accident of preservation. It seems almost certain, therefore, that this tray form is associated with this hole diameter range. Since this is the first recorded find of this type of tray, it will be termed the 'Puckeridge form'.

Plate 2: Puckeridge form tray (PUC/Box 2/0008)

iii. Edge Characteristics.

a. Edge profiles.

Four edge profile types were observed in the Puckeridge assemblage: 'Straight section'; 'Angled section'; 'Lazy S'; 'Overhang profile'. Experiment has demonstrated that these profiles are the products of different manufacturing techniques. The 'Overhang profile' type is much more common in the Puckeridge assemblage than in the Ford Bridge assemblage, and this profile is entirely absent from the Henderson Collection material. The incidence of 'Straight section' and 'Angled section' profiles is far less frequent than in the Henderson Collection. The precise proportions must wait for the statistical analysis of the data.

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b. Edge markings.

There were no unequivocal traces of the 'cut and tear banding' characteristic of an edge formed by cutting with a sharp implement. It would seem, therefore, that most, if not all, of the Puckeridge trays were mould-made.

The assemblage also established the significance of a type of edge marking of which only one instance had been noted previously, in the Ford Bridge material: 'Lines and banding'. Amongst the Puckeridge material, the various permutations of this type of marking are almost commonplace. The import of this type of marking remains obscure: whether the combinations of raised parallel lines and concave bands carried some sort of meaning, or whether they are simply the traces of a lining used to facilitate the release of the tray from the mould in which it was formed, cannot yet be told.

Plate 3: 'Lines and banding' edge marking

iv. Evidence of elaboration.

There is no sign of the 'cleavage grooves' noted by Elsdon on the Old Sleaford material.

The occurrence of 'incised guidelines', not frequent in the Ford Bridge material, and entirely absent from the Henderson Collection, is very frequent – but not universal - in the Puckeridge assemblage. Since these have not been

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reported to occur on material from any other site (J. Collis, pers. com.), not even on mould from the other two known Catuvellaunian mint sites (Verulamium and Camulodunum), it is reasonable to conclude that this represents a tradition local to the Braughing/Puckeridge area.

These guidelines are not necessary to the manufacture of a tray, nor do they enhance its functionality (vide. Landon, 'On Recording Coin Mould', pp. 6 – 7). Furthermore, it can be shown that, when they do occur on a fragment, the arrangement of the guidelines is not consistent. 'Lateral' guidelines can occur without 'horizontal' guidelines, and vice versa. On one or two fragments from the Puckeridge assemblage, 'lateral' guidelines appear in parallel pairs; and on a single example (PUC/Box 6/0150), as well as the 'horizontal' guideline, an additional line has been drawn around the edge of the pediment to form a triangle. Below is a picture of fragment PUC/Box 1/0095, highlighting its twin horizontal guidelines, and single lateral guideline. This is also so far unique.

Plate 4: Lateral and double horizontal incised guidelines

This lack of consistency extends even to the way in which the lines were drawn: some have clearly been made using a straight edge, while others are undeniably drawn freehand. Some have been made with a fine point, others with a broad point. Some are deeply incised, while others are so faint that one can only with difficulty make them out. The one general point that can be made concerning their appearance on a fragment is that no guidelines of any sort have been found on 'Puckeridge form' tray fragments.

The best explanation found so far for the guidelines, and their variability, is that they might be either symbols denoting the metals to be placed in a tray, or, more likely since they were drawn in wet clay at the time of tray manufacture, 'quota marks', so that a tray-maker might prove that he or she had completed the number of trays demanded by the authority commanding the manufacture. A third – and intriguing – possibility is that they are 'ownership marks', which would imply that many people were allowed to have coin minted, but that they were required to do so at a central point.

v. Methods of hole manufacture.

The frequent occurrence in the Puckeridge assemblage of 'slighting' and, on fragments large enough to yield significant results, the absence of repeated patterns of hole spacings, are strong indicators that mould holes in the assemblage were made individually using a single-pronged dibber, rather than in multiples.

In addition, the presence of a few fragments exhibiting slighting in opposite directions on adjacent rows of holes is good proof that not only were the holes made singly, but that sometimes they were made boustrophedon.

Plate 5: Boustrophedon hole making revealed by slighting

PUC/Box 3/0245, above, shows this very clearly. The edge of the slab runs diagonally, top right. In the row immediately below the edge, the bottom hole is slighted from the right, making a mirror-image 'D-shape'. The centre hole of

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the row below this has been slighted from the left, making a normally-oriented 'D-shape'. The centre hole of the bottom row (incomplete holes running diagonally, bottom left) is again a mirror-image 'D-shape', having been slighted from the right.

It became clear from the wide variation in hole profile on fragments with many holes that there is little relation between hole profile and dibber profile.

A word here about terminology: Elsdon has used the word 'matrix' for the implement used to make the holes. Since 'matrix' means 'womb', it seems a wonderfully inappropriate term for a tool that is essentially a blunt prong, and which operates by piercing. The term 'dibber' is therefore to be preferred as much more apposite and accurate.

There were very few instances of 'circle + swirl' markings on the base of holes, which means that, for the most part, the dibbers used did not have a pithy or indented core. There are instead many instances of a superficially similar annular marking, which differs from 'circle + swirl' in that the annulus is higher than the centre. Experiment has shown that this marking is caused by 'double dibbing' a hole.

vi. Number of holes in a tray.

As has been noted above, there are two attested tray forms, one with 7x7+1 holes, the other 5x5 holes. This does not rule out the possibility that there were other tray forms present in the assemblage.

vii. Predictable relationship between base and top hole diameters.

Although the final answer to this question must await the completion of the statistical work, the initial impression gained is that, in conformity with all other mould studied so far, and with the results of experimental tray manufacture, there is no predictable relationship between base and top hole diameter.

During the investigation of the Puckeridge assemblage, it was suggested by David Parker of ULAS, who is working on the material from Merlin Works in Leicester, that it might be possible to track the path of the dibber across a fragment by taking a second top diameter measurement at right angles to the first. The orientation of the longer axis on each hole, relative to the orientation of the longer axis on the other holes on the fragment, would show the orientation of the dibber when each hole was made, and therefore might also show the order in which both holes and hole rows were made.

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It was felt that this idea was good, certainly good enough to warrant investigation, and so five of the larger fragments were selected on which to test the theory. However, two out of the five fragments generated results for dibber orientation that looked almost random. It was realized, after much thought, that while the research design had modelled dibber orientation during the process of hole-making with a single variable, angle of insertion, there were in fact three, independent, variables affecting top diameter: angle of insertion; angle of extraction; shape of dibber. It was decided that this rendered the technique too undependable to justify its employment.

viii. Predictable relationship between hole diameter and coin denomination.

Again, the final verdict on this must await completion of the statistical work, but there are two constants affecting the resolution of this question which tend to suggest that there could never have been a predictable relationship between hole diameter and coin denomination.

The first constant is experimentally derived. Holes were made in a clay slab with a dibber which had been accurately measured on two axes. The clay was allowed to dry naturally, and the holes were then also measured in two axes. The results showed that, whatever care was taken during hole making, the diameter of the holes routinely varied across a slab by up to 3 mm. This accorded well with data taken from actual mould fragments, which leads to the conclusion that the diameter of mould holes made using this method cannot be controlled to a more accurate standard.

The second constant relates to the behaviour of molten metal. Those of us who learnt their chemistry in the days before the subject became safety-conscious may remember being allowed to 'play' with mercury, and how the metal did not flow out into a thin sheet like water when poured onto a flat surface, but instead coalesced into globules under the influence of surface tension. Molten bronze, and silver and gold alloys, do not behave any differently, which means that there would be no direct physical relationship between the pellet and the wall of the mould hole. Indeed, both Geoff Cottam (pers. com.) and Longden emphasize that contact between metal and mould hole was to be minimzed, lest the pellet fuse with the mould. The consequence of this is that, while there is a definite upper limit on the size of coin that can be cast in a hole of a given size, there is no lower limit.

Taking these two constants together, the most that one can say of a hole of a particular diameter is that it was large enough for the making of pellets of a particular weight – but that there is no way of deriving from the evidence that the hole was actually used for making pellets of this size.

This is not the final word on the subject of hole diameter. Elsdon ('Old Sleaford Revealed', Oxbow 19XX) proposes the idea of hole diameter groups,

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and although her data do not actually demonstrate that the groups she proposes exist in the Sleaford material, and her methodology (assuming, as it does, the existence of a direct relationship between base and top hole diameters) is so flawed that no valid conclusions can be drawn from it, the idea is – under the conditions set out in Landon, 'On Recording Coin Mould', pp. 12 – 13 – nonetheless not without value.

We know that at least one assemblage (Ford Bridge) exhibits a continuous spectrum of hole diameters, and that another (Merlin Works) exhibits a discontinuous sequence of hole diameters. At first sight, the Puckeridge assemblage would seem to fall into this second category, with two distinct and separate groups, the first ranging (approximately) from 8 mm. to 14 mm., and the second(approximately) from 15 mm. to 20 mm. While the gap between the groups is not sufficiently large to rule out the possibility that the largest holes in the first group and the smallest holes in the second group could have been made with the same dibber, the fact that all fragments in the first group bearing traces diagnostic of tray form are of the Verulamium form, and none are of the Puckeridge form, while all of the fragments in the second group with traces significant of tray from are consistent with the Puckeridge form, and none exhibit any traces diagnostic of the Verulamium form, would seem to indicate that the discontinuity in the sequence of hole diameters was intentional on the part of the makers.

ix. Control of volume.

As discussed in Landon, 'On Recording Coin Mould', pp. 13 – 15, very precise control of hole volume is a necessary precondition of the credibility of two theories concerning the purpose and method of use of coin mould.

Both the Sellwood/Casey hypothesis that coin mould was a means of ready-reckoning for the production of alloys, and the widely-entertained idea that metal might have been introduced into mould-holes by pouring in the molten state, assume that it was possible to control the volume of a mould hole sufficiently to permit its use as a measuring device.

Preliminary examination of the Puckeridge material accords well with experimentally-derived data, showing that the depth of mould holes made in the manner described can vary wildly across a tray, however much care is taken to control it. Even in advance of statistical analysis, it is possible to state with some confidence that the Puckeridge mould could not have been used to measure metal with any degree of accuracy.

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x. Calcium carbonate traces.

A substantial proportion of the Puckeridge fragments exhibit traces of calcium carbonate. Its occurrence is not related to hole diameter, nor is it restricted to the holes themselves. A number of fragments have been entirely coated, apparently purposively, and even more have splashes and dribbles running across their upper surface.

These accidental markings put it beyond doubt that the calcium carbonate was applied as a viscous liquid wash, and that most often it was applied by pouring a little into each hole, agitating the tray with a swirling motion, and then tilting the tray to dispose of the excess. This is particularly well demonstrated by fragment PUC/Box 3/0165, below:

Plate 6: Calcium carbonate wash

This pediment fragment, with a small part of the apex hole remaining top left, just above its horizontal incised guideline, has a considerable amount of calcium carbonate on its upper surface. Close inspection will reveal that this has flowed into the trough of the guideline: this is not the behaviour of a dry powder, but a liquid, and a liquid that has been poured rather than applied by brush. It should also be noted that of the nine partial and complete holes on the fragment, only three retain traces of chalk wash.

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However, this is not always the case. There are several fragments with holes in which the chalk wash shows distinct brush marks, and there is one striking example, PUC/Box 6/0555, on the top surface of which a right-angled line has been painted.

There are many fragments in the Puckeridge assemblage on which not all the holes exhibit traces of chalk wash. Fragment PUC/Box 3/0165 is a good example of this. There are two possible explanations for this: first, that the wash was not applied to all the holes on these fragments in the first place; second, that the wash is very fragile, does not always bond well to the clay, and is highly susceptible to the action of soil acids, and hence can flake away without leaving any visible trace of its presence.

Longden (2009) points out that the presence in mould holes of a calcium carbonate coating has only been reported on mould from Braughing/Puckeridge and from Verulamium, and suggests on the basis of this that the application of wash is a local variation perhaps made necessary by the low refractive index of local clays. This may well be true, but more needs to be known about the standard of preservation of assemblages without chalk wash, and about the soil pH at the sites where these assemblages were found, before the mechanical or chemical destruction of any wash applied during manufacture can be ruled out.

xi. The introduction of metal into holes.

While it has been shown above (Section ix) that the Puckeridge mould is not suitable for use as a measuring device, and hence was not intended as a receptacle into which molten metal could be poured, the presence in this assemblage of several fragments with cuprinous globules adhering to the clay, both at the mouth of holes and on the top surface, requires explanation.

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Plate 7: Metal globule adhering to the mouth of a hole

As can be seen in the illustration above of fragment PUC/Box 3/0171, these globules exhibit no sign of the 'running' one might expect had they resulted from the pouring of liquid metal. Instead, the signs are that they result from very small pieces of metal which adhered to the clay before smelting. It may be concluded, therefore, that these globules are in fact evidence that metal was placed in the holes as granules or powder (as concluded by Jean Debord, 'L'atelier monetaire gaulois de Villeneuve-Sainte-Germain (Aisne) et sa production', Revue Numismatique 1989, Vol. 6, Issue 31, pp. 7 – 24), rather than as lumps cut from a bar (as suggested by J. May, pers. com. in Chadburn, 'Tasking the Iron Age' in 'Land of the Iceni',1999, ed. Davies and Williamson).

xii. Proportions of used and unused pellet mould.

While the actual proportion of clearly unused mould must await the completion of statistical work, there are a number of observations that can usefully be made of the different degrees of heating evinced by the Puckeridge assemblage.

First, that there appear to be four visible conditions of heating: fragments with no visible signs of heat beyond that required for firing the tray; fragments exhibiting considerable reddening, sometimes to a considerable depth within the fabric, but with no signs of vitrification or vesiculation; fragments (such as PUC/Box 3 0171 above) which exhibit minute traces of vitrification and slight vesiculation, and some of which bear undeniable

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evidence of use; fragments which exhibit signs of extreme heating, with continuous surface vitrification (which can extend some way into the fabric), vesiculation affecting the entire body of the fragment, causing it to bulge, signs of melting and slumping, and charcoal casts in the melted portions.

Plate 8: Melting, vesiculation and charcoal casts

The illustration above of the base of fragment PUC/Box 5/0318 shows the deformation resulting from melting of the fabric, as well as the imprint of the charcoal lumps on which the tray rested during smelting: careful inspection will reveal traces of the graining of the charcoal preserved in the cast.

However, although some fragments exhibit evenly these signs of extreme heating, on many fragments it is clear that heat was not applied evenly to the tray. The illustration below of the top and section of fragment PUC/Box 5/0318 reveals not only the bulging which results from severe vesiculation, but also that, while the edge of the tray was subjected to very intense heating, the middle of the tray was not (note also the gobbet of vitrified and vesiculated clay adhering to the mouth of the hole in the left foreground, the possible significance of which will be considered later).

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Plate 9: Differential heating of edge and centre of a tray

It is not uncommon to observe that the edges of a fragment exhibit signs of greater heating than the middle. David Parker of ULAS (pers. com.) has suggested that this results from the stacking of trays in the furnace during smelting, and it would seem undeniable that such fragments have been stacked during an episode of extreme heating. Fragment PUC/Box 1/0058, illustrated below, shows the same differential heating of edge and middle. It also shows a crust adhering to the cortex of the fragment which appears to have pulled away from a superimposed tray during separation while still close to the melting point of the clay.

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Plate 10: Evidence of trays adhering during heating

The question that must be resolved is at which point in the process the trays were stacked. We know from the work carried out by the Munich University Archaeometry Group that it was not necessary to heat the entire body of the tray to the melting point of the metal to be smelted in it - their experiments have shown that it is possible to achieve fusion of the metal into a pellet while the temperature at the base of the hole does not exceed 700°C, well below the melting point of the clay (960°C – 1000°C). Furthermore, a number of fragments have deformation affecting the top surface so severely that it would appear to have affected the functionality of the tray.

Plate 11: Occlusion of mould hole by heat-induced slumping

Fragment PUC/Box 3/0196, above, demonstrates this point quite neatly: vesiculation and heat-induced slumping have so occluded one of the holes that any pellet that might have been contained within would have been very difficult to extract; yet while such occlusion is far from uncommon in the Puckeridge assemblage, not one trapped pellet has been found. It does not seem unreasonable to infer from this that such extreme heating was not necessarily simultaneous with smelting, but may actually have been carried out subsequently.

The idea that some mould was subjected to a second heating episode after it had been used for smelting has additional evidence to support it. There are several fragments the fractured edges of which have been 'sealed' by heating (PUC/Box 1/0011; PUC/Box 5/0034; PUC/Box 6/0637; PUC/Box 6/0671; PUC Box 6/0891, to list but a few). This means that the trays from which the fragments come must have been broken before the fragments were heated to melting. The clearest evidence, however, comes in the form of two fragments, PUC/Box 6/ 0601 (illustrated below) and PUC/Box 6/0904, each of which is made up of two fused fragments of mould, fusion apparently having occurred after breakage.

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Plate 12: Two fragments melted together after breakage: a second heating episode?

The top fragment of the fused pair PUC/Box 6/0601 exhibits a step-fracture on its base, sealed by the fragment below. It is hard to see how this fracture could have occurred other than before the fusion of the two fragments took place. It seems very likely, then, that a proportion of the Puckeridge mould was subjected to a second heating episode. This has never been noted before, and so far it has not been possible to find a definite reason for the phenomenon. The best theories to date are either that the mould was reheated in order to reclaim trapped metal, or that we are looking at some sort of 'closing ritual'.

Whatever the truth may be, it is certain that the main practical consequence of a second heating episode is to make diagnosis of use even more uncertain without the use of advanced spectroscopic techniques.

xiii. Observations of new phenomena.

a. Grass marks, chaff marks and grain casts.

Many trays were left to dry on a bed of grass before being fired, a practice which experiment has shown will leave distinctive markings on the base of a tray, and occasionally on the top surface as well. However, some trays

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exhibit the characteristic short, broad, straight-veined imprints of chaff, and there are two fragments which have grain-casts. One of these, fragment PUC/Box 5/0401, is illustrated below.

Plate 13: Grain cast on a tray base

Some trays in the Puckeridge assemblage have been in close contact with harvest debris, and the season in which this is most likely to occur is clearly immediately following harvest time.

b. Inclusions in mould fabric.

Many of the fragments have inclusions in their fabric. A substantial proportion has shell temper in varying degrees, in common with certain classes of contemporary pottery. Others have apparently been tempered with grit. But a large number have massive flint and quartzite inclusions, anything up to 10 mm. in diameter. Most of the flint has been broken, but the quartzite occurs mostly as unmodified pebbles, as illustrated by fragment PUC/Box 1/0095, pictured below. The quartzite pebble is in the apex hole in the right foreground of the picture.

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Plate 14: Large pebble inclusion

This cannot easily be understood. Anyone who has been present when flint has shattered under heat will know that this can be an explosive business, and if this occurred during the smelting process, it would have resulted in breakage of the mould, spilling the contents into the furnace. Why were the makers of the trays prepared to risk the loss of all the hard, detailed work that had gone before by not bothering to remove from the clay a few, very large and obvious, chunks of flint? In fact, in many ways, some of the Puckeridge mould reveals a lack of care that is at odds with the minute attention and skill lavished on other parts of the process: holes on some fragments (particularly PUC/Box 2/0002) have been so sloppily made that it has been necessary to squash them in at the ends of rows and columns in order to fit the required number onto the slab. Voids and irregularities along the edges of other slabs reveal that no great care has been taken to push the clay into the edges of the mould during manufacture. The only way to account for this is to assume that the people who made the mould were identical neither with the people who were to carry out the smelting, nor with the people to whom the coin being made was to belong.

c. Clay caps or luting?

This is potentially the most important feature of the entire Puckeridge assemblage. A number of fragments have traces of what appear to be caps at the mouths of the holes made of an orange-brown clay very different from the usual grey/brown fabric of the trays. Examination of PUC/Box 3/0171 shows small fragments of this orange clay adhering to the wall of the hole above the base, and with a calcium carbonate coating just below. This would not be remarkable, were it not for two fragments, PUC/Box 2/0017 and PUC/Box 3/0040, pictured below.

Plate 15: Partial clay caps

Although the two caps on PUC/Box 2/0017 are not entire, this is the more instantly informative of the two fragments, as one is able to see 'beneath the lid'. Both of the holes with caps have been coated with calcium carbonate wash. Between cap and hole base there appears to be a space: beneath the more complete, fully orange cap on the right, this space is filled with what appears to be charcoal, although there is no certainty that this fill was in place before deposition.

However, PUC/Box 3/ 0040 (below) has potentially the greater significance, because the intact cap should ensure that whatever lies beneath is undisturbed. Furthermore, it carries smear marks which demonstrate that purposive human agency put it in place, as well as slight traces of vesiculation that seem to prove that it was heated to much the same temperature as the surfaces around it (these show slight vesiculation, minute traces of vitrification, and purple staining caused by the melting of manganese compounds occurring naturally in the clay).

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Plate 16: Intact clay cap

In advance of invasive investigation or X-ray scanning, any attempt at explanation is pure speculation, but there are two possibilities which suggest themselves.

First, it is possible that these caps were placed on the mould holes to help the exclusion of oxygen during smelting, or to prevent loss of the contents of the hole. This was initially the preferred theory, following on from the statement by van Arsdell in 'Celtic Coinage of Britain', p. 48, that 'moulds from Villeneuve-Saint-Germain, France, were found with little holed covers'. Sadly, examination of the excavator's report on minting at this site (L'atelier monetaire gaulois de Villeneuve-Saint-Germain (Aisne) et sa production', Jean Debord, 1989, Revue Numismatique, Vol. 6, Issue31 pp. 7 – 24) reveals no such thing.

The closest the report comes to mentioning moulds with covers is during a discussion of possible ways in which mould was used. Debord speaks of trays ('plaques') found at Alesia which had 'little channels' linking the holes, and which could have been used in conjunction with ordinary mould as a method for casting 'little ingots'. It may well be that the whole idea of covers for mould holes is the result of mistranslation. It is surely beyond belief that Debord would have neglected to mention a startling discovery like this – had he made such a discovery.

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The second possibility was advanced by David Parker of ULAS, following the identification of a plugged hole on a fragment from Merlin Works as having been deliberately filled with clay ('luted'). As van Arsdell's claim is not supported by the excavator's account, this must now be the preferred theory.

Plate 17: Luted hole from Merlin Works, Leicester

Parker suggests that the hole on this fragment was plugged because not all the holes on the original tray were to be used, which accords well with the observation made of the Puckeridge assemblage that many fragments did not exhibit the same degree of heating across their surface. Although two of the caps appear very different to the Merlin Works luted hole, in that they are orange/brown and seem finished to a significantly higher standard, there is one fragment in the Puckeridge assemblage which bears a much closer resemblance to the Merlin Works example.

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Plate 18: Possible luted hole from Puckeridge

The hole at the top left of fragment PUC/Box 1/0028 is plugged with clay identical with the fabric of the mould. It is vitrified and vesiculated, much more so than either of the two orange/brown caps, and looks much more like an informal expedient than a planned and carefully executed integral part of the process. It may be that the gobbet of vitrified clay adhering to a hole-mouth on fragment PUC/Box 5/0318 (above, Section xii) should be regarded in the same light.

4. Conclusions.

The presence in the assemblage of evidence of weathering and abrasion, particularly among the smaller fragments, as well as unabraded, usually larger, fragments, would seem to indicate that the Puckeridge coin mould was not placed in a closed deposit, but that instead the uppermost layer of the deposit remained open to the action of weather and the action of rootling animals. This is a feature that this assemblage has in common with the material from Ford Bridge, where coin mould constituted only a part of a midden. At neither site were there any signs of 'ritual deposition'.

The apparent coincidence of signs consistent with Puckeridge form trays, and larger diameter holes, would seem to suggest that this group was perceived differently (because treated differently) by the makers. As such, this is one of the few differences noted

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during this survey which looks likely to have been meaningful to those involved in the production process.

The salient characteristic of the Puckeridge assemblage is its variability. This is demonstrable at all levels, with variation in diameter on different axes of a hole; variation in hole diameter and depth across a fragment; variation between fragments in elaboration, edge marking, edge profile; and variation in tray form and sub-form. This list is not exhaustive: there is scarcely a single parameter among those measured that does not exhibit variation in some degree.

Some of this variation is accidental (hole slighting, for instance), some of it is inherent in the processes used in manufacture (variation in hole diameter and depth), and some of it is intentional, reflecting different working practices, even differences in taste. But some of this variation undeniably results from the fact that not all trays of a given type were made using the same implements. This does not refer simply to the fact that it is impossible that 8 mm. holes could have been made with the same dibber as 19 mm. holes, nor just to the fact that a Puckeridge form tray could not have been made in a Verulamium form tray-mould, nor solely to the fact that a high-peaked Verulamium form tray must come from a different mould to a barely-peaked Verulamium form tray.

The evidence that the manufacture of the Puckeridge coin mould trays was not a single, homogenous, episode comes rather from the combination of all of these facts, together with the steady accumulation of minor formal differences, such as variation in edge profiles and edge markings. From the picture that emerges it is not unreasonable to infer the presence of several 'hands' working to produce the trays in the assemblage. A full examination of the implications of this for the social context of coin making in the Late Iron Age in Britain must await the completion of the comparative studies which are to form a major part of the forthcoming book, 'Making a Mint: Comparative Studies in Iron Age Coin Mould'.

The final question about the assemblage to which a reasonably certain answer can be given at this stage is that of origin. It was said in the introduction that the circumstances of the find were 'unclear', and this lack of clarity extends to the find site: there are so many inconsistencies in the finder's account of the discovery that no aspect of this story can be regarded as believable without independent confirmation. Without a properly recorded context, the archaeological value of the assemblage is limited; but without even a rough location, the archaeological value drops almost to nil. This means that any evidence for a find which can be gleaned from the material itself is very important indeed.

It is at this point that we can begin to see the worth of a detailed comparative study of coin mould. Close examination of the Puckeridge material reveals sufficient similarities with the Ford Bridge assemblage in small details not recorded as occurring in material from any other find site to enable the conclusion that the Puckeridge and Ford Bridge assemblages are very closely related. Both incised guidelines and 'lines and banding' are present in each assemblage, and neither of these features conveys any significant functional advantage to a tray: both assemblages contain large enough proportions of

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mould exhibiting neither feature to put this beyond doubt. If incised guidelines are to be understood as markings significant of maker or owner or content or intended denomination, then they are emblematic of a system, a system which was in force at both sites – and not at any other recorded site.

It seems less likely that 'lines and banding' could have performed a similar function; they are not placed so as to be easily visible, and often they are so indistinct as to be almost unnoticeable. Although there is no certain explanation for this type of edge marking, on balance it seems reasonable to conclude that they were not particularly significant to the makers and users of the mould trays, and that they represent instead a minor procedural variation in tray manufacture. During the experimental moulding of trays, it was found that adhesion of the tray to the mould was a real problem. The experimental solution was to grease the mould, but the use of some sort of mould lining, such as bulrush or Iris pseudocorus leaves, would be a perfectly practicable alternative – an individual solution to a common problem. The presence of lines and banding in both assemblages, therefore, could be seen as an indicator that the same individual, or workshop, had a hand in both. From this we may conclude that the Puckeridge assemblage is very likely to fall within the same local tradition of coin mould manufacture as the Ford Bridge assemblage.

Appendix: Notes on Packing.

The Puckeridge assemblage was received from Chris Rudd packed in eight pink plastic storage boxes, together with an inventory, thus:

"*Puckeridge fragments*

Contents of eight pink plastic boxes, listed by CR 30 May 2008, on loan to Philip de Jersey for research purposes, delivered to CCI room at Institute of Archaeology, Oxford, by CR 30 May 2008. Contents insured for up to £25,000 on Chris Rudd's policy provided that reasonable precautions are taken to protect them from theft and damage whilst on loan to P de J.

Box 1

111 large fragments of baked clay coin pellet moulds.

Box 2

42 larger fragments of coin pellet moulds

Box 3

c.301 medium and small fragments of coin pellet moulds

Box 4

?aurochs horn, 5 other horns, 9 bone fragments inc. tooth, 6 typical sherds of white ?pot (used for slip?), lump of chalk (not local to area), piece of pierced pot (?loom weight), 4

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iron nails, porous ?pumice stone, 21 IA potsherds typical of deposit, small mould fragment with green speck of bronze, 4 red (over-fired?) mould fragments.

Box 5

c.400 medium and small fragments on coin pellet moulds (most with 1-3 holes or part of holes)

Box 6

c.1,400 very small fragments of coin pellet moulds (most have no complete holes evident).

Box 7

100s of smaller IA potsherds (many decorated with incised ornament), plus some sherds of white ?pot (used for slip in base of mould holes?)

Box 8

Many larger IA potsherds, mostly incised, some recently repaired."

At the request of Mr. Rudd, this packing scheme was preserved as far as possible, but with some important modifications.

First, all the large, medium and smaller fragments of coin mould were packed individually in ziplock plastic bags.
Second, the very smallest fragments of coin mould were sorted by 'Burn Category' and 'Number of Incomplete Holes', according to the recording protocol (See Landon, 2009, 'On Recording Coin Mould', draft herewith), and then bagged by tens.

Third, a label was affixed to each bag bearing the catalogue number of the contents: 'Site code/Box number/Bag number'. A correspondingly numbered record card was also created. The site code assigned to the Puckeridge assemblage was 'PUC'.

Fourth, during the repacking of the boxes the numerical order of the items was carefully preserved. The bags were replaced in the boxes in separated layers, and above each layer was placed a printed sheet detailing its numerical range. A list of the layers in each box and their numerical ranges is appended below. 'Layer 1' is the topmost layer in each box.

Fifth, during the repacking a number of discontinuities in the numbering of the bags were noted. These are included in the list of layers below, and also noted on each layer sheet in the box where a discontinuity occurs.

Sixth, that the increase in the volume of the contents of Rudd's 'Box 6' caused by the bagging process necessitated the creation of a 'Box 6a.'. This was packed under the same system as the other boxes of coin mould.

Packing list.

PUC/Box 1

Layer 01:	0001 – 0015
Layer 02:	0016 – 0034
Layer 03:	0035 – 0054
Layer 04:	0055 – 0074
Layer 05:	0075 – 0094
Layer 06:	0095 – 0115
Layer 07:	0116 - 0136

PUC/Box 2

Layer 01:	0001 – 0007
Layer 02:	0008 – 0016
Layer 03:	0017 – 0026
Layer 04:	0027 – 0042

PUC/Box 3

Layer 01:	0001 – 0033
Layer 02:	0034 – 0066
Layer 03:	0067 – 0103
Layer 04:	0104 – 0135
Layer 05:	0136 – 0171
Layer 06:	0172 – 0206
Layer 07:	0207 – 0238
Layer 08:	0239 – 0271
Layer 09:	0272 – 0301

PUC/Box 5

Layer 01:	0001 – 0058	
Layer 02:	0059 – 0099	
Layer 03:	0100 – 0148	(Numbering skips 0116)
Layer 04:	0149 – 0185	
Layer 05:	0186 – 0220	
Layer 06:	0221 – 0259	
Layer 07:	0260 – 0299	
Layer 08:	0300 – 0332	
Layer 09:	0333 – 0372	(Numbering skips 0365)
Layer 10:	0373 – 0401	

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PUC/Box 6a

Layer 01:	Miscellaneous (not mould)	
Layer 02:	0001 – 0063	
Layer 03:	0064 – 0138	
Layer 04:	0139 – 0214	(Numbering skips 0153)
Layer 05:	0215 – 0290	
Layer 06:	0291 – 0368	
Layer 07:	0369 – 0445	
Layer 08:	0446 – 0503	

PUC/Box 6

Layer 01:	0504 – 0539	
Layer 02:	0540 – 0576	(Numbering skips 0572)
Layer 03:	0577 – 0609	
Layer 04:	0610 – 0637	
Layer 05	0638 – 0680	
Layer 06:	0681 - 0774	
Layer 07:	0775 – 0910	
Layer 08:	0911 – 0981	
Layer 09:	0982 - 1036	
Layer 10:	0373 – 0401	

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