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**From the Fabricae of Augustus and the Workshops of Charlemagne: A compositional study of corroded copper-alloy artifacts using hand-held portable XRF**  
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**Citation**

Roxburgh, M. A. (2019, December 3). *From the Fabricae of Augustus and the Workshops of Charlemagne: A compositional study of corroded copper-alloy artifacts using hand-held portable XRF*. Retrieved from <https://hdl.handle.net/1887/81376>

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**Issue Date:** 2019-12-03

## Chapter 5

### **The Cross & the Crucible: The production of Carolingian disc brooches as objects of religious exchange?**

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Published in: *Medieval & Modern Matters*, vol.5 (2016) 117-132.

#### INTRODUCTION

The economic nature of the early medieval world has been the subject of much debate (e.g. Hodges 1982; Pestel and Ulmschneider, 2003; Wickham, 2005; Skre, 2008), with much discussion focusing on the role of elite exchange and long distance trade (e.g. Malinowski, 1922; Pirenne, 1939; Lebecq, 1983). But this study has been considerably restricted as only metal, glass and ceramics tend to survive in the archaeological record, amongst a wide spectrum of goods that must have existed at the time. Luxury goods in particular those destined for elite consumption, have been central to these debates but as Wickham puts it these are not reliable guides to the genuine scale of economic activity in the early middle ages (Wickham 2005, 701), also that non-luxury goods need to be analysed instead and in a different way. The disc brooches of the Carolingian and Ottonian periods fall into this category. These mass-produced goods need to be analysed in a different way if their contribution and role in the early medieval economy is to be understood. The technology behind their production could be studied for example, through the archaeological evidence left by furnaces. But as this evidence is generally missing, the quantities found, and morphological consistency of finished items, can tell us something about the economic scale of production and therefore the likely contribution these items had to the wider economy.

Unlike ceramic studies, which benefit from fairly accurate provenance, this is not the case for metalwork. Provenance studies of copper-alloy artefacts are particularly problematical. Much research in this area has been undertaken without fully understanding the life history of an artefact. The impact that scrap metal recycling has on trace element or lead isotope analysis also presents a serious problem. Scrap metal from several sources, once remelted into a new item can easily lead to a misleading signal (Bray et al. 2015, 1). A different model is needed such as that proposed by Bray et al. whereby the bulk composition of the alloys become the central focus. These alloys can be considered as 'streams' of metal available to the craftsman. An object; such as a brooch is made by removing a small amount of alloy from a 'stream', which when cast, cooled and shaped, becomes an item for personal use or exchange. Different streams co-existed in early medieval production, such as bronze, brass or leaded mixtures of the two and some streams were reserved for different types of objects, such as gold and silver for more elite items. But if an item reenters a stream of metal as scrap, perhaps many years

later, its original alloy composition and especially a provenance signal will be much diluted by the composition of the stream it is entering, which is itself under the constant influence of the levels of raw versus recycled metals entering it. An exception to this provenance issue is for coins, which bear mint-marks. These marks are well understood and can be accurately provenanced (Wickham 2005, 702), but this is not the case for brooches, whose value in economic terms is less clear. A combined interpretation is necessary, incorporating new compositional evidence, allowing us to examine brooches and the relation between gift and commodity in, as Theuvs suggests (2004, 132), a Christian imaginary world.

In this article, aspects of the production and economic exchange of Carolingian/Ottonian disc brooches are examined through a compositional analysis of 281 brooches selected from collections across The Netherlands, 133 of which were also measured dimensionally. The areas (see fig. 1) from which they were recovered were: 1. Nijmegen 2. Friesland 3. Groningen 4. Naarden 5. Zeeland.

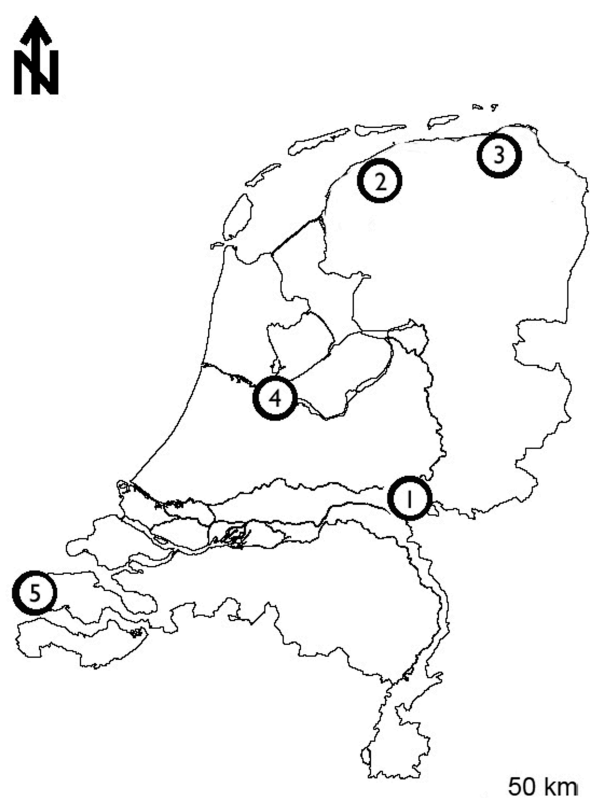


Fig. 1 Find areas for the brooches in this study.

#### THEORETICAL ORIENTATION

In an attempt to model early medieval craft production the Flemish historian Verhulst suggested that artisan activities were mainly located around abbeys, royal courts, large estates and urban centres, with the addition of a small proportion of travelling

artisans, perhaps less regulated than those living within more static environments (Verhulst 2002, 72). The exact nature of these craft activities and the social position of the artisans who produced them is still attracting some debate. However, different organisational structures for artisan activities must have existed. Söderberg, a Swedish archaeologist and craftsman (Söderberg 2004, 8) also attempted a classification for copper-alloy craft activities by differentiating between casting at, or by:

- a) Royal centres, possibly with craftsmen engaged as bondsmen.
- b) Super-regional, permanent workshops, with the products destined for periodic markets.
- c) Permanent administered urban production sites, such as Emporia, e.g. Dorestad and Hamwic,
- d) Infrequently used primitive workshops, making socially determined goods and exhibiting little experimentation.
- e) Merchants, whilst travelling, producing simple ingots and weights.
- f) Domestic households, nonprofessional, including simple jewellery and repairs.

The technology and artisanal skill required to mass-produce disc brooches can be compared to these theoretical workshop models. Artisans are frequently able to choose the raw materials involved and in the quantities required to repeatedly produce the artefacts that they are skilled at making. Typological evidence in terms of morphological consistency can also be combined with a comparison of alloy choice. Consistency (or otherwise) when studied over wide geographic areas, can suggest how standardised production was in terms of intentional choice (Martinón-Torres et al. 2012, 536). The level of standardisation present therefore, can then be modeled conceptually against Söderberg's organisational structures and subsequently something can be suggested about how brooch production interacted within the wider Carolingian economy.

## MATERIAL & METHODS

### Material

Disc brooches are one of the most frequent metal finds of the Carolingian/Ottonian period and much work has been undertaken to produce detailed typologies (Frick, 1992; Bergman, 1999; Bos, 2006). 10 Disc brooches make their first appearance in the Roman period and the shape continues to be popular in the Merovingian period as well, especially silvered and gilded, garnet and filigree decorated types commonly found in furnished graves from this time. Over a hundred types have already been

classified for the Carolingian/Ottonian period by Frick and by Bos in particular. Bos's groups 2.5 (types with one or more crosses) and 2.7 (types with human and animal figures) are the subjects of this paper as they are decorated with overt Christian motifs (Crosses, Saints, Christ figures).

Other Carolingian/Ottonian period groups such as 2.3, 2.4 (stars), 2.7.2 and 2.6 (Pseudo Coin types) may also have carried a Christian message - perhaps in terms of references to Christ, or heaven. It is possible therefore that a greater proportion of the brooches from this period carried Christian messages. However as this is still uncertain we chose to focus on those groups bearing more recognised Christian motifs. These groups were also chosen because of their high find frequency, which was necessary for the approach deployed in this research. The groups that concern us (fig. 2 for examples) are those found to primarily date between the 8th and 10th centuries but with a gradual dwindling off of certain types lasting until the 12th century (Bos 2006a, 709).

### Morphological method

The overall diameter and the thickness of the brooches were measured with a plastic vernier calliper once the brooch had been passed through the HH-XRF device. One aspect of being granted access to these brooches was that the research would be non destructive. This meant that any measurements taken would be on uncleaned artefacts, where varying degrees of corrosion existed. Taking into account wear during use, post depositional corrosion and the unknown dimensional standards employed by the artisans in production; measurements were recorded to the nearest 0.5 millimetre. Manufacturing accuracy beyond this was deemed unlikely.

### Compositional method

A single Niton XL3t GOLDD XRF analyser was used for the compositional study. These machines are factory calibrated with standards for metals and alloys and the electronic metals mode was selected and used throughout the data gathering phase. The advantage of this mode is that the same metals are used (Cu, Sn, Ag, Zn, Au) in modern electronic equipment, or are marked as potential hazardous materials (Pb, Hg, As, Se) as can be found in medieval alloys. In the field the analyser was mounted on a lead covered portable test bench to provide a consistent operating environment and protecting the user from radiation. After testing with longer measuring times, the signal was found to be stable after a reading time of 35 seconds, so this was deemed sufficient to determine an elemental count of 10ppm for most elements. Two spectrum readings per 35 second interval were taken, the first for the main range of elements at 50kV (Cu-K to Ba-K, and Au-L to Pb-L) and the second for the low range at 10kV (Al-K to Cu-K). After the analyses, the spectra were checked for inconsistencies.

An external normalization of the completed dataset in Microsoft Excel™ was undertaken which corrected for the contribution of the light elements that would be

present due to contamination from soil residues (such as sand, clay and iron hydroxides). The elemental concentrations of the alloying elements were normalised on a light elements (Si-Fe) free basis. In the present paper, only the main alloying elements (Cu, Sn, Zn,Pb) are considered. The factory calibration of the device was checked against the CHARM copper-alloy reference set (See fig. 3 and Heginbotham et al. 2014). Further bias introduced by corrosion effects were also evaluated by comparison to studies by Fernandes et al. on corroded Roman finds (Fernandes et al. 2013).

#### Interpretation of compositional data

The classification scheme developed by Bayley and Butcher for their compositional study of Roman brooches was adopted here (Bayley and Butcher 2004, 24). They used ternary graphs to visualise three variable groupings. In this case (see fig. 3) the three main alloying elements in copper-alloy; tin (Sn), zinc (Zn) and lead (Pb). The names given to the areas of the graph are of course associated with terminology employed in modern metallurgy.

It is important to understand however, that ancient names and their corresponding alloy ratios are less well understood (Bayley and Butcher 2004, 14). Any attempt to apply modern borders to these classifications would less likely represent historical boundaries laid down by ancient craftsmen. But by visualising large numbers of measurements this way reveals patterning that better reflects historical boundaries and therefore technical choice. The results below are presented with this in mind.

To enable a better comparison of the results below, two Merovingian brooches are included here (fig. 4). Bos type 2.11.1 is a Cross-shaped brooch (Bos 2006a, 779), the other is the Bos 1.1 'Domburg' type, with kidney shaped terminals (Bos 2006, 459). These results are typical of Merovingian alloys (Roxburgh et al. 2014, 24), which appear to be a continuation of late Roman compositional choice seen in crossbow, and supporting arm brooches (Roxburgh et al. 2017, 187, fig. 5.3.21 and fig. 5.3.23). These diagrams show deliberate use of tin and lead to produce brooches in leaded bronze.



Fig. 2 Carolingian/Ottonian period disc brooches bearing Christian motifs (drawn by author)

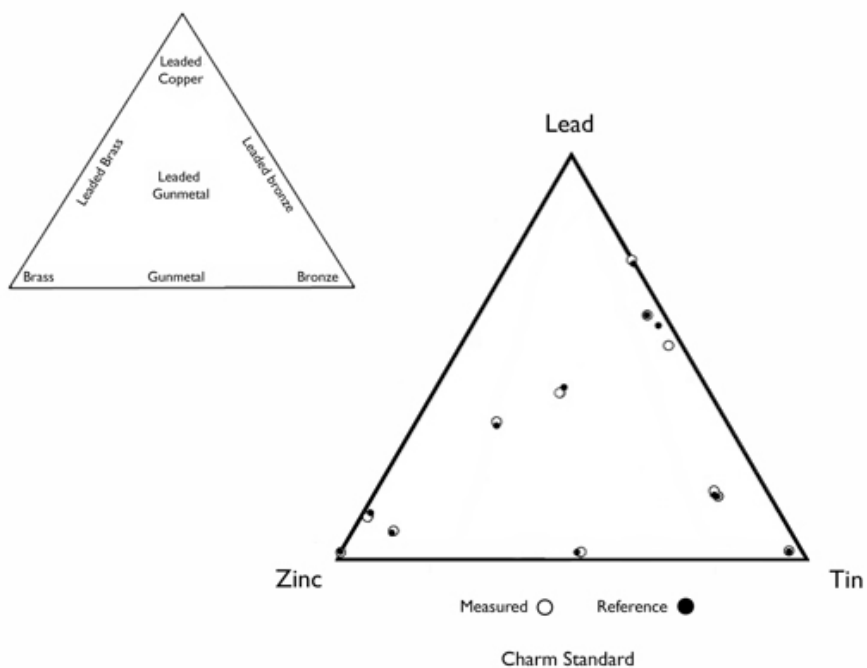


Fig. 3 Ternary graphs showing compositional classifications (after Bayley and Butcher 2004, 24) and measurement bias compared to CHARM standard (drawn by author).



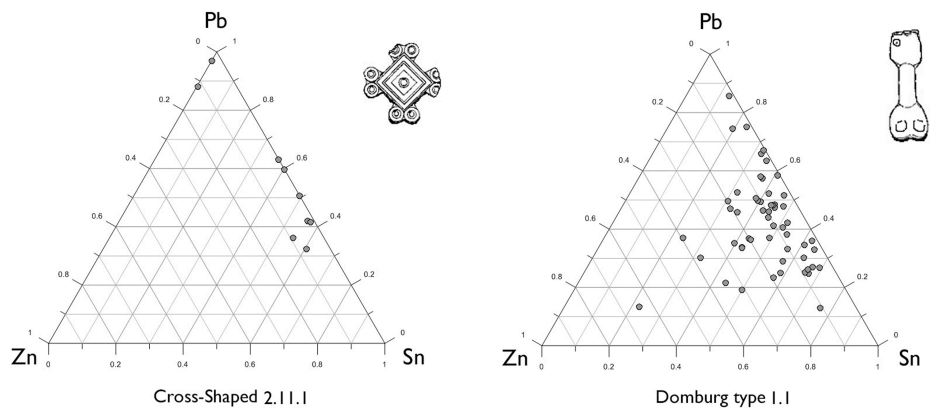


Fig. 4. Ternary graphs showing compositional ratios of Merovingian brooches.

## RESULTS

Of the brooches included in the dimensional study, 36 were constructed using the Cloisonné technique with the remainder being cast. All brooches were enameled, with the exception of the 6 examples of Bos type 2.7.2.2. The measurement of both thickness and diameter was relatively straightforward with the exception of Bos type 2.7.2.2 where corrosion and variable edge decoration made the measurement of thickness unreliable.

Type	Construction	Enamel	Description	Thickness (mm)				n.
				Max.	Min.	Average	StDev	
2.5.1.1	Cloisonné	Yes	Cross	3.5	1.5	2.7	0.7	24
2.5.1.8	Cloisonné	Yes	Cross	3.5	2	2.7	0.6	5
2.5.1.7	Cloisonné	Yes	Cross	3	2	2.7	0.4	7
2.5.1.1	Cast	Yes	Cross	3	1.2	1.8	0.4	26
2.5.1.14	Cast	Yes	Cross	2	1	1.7	0.4	9
2.5.1.6	Cast	Yes	Cross	2	1	1.4	0.4	10
2.5.1.5	Cast	Yes	Cross	2.5	1	1.7	0.5	6
2.5.3.1	Cast	Yes	Cross	1.5	1	1.3	0.3	8
2.5.1.30	Cast	Yes	Cross	3	1	1.5	0.6	10
2.5.2.3	Cast	Yes	Cross	2	1	1.2	0.3	13
2.7.1.2	Cast	Yes	Saint	3	1	1.8	0.5	9
2.7.2.2	Cast	No	Head of Christ	n/a	n/a	n/a	n/a	6

Table 1 Thickness.

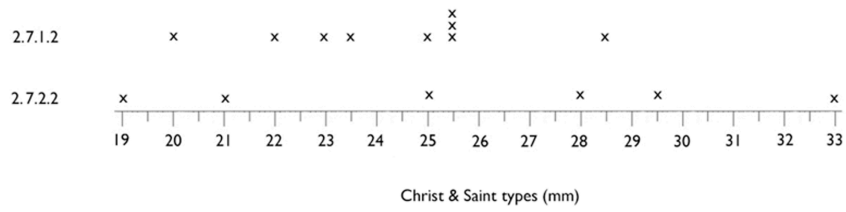


Table 2 Diameter of types displaying human images.

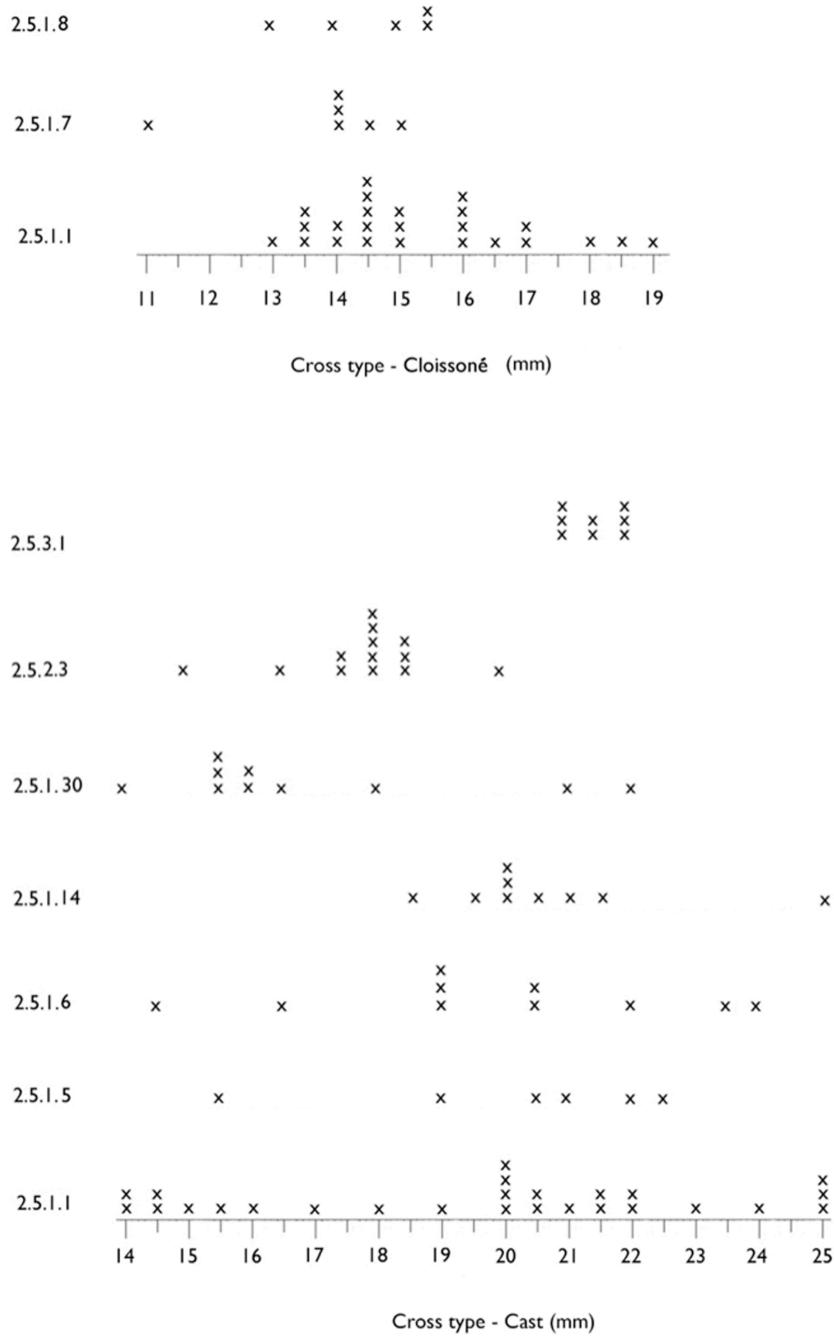


Table 3 Diameter of types displaying crosses

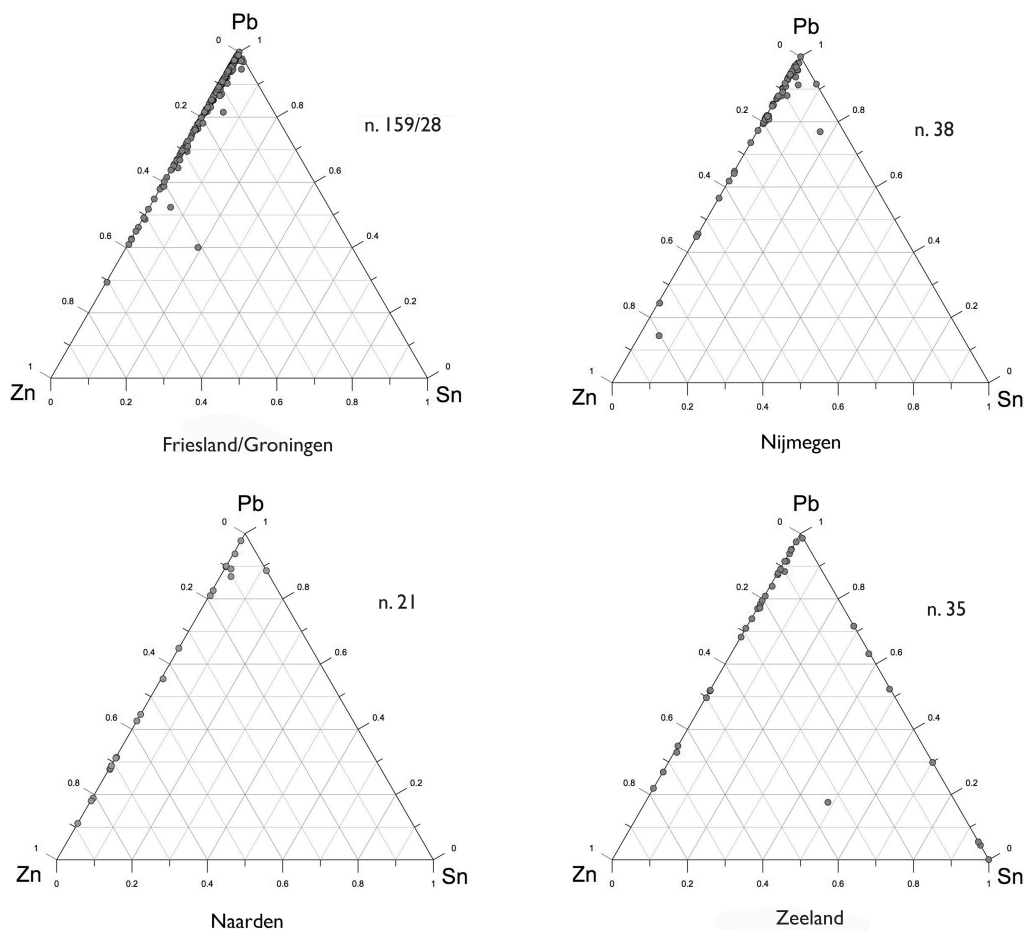


Fig. 5 Ternary graphs showing compositional ratios for Carolingian/Ottonian disc brooches.

## DISCUSSION

### Morphological similarities

The 36 brooches manufactured using the Cloisonné technique were found to have an average thickness of 2.7mm (see table1), with a standard deviation of less than 1, suggesting that the craftsmen were aiming for a thickness of around 3mm for these brooch types. Conversely the 82 cross types using the cast cell technique, were thinner with an average around 1.5mm. The standard deviation across these brooch types was approximately 0.5, indicating very little deviation from the average values. The difference in thickness between the two groups could be explained by the enameling techniques employed. The Cloisonné technique requires a deeper dish in

order to place the wire cell dividers into it. Subsequently the amount of enamel laid into these cells is proportionally deep. The cast technique creates much shallower cells, which trap a much shallower pool of enamel. The thickness of the 9 saint type brooches appears to conform to the same standards as the cross type brooches. This is not surprising as they both use the cast cell technique for enameling.

Brooches could have easily been made with thicknesses beyond that which were necessary to take the enamel and variation in this thickness would have been invisible when viewed from the decorative front. This consistency of thickness measured on both techniques suggests therefore a good level of control.

The diameters of the brooches require a little more interpretation. The Cloisonné brooches display the least deviation. Of the 36 brooches, 72% of them fell between 13.5 and 16 mm (see table 3), indicating a preference for a diameter around 15mm. The measurements of the cast technique brooches revealed a variety of preferred diameters with groupings around 22, 20, 18 and 16 mm. The Saint and Head of Christ types displayed the widest range of diameters (see table 2). The Saints type varied between 20 and 28.5mm with a slight preference for 25mm. The Head of Christ type displayed values between 19 and 33mm with no preferred diameter apparent at all. This type would have presumably been the easiest to make, as they were not enameled. Maintaining a standard diameter for this type was certainly less important than it was for many of the cross types.

All these different diameters could have been related to fashion rather than technical limitations. Diameter could also have varied over time, or perhaps was linked to individual workshops, working to different dimensional standards. The grouping around preferred diameters does seem to indicate a degree of standardization, but this dimension is not as closely controlled as that for the thicknesses.

### Compositional similarities

All of the brooches in the study were measured with the HH-XRF device and the results in Fig. 5 show a sharp deviation from the alloys seen in brooches from earlier periods (see fig. 4). The alloy consists of a mixture of copper, zinc and lead, but no tin. If recycling practices were present in the making of these brooches, then you might expect an element of tin to enter the mixture, as bronze items such as the Merovingian period brooches entered the alloy recycling stream. But this appears not to be the case. The new Carolingian/Ottonian period alloy can be classified by the scheme in fig. 3 as being made of leaded brass or leaded copper (but still with a small proportion of brass). What is more interesting is that the choice of alloy ratio is standard for brooches found across the whole of the geographic area, with one exception. At Domburg in Zeeland a small number of the cast, cross type brooches appear to have been made in bronze, or leaded bronze, like those from the earlier tradition. This difference in alloy choice deviates from the alloy chosen for the 125 other brooches in this study. It could suggest copying, perhaps at a different place of manufacture, a temporary shortage in the preferred alloying ingredients, or even

another source of production out side of the study area. That said, the evidence points to the adoption of a standard alloy for brooches from the Carolingian period onwards.

### Workshop organisation

The results of the compositional study indicated a consistent alloy choice over a large geographic area. The morphological inspection also demonstrated a fairly reasonable control in terms of size and overall craftsmanship. Therefore an hypothesis can be formed by comparing the results to the workshop models presented earlier.

Söderberg's model for domestic household production (f), has to be discarded, as both the skill level and the technology would not be available to consistently produce enameled brooches in a domestic setting. Infrequently used primitive workshops (d) also present a problem in terms of the consistency seen in the results. Brooches could be mass produced in infrequent batches, but you would expect more variation in the finished quality in a primitive setting, as semiskilled artisans copied existing pieces to fulfil a social demand. Also the technology is unlikely to have been available under primitive workshop conditions. Moreover, as the composition shows that alloys were the same over a large area, this points to a centralised input of raw materials. Infrequent batches would more likely show a greater variation in composition.

Casting by merchants (e) is also unlikely. The skill level required to produce these brooches would not lend itself to being learned by travelling merchants. It is also very unlikely that the technology (including casting and enameling) was mobile enough to opportunistically manufacture brooches as the merchant travelled. Also you might expect more recycled material to enter the alloy flow, as a merchant was tempted to reuse traded metal.

All of the previous options can also be discounted when you consider the symbolic nature of the motifs carried on the brooches. A feature of the churches role in the early medieval west was its increasing involvement in politics, whereby religious authority was increasingly overtaking that of the Royal elite (De Jong 2009, 243). It is less likely therefore that all craftsmen at this time, regardless of position or status would be free to mass-produce items bearing religious images. These brooches could well have been produced widely for more secular reasons, for sale at local markets or for commercial gain, but an option that needs consideration is that the ecclesiastical elite controlled these images to some degree; especially in the way they promoted the churches political ambitions.

Royal centres (a), would have had access to the correct skills and technology and could well have possessed the authority to produce religious images. We interpret royal production in this instance as having a preoccupation for production for the elite, such as the casting of the solid bronze doors at the Palace Chapel in Aachen (Schutz 2004, 386). Therefore, this option seems less likely. Brooches with 'Emperor's' images do exist as a category among the Carolingian/Ottonian, disc

brooches. E.g. Bos' group 2.6 the pseudo-coin brooches. This category appears to be inspired by gold coins from the reigns of Chlotarius II and later Louis the Pious and therefore may reasonably be linked to the copying earlier coin types (Bos 2006, 755). But how closely associated these pseudo-coin brooches are to coin production or their motifs to royal patronage, remains unclear. They could still for example have carried a degree of Christian meaning.

Permanent administered urban production sites such as emporia (c) provide a possible solution. The technology and skills required to mass-produce enameled brooches could be available under this model. However the evidence for religious involvement at emporia appears to be limited and again would the religious elite allow secular mass production of items bearing the Christian message (Hodges 2004, 138), if they were not directly benefiting from it? The Church could of course had them made at an emporia on their behalf, although it begs the question why would they not use their own monastic workshops where production, both in an economic and spiritual sense, could be controlled?

Production at Super-Regional permanent workshops (b) appears to offer the most likely solution. The consistency in alloy choice, skill and technology levels required to mass-produce these items would have needed cross craft interaction especially in terms of glass, ceramic and tool production, entangled within a broader social structure, to maintain the artisans at a consistent skill level (Shimada, 2007). This organisation of production is very likely to have stretched over several generations and knowledge to maintain this craft would most likely to have transferred via apprenticeship or parental teaching (Tehrani and Ried, 2008). At a time when artisan production was centralising on the great abbeys this model seems the most likely fit for enameled disc brooches (Lebecq 2000, 129-133). The overtly Christian messages also point to permanent monastic workshops. How super-regional these workshops were remains to be seen, as the archaeological evidence is still elusive. High levels of communication between many monastic workshops over wide geographic distances could make it possible for technical standards to be maintained between distant groups. Ecclesiastical maintenance of tradition could then be responsible for the consistent morphological and compositional standards over several generations of craftsmen. Alternatively, production could have been centred at one or two super-regional centres specialising in these items. Brooches are small and easily portable so many thousands could have been produced and then transported to other central places (including other monastic centres) for further distribution.

Production at emporia or monastic workshops?

The most likely source of production for these brooches appears to be at superregional permanent workshops. Certainly the use of Christian symbolism on these items would suggest a link to monastic production at the large abbeys.

But emporia could have provided the permanent workshops needed for brooch production as well, however this is far less likely. The archaeological evidence for

metal production at Dorestad for example is elusive (Van Es 1990, 173-175), as is the case for Medemblik (Besteman 1974). As suggested by Theuvs the function of emporia could have been more dominated by 'cross-cultural' exchange rather than of production (Theuvs 2004, 134).

The "separate" nature of emporia therefore places them on the edge of Latin Christendom, acting as communications centres between the Christian and pagan spheres of exchange. The production of disc brooches at emporia would be anchored in the profane sector of society, with goods destined for open market, perhaps destined for pagan lands. These disc brooches are found within the Christian sphere of influence therefore unlikely to have been an item created for export.

Monasteries in contrast were primarily cult places, where business in terms of production and subsequent exchange was a secondary affair (Theuvs 2004, 135). This exchange was firmly anchored in a Christian imaginary world, a world where brooches carrying Christian symbols could have engaged in a different reciprocal arrangement than those distributed from the emporia. Whilst the secular nature of emporia is attested by numerous discussions surrounding a large number of archaeological excavations (E.g. Brisbane 1988; Besteman 1974; Van Es and Verwers 1980; Lebecq 1995; Loveluck and Tys 2006), the archaeological evidence for monastic workshops remains elusive.

There is some archaeological evidence for metal production within monastic centres such as Fulda and St Denis (Henning 2005, 17-18), but the only monastery dating to this period to have received detailed archaeological study, is the Benedictine monastery at Vincenzo al Volturno, Italy. The permanent workshops discovered during the excavation were found to be an integrated part of the monastic complex, situated close to the main cult area dedicated to St. Vincent, as opposed to being housed somewhat further away, perhaps in the vicus (Hodges 2004, 138). Therefore production seems to have been strategically placed well within the cosmological environment of the monastic precinct. The excavations in this area demonstrated mixed craft activities where artisans engaged in metalworking, glass production, enamelling, bone and ivory carving. The organisation of these craft activities being comparable to those described by the 12th century Benedictine monk, Theophilus in his book *De Divers Artibus* (Hodges 2004, 140). Lebecq suggests that production at monasteries was quite specialised (Lebecq 2000, 131), especially in coastal regions, in order to exploit local conditions. Such as salt production and livestock rearing at monastic estates in Zeeland. This suggests that the workshops producing brooches could have been at a fewer select specialist monastic sites, possibly situated in the Frankish hinterland some distance away from the coastal areas of Magna Frisia. This again supports a super-regional model serving a larger geographic area.

Wherever these workshops were situated, the activities appear to have all the ingredients necessary to produce items enriched with religious meaning, located in an environment where social power as Härke suggests is created through an interconnectivity of symbols and ritual acts (Härke 2000, 377). The manufacture of objects imbued with ritual and symbolic meaning could therefore serve in a system of exchange that generates or maintains the social hierarchy. Production therefore is

much more likely to have taken place in a permanent monastic workshop where imaginary value could be added, rather than at the more secular emporia.

Exchange between Church and peasantry in the Christian imaginary world.

Before the 9th century peasant society was relatively free and autonomous. But as more and more land slipped into private ownership the peasantry became increasingly 'caged' as Wickham puts it by the power of the church and aristocracy (Wickham 2009, 956). Throughout Carolingian Europe ownership of property shifted away from peasant landowners into the hands of local lords. More and more, peasants became dependent, rent paying tenants, with an increasing obligation in terms of services to their aristocratic or ecclesiastical Landlords.

Land was increasingly donated to the church by peasant farmers; in a reciprocal arrangement where the value of the exchange as Theuws puts it (Theuws 2004, 135), was anchored in a different imaginary world. 'Gifts for the soul' where the reward is received many times over in heaven, perhaps including acts of prayer on earth by the professional clergy (Wickham 2009, 956), represents an exchange system that is clearly different from one of strict economic value. The selling of commodities whether they were surplus or deliberately created for local markets, requires a different socioeconomic relationship than exchange operated through reciprocity (Wickham 2005, 697). The extraction of surplus from the peasant tenant, by the church in the form of rent, would likely include an element of reciprocity involving the imaginary world. Power is created in this situation over the peasant tenant. Godelier distinguishes between inalienable objects and alienable goods in developing Weiner's thoughts on cosmological authentication (Godelier 1999 (1996), 90, 94-95,100-1). In this case the alienable goods are the surplus, in terms of rents being extracted by the church, whereas the reciprocity, given perhaps in the form of prayers would form an inalienable bond with the religious institution. As suggested by Rosenwein (1989, 138), this could have been an exchange system between heaven and earth, from God to men and vice versa. The inalienable elements of this exchange system, therefore contributing to Wickham's 'caging' of the tenant peasantry.

But peasants needed to undertake transactions for alienable goods as well. Those engaging in agrarian farming would attempt to produce as varied a range of foodstuffs as possible, a survival strategy common in all societies. Pastoralists, in all known societies, exchanged surpluses of wool, leather, meat and cheese, with agrarian producers (Wickham 2005, 698).

However any of these surpluses could be exchanged for other foodstuffs or various artisanal products including clothing, ceramic vessels, metal and wooden utensils and tools. Exchange of this nature could have been with the relevant local craft specialists, from wandering pedlars or from local or periodic markets.<sup>44</sup> Artisanal products of this type would likely to have had an hierarchy of exchange linked to the complexity of their production. In peasant spheres of exchange, it would be easy to assume that foodstuffs, clothing and essential tools would have had a



greater day to day priority than the acquisition of a brooch. However it could also be possible that owning a brooch was a necessity, needed to fulfil certain social relations. Therefore demand for this type of artisan product could have been higher, especially if the need was driven by cosmological authentication.

The peasant populations of the Frankish and Frisian coastal and riverine areas may have engaged in various pastoral and agrarian exchange systems, but their requirements in terms of metal goods would have brought them increasingly into contact with artisan production from monastic centres. Whether the peasants in question were dependant peoples, 'trader farmers' (Hodges 1982, 88), or merchants engaged in large-scale trade (Lebecq 1992), to them a brooch could remain alienable, if it remained a profane functional dress accessory. But if the source of brooches carrying a Christian message (those bearing crosses, saints and Christ motifs) was known either by the peasant or the merchant, to be from the Christian imaginary world of the great abbeys, their value would likely to be enriched with additional religious meaning.

Documentary records show that the Abbeys at Fulda and Warden received numerous donations by devoted Frisians during the 8th and 9th Centuries (Lebecq 2000, 132). But rather than donations of land, they took the form of large quantities of cloth mainly as payment of annual rents. If brooch production and their subsequent involvement in transactions, be they as commodities or gifts (Gregory 1982, 71), was located at these large monastic centres, the activities were situated a good distance from the Frisian coastal homelands. Periodic markets such as those described as taking place at the abbey of Saint Denis (Lebecq 2000), allowed visiting Frisians to participate in exchange activities at cult places (Theuws 2004, 129). These activities were likely therefore to have taken place within a Christian sphere of influence, where ritual and political acts formed an integral part of the transaction. Transactions that included the receipt of a disc brooch, bearing a Christian message in terms of a cross, saint or Christ motif would have re-enforced the relationship between the individual and the Church. The brooch in this context would become inalienable to the owner, reinforcing the hierarchy between the powerful ecclesiastical elite and those below it. The owner a brooch from this inalienable transaction could also benefit socially when returning to Frisia. The display of a brooch, imbued with 'cosmological authentication' (Theuws 2004, 129), would further serve to equalise or generate a new hierarchy amongst social groups who were not free to undertake the journey. This could in turn create a desire for those able, to undertake the same journey and just as pilgrims in the middle ages sought to possess pilgrim badges, more people would undertake the journey in order to return with a prestige object, not because of its material value but of its immaterial worth; a value that enabled a shift in social hierarchy based on events firmly embedded in the Christian imaginary world.

## CONCLUSION

This article presents a combined study of the morphological and compositional characteristics of 133 Carolingian/Ottonian disc brooches, bearing overt Christian motifs. The aim was to assess the degree of consistency present in these brooches recovered from across a wide geographic area. Then to form an hypothesis of how production was organised based on suggested models for this period. Once done, their place in the early medieval economy could be more readily understood.

The results indicated a high level of consistency in alloy choice and to a lesser extent in morphological characteristics. This consistency, when compared to organisational models for the time, rules out production by travelling merchants or in primitive or domestic settings. It suggests that production was organised on a regional or even super regional scale. An analysis of production at royal estates, emporia and the great abbeys found the latter to be the most likely source of these objects. Furthermore, the Christian nature of these brooches, if produced within monastic centres such as the great Benedictine monastery at Vincenzo al Volturno, would imbue them with religious meaning and allow for a fresh interpretation of their methods of exchange. An exchange system is proposed that takes us beyond secular, social and economic values to a world of reciprocity between the Church and its congregation. Linking production to the Christian imaginary world, these small, mass-produced brooches may have served to reinforce the social hierarchy between the powerful ecclesiastical elite and the individual. This model of exchange brings us closer to the essence of the early medieval Christian world, at a time when peasant society was increasingly becoming 'caged', as dependant, rent paying tenants of aristocratic and ecclesiastical landlords.

## REFERENCES

- Bayley, J. and S. Butcher, 2004. *Roman brooches in Britain: A technological and typological study based on the Richborough collection*. London: Society of Antiquaries
- Bergmann, R., 1999. Karolingischottonische Fibeln aus Westfalen. In: C. Stiegemann, M. Wemhoff (eds), *Kunst und Kultur der Karolingerzeit. Beiträge zum Katalog der Ausstellung Paderborn*. Mainz: Phillip von Zabern.
- Besteman, J. C., 1974. Carolingian Medemblik. *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 24, 43-106.
- Bos, J. M., 2006. Medieval brooches from the Dutch province of Friesland (Frisia): a regional perspective on the Wijnaldum brooches, Part I. Small Equal-Armed Brooches. *Palaeohistoria. Acta et communications institute archaeologici universitatis Groninganae* 47/48, 455-477.
- Bos, J. M., 2006a. Medieval brooches from the Dutch province of Friesland (Frisia): a regional perspective on the Wijnaldum brooches, Part II. Disc Brooches.

- Palaeohistoria. Acta et communications institute archaeologici universitatis Groninganae* 47/48, 709–793.
- Bray, P., A. Cuénod, C. Gosden, P. Hommel, R. Lui and A.M. Pollard, 2015, Form and flow: the ‘karmic cycle’ of copper. *Journal of Archaeological Science* 56, 202-209.
- Brisbane, M., 1988. Hamwic (Saxon Southampton): an eighth-century port and production centre. In: R. Hodges and B. Hobley (eds), *The rebirth of Towns in the West AD 700-1050, Council for British Archaeology Research Report 68*. York: Council for British Archaeology, 101-108.
- De Jong, M., 2009. The State of the Church: ecclesia and early medieval state formation. In: W. Pohl, V. Wieser (eds), *Der frühmittelalterliche Staat: Europäische Perspektive Forschungen zur Geschichte des Mittelalters 16*. Vienna: Austrian academy of Sciences Press, 241-255.
- Fernandes, R. and B.J.H. van Os and D.J. Huisman, 2013. The use of hand-held XRF for investigating the composition and corrosion of Roman copper-alloyed artefacts. *Heritage Science* 1, 30.
- Frick, H. J., 1992. Karolingischottonische Scheibenfibeln des nordlichen Formenkreises. In: M. Müller-Wille, K. Schietzel (eds), *Offa:49/50 Berichte und Mitteilungen zur Urgeschichte. Frühgeschichte und Mittelalterarchäologie*, Schleswig-Holstein: Die Landesregierung Schleswig-Holstein, 243 – 409.
- Godelier, M., 1999. *The enigma of the gift*. Chicago: University of Chicago Press.
- Gregory, C., 1982. *Gifts and commodities*. Chicago: University of Chicago Press.
- Härke, H., 2000. The Circulation of Weapons in Anglo-Saxon Society. In: F. Theuvs, J. L. Nelson (eds), *Rituals of power from Late Antiquity to the Early Middle Ages (The Transformation of the Roman World, 8)*. Leiden: Brill, 377-399.
- Henning, J., 2005. Early Medieval Towns: The way of the economy in the Frankish area between dynamism and deceleration 500 -1000AD. In: J. Henning (ed), *Post-Roman Towns, Trade and Settlement in Europe and Byzantium: Heirs of the Roman West (Millennium Studien/Millennium Studies)*. Berlin: De Gruyter, 3 - 40.
- Heginbotham, A., J. Bassett, D., Bourgarit, C. Eveleigh, L. Glinsman, D. Hook, D. Smith, R. J. Speakman, A. Shugar and R. Van Langh, 2015. The copper CHARM set: a new set of certified reference materials for the standardization of quantitative X-ray fluorescence analysis of heritage copper alloys, *Archaeometry* 57(5), 856–868.
- Hodges, R., 1982. Dark Age Economics: The origins of Towns and Trade A.D. 600 1000, *New approaches in archaeology*. London: Duckworth.
- Hodges, R., 2000. *Towns and trade in the age of Charlemagne*. London: Bristol Classical Press.
- Hodges, R., 2004. The cosmology of the early medieval emporia? *Archaeological Dialogues*, 10 (2). 138-144.
- Lebecq, S., 1983. *Marchands et navigateurs frisons du haut Moyen Age: Corpus des sources écrites*. Lille: Presses Univ. Septentrion.

- Lebecq, S., 1992. The Frisian trade in the Dark Ages; a Frisian or a Frankish/Frisian trade? In: A. Carmiggelt (ed), *Rotterdam Papers VII*, 7 - 15.
- Lebecq, S., 1995. L'Emporium Proto-Mé die' val de Walcheren-Domburg: Une mise en perspective. In: J-M. Duvosquel and E. Thoen (eds), *Peasants & Townsman in Medieval Europe—Studia in Honorem Adriaan Verhulst*. Belgisch Centrum voor Landelijke Geschiedenis/Centre Belge d'histoire Rurale 14. Ghent: Snoek-Ducaju, 73–89.
- Lebecq, S., 2000. The role of the Monasteries in the System of Production and Exchange of the Frankish world Between the Seventh and the Ninth Centuries. In I. L. Hansen, C. Wickham (eds), *The Long Eighth Century, The Transformation of the Roman World*, 11. Leiden: Brill, 121 - 148.
- Loveluck, C. and D. Tys, 2006. Coastal societies, exchange and identity along the Channel and southern North Sea shores of Europe, AD 600-1000. *Journal of Maritime Archaeology* 1, 140–169.
- Martinón-Torres, M., X.J. Lee, A. Brevan, Y. Xia, K. Zhao and T. Rehren, T., 2012. Forty thousand arms for a single emperor: from chemical data to the labor organization behind the bronze arrows of the Terracotta Army, *Journal of Archaeological Method and Theory* 21(3), 534–562.
- Malinowsk, B., 1922: *Argonauts of the Western Pacific*. London:Routledge.
- Pestell, T. and K. Ulmschneider, (eds) 2003. *Markets in early medieval Europe: trading and productive sites, 650-850*. Oxford:Windgather.
- Pirenne, H., 1937. Mahomet et Charlemagne, Brussels, trans. as *Mohammed and Charlemagne* (1939). New York: Dover.
- Rosenwine, B. H., 1989. *To Be the Neighbor of Saint Peter: The Social Meaning of Cluny's Property, 909–1049*. New York: Cornell University Press.
- Roxburgh, M. A., H. Huisman and B. van Os, 2014. All change? The end of a metalworking tradition in early medieval Frisia. *De Vrije Fries, Jaarboek uitgegeven door het Koninklijk Fries Genootschap voor geschiedenis en cultuur* 94. Leeuwarden: Fryske Akademy. 19-30.
- Roxburgh, M., S. Heeren, H. Huisman, and B. van Os, 2017. De koperlegeringen van Romeinsefibulae en hunbetekenis. In S. Heeren and L. van der Feijst (eds) *Prehistorische, Romeinse en middeleeuwse fibulae uit de Lage Landen. Beschrijving, analyse en interpretatie van een archeologische vondstcategorie*, Amersfoort: Private Press, 243–258.
- Schutz, H., 2004. The Carolingians in Central Europe, Their History, Arts and Architecture: A Cultural History of Central Europe, 750-900. *Cultures, beliefs & traditions: Medieval & early modern peoples* 18. Leiden:Brill.
- Shimada, I. (ed), 2007. *Craft production in complex societies: multicraft and producer perspectives*. Salt Lake City: University of Utah Press.
- Skyre, D., 2008. Post-Substantivist Towns and Trade AD 600-1000. In: D. Skyre (ed), *Means of Exchange. Dealing with Silver in the Viking Age*. Kaupang Excavation Project Publication Series 2. Aarhus:Aarhus University Press. 327-341.
- Söderberg, A., 2004. Metallurgic ceramics as the key to Viking Age workshop

- organisation. *Journal of Nordic Archaeological Sciences* 14, 115-124.
- Tehrani, J. J. and F. Riede, 2008. Towards an archaeology of pedagogy: Learning, teaching and the generation of material culture traditions, *World Archaeology* 40, 316-331.
- Theuvs, F., 2004. Exchange, religion, identity and central places in the early Middle Ages. *Archaeological Dialogues* 10(2). 121-138.
- van Es, W. A. and W. J. H. Verwers, 1980. Excavations at Dorestad 1: The Harbour: Hoogstraat I, *Nederlandse Oudheden* 9. Amersfoort: Rijksdienst voor het Oudheidkundig Bodemonderzoek.
- van Es, W.A., 1990. Dorestad centred. In: J. C. Besteman, J. M. Bos and H.A. Heidinga (eds), *Medieval archaeology in the Netherlands: Studies presented to H.H.van Regteren Altena*. Amersfoort: Rijksdienst voor het Oudheidkundig Bodemonderzoek. 151–182.
- Verhulst, A., 2002. *The Carolingian Economy*. Cambridge: Cambridge University Press.
- Weiner, A.B., 1992. *Inalienable possessions: The paradox of keeping while giving*. Berkeley: University of California Press.
- Wickham, C., 2005. *Framing the Early Middle Ages: Europe and the Mediterranean 400-800*. Oxford: Oxford University Press.
- Wickham, C., 2009. *The Inheritance of Rome: A History of Europe from 400 - 1000AD*. London: Penguin.