

Late Saxon Balances and Weights from England

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DISPERSED REFERENCES to weights and balances in England dating to the late Saxon period (9th to 11th centuries) are collated and assessed. A classification of types is presented, and comparisons drawn with Irish and Scandinavian material.

Few finds of weights and balances are known, but the lists here are likely to be incomplete for several reasons. Identification of an artefact as a weight is not always straightforward, and often made because no other function can be postulated for undiagnostic lead discs. Similarly, complete balances are fragile and rare, and fragments perhaps unidentified. For example, analysis of X-rays of excavation material in Ipswich has revealed a number of balance fragments which have not been conserved and might otherwise have been unnoticed. In other cases, the objects may simply be unpublished in museums. No systematic survey of museums or archaeological units was made in conjunction with this study, although a number were approached.

The contexts in which one might expect to find a balance and weight are limited in late Saxon England. Several early Anglo-Saxon weights and balances are known due to a custom of including these items in graves; with one notable exception, this is not true for the later period. Instead, finds relating to late Saxon England are chance losses, discovered almost entirely in settlement archaeology, especially from ports, or increasingly, metal-detecting activities. Such a pattern of deposition and recovery is unlikely to present a comprehensive or quantifiable picture of use.

The dating of weights and balances is particularly difficult, especially when typological considerations are few. This has led in the past to comparisons without regard to chronology or region. In part this paper is designed to provide a first step towards identifying objects and their characteristic features which have been found in contexts firmly dated to this period within England. Nevertheless, the problem of residual material, including Roman into late Saxon contexts, and late Saxon into medieval contexts, presents some problems.

A further problem arises in finding published material with which to compare the weights and balances. For contemporary finds, only those from Scandinavia are

readily accessible. Weights and balances in these regions (and the Baltic) are frequently found, due to large numbers originally in use in their weight money economy, large-scale excavation programmes and, for some of the period, traditions of inclusion as grave goods. Finds of weights and balances in Scotland and Ireland are also often in Scandinavian contexts, although increasingly, at least in Ireland, an insular tradition can be discerned. The picture is far less clear for Continental use of weights and balances. Few published finds can be cited for this area, although the similar monetary traditions between England and these areas in the late Saxon period suggests comparisons might prove very interesting. Where possible, features of the balances and weights are also compared to Roman and medieval examples, though again few large published works on this material exist.

BALANCES

The only type of balance found thus far in late Saxon England is the hand-held scale from which two scale pans hang, with beam arms of equal length, either fixed or folding. Both forms are long-lived so that a medieval example is little different from a Roman example or indeed a modern apothecary balance.¹ Consequently, constructing typologies is difficult, and dating cannot depend on form alone. When the archaeological context is ambiguous or lacking, examples can only be ascribed to the late Saxon period based on ornamental features sometimes found on the beams or pans.

Roman and medieval steelyards have been found in archaeological contexts in Britain,² but thus far none dating to the Anglo-Saxon period. However, examples are known from a few Viking Age finds in Scandinavia,³ and it is not unlikely that similar were used in England, particularly for weighing heavy commodities. Documentary sources also provide some indication of the different types of balances used in Anglo-Saxon England for which no remains survive. For example Ælfric lists at least five types of balances, some, like a wool-balance, designed for a specific commodity.⁴ Asser's *Life of Alfred* describes the weighing out of wax against pennies.⁵ Weighing scales (*wægepunde*) are also listed as part of the standard equipment the 11th-century reeve should possess.⁶ The term only occurs twice in Old English, and its translation is unclear, perhaps referring to a special type of balance or steelyard.

The number of balances which are in contexts securely datable to this period is very small. Few complete examples have survived, and attribution is often based on fragmentary preservation. A wide range of terminology is often employed when describing the component parts of balances; here terms as noted in Fig. 1 will be used.

Almost all finds are from urban contexts, particularly from East Anglia and York, and may well have been the property of merchants or craftsmen. Finds of balances, however, are also reported from Brandon, Suffolk,⁷ a wealthy rural site, possibly monastic. The balances range from sophisticated to very crude instruments. With the exception of an iron balance from Exeter, all are of bronze or copper alloy. Both folding and non-folding examples are represented, without any apparent

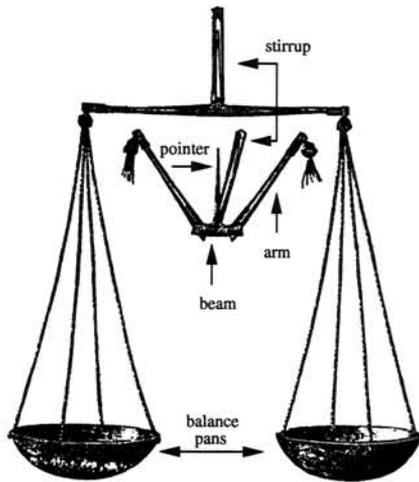


FIG. 1
Balance Terminology (drawing after O. Rygh,
Norske Oldsager)

chronological or geographical preferences. The earliest balances are seven balances or fragments dating to the 9th century from Ipswich, with all other finds in 10th- or 11th-century contexts. Most are small in size, presumably for use in fine weighing. Almost all are unornamented, but have rope mouldings at the ends.

The finds are dominated by Ipswich (Figs. 2-4), in part due to the vigilant eye of John Newman.⁸ At latest count, seven balances or fragments from 9th-century contexts are known, and three from 10th-century contexts. An additional two balances can probably be dated to the late Saxon period, with seven tentatively ascribed to the 11th/12th centuries. Many were found in association with metal-working debris. Other published examples in East Anglia augment this picture, with finds from Norwich,⁹ Great Yarmouth,¹⁰ and Thetford.¹¹

The excavations in York, particularly Coppergate, have produced remains of four copper-alloy balances¹² and two pan fragments¹³ dating to the 10th or 11th centuries. Elsewhere in the north, a late Saxon balance was also found in Beverley, North Humberside.¹⁴ A very different context exists for the balance from a grave under Kildale Church, Yorkshire. Several graves were found below the chancel and north wall of the nave in 1867, accompanied by a number of goods which were later stolen. A richly furnished grave contained, among other things, a sword, spear, pair of tweezers, a wooden bucket frame, and a folding balance with pans, together possibly with the remains of a lead weight. The balance was not recognized as such originally,¹⁵ but was later illustrated and compared to other Viking Age balances.¹⁶ The context of the Kildale burial and the finds strongly suggest a Scandinavian owner, though the burial within the church would imply a local and influential man.¹⁷ Similarly richly furnished graves, with sword and balance, are known in Scandinavia, particularly from Norway,¹⁸ where grave finds contain a large mixture of utilitarian and prestige objects.

Excavations from Lincoln have also produced a number of balances, all unpublished, but dating is problematic, with much residual material. In some cases

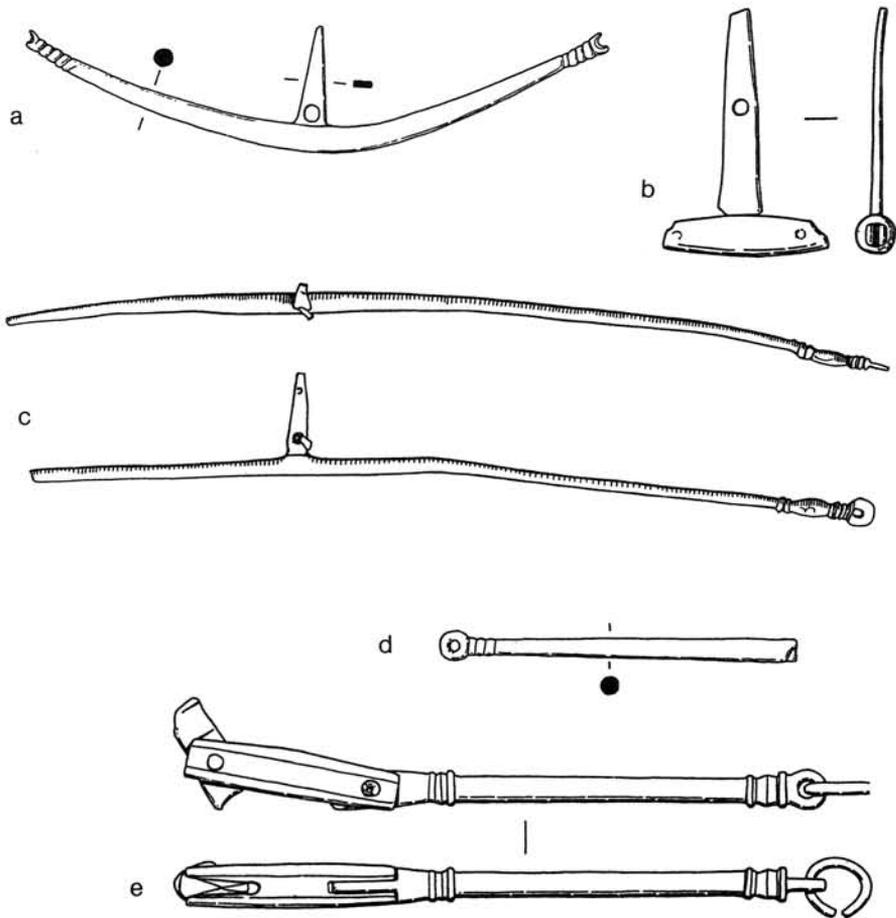


FIG. 2

Ninth-century balances from Ipswich. *a.* 247/3104; *b.* 369/3104; *c.* 63/4601; *d.* 370/3104; *e.* 292/3105.
Scale 1:1

(Donna Wreathall, Suffolk County Council)

where Roman and Saxon finds occur, the balances are more reminiscent of Roman types, whereas in others, where Anglo-Saxon and medieval finds occur together, the balances are without any distinguishing features to allow firm dating.¹⁹ An unpublished example from Northampton dating to the late Saxon period can be augmented by several less-securely dated examples.²⁰

No finds can be dated unambiguously to this period from London, and S. England is poorly represented. No securely dated finds, for example, are reported from Southampton²¹ or Canterbury.²² The extensive excavations at Winchester produced only one fragmentary balance beam dating to this period.²³ An exception in several ways is an ornamented balance dating to the late Saxon period from Exeter, which was found with a thick fragmentary chain (Pl. VI, A).²⁴

COMPARATIVE MATERIAL

Parallels to all the balances in England, with the exception of the Exeter balance, can be found from Scandinavia. Over 60 balances or fragments were known from Viking Age Norwegian finds in 1974,²⁵ over 100 from Sweden in 1984,²⁶ and, although no comprehensive study has been undertaken on the Danish material, over 55 are known from Hedeby alone²⁷ and can be augmented by other scattered references.²⁸

In addition, contemporary balances are known from Europe, especially along the Baltic,²⁹ and Russia.³⁰ Four balances are known from Scotland, three of which are from Scandinavian graves³¹ and one from the 9th-century Pictish Croy, Invernesshire hoard.³² An odd balance, with features harking back to Roman traditions, was found at Ronaldsway in the Isle of Man, and dates to the early Christian period.³³ The excavations of the Scandinavian graves at Kilmainham/Islandbridge, outside Dublin, Ireland, produced four balances, which often provide the earliest parallels to characteristics.³⁴ These can be augmented by a number from recent excavations in Ireland and isolated other examples.³⁵ The Irish examples may be under-represented, since some of the Norwegian examples are thought to be Irish in origin.³⁶

In short, balances were used throughout the north. In areas with a metal weight economy, where all bullion had to be weighed, one would expect a greater use of small balances, as indeed are found in Scandinavia and E. Europe. Such small folding balances must have been a necessary possession of every merchant, but balances were also used by the itinerant smith as well, as shown by graves with balances and other equipment.³⁷

The time is ripe for a re-analysis of much of this material. Earlier studies by Kisch³⁸ are out of date, with many of the datings and historical contexts suspect. Heiko Steuer has taken a broad and thorough look at balances from Roman to the medieval period, providing the major step towards such re-analysis. Nevertheless, comprehensive publications of Roman or medieval balances are lacking, hindering comparisons with the late Saxon material.³⁹ For the Merovingian and early Anglo-Saxon balances more material is accessible, particularly due to the publications of Werner, Steuer and Scull.⁴⁰ Steuer's discussion of the Viking Age balances provides the major study available at present on material of this period. Although he has devised a typology for N. Europe covering six types in this period, only two (Types 2 and 3), for folding balances, are discussed in any depth.⁴¹

CHARACTERISTICS OF BALANCES FOUND IN ENGLAND

The small number and fragmentary state of surviving examples limit the discussion of characteristic features of late Saxon balances. Moreover, as noted above, the balances which form the core of this discussion are liable to be an incomplete sample. Nevertheless, it is useful at this stage to note the range of features current, and parallels where known.

Dating remains the major problem. The discussion here has been limited to balances in securely dated late Saxon contexts, except in the very few cases where ornamentation allows attribution to the late Saxon period.⁴²

FOLDING VS NON-FOLDING BALANCES

Non-folding balances are the main type of balance found before 800. Roman weighing instruments are primarily steelyards, and of the equal-armed balances dated to the Roman period, many incorporate steelyard type principles. Most are non-folding.⁴³ Late Roman and Byzantine examples range from 0.10 to 0.40 m long, with much longer pointers. Merovingian and early Anglo-Saxon examples are usually smaller, with beam lengths around 0.10 to 0.15 m, continuing the Roman equal-armed tradition rather than the new Byzantine innovations. Again, almost all are non-folding.⁴⁴

After a gap in the late 7th and 8th centuries, when balances have not been found in N. Europe, they again appear in both folding and non-folding versions. In Scandinavia, the folding types are far more common in the later Viking Age,⁴⁵ but no such generalizations can be made yet for the English material, due to the smaller number of well-preserved examples. However, the surviving material at present suggests no such chronological difference in the English material, with folding and non-folding appearing together throughout the period. Interestingly, Wallace found that in Dublin non-folding balances were more popular than folding balances in the later Viking period⁴⁶ and the English examples may relate more to Irish Sea preferences.

Steuer's Type 3 balance, a highly accurate folding balance probably imported from Arabic countries from the very end of the 9th century, is represented in the English material by balances from Thetford and Kildale.⁴⁷ This type is characterized by ornamented punched triangles on the beam and arms, with beams *c.* 0.08 to 0.13 m in length, pointers of a different material, and with four strands holding the balance pans (Fig. 1). Imitations of this type of balance probably occurred quite quickly, as evidenced by the production of balances in Hedeby and Birka. Nevertheless, these imitations were not as accurate as the models.⁴⁸

The Type 2 balances appear at the beginning of the 10th century in Norway and the British Isles, particularly Ireland. Although folding, in other design features they relate to the older non-folding balances of Merovingian period, but with a longer beam length (average *c.* 0.18 m), tinned bronze metal, and pans hanging on three strands, often metal chains. Steuer felt these are imperfectly understood imitations of the Type 3 balance, drawing on older traditions.⁴⁹ This type of balance is distinctive, but not overly common despite the attention it has received.

Most of the folding balances from England cannot be associated with either type. In most cases this is due to incomplete preservation. However, in addition to the Thetford and Kildale balances, in seven cases, three from Ipswich, one each from Great Yarmouth, York, Beverley, and Exeter, enough remains survive to indicate different types from Steuer's Type 2 and 3. With the exception of the Exeter balance, all are unornamented and at least four are probably longer than the Type 3, but

shorter than Type 2. One of the Ipswich balances is also early in date, from a 9th-century context.

A study of the non-folding types of this period throughout the north is promised by Steuer.⁵⁰ He noted, however, that many of the non-folding Viking Age balances contain similar construction details to earlier Merovingian and Roman examples.⁵¹

BEAMS AND ARMS

Where complete remains survive or the size can be estimated, the balance beams of late Saxon balances in England are *c.* 0.75 m to 0.16 m long, similar to the Merovingian and early Anglo-Saxon examples. Some late Saxon balances are extremely crude, and no extant examples reflect the Byzantine design. The sizes fall within the range of contemporary parallels. Published Irish examples are in general slightly larger (beams where known range from 0.13 to 0.31 m), but Wallace noted that sizes varied.⁵²

Most of the beams have rope mouldings on the ends of the arms, and in two examples, also near the hinge, sometimes finely articulated. In several examples the mouldings enclose a more bulbous section, producing a capsule-like effect (Fig. 2c). Such mouldings are also common in Roman,⁵³ contemporary,⁵⁴ or medieval examples,⁵⁵ and cannot be used as a distinctive feature.

The arms of the Great Yarmouth, Exeter and probably the Beverley balance end in a more bulbous thickening.⁵⁶ Contemporary parallels are less common, but include the 9th-century Kiloran Bay, Colonsay, Scotland balance which ends in square casings, the Gigha, Scotland balance, two balances from S. Sweden dated to the first half of the 11th century, and Slavic examples from the 9th to 11th centuries.⁵⁷ Similarly, Roman and medieval English balances also have such endings.⁵⁸

A crude 10th- or 11th-century balance from Thetford merely has a hole through the end of the beam, without any ornamentation. It is reminiscent of some of the Merovingian balances⁵⁹ although medieval examples without any articulation on the ends are also known.⁶⁰

A 10th-century arm fragment from Coppergate, York has a polyhedral, ornamented with ring and dot decoration, near the folding hinge.⁶¹ The feature may well indicate Scandinavian or Baltic production or imitation; weights of this form are known from Viking Age contexts in both areas (see below). Polyhedrals are also found on the ends and near the hinges of a large 9th-century Kilmainham/Islandbridge, Ireland balance,⁶² as well as some Scandinavian examples.⁶³ The use of polyhedrals on both the ends of arms and near the hinge was also particularly popular on 11th- to 13th-century Scandinavian and Slavic balances,⁶⁴ and not unknown in medieval England, as shown by a 13th-century example from Winchester.⁶⁵ A slightly less well dated example from Thetford, found with 11th- and 12th-century pottery, also had this feature, together with clearly articulated rope mouldings at the end.⁶⁶ As a result, an unstratified arm from St Peter's Street, Northampton with polyhedrals on the ends and near the hinge⁶⁷ may be late Saxon

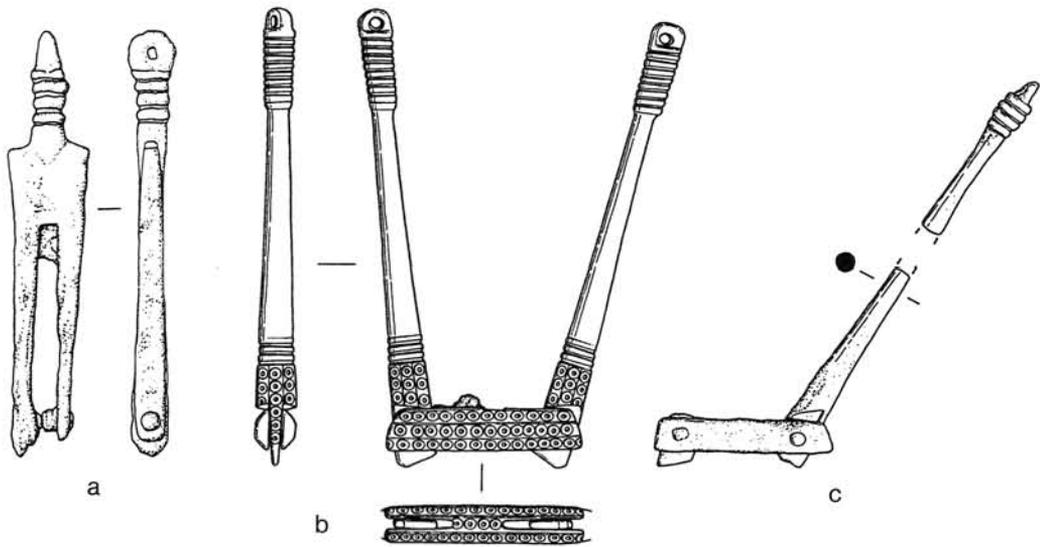


FIG. 3

Tenth-Century balances and stirrup from Ipswich. *a.* 1713/3104; *b.* 360/4801; *c.* 531/3104. Scale 1:1
(Donna Wreathall, Suffolk County Council)

or medieval in date. Kisch also published a Byzantine balance with polyhedrals on the arms, but did not state his dating evidence.⁶⁸

The distinctive decoration of punched triangles on the beams and arms from the Thetford and Kildale balances, allowing attribution to Steuer's Type 3, has been mentioned above. Steuer felt these balances were imported to Scandinavia from the E., arriving with the stream of Arabic coins, and were then carried by Scandinavian merchants to the British Isles.⁶⁹

A variant of this form is a 10th-century balance from Ipswich whose arms and central beam are decorated with fine ring and dot decoration (Fig. 3b).⁷⁰ A folding balance with ring and dot decoration on the beam from Wiltshire was published for no obvious reason as Roman,⁷¹ and it may well date to the late Saxon period. Contemporary parallels include a balance from Norway.⁷² No other English balances have similar decoration on the arms and beams, although such decoration does occur on some stirrups discussed below.

The Exeter balance is ornamented on both the beam end and arms (Pl. VI, A). The beam has three incised lines on each side, with a running S scroll on each. The surviving arm has a variant of the polyhedral ornamentation, where the round section is squared off, and the flat faces ornamented with diamonds enclosing a ring and dot, imitating a polyhedral. In addition, incised lines appear near the hinge. This balance is unique among the late Saxon period, without any contemporary parallels known.

Most of the arms terminate with simple rounded or squared off ends with circular eyes to hold the chains or threads suspending the pans. The Great Yarmouth and Exeter balances are again different, with splayed lozenge-shaped

ends enclosing the eye. This feature can be paralleled in Roman and contemporary balances.⁷³

STIRRUPS

Stirrups survive from several sites, including a late 10th-century example from Norwich,⁷⁴ a 10th-century and probable late Saxon example from Ipswich,⁷⁵ an 11th-century example from Great Yarmouth,⁷⁶ a 10th-century example from York,⁷⁷ and a late Saxon example from Northampton.⁷⁸ The Norwich and Ipswich examples are stirrups only, while the Great Yarmouth and York stirrups are associated with the beams and arms. One of the Ipswich examples is too corroded to identify details. The other stirrup (Fig. 3a) is well preserved and similar to another Ipswich example from an 11th-/12th-century context (Fig. 4d).⁷⁹

The Norwich example is fragmentary and bent, but appears to have been a simple narrow band looped over. The Great Yarmouth stirrup is similar, although the top portion has been shaped to give a definite loop. Similar simple shaped bands are not particularly diagnostic, occurring, for example, from Roman to medieval contexts.⁸⁰

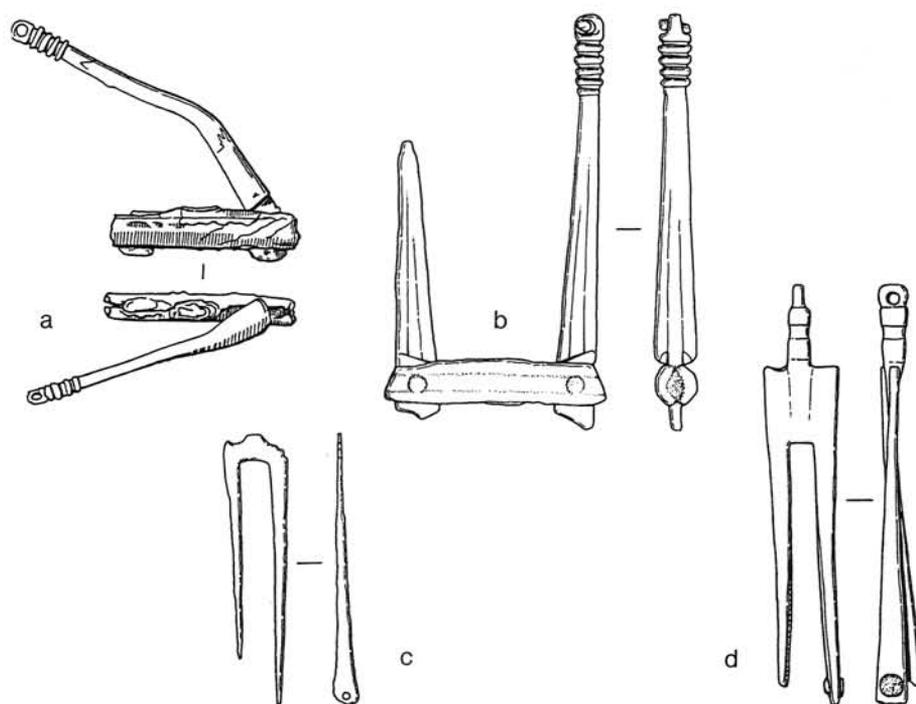


FIG. 4

Early medieval balances and stirrup from Ipswich. *a.* 69/4601; *b.* 21/3201; *c.* 1874/1304; *d.* 452/3104.
Scale 1:1.

(Donna Wreathall, Suffolk County Council)

The remaining examples in good condition, the 10th-century Ipswich (Fig. 3a) and York stirrups, have squared-off shoulders, a thickened upper section and a straight join where the two uprights meet. Both are designed to be suspended; the Ipswich example has a rope moulding leading to the eye, the York example a thickening and flared-out flattened section with an eye. Few published contemporary examples are available for comparison, but the shape is also simple and undiagnostic. One of the Kilmainham/Islandbridge stirrups is similar,⁸¹ as is a stirrup attached to a Steuer Type 3 folding balance from a grave find from Vestre Dolven, Norway (Fig. 1).⁸²

Ornamentation is only discernible on the Norwich stirrup, which has ring and dot decoration along much of the band. Ring and dot ornamentation is common on Viking Age Scandinavian artefacts, and its use on a balance beam and arm from Ipswich has been noted above. It occurs on a stirrup from Kilmainham/Islandbridge, Ireland, a balance with features harking back to Merovingian design.⁸³ However, it cannot be used to characterize Viking Age stirrups, since it is particularly common on medieval stirrups of the 12th and 13th centuries.⁸⁴

POINTERS

The pointer was attached to the centre of the beam, with a hole through which the two uprights of the stirrup was fastened. In some cases the pointer is a separate piece inserted into the beam and often held by a rivet; in other cases it has been constructed as one piece with the beam.

Several beams still have their pointers attached, and considerable variety is evidenced. The lengths are generally small, and the ratio of the pointer length to the total beam is usually less than 1:4, an exception being the Great Yarmouth balance which is approximately 1:3.⁸⁵ The position of the hole through which the stirrup is fastened also varies; in some cases it is very near to the beam, in other cases as much as 0.15 m above (Fig. 2b).

Roman balances were either without pointers, or with short, broad horizontal pieces rarely more than one-tenth of the beam length. Byzantine examples, however, often have a long, very thin pointer whose length is one quarter to one half of the beam length. Although the Merovingian and early Anglo-Saxon balances harked back to the tradition of the Roman rather than the Byzantine balance, a few 7th-century examples with longer pointers and ratios greater than 1:4 are known.⁸⁶ Other contemporary and medieval examples are mixed in their lengths, although the more elaborate medieval examples often have longer pointers.⁸⁷

BALANCE PANS

Balance pans survive from 10th-century contexts in York, a 10th- or 11th-century context from Thetford, and 11th-century contexts from Norwich and Great Yarmouth.⁸⁸ This is probably a gross under-representation since pans are often fragmentary and, if found on their own, difficult to identify. The examples listed above show a number of similarities: they are all small, shallow and round, with

diameters ranging from *c.* 0.30 to 0.35 m, with the exception of the fragmentary Great Yarmouth pans which are even less. Where the number of holes can be determined, all have three holes. Ornamentation can be discerned on the Thetford and one of the York pans, where there are traces of concentric rings.

In only two cases is there any evidence of the means by which the pans hung: a fragment of thread was found with the Great Yarmouth balance,⁸⁹ and a chain survives with the Exeter balance. However, the Exeter balance is again unusual, with the one surviving chain a thick intricate copper alloy chain link (Pl. VI, A). It may have suspended the pans in a similar method as the Jåtten, Norway balance, where a heavy chain was suspended from the arm end to a lower attachment from which the three chains hung.⁹⁰

Roman balance pans are found with three or four holes, although Byzantine examples are known with three. Merovingian and early Anglo-Saxon pans are also generally with three holes.⁹¹ On the other hand Arabic pans from medieval to modern times generally had four holes.⁹² Contemporary examples from Scandinavia are mixed. Steuer noted that his Type 3 balances, the imported folding balances from the Arabic lands, had four holes, whereas the slightly later and larger folding balances manufactured in Scandinavia (his Type 2) had only three holes, from which metal chains hung.⁹³ In general, balances with three holes seem more common.

Few sizes of pans have been published with which to compare the English examples. Of the Norwegian pans published by Jondell, all are larger than the English examples.⁹⁴ However, many of the Dublin pans are of similar size, though some may be medieval in date. Unstratified examples from London, probably medieval in date, also provide parallels.⁹⁵

The ornamentation on the York and Thetford pans is very simple. Other contemporary balances are similar, for example two of the Kilmainham/Islandbridge, Ireland balances,⁹⁶ but little significance should be attached to such simple decoration. Other Scandinavian balances often have rosettes or elaborate geometric decoration, in some cases on tinned pans.⁹⁷

A large, unfinished balance pan was found in a 13th-century context from Northampton, but has been dated to the late Saxon period based on its ornamentation. The hatched patterns on the rim is similar to some of the Norwegian Viking Age examples, including balances of Steuer Type 3, and it is noteworthy that the pan would have had four holes.⁹⁸ If late Saxon in date, its unfinished state raises the possibility that imitations of Type 3 balances were manufactured in England in the late Saxon period.

DISCUSSION

The balances found in England which can be dated to the late Saxon period display considerable diversity, even those from 9th-century contexts. No single tradition or workshop is evident, nor any uniform technology. Their accuracy is likely to have varied considerably.⁹⁹

With the exception of the ornamentation characteristic of Steuer's Type 3 balances and some pans, there are few diagnostic features for balances in the late Saxon period. As a result, the features on most of the English balances in contexts dating to the late Saxon period can be paralleled in earlier or later contexts. This means that for poorly dated finds, there is little at present to allow dating to the late Saxon period, with distinguishing between late Saxon and medieval products almost impossible. Nevertheless, certain preferences are visible, including small sizes of balances, the use of rope mouldings on the ends and small balance pans. Further publication of securely dated examples may in the future refine the picture to some degree, particularly for the more sophisticated examples.

It is also rarely possible with the present knowledge to localize production and ownership of the English balances, with the exception of the Kildale and Thetford ornamentated examples, although local imitation cannot be ruled out. Moreover, place of production does not necessarily imply ethnicity of the owner, given that such portable objects were by definition part of the trading milieu. Future research into diagnostic elements of balances may allow a finer attribution, but with such small numbers in the British Isles, the fragmentary condition of the surviving examples, the longevity of form, and the portability of the objects, determining the ethnicity of the owner and manufacturer will remain problematic.

WEIGHTS

Although more weights than balances are known from late Saxon England, the numbers are still not large (Table 1). Unlike balances, however, some forms of weights can be associated with the late Saxon period alone, and with regional preferences. In the description below, the different forms of weights found in England will be discussed, together with the known parallels.¹⁰⁰

Like the balances, weights are found (generally in sets with balances) in early Anglo-Saxon contexts in the 6th and 7th centuries, after which there is a gap until the 9th century. The early Anglo-Saxon weights tended to be re-used coins, particularly Roman, Byzantine weights, or thin bronze discs, most extremely lightweight.¹⁰¹ None of the late Saxon weights are of these types.

The known late Saxon weights reflect the same Yorkshire and East Anglian distribution shown by the balances. In particular, excavations at Coppergate, York have uncovered a large number of weights, almost doubling the previously known corpus. These weights comprise a large number of forms so that almost every type of weight is represented. Even the four weights found together, and thus possibly part of a set, comprise very different forms: a cylindrical disc, truncated pyramid, flattened cone, and a lead-coated iron plano-convex-shaped weight. A similar diversity was found in Hedeby, where Jankuhn's typology of 22 weights was divided among ten forms.¹⁰²

Although a number of weights were recovered in excavations at Lincoln, problems of dating allow none to be ascribed to the late Saxon period with any certainty; as a result, although several may be late Saxon in date, these weights have

been omitted from the discussion below. Despite the large number of balances found in late Saxon contexts in Ipswich, only three weights (one ambiguous) can be dated securely to this period. Only one published weight from London is late Saxon, although recent unpublished finds from the Vintry area of London may be relevant; unfortunately, most cannot be finely dated at present. Similar problems in dating occur with four recently published weights from Winchester; these are discussed separately below.

I. UNORNAMENTED LEAD WEIGHTS

This category comprises the largest number of weights, with most plain discs, though bun-shaped weights, spheres, truncated pyramids and truncated cones are also known. Most of the English examples are from Coppergate. Other finds include a heavy lead drum-shaped disc from a late 10th- or 11th-century context from Thetford¹⁰³ and a lighter disc from St Neots, Cambridgeshire.¹⁰⁴ A heavy spherical weight from Coppergate is perforated at both ends, and possibly is a fishing weight. The three Ipswich weights dating to the period are all lead, one conical, one pierced disc, and an ambiguous pierced five-sided piece of lead. A 'plug of lead' was found with the balance in the Kildale burial,¹⁰⁵ and may indicate that a weight was also present.

Unornamented lead weights are the hardest to attribute with certainty as weights. The line between plain lead discs used as weights or counters is very difficult to determine. Similarly, perforated lead discs could be either weights or spindle whorls (which are, of course, weights of a kind, but without tight metrological significance). From Coppergate, three thick perforated lead discs may be weights, but they could be spindle whorls; they are included in Table 1 but with reservations.¹⁰⁶ Similarly, a perforated bun-shaped weight dating to the late Saxon period from Northampton¹⁰⁷ and the two Ipswich pierced objects are problematic.

A thorough study of medieval spindle whorls from Bergen, Norway, and isolated references elsewhere to weights of objects identified as Viking Age spindle whorls, both lead and other substances,¹⁰⁸ indicate overlap in the weights of spindle whorls and perforated lead discs. As a result, weight alone will not provide a diagnostic feature. Nevertheless, some of the pierced lead discs are likely to be weights, since lead spindle whorls are not common. Moreover, pierced lead discs are occasionally found in weight sets alongside weights of other forms.¹⁰⁹

Elsewhere lead weights are the most common type of weight, also in a variety of forms. They comprise the majority of the over 200 weights found in Dublin. It is not possible to discuss the Dublin weights in detail since they are as yet unpublished, but Wallace has summarized the results of analysis and indicates a similar diversity of forms as found at Coppergate.¹¹⁰ Similarly, lead weights are very common in Scandinavia, although no single study deals with them as a group. Several typologies have been proposed,¹¹¹ but are hampered by corrosion, lack of precision in manufacture, and the ambiguity of form. Steuer suggested that the variety of forms represents local traditions in their manufacture.¹¹² Wallace has no doubt that most of the Dublin weights were manufactured locally.¹¹³

2. TRUNCATED SPHERES

Five truncated spheres (spheres with opposite poles flat ended)¹¹⁴ with iron cores and copper alloy casings were found at Coppergate in contexts firmly datable to the late Saxon period. In addition, recent excavations on the London waterfront sites have uncovered at least half a dozen such weights. This material is still under evaluation, but derives from contexts from the 10th to the 12th centuries.¹¹⁵ A recent find from Norfolk is without context, but similar to many other late Saxon examples including one from Coppergate.¹¹⁶

These weights represent one of the most common type of Viking Age Scandinavian weight, found also along the Baltic. The form is known from Roman times, spreading to the Arabic world. However these earlier examples are usually of bronze or, in the Roman cases, sometimes of stone or bronze-coated lead,¹¹⁷ whereas the Scandinavian and Baltic examples are generally iron coated by copper alloy.¹¹⁸ Although most weights of this type date to the Viking Age, examples are known from late 11th- and 12th-century contexts in Scandinavia and the Baltic, where many are often deliberately gouged.¹¹⁹ As a result, weights of this form without context are likely, though not certain, to date to the late Saxon period.

The origins of the Scandinavian weights are now thought to derive from the Arabic world, coming to Scandinavia with Arabic coins.¹²⁰ There, like the balances, they were soon copied. In some Scandinavian cases the shaved poles are marked with Arabic script or an imitation.¹²¹ The majority, presumably later, examples have ring and dots on the poles, sometimes linked by lines, generally with the flattened rim outlined by a ring of ring and dots.¹²² The Coppergate examples, where the ornamentation can be discerned, consist of dots linked by lines, in one case forming the 'triskele' figures Brøgger associates with öre weights;¹²³ the Norfolk weight also has this pattern. On one weight the copper alloy coating only partially covers the surface, a variation on the normal Scandinavian form. Despite the large number of weights from Dublin, few truncated spheres are known.¹²⁴

3. POLYHEDRALS

In Scandinavia the truncated spheres are often accompanied by small bronze polyhedral weights, generally made from cubes with each corner flattened, and the large faces marked with dots.¹²⁵ Several are known from England, but none in securely dated contexts. Four, possibly more, are said to have been found near Sheffield, with dots appearing to reflect a unit around 0.68 grams.¹²⁶ A more elaborate form, with two hexagonal faces at the top and bottom, and each face ornamented with a dot, was found at York. It resembles an Arabic example (not dated) illustrated by Kisch, and possibly one of the Birka weights.¹²⁷

Dating of these weights is difficult without context. The origins, like the truncated spheres, appear to belong to the Arabic world, where the form continued into modern times.¹²⁸ In Scandinavia, Viking Age imitations have also been identified,¹²⁹ but these weights are generally lightweight, less than 4.25 grams.¹³⁰ The Sheffield weights are similarly lightweight, but the York polyhedral is significantly heavier. However, polyhedrals along the Baltic are also heavier than the

Scandinavian examples, though many may be later than the Viking Age.¹³¹ The longevity of this form in Arabic lands also leaves open the possibility that the English finds are imports of medieval to modern date.

The use of the polyhedral as a decorative feature is widespread from at least Roman times in both W. and E. Europe and the Arabic empire,¹³² including Anglo-Saxon England.¹³³ As noted above, it is sometimes found on balance beams, usually medieval ones, although a 10th-century Coppergate example already has this feature.

4. LEAD WEIGHTS WITH COPPER ALLOY OR ENAMELLED MOUNTS

Three English finds reflect a growing corpus of weights comprised of this type; unfortunately, none of the English examples is securely dated, but the ornamentation on the mounts and comparative examples allow a late Saxon date to be assumed.

A shallow pyramid capped with an enamelled plate ornamented with a winged animal was found in post-medieval demolition layers of the Clementhorpe Abbey site in York.¹³⁴ The decoration suggests an 8th- or 9th-century date for the enamelled plate. A very heavy lead disk with gilt copper alloy cap ornamented with a rosette pattern, triquetra knots and animals, was found at Mildenhall, Suffolk.¹³⁵ Although no exact parallels are known, the ornamentation and form suggest a 9th-century date. A recent find from Thetford with a fragmentary gilt copper alloy mount is without context but may well be of similar date.¹³⁶

These weights belong to a small group of lead weights with copper alloy or enamelled mounts, many of which are re-used metalwork. The most famous parallels are the weight set from Kiloran Bay, Colonsay, Scotland, which had both enamelled and gilt copper alloy mounts,¹³⁷ and a number of weights, possibly from a set, from the cemetery at Kilmainham/Islandbridge, outside Dublin, Ireland.¹³⁸ From Scotland, four other finds are known: a weight found in the Talnotrie hoard, deposited *c.* 875,¹³⁹ a fragment of an oval brooch used for a mount from a settlement find from Little Dunagoil, Bute,¹⁴⁰ and a recent excavation find from Whithorn.¹⁴¹

A few similar weights were uncovered in the Dublin excavations, but they are not common amongst this material.¹⁴² Elsewhere in Ireland recent finds are adding to the corpus, including three found in Co. Westmeath,¹⁴³ and at least four from Co. Armagh.¹⁴⁴ An interesting heavy example was found on the shore at Freshwater West, Castlemartin, Dyfed, Wales.¹⁴⁵ From Norway, *c.* 20 examples are known, most from graves, and in some cases found with lead weights of other forms.¹⁴⁶

Only the Colonsay weight set and the Kilmainham/Islandbridge set, if indeed it is one, contain weights of this kind in any numbers. The largest set containing these weights from Norway is from a 10th-century woman's grave from Hopperstad, Sogn og Fjordane, but only two of the five weights were manufactured with a lead base and copper alloy mount.¹⁴⁷ Given such small numbers of finds, it is difficult to localize production of these weights. Many of the mounts derive from insular metalwork, but many are clearly re-used,¹⁴⁸ and cannot therefore indicate an insular place of

production for the weights. The Kiloran Bay set, for example, contains mounts from both Scottish/Irish and Anglo-Saxon sources.¹⁴⁹

Indeed, the fact of Scandinavian re-use of similar pieces in other ways, such as on brooches,¹⁵⁰ is the most compelling argument for a Scandinavian manufacture of these weights. However, this need not have been in Norway. The Norwegian weights are often found with weights of different kinds, and in general date to the 10th century.¹⁵¹ In contrast, the weights from Scotland and Ireland date to the 9th century and include the two large sets.¹⁵² As a result these weights may be a product of the Scandinavian settlers, many of whom presumably were traders as well, in the Irish Sea area. The York example supports this interpretation; the East Anglian examples are more puzzling though not inexplicable given Scandinavian conquest and settlement in the area.

A now corroded and illegible styca mounted on a lead base from Sancton, North Humberside¹⁵³ is a variant of this type, but may relate more to coin weights (see below). It can be paralleled to two weights from a grave from Vig, Fjære, Aust-Agder in Norway.¹⁵⁴

5. THREE-DIMENSIONAL FILLED METALWORK

Related to the weights with mounts are the two examples from England of metalwork filled with lead to convert them into weights. A recent metal detector find from Ixworth, Suffolk is a gilt bronze mount in the form of a head, with broad moustache.¹⁵⁵ Similarly, a head from Furness, Lancashire was later filled with lead and adapted into a weight.¹⁵⁶ Both heads are probably Northumbrian or Irish metalwork, and can be paralleled in Northumbrian Hiberno-Saxon manuscript illustration of the 8th century.¹⁵⁷

Although this adaptation cannot be dated or indeed associated with any ethnic group, given the fact that Scandinavians converted other insular metalwork into weights it is not unreasonable to associate the re-use of them. The adaptation of older metalwork into weights by filling cavities with lead is paralleled by a find from Trondheim, Norway, where a heavy lead-filled 10th-century harness mount occurred in occupation levels dating to the second half of the 11th century.¹⁵⁸ The original idea may date back to Roman steelyard weights, some of which were heads of deities filled with lead.¹⁵⁹

6. 'COIN WEIGHTS'

Heavy lead discs struck with coin dies represent the most geographically widespread form of weight found in England. At least one, and possibly two, are known from York: one with a coin stamp of an Æthelred imitation obverse,¹⁶⁰ the other, generally associated with York, with two reverse dies from the time of Anlaf Sihtricsson (mid 10th century).¹⁶¹ A much cruder example, possibly unfinished or a waster, was found in Thetford, Norfolk, also with dies of Æthelred II.¹⁶² Two such weights are also known from London and Winchester: a rectangular lead disc from St Paul's churchyard, London, struck with dies from an Alfred coin, and a circular

disc struck with the reverse of a moneyer working from the end of Cnut's reign into that of Edward the Confessor from Winchester.¹⁶³ A find from Whitby described as 'a circular lead weight marked Eanred'¹⁶⁴ may also be of this form, but no further details are known.

These objects have been interpreted variously as trial pieces¹⁶⁵ or weights.¹⁶⁶ Recently, Marion Archibald has shown that thin lead discs struck with dies occur in more numbers than previously suspected, and often on wharf or trading sites. As a result, she suggests many may be custom tokens. However, in the case of the heavier examples mentioned here, she leaves open the possibility that they were weights.¹⁶⁷

The heavy weights of these objects and the care in production support their interpretation as weights, and if accepted, suggest the possibility that these weights were official in nature, perhaps used at a mint or as a market weight.¹⁶⁸ However, none can be correlated easily with weights of Anglo-Saxon coins.¹⁶⁹ They span a long period, suggesting use throughout the late Saxon period. Some, such as the London and Winchester examples, are probably in the English rather than Scandinavian tradition, but the possibility of Scandinavian imitation, especially on the weights with imitation coins or Scandinavian issues, cannot be discounted. Five such weights, with stamps of Carolingian coins, are known from the continent dating to the 9th century,¹⁷⁰ and may provide the inspiration for the English examples. In addition, a similar weight, bearing the name of the 10th-century Emperor Otto, was recently found in London, and can be paralleled by other German examples with similar weights but more barbarous designs.¹⁷¹

7. 'ANCHOR-SHAPED' WEIGHTS

Lead-shaped objects in the shape of anchors have been found in Coppergate¹⁷² and Chester.¹⁷³ The Coppergate example was originally published as a pendant. However, several similar objects from Dublin have been classified as weights, primarily due to their metrological conformity to other Irish weights.¹⁷⁴ An example is also known from Hedeby.¹⁷⁵

8. OTHER WEIGHT FORMS

A plano-convex iron weight with lead coating from Coppergate is unique. It is possibly a local product: but nevertheless is one of the four weights from Coppergate which may form the only weight set found in England. The lead coating may have been used to hinder corrosion of iron, but no such explanation can be used for a strange perforated lead disc, coated in iron, from the Chapel site at Cheddar. The dating appears to indicate the late Anglo-Saxon period.¹⁷⁶

An unprovenanced bronze disc with a quadruped against a carved background was published by Wilson as an 8th- or 9th-century Anglo-Saxon weight.¹⁷⁷ No such use of heavy bronze discs for weights is known in the late Saxon period, and the attribution must rest on the ornamentation of the quadruped. However, it is similar to medieval Irish bronze gaming pieces,¹⁷⁸ although slightly smaller, and may therefore date to this period. It is listed in Table 1 with reservations.

Four flat weights from Winchester have been tentatively ascribed to the late Saxon period by Biddle, based on their ornamentation alone since the archaeological contexts are unstratified, very late, or unknown.¹⁷⁹ However, the decoration of debased floriated equal-armed crosses is by no means obviously datable only to this period, and could be later. Two are of a type described above (number 4, lead base with copper alloy mount); the mounts are not insular, but rather openwork crosses, one with ring and dot decoration. Other unpublished finds from London also have mounts resulting in openwork design, but unfortunately the contexts for these weights are not secure, allowing only a 10th-/12th-century date.¹⁸⁰ Further analysis of the London finds may provide a firmer attribution for weights of this type. The other two Winchester weights are entirely of lead, with indistinct designs, probably floral. The casting of the weights with lead designs is not otherwise found in weights securely dated to this period.

Attribution of these weights to the late Saxon period remains inconclusive. If the form can be shown to be early it might represent an English adaptation of the Irish Sea weights with mounts.

A fifth weight from Winchester, an incomplete rounded form in lead coated with copper alloy, was originally meant to hang, possibly from a steelyard, and may date to the 9th to mid 10th century.¹⁸¹ However, the object is too fragmentary and the dating too uncertain to draw further conclusions.

DISTRIBUTION OF WEIGHTS AND BALANCES

The finds of weights and balances are dominated by York and East Anglia. Most are found in ports, trading towns, royal sites (e.g. Northampton and Cheddar), or élite sites (e.g. Brandon). To some extent the distribution reflects vigorous programmes of excavation and publication in both areas. Interestingly, until the recent excavations on the Thames in the Vintry area of London, the archaeological evidence for late Saxon weights and balances was virtually non-existent, despite an equally vigorous excavation policy. This in part is due to the fact that middle and late Saxon London is the least understood of London settlements, and to problems in dating. The publication of the Vintry material should fill the gap and confirm the use of weights and balances in London, mentioned from as early as the 9th century in documentary sources.¹⁸²

The number of weights from England is small — compare, for example, the over 200 examples known from Dublin with the 27 finds from York. Moreover, the majority appear in towns where foreign merchants would have travelled. In some cases, such as the lead anchors from Coppergate and Chester, the likelihood is of an Irish owner, probably a merchant who also worked in Dublin. There can be little doubt that the truncated spheres are Scandinavian or colonial Scandinavian, as are the polyhedrals if they date to this period. The lead bases with metal or enamel mounts also suggest an Irish Sea provenance, though it is difficult to be more precise. Only some of the 'coin weights' seem distinctly English, perhaps to be augmented by weights of the type found in Winchester and London if securely dated parallels can be found.

Nevertheless, it is difficult to determine whether all the York and East Anglian weights and balances belonged to foreign owners. The broad dating for most of these objects would overlap periods of Scandinavian occupation. In East Anglia, Vikings raided from the early 9th century, and settled in the later 9th, while the presence in Northumbria was even longer.¹⁸³ It is worth noting as well that no mint existed in the Anglo-Saxon period N. of York,¹⁸⁴ and southern royal control was always less strong in this area.¹⁸⁵ From York and East Anglia the Scandinavians minted their own coins in the last decade of the 9th and early 10th centuries, and even after re-conquest by the English kings these mints produced coins which often vary in weight and design.¹⁸⁶

During the periods of Scandinavian control it is possible that a metal-weight economy may have functioned, although the minting of coins by the new Scandinavian rulers in the tradition, but not standard, of their English predecessors suggests a continuation in some form of a coined metal economy. Nevertheless, the trading connections of the Scandinavians would have been to areas with metal-weight economies, such as Dublin and Scandinavia, and these contacts would have continued after the English reconquest. Moreover, the economic focus of communities N. of York throughout the period is less clear. A metal-weight economy may have existed in this fringe area, as indicated by hoards with hacksilver and ingots as well as coins.

METROLOGY

Weights have in the past served as the major evidence for Viking Age metrology, in particular in studies by Arne, Brøgger, Steuer, Kyhlberg, Nielsen, and Wallace.¹⁸⁷ In all cases the theories have sparked off long debates, with the same weights often being used to support very different claims.

In part this confusion results from using damaged objects to reflect very precise weight systems. Many weights are visually damaged, and some have disintegrated further since discovery. For example, the lead weights with stycas mounted on top from Vig, Norway weighed 18.18 and 14.55 grams when found, but one hundred years later weighed 10.42 and 8.72 grams respectively, a difference too large to be attributed to weighing on balances of different accuracy.¹⁸⁸

In cases where the weights were manufactured with great precision in geometric forms, such as the truncated spheres and polyhedrals, weight reconstruction techniques have been employed.¹⁸⁹ These figures, based on measurements correlated with specific weight and volume, provide the maximum possible weight, but given the condition of many of the objects, are probably closer to the original weight than the extant object. The severity of the distortion can be seen in some of the truncated spheres from Hedeby, where differences between 13% and 60% were found for actual and reconstructed weights.¹⁹⁰ Unfortunately, no such precision was used in the manufacture of lead weights, with the result that no weight reconstruction techniques can be attempted for these objects.

Most metrological studies involving weights also assume that all weights carry equal value. Only recently has some attention been directed to the find

circumstances and their implications. Although weight sets are known, particularly from the trading towns such as Hedeby and Birka,¹⁹¹ many finds, including grave finds, contain only one or two weights. Moreover, weights are found not only in men's graves, but also in those of women and children.¹⁹² In these cases, the weights are more likely to fulfil a symbolic rather than utilitarian function, and may not have been metrologically precise when buried.

With the possible exception of the four weights found together in a house in Coppergate, all English weights are single finds and either stray losses or without context. Most are in fair or poor condition. Although not all weights were examined, a subjective assessment of corrosion and damage for those that were seen or illustrated is indicated in Table 1. This provides a rough indication of which weights are patently unusable in metrological study, and which weights may provide the best metrological evidence.

An obvious aim is to correlate these weights with the Anglo-Saxon metrological system. However, the Anglo-Saxon weight systems for precious metals are an extremely contentious issue, since the evidence of coins, which varied in weight, is difficult to merge with the documentary evidence of weight units.¹⁹³ The issue is further complicated by the probability that a minting surcharge was imposed by Anglo-Saxon monarchs from an early period, with the result that the coinage unit and bullion units are different.¹⁹⁴ Moreover, given the light weight of most Anglo-Saxon coins, which in the late Saxon period are less than two grams, it is very easy to correlate any weight with a multiple of coins.

Approaches using medieval or later documentary evidence worked back to the Anglo-Saxon period are more common but equally fraught with problems.¹⁹⁵ No unbroken tradition can be demonstrated with certainty; the possibility of concurrent standards or variations due to commodities or region further complicates the issue. As a result, there are a number of postulated units with which one could compare these weights, with the merits of each case involving lengthy arguments.¹⁹⁶ For the discussion here, only one of the units will be compared, a unit of 3.1 grams, not with any conviction that its case is best, but simply because it is frequently met with in the literature. This unit is generally correlated to one-tenth of a Troy ounce, which in turn was one-twelfth of a Troy pound.¹⁹⁷ Although the foundation of this unit is unclear (the evidence for the Troy pound cannot be pushed further back than the 13th century),¹⁹⁸ it is frequently cited in relation to the early Anglo-Saxon weights which are usually so light that they too can be easily correlated to a number of units.

The presence in York of truncated spheres and polyhedrals on the one hand, and anchor-shaped weights known primarily from Dublin on the other, indicates the possibility of multiple standards in the material. Table 1 correlates the weights to three postulated systems: the postulated Anglo-Saxon unit of 3.1 grams, a Dublin unit of 26.6 grams put forward by Wallace based on analysis of over 200 lead weights,¹⁹⁹ and a Scandinavian system of the truncated spheres with a unit somewhere around 24 grams;²⁰⁰ here Nielsen's figure of 24.4 ± 0.8 grams will be used. No attempt has been made to correlate the postulated Anglo-Saxon unit of 1.3 grams, or coinage weights, due to the light weight of the base units, condition of the weights, and other factors mentioned above.

TABLE I
LATE SAXON WEIGHTS FOUND IN ENGLAND¹

<i>Findspot</i>	<i>Shape</i>	<i>Weight (grams)</i>	<i>x base unit</i>	<i>3.1 unit</i>	<i>4.07 unit</i>	<i>4.43 unit</i>	<i>Cond- ition</i>	<i>Comments/ source</i>
York?	coin die	3.86	1x	+ 0.76	- 0.21	- 0.57	NS	fn. 160
Coppergate	lead disc	4.59	1x	+ 1.49	+ 0.52	+ 0.16	F	
Coppergate	lead disc	5.81	2x/1x/1x	- 0.39	+ 1.74	+ 1.38	G	
Coppergate	perf. disc	6.14	2x/2x/1x	- 0.06	- 2.00	+ 1.71	G	
Coppergate	lead disc	8.49	3x/2x/2x	- 0.81	+ 0.35	- 0.37	G/F	
Ipswich	perf. disc	11.8	4x/3x/3x	- 0.6	- 0.41	- 1.49	G/F	(2)
Clementhorpe	cut pyramid	11.80	4x/3x/3x	- 0.60	- 0.41	- 1.49	F/P	
Coppergate	lead disc	12.26	4x/3x/3x	- 0.14	+ 0.05	- 1.03	P	
York	polyhedral	14.77	5x/4x/3x	- 0.73	- 1.51	+ 1.48	G/F	
Coppergate	bun-shaped	14.83	5x/4x/3x	- 0.67	- 1.45	+ 1.54	P	
Coppergate	perf. disc	18.15	6x/4x/4x	- 0.45	+ 1.87	+ 0.43	G	
Coppergate	trun. sphere	18.21	6x/4x/4x	- 0.39	+ 1.93	+ 0.49	P	
Northampton	perf. disc	20.00	6x/5x/5x	+ 1.4	- 0.35	- 2.15	NS	(2)
Sancton	coin on disc	20.42	7x/5x/5x	- 1.28	+ 0.07	- 1.73	NS	fn. 153
Coppergate	bun-shaped	20.89	7x/5x/5x	- 0.81	+ 0.54	- 1.26	G/F	
Coppergate	trun. sphere	21.90	7x/5x/5x	+ 0.20	+ 1.55	- 0.25	P	
Coppergate	perf. disc	22.52	7x/6x/5x	+ 0.82	- 1.90	+ 0.37	F	
Norfolk	trun. sphere	23.7	8x/6x/5x	- 1.1	- 0.72	+ 1.55	F	(2); fn. 116
Coppergate	button	25.35	8x/6x/6x	+ 0.55	+ 0.93	- 1.23	F	
Coppergate	anchor	26.37	9x/6x/6x	- 1.53	+ 1.95	- 0.21	G/F	
Coppergate	trun. sphere	26.97	9x/7x/6x	- 0.93	- 1.52	+ 0.39	P	
Coppergate	cut pyramid	27.15	9x/7x/6x	- 0.75	- 1.34	+ 0.57	F/P	
Coppergate	lead disc	27.16	9x/7x/6x	- 0.74	- 1.33	+ 0.58	F	
York	coin die	27.68	9x/7x/6x	- 0.22	- 0.81	+ 1.10	F/P	
Ipswich	trun. cone	32.6	11x/8x/7x	- 1.5	+ 0.04	+ 1.59	G	(2)
Coppergate	bun-shaped	35.35	11x/9x/8x	+ 1.25	- 1.28	- 0.09	P	
Coppergate	trun. sphere	35.65	12x/9x/8x	- 1.55	- 0.98	+ 0.21	P	
Winchester	coin die	37.61	12x/9x/8x	+ 0.41	+ 0.98	+ 2.17	NS	fn. 163
Coppergate	trun. cone	39.43	13x/10x/9x	- 0.87	- 1.27	- 0.44	G	
Thetford	coin die	44.86	14x/11x/10x	+ 1.46	+ 0.09	+ 0.56	P	
Ipswich	lead plate	49.7	16x/12x/11x	+ 0.10	+ 0.86	+ 0.97	G/F	(2)
Coppergate	lead disc	53.03	17x/13x/12x	+ 0.33	+ 0.12	- 0.13	G	
St Neots	lead disc	54.5	18x/13x/12x	- 1.3	+ 1.59	+ 1.34	NS	(3); fn. 104
Coppergate	trun. cone	58.53	19x/14x/13x	- 0.37	+ 1.55	+ 0.94	P	
Unprovenanced	bronze disc	68.73	22x/17x/16x	+ 0.53	- 0.46	- 2.15	F/P	fn. 177
Coppergate	trun. sphere	97.71	32x/24x/22x	- 1.49	+ 0.03	+ 0.25	G	
Thetford	lead disc	98.49	32x/24x/22x	- 0.71	+ 0.81	+ 1.03	NS	
Ixworth	3-D head	100.83	33x/25x/23x	- 1.47	- 0.92	- 1.06	F/P	fn. 155
Furness	3-D head	126.3	41x/31x/29x	- 0.8	+ 0.13	- 2.17	F/P	(2); fn. 156
Thetford	disc/mount	147.55	48x/36x/33x	- 1.25	+ 1.03	+ 1.36	P	
Coppergate	sphere	150.13	48x/37x/34x	+ 1.33	- 0.46	- 0.49	G	
London	coin die	163.25	53x/40x/37x	- 1.05	+ 0.45	- 0.66	F	
Mildenhall	disc/mount	246.82	80x/61x/56x	- 1.18	- 1.45	- 1.26	P	

All weights unpublished and/or re-weighed recently unless noted in the Comments column.

KEY:

(1) Missing details: Whitby; Cheddar (poor condition); Northampton, Chalk Lane site; near Sheffield; London (Vintry area).

(2) Weighed to unknown accuracy.

(3) Converted to grams.

Condition: G: Good; F: Fair; P: Poor; NS: Not seen.

Many of the weights do not correspond to the mid 20 gram unit, but may do so to one-sixth. This subdivision is somewhat arbitrary, but allows both thirds, which are known to have been important in Scandinavia, and halves, which one presumes might be important. It is important to realize when looking at Table 1 that the maximum deviation is 1.55 grams (half of 3.1 grams) for the Anglo-Saxon unit, 2.03 grams (half of 4.07 grams) for the Scandinavian unit, and 2.21 grams (half of 4.46 grams) for the Dublin unit. As a result, any weights deviating by more than a gram must be considered a bad fit, and less than half a gram is desirable for weights of good condition. Multiples which correspond to the mid 20 gram units are more probable than odd numbers; for example, the lead disc weighing 53.03 grams is more probably twelve times a unit rather than thirteen times, given the popularity of the duodecimal reckoning. There is also an overlap between eight times the Anglo-Saxon unit (24.8 grams) and the Scandinavian unit (24.4 grams).

Of the eight weights judged to be in good condition, in four of the cases no one system stands out. For the Scandinavian unit, the well-preserved truncated sphere from York weighing 97.71 grams is virtually identical to four times the 24.4 gram unit identified at Hedeby with similar weights. In addition, the Ipswich truncated cone at 32.6 grams best fits this system. Only one weight correlates well with the Anglo-Saxon system, the Coppergate perforated disc at 6.14 grams. The lead disc in good condition from Coppergate at 53.03 grams is very close to twice the Dublin unit; it can also be correlated closely with the other systems, although in less convincing multiples.

Widening the net to the six weights judged good to fair, even fewer correlations are close. The Coppergate anchor at 26.37 grams corresponds well with Wallace's 26.6 gram unit, especially considering that a bit of the suspension loop is broken off. The ambiguous Ipswich plate at 49.7 grams is close to sixteen times the Anglo-Saxon unit, while the Ipswich perforated disc is best correlated to the Scandinavian unit, albeit not closely. Similarly, the Coppergate bun-shaped weight is closer to the Scandinavian unit than the others. The polyhedrals found near Sheffield also correspond well with the Scandinavian unit,²⁰¹ while the York polyhedral is a poor fit in all systems, leading to further suspicion that it may be post-Conquest in date.

From the admittedly flimsy evidence there does appear to be some division within the material, in part relating to weight forms. The truncated spheres, as might be expected, appear to conform to a Scandinavian system, while the Coppergate anchor not surprisingly conforms to the Dublin examples. Lead discs are mixed, though less close to the Scandinavian system than the other two. No one system stands out for the coin dies, but these objects in at least three cases are not in good condition. The two weights with lead base and copper alloy mount, both in poor condition, may be closer to the whole multiples of the Scandinavian unit ($6x=146.4$ grams; $10x=244$ grams) than other units, though a case has also been made for the Mildenhall weight belonging to the Troy weight system (indeed, in a potentially circular argument, providing some evidence for its use in the late Saxon period), where 8 oz. of 31.1 grams = 248.8 grams.²⁰²

Altogether, it is unwise to press any of these points, especially given the conditions of the weights and uncertainty governing the units. Indeed, other units

could be chosen, particularly for Anglo-Saxon metrology, which would probably produce equally valid results. If one examines the entire spread of weights, there is a hint that units in the mid 20 grams and its multiples were desired; however, all three postulated systems have units around this figure, which can also be shown to relate to silver ingots from NW. England and Ireland.²⁰³

CONCLUSIONS

The evidence of use of weights and balances in Anglo-Saxon England is increasing, allowing at least some indication of the types current in Anglo-Saxon England. The archaeological evidence clearly shows the use of weights and balances from at least the 9th century, particularly in ports. Finds are concentrated in East Anglia and York, in areas with strong Scandinavian influence. However, weights and balances are not entirely lacking in other areas of England, and hints in documentary references indicate their use in places without direct archaeological confirmation. Further publication of Roman, Anglo-Saxon and medieval weights and balances would allow further refinement of diagnostic features.

ACKNOWLEDGEMENTS

I am grateful to a number of people who provided information on weights and balances, many of which are unpublished, including John Allan, Marion Archibald, Cormac Bourke, Duncan Brown, Michelle Brown, R. Carr, John Clark, Ellen Zak Danforth, Geoff Egan, Barbara Green, Nick Griffiths, Jenny Mann, Sue Margeson, Sonia O'Connor, Ragnall Ó Floinn, Wendy Parry, Elizabeth Pirie, Frances Pritchard, Ian Riddler, D. Robinson, Dominic Tweddle, Patrick Wallace, and J. B. Whitwell. In particular, a special debt is owed to John Newman of the Suffolk County Council for re-examining much of the material from Ipswich and providing notes, drawings, and photographs, and to Norman Biggs and Alison Goodall for providing information on a range of unpublished material. I would also like to thank James Graham-Campbell and Geoff Egan for comments on a draft of this paper.

NOTES

- ¹ B. Kisch, 'Scales and weights. A historical outline', *Yale Studies in the History of Science and Medicine*, 1 (1965), 27 ff.
- ² E.g. W. H. Manning, *Catalogue of the Romano-British Iron Tools, Fittings and Weapons in the British Museum* (London, 1985), 106-07; *London Museum Catalogue No. 7, Medieval Catalogue* (London, 1940), 171-72.
- ³ O. Kyhlberg, 'Vågar och viktod. Diskussion kring frågor om precision och noggrannhet', *Formvännan*, 70 (1975), 159-61; Gert Hatz, *Handel und Verkehr zwischen dem Deutschen Reich und Schweden in der späten Wikingerzeit. Die deutschen Münzen des 10. und 11. Jahrhunderts in Schweden* (Lund, 1974), 109 with references.
- ⁴ T. Wright and R. P. Wülcker, *Old English Vocabularies* (London, 1884), 148.
- ⁵ W. H. Stevenson (ed.), *Asser's Life of King Alfred* (Oxford, 1904), ch. 104; S. Keynes and M. Lapidge (eds.), *Alfred the Great. Asser's Life of King Alfred and other Contemporary Sources* (Harmondsworth, 1983), 108.
- ⁶ F. Liebermann (ed.), *Die Gesetze der Angelsachsen* (Halle, 1903-16), 453-54; P. V. Addyman, 'Archaeology and Anglo-Saxon society', in G. d. G. Sieveking, I. H. Longworth and K. E. Wilson (eds.), *Problems in Economic and Social Archaeology* (London, 1976), 319.
- ⁷ Pers. comm. R. Carr.
- ⁸ The Ipswich finds are unpublished. I am very grateful to John Newman for drawing my attention to the large number of finds, providing sketches and descriptions, and for permission to discuss these objects prior to their publication.
- ⁹ S. Margeson and V. Williams, 'The artefacts', in B. Ayres (ed.), *Excavations within the North-East Bailey of Norwich Castle, 1979* (East Anglian Archaeology Report, 28) (Norfolk, 1985), 31, nos. 19 and 20.
- ¹⁰ A. Rogerson, 'Excavations on Fuller's Hill, Great Yarmouth', in P. Wade-Martins (ed.), *Norfolk* (East Anglian Archaeology Report, 2) (Norfolk, 1976), 161, 163, no. 3.

¹¹ A. R. Goodall, 'Non-ferrous metal objects', in A. Rogerson and C. Dallas (eds.), *Excavations in Thetford 1948-59 and 1973-1980* (East Anglian Archaeology Report, 22) (Norfolk, 1984), 69, nos. 56, 57, 59, and 60.

¹² Three balances are illustrated in R. Hall, *The Viking Dig* (London, 1984), 109; however, the upper two (YAT 1978.7.3716; 1975.6.82) are in post-Conquest contexts and are excluded from the discussion here. The lower balance (YAT 1980.7.7576) is also published in E. Roesdahl et al., *The Vikings in England* (London, 1981), 127; the pointer, however, is a separate piece and may not be originally part of this balance. A well-preserved non-folding balance found in 10th-century contexts (YAT 1980.7.9512) is unpublished, as are the two arm fragments (YAT 1980.7.7848; 1979.7.4034). I would like to thank Dominic Tweddle for permission to mention these unpublished pieces in advance of their publication.

¹³ Balance pans were found with balance 1980.7.9512, and as a single find in a 10th-century context (1980.7.8569; Roesdahl et al., op. cit. in note 12). See also note 88.

¹⁴ A. Goodall, 'The copper alloy and gold', in P. Armstrong et al. (eds.), *Excavations in Lurk Lane, Beverley 1979-1982* (Sheffield Excavation Reports, 1) (Beverley, 1991), 151 no. 618.

¹⁵ J. C. Atkinson, '[On discoveries recently made in the parish church of Kildale]', *Proc. Soc. Antiq. London*, 4, 2nd series (1867-1870), 53.

¹⁶ F. Elgee, *Early Man in North-east Yorkshire* (Gloucester, 1930), 220.

¹⁷ But see C. D. Morris, 'Viking and native in northern England. A case-study', in H. Bekker Nielsen, P. Foote, and O. Olsen (eds.), *Proceedings of the Eighth Viking Congress* (Odense, 1981), 234, who questions the evidence of whether the burial and church are contemporary and associated.

¹⁸ E. Jondell, 'Vikingtidens balansvågar i Norge', C 1-uppsats i arkeologi diss., Institute of North-European Archaeology, Uppsala University (Uppsala, 1974).

¹⁹ I would like to thank Jenny Mann for sending full details concerning balance and weights finds in advance of publication.

²⁰ Stirrup and beam fragments from the Chalk Lane site (pers. comm. Alison Goodall). The St Peter's Street excavations produced remains of three unstratified balances; see G. E. Oakley and L. E. Webster, 'The copper alloy objects', in J. H. Williams (ed.), *St Peter's Street Northampton. Excavations 1973-1976* (Northampton, 1979), 258.

²¹ Pers. comm. Duncan Brown.

²² Pers. comm. Julie Lovett.

²³ M. Biddle, *Object and Economy in Medieval Winchester* (Winchester Studies, vol. 7, pt. 2) (Oxford, 1990), vol. II, 922, 924, no. 3208.

²⁴ Pers. comm. John Allan, Royal Albert Memorial Museum, Exeter. This unusual balance, an isolated find from No. 198 High Street, Exeter, dated to the 10th or 11th century, is unpublished.

²⁵ Jondell, op. cit. in note 18; J. Petersen, *British Antiquities of the Viking Period Found in Norway* (= H. Shetelig (ed.), *Viking Antiquities in Great Britain and Ireland*, vol. v) (Oslo, 1940), 155-66.

²⁶ E. Sperber, 'How accurate was Viking Age weighing in Sweden?' *Formvannen*, 83 (1988), 157; Hatz, op. cit. in note 3, 110ff.

²⁷ H. Jankuhn, *Die Ausgrabungen in Haithabu (1937-1939)* (Berlin, 1943), 187; H. Steuer, 'Gewichtsgeldwirtschaften im frühgeschichtlichen Europa — Feinwaagen und Gewichte als Quellen zur Währungsgeschichte' in K. Düwel et al. (eds.), *Untersuchungen zu Handel und Verkehr der vor- und frühgeschichtlichen Zeit in Mittel- und Nordeuropa. Teil IV. Der Handel der Karolinger- und Wikingerzeit, (= Abhandlungen der Akademie der Wissenschaften in Göttingen. Philologisch-Historische Klasse, Dritte Folge, Nr. 156., 405-527)* (Göttingen, 1987), 473.

²⁸ P. Nørland, *Trelleborg* (Copenhagen, 1948), 143-44 (Trelleborg); V. Boye, 'To fund av Smedeværktøi fra den sidste hedenske Tid i Danmark', *Annaler for Nordisk Oldkyndighed og Historie* (1858), 191-200 (Thiele); E. Roesdahl, 'Otte vikingetidensgrave i Sdr. Onsild', *Aarbøger for Nordisk Oldkyndighed og Historie* (1976), 33 (Sdr. Onsild); J. Brøndsted, 'Danish inhumation graves of the Viking period', *Acta Archaeologica*, 7 (1936), 172-73, 178, 187 (N. Langelse, Kaagaarden, Kallehave); and D. Meier and J. Reichstein, 'Eine Wikingerzeitliche Siedlung westlich von Kosel, Kreis Rendsburg-Eckernförde (LA 117)', *Offa* 41 (1984), 139-40 (Kosel, Schleswig-Holstein).

²⁹ Steuer, op. cit. in note 27, 524-25; W. La Baume and J. Wilczek, 'Die frühmittelalterlichen Silberwaagen aus Ostpreußen', *Alt-Preußen*, 5 (1940); Bernt von zur Mühlen, 'Die Kultur der Wikinger in Ostpreussen', *Bonner Hefte zur Vorgeschichte* 9 (1975), Fundliste 27; A. Hollnagel, 'Frühmittelalterliche Bronzklappwaagen und Gewichte aus Mecklenburg', *Ausgrabungen und Funde*, 12 (1967), 227-34.

³⁰ A. Stalsberg, 'Woman as actors in North European Viking Age trade', in R. Samson (ed.), *Social Approaches to Viking Studies* (Glasgow, 1991), 78.

³¹ Kiloran Bay, Colonsay grave find: S. Grieg, *Viking Antiquities in Scotland* (= H. Shetelig (ed.), *Viking Antiquities in Great Britain and Ireland*, vol. II) (Oslo, 1940), 55; Gigha grave find: T. Bryce, 'Note on a balance and weights of the Viking period found in the island of Gigha', *Proc. Soc. Antiquaries Scotland*, 47 (1912-12), 436-43; Grieg, op. cit., 29-30; and a lost grave find from Ensay in the Western Isles: Grieg, op. cit., 79.

³² J. A. Graham-Campbell, 'The Viking-Age silver and gold hoards of Scandinavian character from Scotland', *Proc. Soc. Antiq. Scotland*, 10; (1975-76), 117-18; Steuer, op. cit. in note 27, 444, fn. 144 argues this balance is in the earlier Roman tradition.

³³ F. G. Skinner and R. L. S. Bruce-Mitford, 'A Celtic balance-beam of the Christian period', *Antiq. J.*, 20 (1940), 80-102; L. R. Laing and J. Laing, 'The early Christian period settlement at Ronaldsway, Isle of Man, a reappraisal', *Proc. Isle of Man Nat. Hist. Antiq. Soc.*, 9 (1984-87), 406.

³⁴ J. Bøe, *Norse Antiquities in Ireland* (= H. Shetelig (ed.), *Viking Antiquities in Great Britain and Ireland*, vol. III) (Oslo, 1940), 50, 51. The balances have not been published in detail, however, and certain features reported here are the result of a recent examination.

³⁵ An unpublished number were recovered in the recent excavations in Dublin, ranging from late Saxon to medieval in date; see P. F. Wallace, 'The economy and commerce of Viking Age Dublin', in K. Düwel *et al.* (eds.), *Untersuchungen zu Handel und Verkehr der vor- und frühgeschichtlichen Zeit in Mittel- und Nordeuropa. Teil IV. Der Handel der Karolinger- und Wikingerzeit*, (= *Abhandlungen der Akademie der Wissenschaften in Göttingen. Philologisch-Historische Klasse, Dritte Folge*, Nr. 156., 200-45) (Göttingen, 1987), 214. Full publication of these balances should provide an invaluable series of dated examples. Earlier published finds include a balance from near Christ Church Cathedral, Dublin (Bøe, *op. cit.* in note 34, 69), a folding balance of Steuer type 3 from Strokestown Crannog, Roscommon (R476; Steuer, *op. cit.* in note 27, 525, no. 56), and a bowl, possibly a scale pan, from Ballyholme, Co. Down (Bøe, *op. cit.* in note 34, 73, 75). Skinner and Bruce-Mitford, *op. cit.* in note 33, 98 also record a find from Loughtamend, Co. Antrim. A balance pan (unpublished) was also found in recent dredging of the River Blackwater, Co. Armagh, probably associated with several weights and hacksilver (pers. comm. Cormac Bourke).

³⁶ Petersen, *op. cit.* in note 25, 10-11; Jondell, *op. cit.* in note 18, 33; but see also T. J. Arne, 'Ein persisches Gewichtssystem in Schweden', *Orientalisches Archiv*, 2 (1911-12), 122; H. Steuer, 'Feinwaagen und Gewichte als Quellen zur Handelsgeschichte des Ostseeraumes', in H. Jankuhn *et al.* (eds.), *Handelsplätze des frühen und hohen Mittelalters*, (= *Archäologische und naturwissenschaftliche Untersuchungen an ländlichen und frühstädtischen Siedlungen im deutschen Küstengebiet vom 5. Jahrhundert v. Chr. bis zum 11. Jahrhundert n. Chr.*), vol. 2 (Weinheim, 1984), 279; and Wallace, *op. cit.* in note 35, 214-15.

³⁷ Boye, *op. cit.* in note 28; E. Wamers, *Insularer Metallschmuck in wikingerzeitlichen Gräbern Nordeuropas* (= *Offa Bücher*, 56) (Neumünster, 1985), 112-13, nos. 17, 28, 29, 32, 43, 52, 53, 59.

³⁸ B. Kisch, 'Weights and scales in medieval Scandinavia', *J. Hist. Medicine and Allied Sciences*, 14 (1959), 160-68; Kisch, *op. cit.* in note 1.

³⁹ See, however, Steuer, *op. cit.* in note 27, 423 ff. for a general survey of the Roman types, and H. Steuer, 'Zusammenklappbare Waagen des hohen Mittelalters', *Archäologisches Korrespondenzblatt*, 7 (1977), 295-300 for a discussion of a common medieval balance type of the 12th and 13th centuries.

⁴⁰ J. Werner, 'Waage und Geld in der Merowingerzeit', *Sitzungsberichte der Bayerischen Akademie der Wissenschaften Philosophisch-historische Klasse*, 1 (1954); Steuer, *op. cit.* in note 27, 433 ff.; C. Scull, 'Scales and weights in early Anglo-Saxon England', *Archaeol. J.*, 147 (1990), 183-215.

⁴¹ Steuer, *op. cit.* in note 27, 459 ff. Some indication of the dating and beam lengths of the other types can be gleaned from Abb. 9, p. 487; Abb. 14, p. 497.

⁴² For this reason, two balances sometimes published as late Saxon have been excluded. A folding balance from North Elmham is unstratified (P. Wade-Martins, 'Excavations at North Elmham, 1964, an interim report', *Norfolk Archaeology*, 35 (1970), 66, Fig. 19D) while the folding balance from Goltho, Lincolnshire is from a 13th-century context (G. Beresford, *The Medieval Clay-land Village, Excavations at Goltho and Barton Blount* (Society for Medieval Archaeology Monograph Series, 6) (London, 1975), 94-95, no. 37; dating discussed 20, 26).

⁴³ Steuer, *op. cit.* in note 27, 423-24. See, e.g., *London Museum Catalogue no. 3, London in Roman Times* (London, 1930), 85 for a Roman balance from London with attached steelyard weight. Contexts for folding balances dating to the Roman period are often not secure (see e.g. Steuer, *op. cit.* in note 27, 462, fn. 202), and further work on this material is needed. An example published by Kisch (*op. cit.* in note 38, 165, Fig. 1; *op. cit.* in note 1, 37, Fig. 9) as Roman, has been more plausibly dated by Steuer (*op. cit.* in note 39, 299, no. 14) as medieval in date. Examples of published folding Roman balances from England include Ilchester (P. Leach, *Ilchester vol. 1. Excavations 1974-5* (Western Archaeological Trust Excavation Monograph, 3) (Bristol, 1982), 252, no. 98) and Chester (F. H. Williams, 'Deva, on some traces of a building discovered west of the Forum, Chester, 1894', *J. Brit. Archaeol. Assoc.*, new ser. 1 (1895), 79-80).

⁴⁴ Steuer, *op. cit.* note 27, 423 ff., 431, 443 ff., with references; Werner, *op. cit.* in note 40; Scull, *op. cit.* in note 40, with references.

⁴⁵ E.g. using date from Jondell, *op. cit.* in note 18; Sperber, *op. cit.* in note 26.

⁴⁶ Wallace, *op. cit.* in note 35.

⁴⁷ Goodall, *op. cit.* in note 11, 69, 74, no. 57, in a 10th-century context; Elgee, *op. cit.* in note 16. Another unstratified arm and beam from a different site in Thetford is so similar to the fragmentary arm, that it too must be seen as dating to this period (Goodall, *op. cit.* in note 11, 69, 74, no. 56).

⁴⁸ Steuer, *op. cit.* in note 27, 462-63, 466.

⁴⁹ Steuer, *op. cit.* in note 27, 462, 526.

⁵⁰ Steuer, *op. cit.* in note 27, 459, fn. 192.

⁵¹ Steuer, *op. cit.* in note 27, *ibid.*, 444, fn. 144.

⁵² Wallace, *op. cit.* in note 35.

⁵³ E.g. Pompeii (F. G. Skinner, *Weights and Measures, their Ancient Origins and their Development in Great Britain up to A.D. 1855* (London, 1967), Fig. XI); Augst (A. Mutz, *Römische Waagen und Gewichte aus Augst und Kaiseraugst* (Augster Museumshefte, 6) (Augst, 1983), 26); Ilchester (Leach, *op. cit.* in note 43); London (London Museum Catalogue no. 3, *London in Roman Times* (London, 1930), 85).

⁵⁴ E.g. Kilmainham/Islandbridge R2402; Sweden (M. Molander, 'Redskap för handel', in A. W. Mårtensson (ed.), *Uppgrävet förflyttat för PKbanken i Lund* (Archaeologica Lundensia, VII) (Lund, 1976), 189, Fig. 131; Kisch, *op. cit.* in note 38, Fig. 9); Norway (Petersen, *op. cit.* in note 25, 158); Hedeby (Jankuhn, *op. cit.* in note 27, 188). Steuer, *op. cit.* in note 27, 459, fn. 192 dates some of the simple, non-folding balances with rope mouldings to the 9th century.

⁵⁵ E.g. unpublished examples from Ipswich; Salisbury (J. W. G. Musty, 'A pipe-line near Old Sarum, prehistoric, Roman and medieval finds including two twelfth-century lime-kilns', *Wilts. Archaeol. Mag.*, 57 (1958-60), 189-90).

⁵⁶ Rogerson, *op. cit.* in note 10; Goodall, *op. cit.* in note 14.

- ⁵⁷ Grieg, op. cit. in note 31, 55; Bryce, op. cit. in note 31; Strömberg, *Untersuchungen zur jüngeren Eisenzeit in Schonen* (Bonn and Lund, 1961), Taf. 76, no. 5; Molander, op. cit. in note 54; Hollnagel, op. cit. in note 29, 232.
- ⁵⁸ Roman: E. Nowotny, 'Zur Mechanik der antiken Wage', *Jahreshefte des österreichischen Archäologischen Institutes in Wien (Nachträge)*, 16 (1913), 191-92; Medieval: Goltho (Beresford, op. cit. in note 42), Lund, Sweden (Molander, op. cit. in note 54), and an unpublished example from Silver Street, Lincoln (small find 35) from a 13th-century pit which also contained late Saxon pottery.
- ⁵⁹ E.g. Pfullingen (Werner, op. cit. in note 40, 10).
- ⁶⁰ E.g. Margeson and Williams, op. cit. in note 9, 31, no. 18.
- ⁶¹ 1979.7.4034.
- ⁶² R1856. Published in Bøe, op. cit. in note 34, p. 50, but without mention of the polyhedrals.
- ⁶³ E.g. Jondell, op. cit. in note 18, nos. 18, 19, 57.
- ⁶⁴ Steuer, op. cit. in note 39; E. Bakka, 'Ein mittelalterliche Gewichtssatz von Åkerhaugen in Sauherad, Telemark, Ostnorge', *Offa*, 37 (1980), 155; Hollnagel, op. cit. in note 29, 232; Jondell, op. cit. in note 18, 33.
- ⁶⁵ Biddle, op. cit. in note 23, vol. II, 922, 924, no. 3211.
- ⁶⁶ Goodall, op. cit. in note 11, 74, no. 58.
- ⁶⁷ Oakley and Webster, op. cit. in note 20, 257-58, no. 89.
- ⁶⁸ Kisch, op. cit. in note 1, 37, Fig. 8.
- ⁶⁹ Steuer, op. cit. in note 27, 462.
- ⁷⁰ School Street site 360/4801.
- ⁷¹ A. D. Passmore, 'Notes on Roman finds in North Wilts', *Wilts. Archaeol. Mag.*, 41 (1920), 391-92.
- ⁷² Jondell, op. cit. in note 18, no. 5.
- ⁷³ E.g. H. R. Jenemann, 'Über Ausführung und Genauigkeit von Münzwägungen in spätrömischer und neuer Zeit', *Triener Zeitschrift*, 48 (1985), 177, no. 6; balances from 10th-century graves from Denmark (Brøndsted, op. cit. in note 28, 178, Fig. 87c, 172-73; a balance from an 11th-century hoard from Sweden (Strömberg, op. cit. in note 57, Taf. 76, no. 5).
- ⁷⁴ Margeson and Williams, op. cit. in note 9, 31, no. 20.
- ⁷⁵ Buttermarket site, 1713/3104, 1844/3104.
- ⁷⁶ Rogerson, op. cit. in note 10.
- ⁷⁷ 1980.7.9512.
- ⁷⁸ Unpublished. Pers. comm. Alison Goodall; no further details are known.
- ⁷⁹ Buttermarket site, 452/3104.
- ⁸⁰ E.g. Roman: Jenemann, op. cit. in note 73, 176 nos. 3 and 5; early Anglo-Saxon grave finds: T. Sheppard, *Saxon Relics from Barton, Lincs* (Hull Museum Publications, 208) (Hull, 1940), 43; the 9th-century Kiloran Bay, Colonsay grave find: Grieg, op. cit. in note 31, 54; first half of the 11th century from Lund, Sweden: Molander, op. cit. in note 54; 12th-/13th-century contexts in Dublin (on display in the National Museum of Ireland); and 14th- and 15th-century contexts in Lincoln (though with a quantity of residual late Saxon material): St Mark's Station, small find no. 367.
- ⁸¹ R2402.
- ⁸² O. Rygh, *Norsk Oldsager* (Christiania, 1885), no. 476.
- ⁸³ R420; Steuer, op. cit. in note 27, 446, fn. 144.
- ⁸⁴ Steuer, op. cit. in note 39, 295, 297, Tafel 54; Margeson and Williams, op. cit. in note 9, 31. Similar 13th-century examples are on display at the National Museum of Ireland. The Dublin finds include a number of stirrups of different types, and publication of this material should prove helpful. Kisch publishes a stirrup with ring and dot decoration as Roman (Kisch, op. cit. in note 38, 165, Fig. 1; 1965, 37, Fig. 9) but Steuer's dating to the 12th or 13th century is more convincing (Steuer, op. cit. in note 39, 299, no. 14).
- ⁸⁵ Rogerson, op. cit. in note 10. One of the 10th-century York examples (1980.7.7576) was published with a very long pointer (Hall, op. cit. in note 12), but the pointer is separate, and it is unclear if it originally belonged to this balance. A much corroded and fragmentary balance from Ipswich, probably dating to the late Saxon period (Buttermarket 1844/3104), also appears to have a long pointer in relation to its beam length.
- ⁸⁶ Steuer, op. cit. in note 27, 424, 431, 446-47.
- ⁸⁷ E.g. Steuer, op. cit. in note 39, Tafel 54.
- ⁸⁸ York: Two pans were published in Roesdahl *et al.*, op. cit. in note 12 (1980.7.8569; 1978.7.3378); the latter one, however, dates to the Norman period or later. A pan was also found with balance 1980.7.9512. Thetford: Goodall, op. cit. in note 11, 69, no. 60. Norwich: Margeson and Williams, op. cit. in note 9, 31, no. 19. Great Yarmouth: Rogerson, op. cit. in note 10.
- ⁸⁹ Rogerson, op. cit. in note 10.
- ⁹⁰ J. Graham-Campbell, *Viking Artefacts, a Select Catalogue* (London, 1980), no. 306.
- ⁹¹ Steuer, op. cit. in note 27, 416, 444; Kisch, op. cit. in note 1, 42, 71, Fig. 32.
- ⁹² Kisch, op. cit. in note 38, 162-63.
- ⁹³ Steuer, op. cit. in note 27, 462.
- ⁹⁴ Jondell, op. cit. in note 18.
- ⁹⁵ E.g. unpublished examples from the Thames Exchange and Vintry Hall sites.
- ⁹⁶ R.2395; R.1856.
- ⁹⁷ Jondell, op. cit. in note 18; Steuer, op. cit. in note 27, 525-26. Steuer uses it as a diagnostic feature for identifying local variations in balances (Steuer, op. cit. in note 36, 278-79).
- ⁹⁸ Oakley and Webster, op. cit. in note 20, 258, no. Cug2.
- ⁹⁹ See Sperber, op. cit. in note 26, 157-66 for a discussion of the accuracy of Viking Age balances. Steuer has

highlighted the accuracy of Type 3 balances, and the increasing inaccuracy of imitations and other later Viking Age types (Steuer, op. cit. in note 36, 277 ff.; op. cit. in note 27, 462 ff.).

¹⁶⁰ In published descriptions, identification of fabric as bronze, copper alloy, or brass are often encountered, though seldom based on metallurgical analysis. Unless such analysis has been undertaken to determine the metal, copper alloy will be assumed.

¹⁰¹ Steuer, op. cit. in note 27, 448; Scull, op. cit. in note 40.

¹⁰² Jankuhn, op. cit. in note 27, 198.

¹⁰³ Goodall, op. cit. in note 11, 69, no. 61.

¹⁰⁴ P. V. Addyman, 'Late Saxon settlements in the St. Neots area', *Proc. Cambridge Antiq. Soc.*, 64 (1973), 90, 95.

¹⁰⁵ Atkinson, op. cit. in note 15.

¹⁰⁶ A number of more 'classic' lead spindle whorls were also found at Coppergate, and have been excluded from this discussion. However, further study of the spindle whorl weights and fabrics might prove very useful.

¹⁰⁷ A. R. Goodall, 'Objects of pewter and lead', in J. H. Williams (ed.), *Middle Saxon Palaces at Northampton* (Northampton, 1985), fiche 68, ill. p. 67. Other unpublished lead weights dating to this period from the Chalk Lane site at Northampton were also recovered (Alison Goodall, pers. comm.), but no further details are known.

¹⁰⁸ I. Øye, *Textile Equipment and its Working Environment, Bryggen in Bergen c. 1150-1500* (The Bryggen Papers, Main Series, vol. 2) (Oslo, 1988), 37-55, esp. 50.

¹⁰⁹ E.g. the Gigha, Scotland grave find, although the find circumstances are not as secure as would be liked; Grieg, op. cit. in note 31, 29-30.

¹¹⁰ Wallace, op. cit. in note 35, 212-14.

¹¹¹ E.g. Jankuhn, op. cit. in note 27, 191, 198; Maj-Britt Cederlöw, 'Vikingatida vikter', Trebetygsuppsats i nordisk och jämförande fornkunskap diss. (Lund, 1971), 7-9; O. Kyhlberg, *Vikt och Värde* (Stockholm Studies in Archaeology, 1) (Stockholm, 1980), 240-41.

¹¹² Steuer, op. cit. in note 27, 467.

¹¹³ Wallace, op. cit. in note 35, 212.

¹¹⁴ These weights are known by a variety of names in the literature, e.g. cheese-shaped weights, segmented sphere, truncated double cone, *kulformiga viktod*, *kugelformige Gewichte*.

¹¹⁵ Pers. comm. Geoff Egan (Museum of London) and Norman Biggs (London School of Economics).

¹¹⁶ Pers. comm. Norman Biggs. Professor Biggs also informs me that another of this type, without any context but probably from England, has been purchased by a collector.

¹¹⁷ Kisch, op. cit. in note 38, 161; S. Frere, *Verulamium Excavations, vol. 1* (Reports of the Research Committee of the Society of Antiquaries of London, 28) (Oxford, 1972), 124, no. 88.

¹¹⁸ Kisch, op. cit. in note 38, 161-62.

¹¹⁹ H. Steuer, 'Gekerbte Gewichte der späten Wikingerzeit', *Fornvännen*, 82 (1987), 66-74; Molander, op. cit. in note 54, 191.

¹²⁰ *Ibid.*, Steuer, op. cit. in note 27, 460 ff.

¹²¹ Kisch, op. cit. in note 38, 165; H. Steuer, 'Gewichte aus Haithabu', *Berichte über die Ausgrabungen in Haithabu*, 6 (1973), 11.

¹²² Steuer, op. cit. in note 121, 13; *id.*, op. cit. in note 36, 283.

¹²³ A. W. Brøgger, *Ertog og Øre. Den gamle norske vegt. (Videnskapselskaps Skrifter II, Hist.-Filos. Klass 3* (Kristiania, 1921), 107.

¹²⁴ Wallace, op. cit. in note 35, 212.

¹²⁵ H. Arbman, *Birka I. Die Gräber. Tafeln* (Uppsala, 1940), Taf. 127, nos. 1, 2, 10-13 illustrates several. For discussions of this weight form see also Kisch, op. cit. in note 38, 162; Steuer, op. cit. in note 27, 468-70, 475-77, 526-27; Kyhlberg, op. cit. in note 111, 220; P. Balog, 'Islamic bronze weights from Egypt', *J. Economic and Social History of the Orient*, 13 (1970), 236-37.

¹²⁶ Pers. comm. Norman Biggs.

¹²⁷ This weight is now in the Yorkshire Museum. Kisch, op. cit. in note 38, Fig. 3; Arbman, op. cit. in note 125, Taf. 134, no. 2.

¹²⁸ Kisch, op. cit. in note 38, 162; Steuer, op. cit. in note 27, 475-77; Balog, op. cit. in note 125, 236-37.

¹²⁹ Steuer, op. cit. in note 121, 12-13.

¹³⁰ Steuer, op. cit. in note 27, 526-27.

¹³¹ *Ibid.*

¹³² Kisch, op. cit. in note 38, 165; M. Stenberger, *Die Schatzfunde Gotlands der Wikingerzeit*, vol. 1 (Stockholm, 1958), Abb. 14, Abb. 17; Graham-Campbell, op. cit. in note 90, no. 193; Oakley and Webster, op. cit. in note 20.

¹³³ E.g. one of the objects in the Trewiddle hoard; D. M. Wilson, *Anglo-Saxon Ornamental Metalwork 700-1100 in the British Museum* (London, 1964), no. 92.

¹³⁴ D. Tweddle, 'The weight of the evidence', *Interim*, 9 (1983), 24-25.

¹³⁵ R. A. Smith, 'Anglo-Saxon remains', in W. Page (ed.), *The Victoria History of the County of Suffolk*, vol. 1 (London, 1911), 345. This weight is now in the Streeter Collection in the Yale Medical Library.

¹³⁶ This unpublished object was kindly pointed out to me by Dr Sue Margeson of Norfolk Museums Service.

¹³⁷ Graham-Campbell, op. cit. in note 90, no. 307.

¹³⁸ Graham-Campbell, op. cit. in note 90, no. 308. Brøgger, op. cit. in note 123, 77 discussed these weights, but stated their findspot as Ballyholme, near Bangor, Co. Down. This error was repeated by a number of later authors, including Kisch, op. cit. in note 1, 83 and Kyhlberg, op. cit. in note 111, 171.

¹³⁹ Graham-Campbell, op. cit. in note 32, 115, 118.

- ¹⁴⁰ D. N. Marshall, 'Report on excavations at Little Dunagoil', *Trans. Buteshire Nat. Hist. Soc.*, 16 (1964), 48, 52. I am indebted to James Graham-Campbell for drawing my attention to this weight, and identifying the oval brooch fragment.
- ¹⁴¹ Pers. comm. P. Hill.
- ¹⁴² I would like to thank Dr Patrick Wallace for permission to examine these weights before their publication.
- ¹⁴³ J. G. Sheehan, 'Viking Age silver arm-rings from Ireland', M.A. diss., National University of Ireland, Galway (Galway, 1984), 59.
- ¹⁴⁴ Pers. comm. Cormac Bourke.
- ¹⁴⁵ M. Redknap, *The Christian Celts. Treasures of Late Celtic Wales* (Cardiff, 1991), 78; D. W. Dykes, *Anglo-Saxon Coins in the National Museum of Wales* (expanded reprint from AMGUEDDFA, *Bulletin of the National Museum of Wales*, 24 (Winter, 1976) (Cardiff, n.d.), 21.
- ¹⁴⁶ Brøgger, op. cit. in note 123, 80–81; Wamers, op. cit. in note 37, Kat. nos. 23, 27, 29, 43, 64, 80, 102, 126, 130; Petersen, op. cit. in note 25, 163, no. 31.
- ¹⁴⁷ Brøgger, op. cit. in note 123, 80, 84; Wamers, op. cit. in note 37, no. 64.
- ¹⁴⁸ Graham-Campbell, op. cit. in note 90, 88–89; Wamers, op. cit. in note 37.
- ¹⁴⁹ Graham-Campbell, op. cit. in note 90, 88–89.
- ¹⁵⁰ Petersen, op. cit. in note 25, 7; Wamers, op. cit. in note 37.
- ¹⁵¹ Wamers, op. cit. in note 37, 61.
- ¹⁵² Graham-Campbell, op. cit. in note 32, 118; id., 'The Viking-Age silver hoards of Ireland', in B. Amqvist and D. Greene (eds.), *Proceedings of the Seventh Viking Congress* (Dublin, 1976), 40; Grieg, op. cit. in note 31, 59.
- ¹⁵³ J. Booth and I. Blowers, 'Finds of sceattas and stycas from Sancton', *Numismatic Chronicle*, 143 (1983), 145.
- ¹⁵⁴ K. Skaare, *Coins and Coinage in Viking-Age Norway* (Oslo, 1976), 44–45, 144.
- ¹⁵⁵ S. Youngs (ed.), *The Work of Angels. Masterpieces of Celtic Metalwork, 6th–9th Centuries A.D.* (London, 1989), no. 136.
- ¹⁵⁶ Youngs, op. cit. in note 155, no. 135.
- ¹⁵⁷ Pers. comm. Michelle Brown.
- ¹⁵⁸ A. Christophersen, *Trondheim — en by i middelalderen* (Trondheim, 1987), 82–83.
- ¹⁵⁹ M. Henig and K. Leahy, 'A steelyard weight from Manton, South Humberside', *Antiq. J.*, 68 (1988), 321–22.
- ¹⁶⁰ Waterman, op. cit. in note 123, 77, 80.
- ¹⁶¹ R. H. M. Dolley, 'A Piedfort lead trial-piece of Edward the Confessor', *British Numismatic J.*, 27 (1953), 176; M. M. Archibald and C. E. Blunt, *Anglo-Saxon Coins V. Athelstan to the Reform of Edgar 924–c. 973* (Sylloge of Coins of the British Isles, 34 (London, 1986), no. 1255).
- ¹⁶² M. Archibald, 'Anglo-Saxon and Norman lead objects with official coin types', in A. G. Vince (ed.), *Aspects of Saxon and Norman London 2: Finds and Environmental Evidence* (London and Middlesex Archaeological Society Special Paper, 12) (London, 1991).
- ¹⁶³ Dolley, op. cit. in note 161, 175–77.
- ¹⁶⁴ R. J. Cramp, 'Analysis of the finds register and location plan of Whitby Abbey', in D. M. Wilson (ed.), *The Archaeology of Anglo-Saxon England* (London, 1976), 456.
- ¹⁶⁵ Dolley, op. cit. in note 161.
- ¹⁶⁶ E.g. S. Lyon, 'Historical problems of Anglo-Saxon coinage — (3) denominations and weights', *British Numismatic J.*, 38 (1969), 219, fn. 2.
- ¹⁶⁷ Archibald, op. cit. in note 162.
- ¹⁶⁸ A. Vince, *Saxon London, an Archaeological Investigation* (London, 1990), 113.
- ¹⁶⁹ Although the London weight has been compared to 120 pennies (*ibid.*, 113–14; Archibald, op. cit. in note 162), the condition of the weight, and the difficulty in determining what weight of penny is reflected, make such attributions difficult. See also below, the discussion on metrology.
- ¹⁷⁰ K. F. Morrison, 'Numismatics and Carolingian trade: a critique of the evidence', *Speculum*, 38 (1963), 423–24.
- ¹⁷¹ W. Hess, 'A German weight bearing the name of an Emperor Otto', *Spink's Numismatic Circular*, 98 (1990), 306–07.
- ¹⁷² Hall, op. cit. in note 12, 106.
- ¹⁷³ J. A. Axworthy Rutter, 'Glass, other metal, industrial and organic artefacts', in D. J. P. Mason (ed.), *Excavations at Chester 26–42 Lower Bridge Street 1974–6. The Dark Age and Saxon Periods* (Grosvenor Museum Archaeological Excavation and Survey Reports, No. 3) (Chester, 1985), 62.
- ¹⁷⁴ Wallace, op. cit. in note 35, 212.
- ¹⁷⁵ H. Elsner, *Wikinger Museum Haithabu* (Schleswig, n.d.), 114.
- ¹⁷⁶ P. Rahtz et al., *The Saxon and Medieval Palaces at Cheddar. Excavations 1960–62* (British Archaeol. Reports. British Ser., 65) (Oxford, 1979), 287.
- ¹⁷⁷ Wilson, op. cit. in note 133, 208, no. 150.
- ¹⁷⁸ H. M. Roe, 'A medieval bronze gaming piece from Laoighis', *J. Roy. Soc. Antiq. Ireland*, 75 (1945), 156–59.
- ¹⁷⁹ Biddle, op. cit. in note 23, 918, 921, find nos. 3188, 3192, 3194 and 3195; discussed p. 910.
- ¹⁸⁰ Pers. comm. Geoff Egan, Norman Biggs.
- ¹⁸¹ Biddle, op. cit. in note 23, 923, 921, find no. 3200.
- ¹⁸² For example, a grant by Burgred, King of Mercia to Ealhun, Bishop of Winchester, 857: '... he [Bishop Ealhun] is to have therein to use freely the scale and weights and measures as is customary in the port [of London]'. P. H. Sawyer, *Anglo-Saxon Charters* (London, 1968), no. 208; W. de G. Birch, *Cartularium Saxonicum* (London, 1885–93), no. 492; translation in D. Whitelock (ed. and trans.), *English Historical Documents I. c. 500–1042* (London, 1979), no. 92.

- ¹⁸³ P. H. Sawyer, *From Roman Britain to Norman England* (London, 1978), 114 ff.
- ¹⁸⁴ D. Hill, *An Atlas of Anglo-Saxon England* (Oxford, 1981), 126–28.
- ¹⁸⁵ Sawyer, *op. cit.* in note 183, 201.
- ¹⁸⁶ C. E. Blunt, B.H.I.H. Stewart and C. S. S. Lyon, *Coinage in Tenth-Century England* (Oxford, 1989), 237; C. E. Blunt, 'The St Edmund memorial coinage', *Proc. Suffolk Instit. Archaeol.*, 31 (1969), 234–55; C. S. S. Lyon and B. H. I. H. Stewart, 'The Northumbrian Viking coins in the Cuerdale hoard', in M. Dolley (ed.), *Anglo-Saxon Coins* (London, 1961); P. Grierson and M. Blackburn 1986, *Medieval European Coinage I. The Early Middle Ages (5th-10th Centuries)* (Cambridge, 1986), 316–25.
- ¹⁸⁷ Arne, *op. cit.* in note 36; T. J. Arne, *La Suède et l'Orient* (Uppsala, 1914); Brøgger, *op. cit.* in note 123; Steuer, *op. cit.* in note 121; Kyhlberg, *op. cit.* in note 111; Hans-Otto Nielsen, 'Röntgenologische und metrische Untersuchungen an zwei Kugel-Gewichtssätzen aus Haithabu', *Berichte über die Ausgrabungen in Haithabu*, 18 (1983), 109–20; and unpublished; and Wallace, *op. cit.* in note 35, 212–13.
- ¹⁸⁸ Skaare, *op. cit.* in note 154, 144.
- ¹⁸⁹ Kyhlberg, *op. cit.* in note 3, 158–59; *op. cit.* in note 111; 234–38; Nielsen, *op. cit.* in note 187.
- ¹⁹⁰ Nielsen, *op. cit.* in note 187, 115–16.
- ¹⁹¹ Steuer, *op. cit.* in note 121; Nielsen, *op. cit.* in note 187, 111; Kyhlberg, *op. cit.* in note 111, 252–58.
- ¹⁹² C. Blindheim, B. Heyerdahl-Larsen and R. L. Tollnes, *Kaupang-funnene* (Norske Oldfunn, XI), vol. 1 (Oslo, 1981), 146; Steuer, *op. cit.* in note 27, 472–73; Stalsberg, *op. cit.* in note 30.
- ¹⁹³ The issue of Anglo-Saxon metrological systems is extremely complicated, fraught with circular arguments, dubious assumptions, and cultural and temporal leaps. See, for example, F. Seebohm, 'On the early currencies of the German tribes', *Vierteljahrsschrift für Social- und Wirtschaftsgeschichte*, 1 (1903), 171–95; H. M. Chadwick, *Studies on Anglo-Saxon Institutions* (Cambridge, 1905); R. A. Smith, 'Early Anglo-Saxon weights', *Antiq. J.*, 3 (1923), 122–28; H. B. A. Petersson, *Anglo-Saxon Currency. King Edgar's Reform to the Norman Conquest* (Lund, 1969); Lyon, *op. cit.* in note 166; id., 'Some problems in interpreting Anglo-Saxon coinage', *Anglo-Saxon England*, 5 (1976), 173–224; P. Nightingale, 'The ora, the mark, and the mancus, weight-standards and the coinage in eleventh-century England, part 1', *Numismatic Chron.*, 143 (1983), 248–57; id., 'The ora, the mark, and the mancus, weight-standards and the coinage in eleventh-century England, part 2', *Numismatic Chron.*, 144 (1984), 234–48; Blunt, Stewart and Lyon, *op. cit.* in note 186, 235 ff.; R. D. Connor, *The Weights and Measures of England* (London, 1987).
- ¹⁹⁴ Lyon, *op. cit.* in note 193, 174–75.
- ¹⁹⁵ See, e.g. Connor, *op. cit.* in note 193, 100 ff.; Biddle, *op. cit.* in note 23, 910–15; N. Biggs, 'English coin-weights, up to 1588', *British Numismatic J.*, 60 (1990).
- ¹⁹⁶ See, e.g. Biddle, *op. cit.* in note 23, 915 where the four postulated Anglo-Saxon weights (as well as later examples) are compared against several systems.
- ¹⁹⁷ Smith, *op. cit.* in note 193, 122.
- ¹⁹⁸ P. Grierson, 'Weight and coinage', *Numismatic Chron.*, 7 (1964), iv.
- ¹⁹⁹ Wallace, *op. cit.* in note 35, 212.
- ²⁰⁰ See S. E. Kruse, 'Ingots and weight units in Viking Age silver hoards', *World Archaeol.*, 20 (1988), 285–301 with references.
- ²⁰¹ Exact weights are not available, but Norman Biggs informs me that the weights closely reflect a unit of 0.68 grams, multiplied by the number of dots on the flat face. For the three weights for which he has information, this yields standards of c. 1.36 grams (2 dots), c. 2.04 grams (3 dots) and c. 4.08 grams (6 dots).
- ²⁰² Connor, *op. cit.* in note 193, 120; Biddle, *op. cit.* in note 23, 914.
- ²⁰³ Kruse, *op. cit.* in note 200.