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# Analysis of a gold mancus of Coenwulf of Mercia and other comparable coins

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**Summary** A gold mancus of Coenwulf, king of Mercia (AD 796–821), found in 2001, was subjected to material and stylistic analysis and compared to other Anglo-Saxon gold coins before its acquisition by the British Museum in 2006. Examination by scanning electron microscopy revealed that in common with the comparative coins, the Coenwulf mancus was die-struck, although its unusually well-preserved state revealed die preparation features not visible to the naked eye on the other coins. Analysis by X-ray fluorescence spectrometry showed that the coin was made from an alloy of gold, silver and copper with a high, but not exceptional, gold content. The high gold content may lie behind the lack of stress-corrosion cracking on the newly found coin. Stylistic analysis is consistent with coins struck from dies made by a die cutter who normally produced dies for Canterbury moneyers, although the coin was probably minted in London. Both the material and stylistic evidence suggest the coin is a genuine gold mancus of Coenwulf.

## INTRODUCTION

A unique gold coin in the name of Coenwulf, king of Mercia (AD 796–821), was discovered in 2001 by a metal detectorist, close to the bank of the River Ivel near Biggleswade in Bedfordshire, UK, Figure 1. The coin weighs 4.33 g, has a diameter of 21 mm, and has been identified as a ‘mancus’, a term used of Anglo-Saxon gold coins in documentary sources of the period [1–3]. The coin was initially offered to the British Museum by the finder, but a lengthy investigation established that title to the coin was shared between the finder and landowners, who eventually decided to put the coin up for auction in October 2004. Having failed to secure the coin at auction, the British Museum subsequently succeeded in acquiring the coin (British Museum registration number CM 2006,0204.1) in February 2006, following a ban on its export.<sup>1</sup>

After an early phase of gold coinage in the seventh century, Anglo-Saxon gold coins are extremely rare. Between the mid-eighth century and the Norman conquest in 1066, only eight gold Anglo-Saxon coins are recorded, with no further English gold coins recorded before the reintroduction of gold coinage under Henry III in the 1250s. The Coenwulf coin itself is unique and is also in exceptional condition. The stability of gold means that gold coins tend to be better preserved than those made of silver or copper alloys, but the newly acquired coin appeared to show almost no sign of wear before its deposition, with only a single large

(apparently recent) scratch immediately visible in front of the bust on the obverse.

Both the lack of a direct parallel for the coin and its recently struck appearance made it essential to establish, in so far as this is possible, that the coin was genuine, before its acquisition could proceed. This was done partly by comparing the style of the die cutting with Coenwulf’s extensive silver coinage, and partly by scientific analysis of the new coin, comparing it with other available Anglo-Saxon gold coins. Six of the seven other examples are in the British Museum collection and were thus available for study. Most of these had previously been measured for fineness by specific gravity, but none had been examined by more modern analytical techniques, so this comparative study provided an opportunity to look at these coins in more



FIGURE 1. Gold mancus of Coenwulf of Mercia (2006,0204.1)

detail than had previously been possible. All seven coins, seen in Figures 1 and 2, and listed in Table 1 in chronological order, were therefore examined by optical and scanning electron microscopy (SEM) and analysed by X-ray fluorescence (XRF) spectrometry [3, 4].<sup>2</sup>

## XRF ANALYSIS

The coins were analysed non-destructively by XRF to give semi-quantitative elemental analyses, see Table 1. The precision (reproducibility) of these XRF results is about  $\pm 1-2\%$



FIGURE 2. The six comparative mid- to late-Anglo-Saxon gold coins in the British Museum collection, in chronological order: (a) gold dinar of Offa of Mercia; (b) gold mancus of the moneyer Pændræd; (c) gold mancus of the moneyer Ciolheard; (d) gold solidus of Archbishop Wigmund of York; (e) gold mancus of Æthelræd II; and (f) gold mancus of Edward the Confessor (see Table 1)

TABLE 1. The seven gold Anglo-Saxon coins examined in this study and their elemental compositions determined by XRF

British Museum No.	Description	Figure	XRF analysis results		
			Gold (%)	Silver (%)	Copper (%)
1913,1213.1	Gold dinar of Offa of Mercia (757–796)	2a	94	5.5	0.4
1962,0313.1	Gold mancus of the moneyer Pændræd, <i>temp</i> Offa	2b	95	2.3	2.8
1984,1221.1	Gold mancus of the moneyer Ciolheard, <i>temp</i> Offa or Coenwulf	2c	83	14.5	2.6
2006,0204.1	Gold mancus of Coenwulf (796–821)	1	99	1.0	0.1
1848,0819.171	Gold solidus of Archbishop Wigmund of York (c.837–854?)	2d	92	6.0	1.7
1883,0516.1	Gold mancus of Æthelræd II (978–1016), Helmet type, moneyer Leofwine of Lewes	2e	93	7.0	0.3
1951,0601.1	Gold mancus of Edward the Confessor (1042–1066), Expanding Cross type, moneyer Lyfinc of Warwick	2f	99	1.5	nd

Note: 'nd' denotes that copper was not found above the detection limit of 0.05%

relative for gold,  $\pm 5$ –10% for silver and  $\pm 10$ –20% for copper. The accuracy cannot be defined as the analysis is predominantly of the surface and this may not be fully representative of the bulk composition. The gold content in each case is likely to be overestimated due to surface depletion of the silver and particularly the copper. This is caused by slight dissolution of these more reactive metals in the burial environment; since the compositions must be normalized to 100%, the result is a corresponding increase in the reported gold content. The effect is usually small, unless the burial environment is very acidic, and would result in differences smaller than those between the analyses given in Table 1, which indicate a real range in composition.

The Coenwulf coin, in common with the comparative examples, is thus a gold alloy containing silver and copper. Although it has a comparatively high gold content, the coin of Edward is of very similar composition.

#### OPTICAL AND SCANNING ELECTRON MICROSCOPY (SEM)

The expected method of manufacture of the Coenwulf coin, and the others being examined, would be by striking between a pair of dies. The clearest evidence of this, surface flow lines indicating metal movement under the dies, is visible on the Coenwulf coin at the beaded edge (Figure 3), indicating that the coin is probably die-struck. Similar features were observed on most of the other coins, where these have not been obliterated by wear.

Wear traces on the Coenwulf coin are slight and confined to the highest points of the design, with some minor scratches and damage to the surface, Figure 4. The coin has clearly not experienced much handling. The comparative coins show different degrees of wear ranging from the major wear on, for example, the Pændræd mancus to slight wear on the Edward the Confessor mancus, although even the wear on the latter is greater than that of the Coenwulf coin.

A distinctive feature on the Coenwulf coin is a cross-hatched pattern of fine raised lines on the flat field of the coin; these are visible on both faces but not present on any of the raised parts of the design or lettering, Figure 5. This feature is reminiscent of the effects of cleaning up a die face using a file or similar tool prior to, or after, punching in the lettering or design. A file could produce a series of parallel scratches, which would be cross-hatched if applied in two directions. This would not be present on the incuse design areas on the die, as these areas would be protected from the filing or added after the filing had been carried out. If not removed by subsequent polishing, the file marks would be transferred to any coin struck by the dies and show as raised lines. Similar marks were observed on all but one of the comparative coins; the exception was the mancus of Pændræd, but this coin is heavily worn. None of the comparative coins show these marks as extensively as the



FIGURE 3. Secondary electron image in the SEM of the gold mancus of Coenwulf, showing striations on the edge beading due to die striking. Scale bar length 500  $\mu\text{m}$

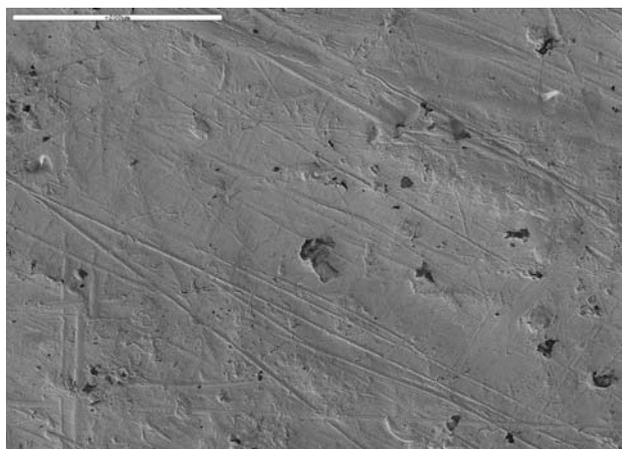


FIGURE 4. Secondary electron image in the SEM of the gold mancus of Coenwulf, showing traces of wear, including slight scratches on the face. Scale bar length 200  $\mu\text{m}$

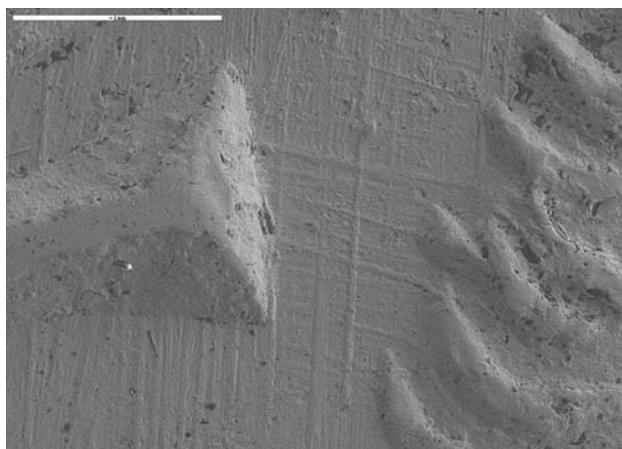


FIGURE 5. Secondary electron image in the SEM of the gold mancus of Coenwulf, showing impressions of the filing marks from die preparation. Scale bar length 1 mm

Coenwulf coin and in some cases they are only visible on one face. The extent of the survival of these marks on the Coenwulf coin is an indication of the limited amount of wear this coin has received.

The Coenwulf mancus was examined for signs of stress-corrosion cracking but no clear indications of this were observed. Such cracking follows the equiaxed (annealed) grain boundaries. In alloys with a high gold content, such as that used for the Coenwulf coin, this cracking, if it occurs at all, is generally considered to develop only over long periods of time. However, for base alloys (generally those with high copper contents) it can develop over a much shorter time. Some cracks were observed on the head area of the obverse (Figure 6), and also near the beaded edge, but these do not seem to follow grain boundaries as would be expected for stress cracking; they may instead be residual flaws in the coin blank. Some cracks on the other coins examined could be attributed to stress cracking, for example on the Æthelræd coin, Figure 7. This coin has a slightly baser composition than the Coenwulf mancus (Table 1) and is therefore more likely to have developed stress cracking. It is notable that the coin of Edward, of similar composition to the Coenwulf coin, did not show any clear signs of stress-corrosion cracking. Comparison of the grain structures and grain porosities of these two coins also shows strong similarities.

The Coenwulf coin has traces of what appear to be grey or reddish soil residues between some of the edge beading; small quantities of these residues can also be seen in porosities in the coin face, Figure 8. Analyses of the deposits at the edge by energy dispersive X-ray analysis in the SEM showed these to be siliceous with moderate amounts of calcium and iron, along with other elements, such as aluminium, all of which are consistent with a soil origin. The coin was reportedly found on Biggleswade Common in Bedfordshire and although an XRF analysis of soil collected from this area showed a similar elemental composition to the residues on the coin, it should be noted that such soils are very common throughout lowland Britain.

Finally, the Coenwulf and comparative coins were also examined by optical microscopy and XRF spectrometry for the presence of platinum group element (PGE) inclusions, material which may be characteristic of alluvial gold, but none was found on any of the coins.

#### STYLISTIC ANALYSIS

Stylistic analysis of the Coenwulf mancus is based on comparison, not with the other gold coins, but with the extensive silver penny coinage in the name of Coenwulf. Like his better-known predecessor Offa, Coenwulf was a Mercian king who also succeeded in establishing himself as ruler over Kent and East Anglia. Coins were issued in his name in all three kingdoms and most coins can be attributed with reasonable certainty to one of the three kingdoms,

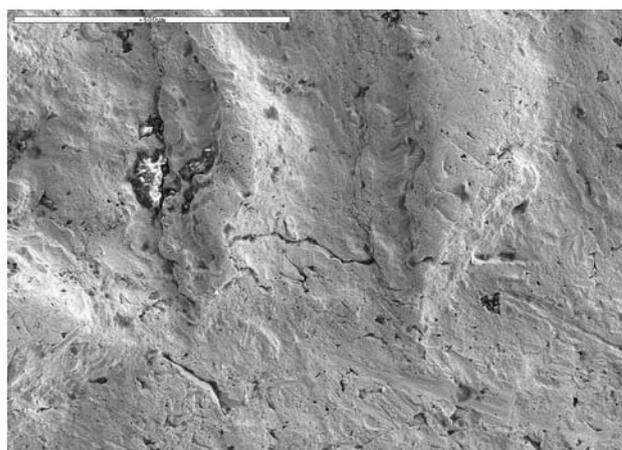


FIGURE 6. Secondary electron image in the SEM of the gold mancus of Coenwulf, showing surface cracks in the head area on the obverse. Scale bar length 500  $\mu\text{m}$

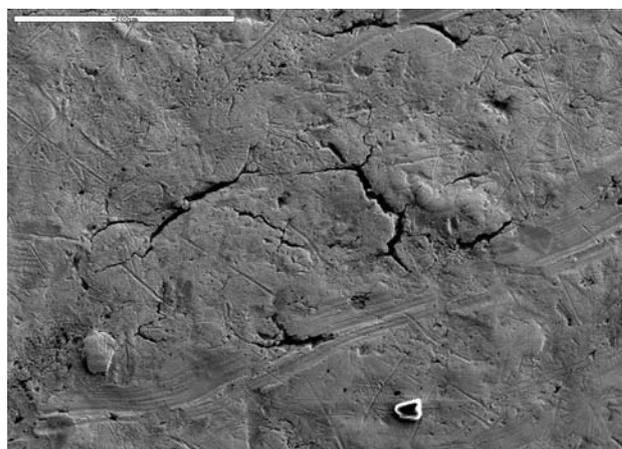


FIGURE 7. Secondary electron image in the SEM of the gold mancus of Æthelræd, showing cracking that is possibly indicative of stress corrosion. Scale bar length 200  $\mu\text{m}$

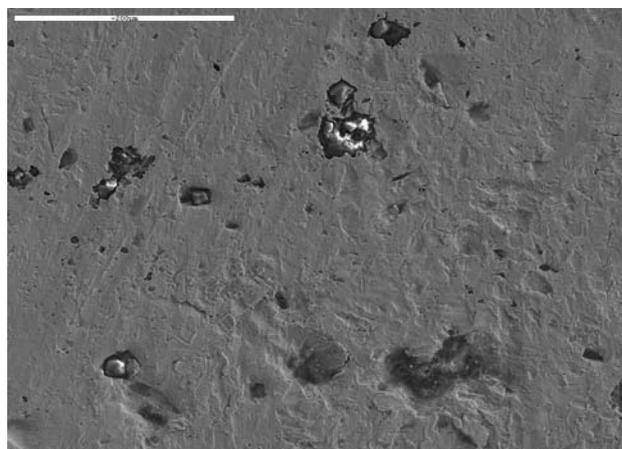


FIGURE 8. Secondary electron image in the SEM of the gold mancus of Coenwulf, showing siliceous material in some of the cavities. Scale bar length 200  $\mu\text{m}$



FIGURE 9. Comparative coins: (a) silver penny of Coenwulf, moneyer Oba of Canterbury; and (b) gold solidus of Charlemagne

although the coins do not carry mint signatures. In some cases the identification of the mint comes from the fact that the moneyers concerned also struck coins for other known individuals specific to one kingdom, namely East Anglian or Kentish kings, or the archbishops of Canterbury. In other cases, the moneyers who are otherwise unidentified can be attributed to a particular kingdom because of stylistic similarities with other moneyers who can be identified securely. Minting in Kent was centred on Canterbury, while minting in Mercia appears to have been centred on London [5, 6]. However, the stylistic similarities that have led to identification with particular mints indicate that specific groups of dies came from a common source, rather than that they were all necessarily used for minting in the same place. This distinction is important, because of a peculiarity of the new Coenwulf coin.

The obverse of the coin shows a right-facing stylized Roman imperial diademed bust, with the inscription COENWULF REX M, with a contraction mark over the M, the standard contraction for Merciorum, giving a full inscription 'Coenwulf, king of the Mercians'. The style of both the bust and the inscription places this coin firmly in the Canterbury issues of both Coenwulf and his brother

Cuthred, sub-king of Kent under Coenwulf (798–807) [5].<sup>3</sup> The lettering on the reverse inscription is in the same style and, typically for this period, the reverse design is based around an ornate cross. In this variety, the terminals of the limbs of the cross meet and curve back to the centre, creating the effect of a flower with eight petals. Again, a direct parallel can be found on a Coenwulf penny of the Canterbury moneyer Oba (CM 1854,0621.18: Figure 9a). However, the reverse inscription reads DE VICO LVNDONIAE ('From the vicus of London'). The choice to describe London as a vicus (from the Old English wic, meaning a trading centre) rather than a civitas (city), or simply to give the name of London without further qualification, has direct parallels with a gold solidus of the Frankish ruler Charlemagne (768–814), which bears the inscription VICO DORESTAT (CM G3, FrGC10: Figure 9b). It seems likely that Coenwulf's gold coinage should be interpreted at least in part as a response to the introduction by Charlemagne of a regal coinage in gold, in the wider context of international one-upmanship between rulers [7, 8].

The London mint signature combined with a Canterbury style could be seen as problematic if the stylistic associations are directly associated with minting. A forger

might, for example, have been inspired by the idea of the Charlemagne solidus, but have copied designs from a Canterbury coin. However, if the styles are seen as linked as much with die cutting (which could just as easily have taken place in London as Canterbury) as with actual minting, this ceases to be a problem. The selection of this particular die-cutter to produce dies for the gold coinage may have been entirely random, or may reflect recognition of his skill. The coins with which the mancus can be most closely linked are amongst the most attractive of Coenwulf's silver pennies, and it is likely that it was deliberately planned that the mancus, as a high-status coin, should look as impressive as possible.

## CONCLUSIONS

The microscopic examination of the Coenwulf mancus shows features that are consistent with manufacture by die striking, the expected method of production, in common with all the other Anglo-Saxon gold coins studied. The excellent state of preservation for the coin is unusual as it shows only slight evidence of wear and would have to have been almost as struck when deposited. There is little sign of any recent damage other than a few minor scratches and although this might be explained by the coin having been in a protected environment, such as a container, there is no information on this aspect of the find. In contrast, the comparative examples show more wear, which in at least one case is extensive. The lack of wear on the Coenwulf coin has contributed to the survival of some die preparation features in the form of file marks. These were observed on almost all the comparative coins, albeit less extensively, and generally with similar patterning and dimensions.

The composition of the coin is consistent with other Anglo-Saxon coins of similar date and although of higher gold content than most it is very similar to one of the comparative coins. No definite stress-corrosion cracks were observed, but neither were these evident on the coin of Edward that is closest in composition to the Coenwulf mancus.

The stylistic analysis is also entirely consistent with this being a genuine coin of Coenwulf, struck from dies produced by a die-cutter who normally produced dies for Canterbury moneyers (although not necessarily exclusively).

Furthermore, as a result of this investigation, we are also now better informed about the composition and aspects of the manufacture of the other comparable coins in the British Museum collection.

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## NOTES

1. The coin was acquired with the generous assistance of the National Heritage Memorial Fund, the Art Fund, the Goldsmiths' Company Charity, the British Museum Friends and a number of private donations.
2. Further details of these coins, together with an eighth (a gold mancus of Edward the Elder in the Musée Cantonal, Lausanne), and a more general discussion of the use of gold in England in the period, can be found in [3]. The eight coins will also be discussed further, together with coins of the earlier phase of Anglo-Saxon gold coinage, in [4].
3. For example, there are clear similarities to the dies of Coenwulf 29 and 31 and Cuthred 18 and 22 (between them representing a variety of moneyers) in [5]. The authors are grateful to Stewart Lyon for useful discussion of this point.