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WERE BEAKER-PEOPLE THE FIRST METALLURGISTS IN IRELAND?

(Figs. 1–14)

SUMMARY

Study of Irish thick-butted axes (p. 142 ff.) shows a strong Central European influence which can be related to finds associated with bell-beakers (p. 155 ff.). This influence comes through the thin-butted axe (p. 150 ff.), one of several Central European innovations introduced during the beaker period, among them halberds (p. 152 ff), and tin-bronze alloys. These innovations made impact on an archaic industry producing thick-butted axes, – an industry of which the affinities remain indefinite, but which are more likely to be with the beaker-culture than with other cultural complexes (p. 166 ff).

Three phases of the Irish Early Bronze Age are deduced (p. 168 ff.); *phase 1*, covering the earliest industry and the Central European innovations in the beaker period; *phase 2*, which covers the more general use of these innovations, and is roughly synchronous with the first phase of the Wessex Culture in southern England; *phase 3*, synchronous with the second phase of Wessex Culture, is outside the scope of this paper.

THE PROBLEM

Ireland's role as an important early metallurgical centre has been confirmed by recent spectrographic analyses revealing many primitive objects to have been made of smelted copper; in contrast copper objects are few in England and Wales¹. Native copper is seen not to have been used significantly in Ireland and the early gold objects (as suggested below, p. 165) are unlikely to have been made earlier than smelted copper. The problem of the origin of Irish metallurgy has long exercised a fascination (even when its early competence was only matter for conjecture), and is important *vis-à-vis* the neighbouring lands of continental Europe. Opinion has crystallized around two opposed view-points: 1. that it was introduced from the

east by users of beakers who had entered Britain from the Rhineland (Coghlan and Case, 1957, p. 100 ff.), and 2. that it was introduced from the west (Iberia is generally assumed) by or "in the wake of" builders of passage-graves, at some period prior to the arrival of beaker-people (Childe, 1949, p. 113-118; Raftery, 1963, p. 107-108).

These two opinions may be varied so as to blur their contrast. For instance, it is not essential to assume that the earliest metallurgy came from the west, if it was indeed associated with passage-graves. It might have been introduced to Ireland by the same traders (probably of central European origin) who began to dispose of copper implements (possibly all of central European make) in Scandinavia at the end of the Early Neolithic or start of the Middle Neolithic and who presumably continued to do so during the currency of passage-graves there. This assumption finds some support in resemblances between Irish and Scandinavian Neolithic pottery (Case, 1963a, p. 9-11) and by certain if vague resemblances between Irish and Scandinavian early copper axes such as those in the Bygholn hoard. Such a metallurgical industry, if implanted in Ireland, would belong to the third millennium, be pre-beaker, and contemporary with the English Middle Neolithic (Case, 1962, p. 212 ff.); it could be associated with passage-graves, but would be of eastern origin.

What is meant by east or west? The metallurgists who mastered the complex Irish sulphide ores are most unlikely to have originated in areas where such deposits are absent or were unused: therefore, certainly not in the Low Countries, which probably gave much to the beaker-cultures of Scotland and England, nor in Scandinavia, where indigenous ores were not smelted at an early date, nor in Brittany, since it is held little likely that the limited deposits there were worked in early times (Briard & Maréchal, 1958, p. 429). Nor does it seem possible on the available evidence to infer very early use of the deposits on Heligoland (Lorenzen, 1965). To the east the nearest appropriate deposits are near the Middle Rhine, on the fringe of the great cuprifrous region of central Europe; to the west (the Cevennes being rather remote) they are those of north-west Iberia, where gold and tin also occur.

THICK-BUTTED AXES

The most relevant approach to the problem of the earliest Irish metallurgy is, at the moment, through study of the metal objects themselves. Prime importance must therefore be given to the early Irish copper axes, since they are the most numerous surviving data; and this approach is quite appropriate, since the axe has been one of the most powerful instruments of cultural and ecological change.

The majority of early Irish copper axes are of a generally broad-shouldered *thick-*

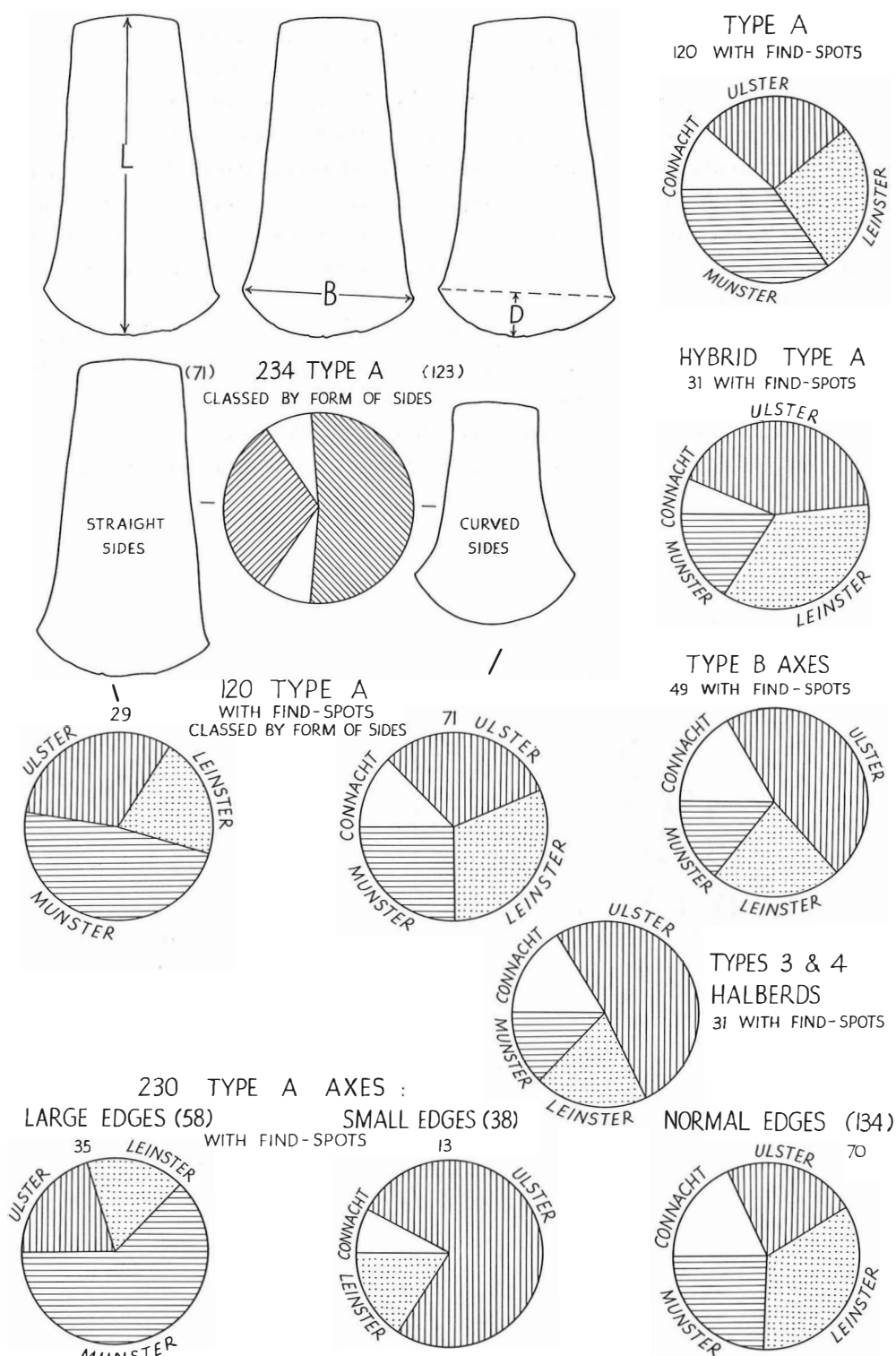


Fig. 1. Top left: Key to measurements of Continental and type A axes. Below: Relative proportions of type A axes with straight and curved sides. Elsewhere: Proportionate distributions by provinces of types and traits of Irish axes and halberds.

butted form (e.g. Fig. 4, nos. 1, 2), here for shortness' sake called *type A*². All other types of copper axe are comparatively very few. The Irish type A axe is superficially similar to axes of early type throughout western Europe, called trapeze-shaped axes, Altheim axes, *etc.*, such as appear notably in the Bygholm hoard and elsewhere in south Scandinavia, at Altheim, the Goldberg, Mondsee, and in the west at Vila Nova de S. Pedro and in southern Spain associated with objects of the so-called colonies (Blance, 1961, p. 192 ff.). These contexts may be accepted as pre-beaker; but the trapeze-shaped axe has twice been found with bell-beakers: at Le Pinnacle, Jersey, with sherds including some of so-called Maritime type (Godfray & Burdo, 1949/50, p. 181-182); and in the Po valley in the well-known grave at S. Cristina with a cord-impressed beaker (of Reflux type in Sangmeister's definition)³. Its apparent association with passage-graves is also notable.

The basic form dates to the 4th millennium in the Fertile Crescent, and to the 3rd millennium in Anatolia and the Aegean islands, whence it was probably diffused

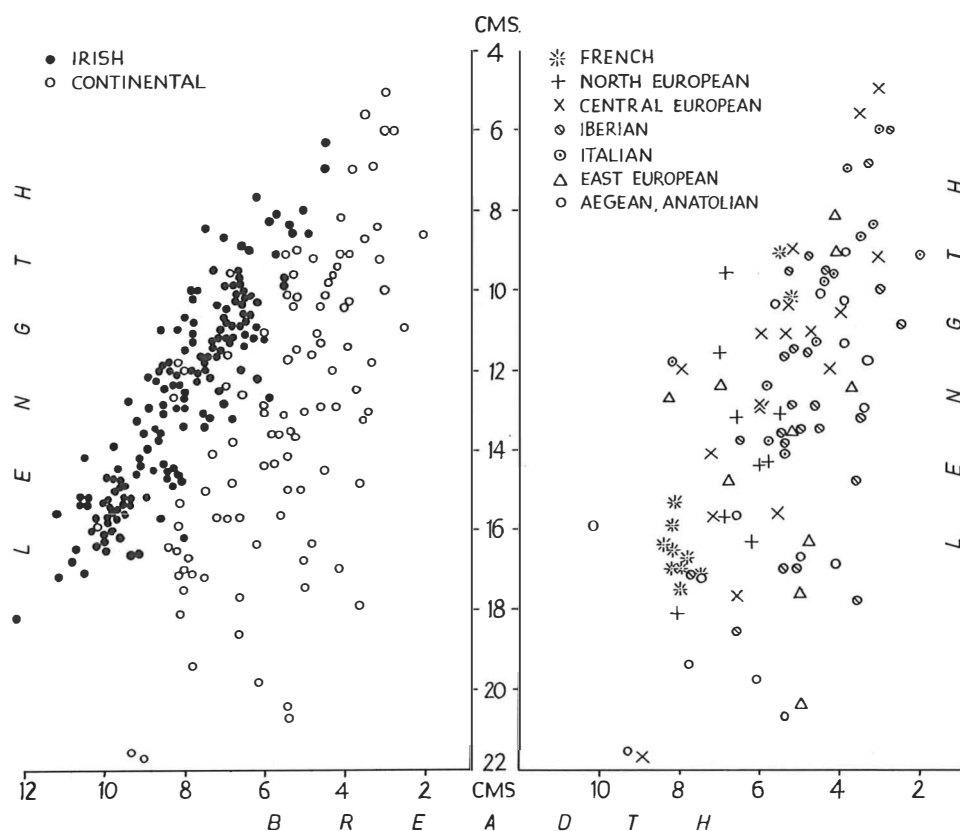


Fig. 2. Type A and trapeze-shaped axes, association of length with breadth. *Left*: Comparison of Irish and Continental. *Right*: Breakdown of Continental.

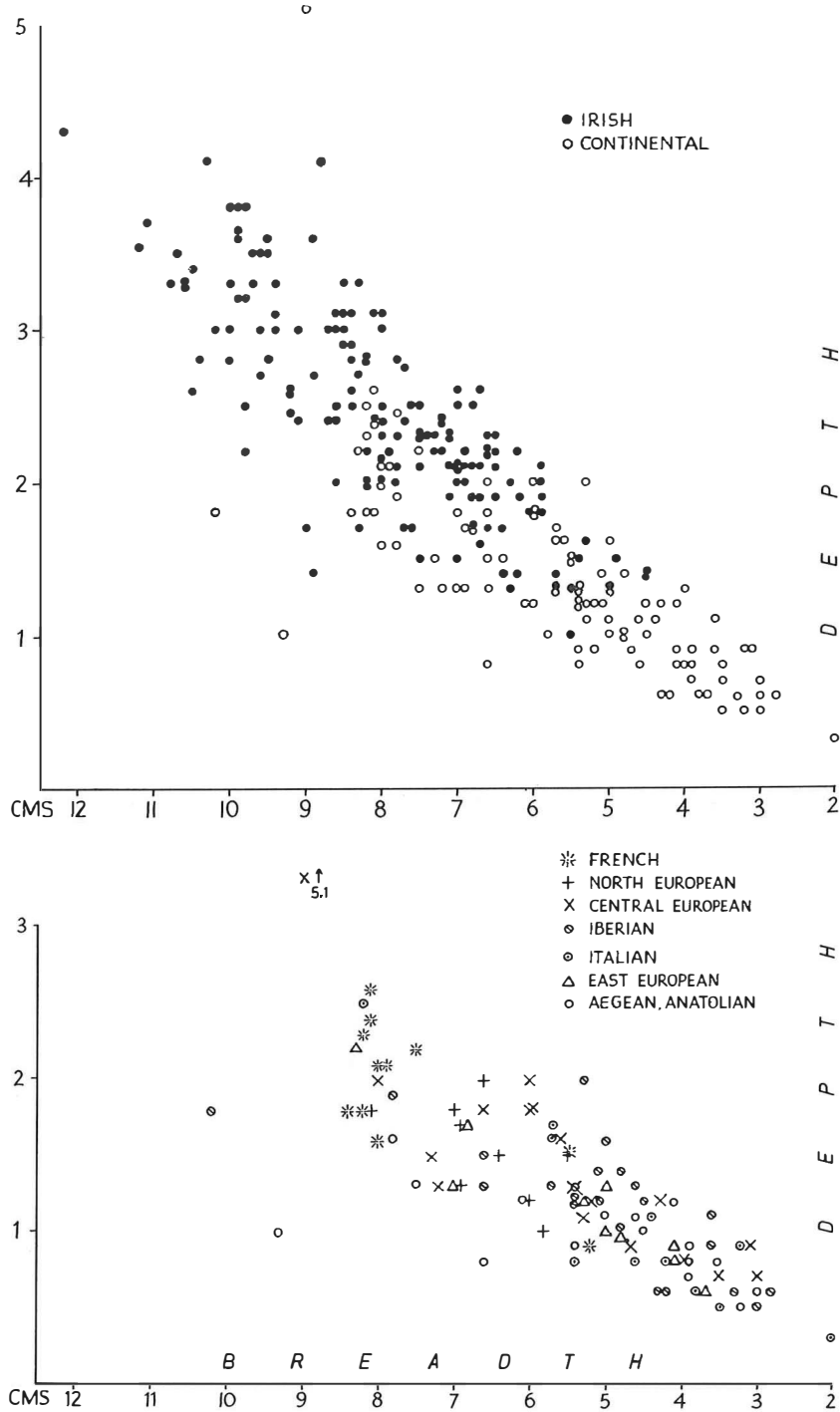


Fig. 3. Type A and trapeze-shaped axes, association of breadth with depth. *Top*: Comparison of Irish and Continental. *Bottom*: Breakdown of Continental.

through Europe and the Mediterranean. This form had a long life in Cyprus, from the Early Cypriot in the later half of the 3rd millennium to the Late and even survived sparsely in the 12th-century hoards (Catling, 1964, p. 86, Pl. 6*d*). One should not be surprised to find it enduring late in Atlantic Europe.

In order to assess Irish axes of type A relative to the apparently similar trapeze-shaped axes throughout the continent of Europe and the Mediterranean region, the absolute dimensions and proportions of over 100 European and west Asiatic⁴ axes (of pre-Early Bronze Age date throughout continental Europe and of date corresponding to the Anatolian Early Bronze Age in the east Mediterranean) were compared with a sample of over 200 from Ireland⁵. Three measurements were selected: length, breadth of the cutting-edge and its depth (L, B and D respectively in Fig. 1). Association diagrams were drawn and two general trends emerged, proceeding from south to north, and south-east to north-west: increasing breadth of the cutting-edge relative to the total length of the axehead (Fig. 2); increasing depth of the cutting-edge relative to its breadth (Fig. 3). Irish axes appear as extreme northern and western variants, exceedingly broad and exceedingly deep (thus curved) in the cutting-edge.

Obviously some of the implements in the sample from the Mediterranean region were adze-blades, or axe-heads intended to be interchangeable as adze-blades, for which a long body and straight edge would be appropriate. But with those from north of the Mediterranean region the function as an axe-head appears to have been primary, and if the comparison is restricted to these the majority of Irish axes still appear aberrant. Again, Fig. 2 and even Fig. 3 must reflect to some extent the gradual adaptation of the copper axe to work in little altered temperate forest. But they also show contrast between the axes from Ireland and those from north-west continental Europe, where conditions may not have differed effectively.

Thus, out of a sample of 234 Irish axes of type A, only 9 (*e.g.* Fig. 4, no. 1) or barely 4 per cent can be compared closely in dimensions with northern, north-western or western continental European examples. Of these, two were found in Ulster, one in Leinster and three in Munster – not a concentrated distribution. And those which have been spectrographically analysed are likely to have been smelted from Irish copper.

Thus, the trapeze-shaped axe, the type-fossil which can be associated with passage-graves, both in Atlantic and north-central Europe, and could be associated with very early metallurgy, is scarcely represented in Ireland. The opinions expressed on p. 142, which connect early Irish metallurgy with passage-graves, at once meet an obstacle. Unless one arbitrarily assumes selective scrapping in ancient times, the primeval form of European copper axe had a diffuse effect on Irish technology, and some other influence was at work.

A fragment of evidence, possibly in favour of a very early date for Irish metallur-

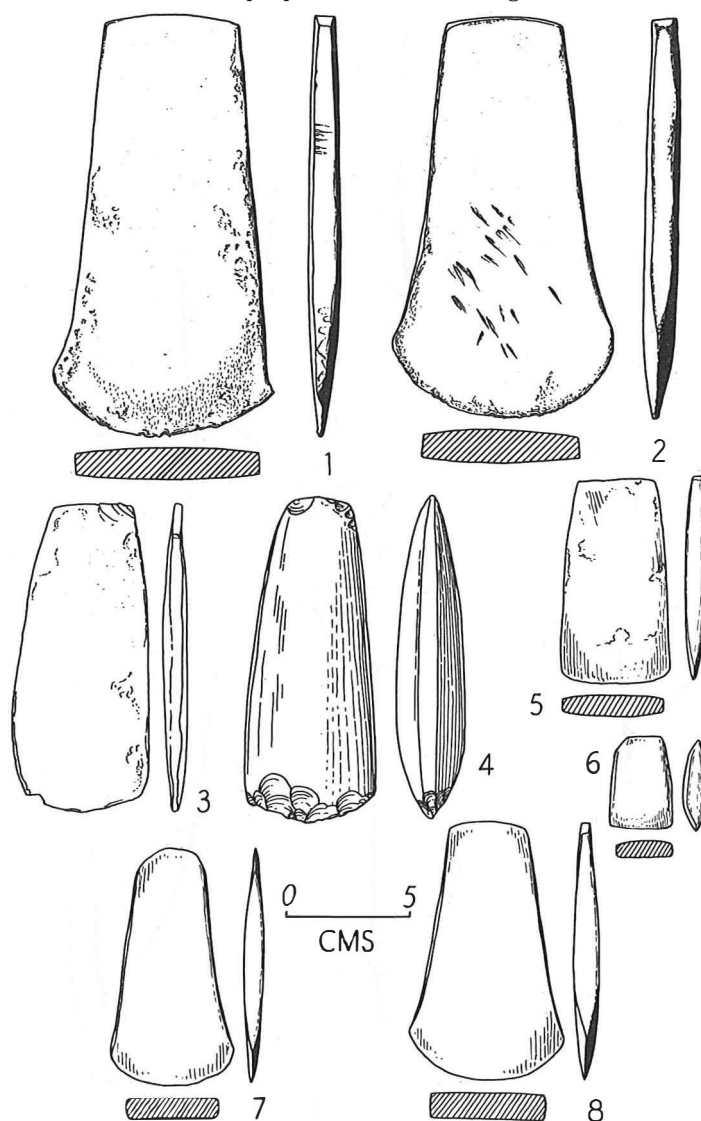
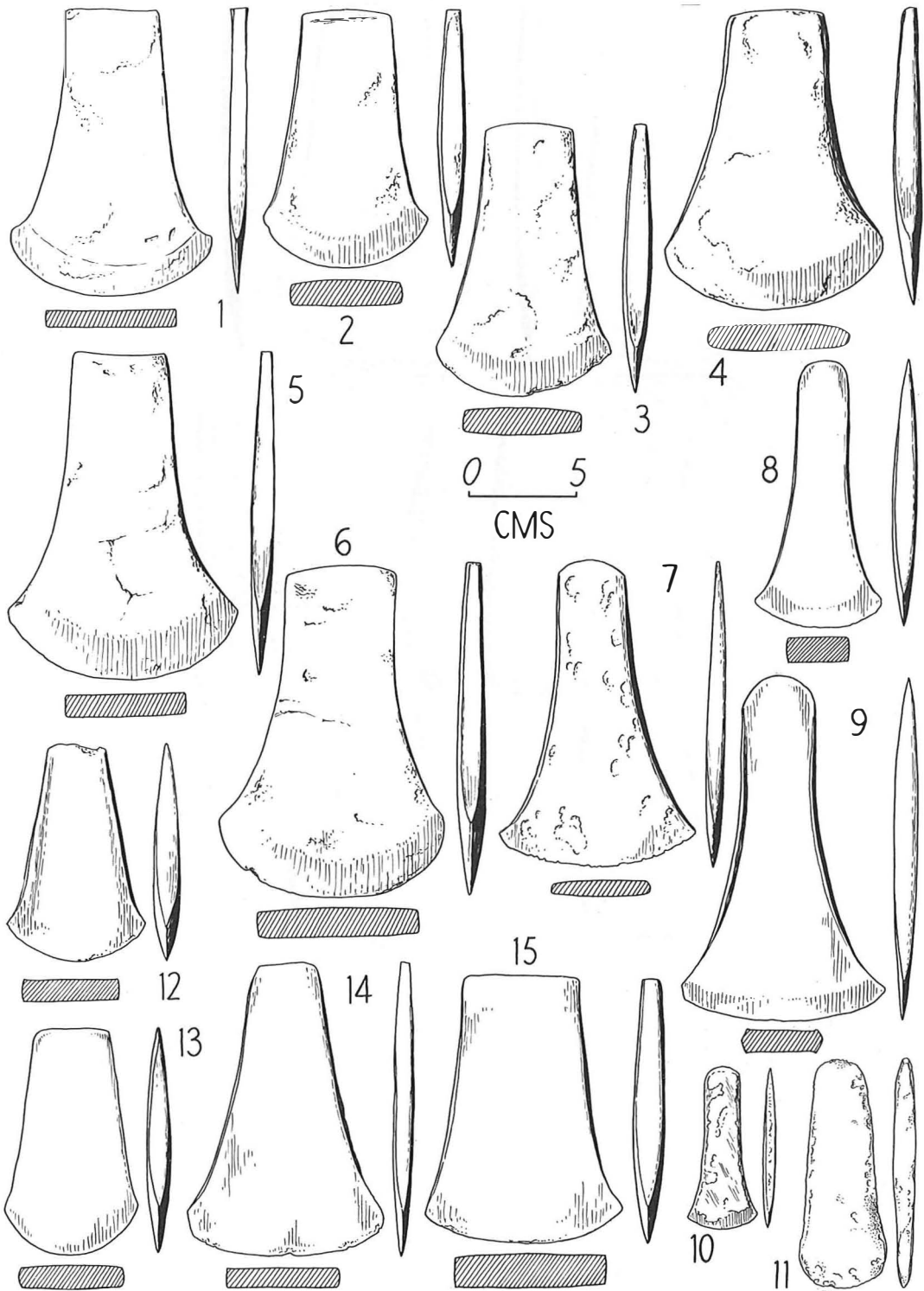


Fig. 4. 1, 2, Hoard at Castletown Roche, Cork; 3, Ireland; 4, Beaghmore, Tyrone (after Jope); 5, Trillick, Tyrone; 6, Toome, Antrim (after Jope); 7, Cullybackey, Antrim; 8, Co. Antrim. 1-3, 5, 7, 8, copper or bronze; 4, 6, stone.

(1, 2, 5, *Ashmolean*; 3, *Pitt-Rivers, Oxford*; 7, 8, *National Museum, Dublin*; 4, *Private*). Scale 2: 5.

gy, may however be examined in passing. Eight adze-blades or axe-heads (*e.g.* Fig. 4, nos. 3 and 5) not of type A (two found in Ulster, two in Connacht, one in Leinster, and all which have been spectrographically analysed probably of Irish metal) resemble in plan stone implements of porcellanite (*e.g.* Fig. 4, nos. 4 and 6) from



north Antrim, Ulster. Use of this rock of *group IX* for axes and other implements may be dated towards the end of the 3rd millennium (Evans, Grinsell, Piggott & Wallis, 1962, p.234–235), but a date towards the middle for its early use may be more likely (Case, 1961, p.214). But this would be most speculative ground for claiming third millennium metallurgy for Ireland, since it would be very difficult to deny that the porcellanite axe did not survive strongly in use into the second⁶.

What then was the other technological influence which had a marked impact on axes of type A, causing them to diverge from continental trapeze-shaped axes?

Morphological analysis helps to answer this question. Out of the 234 Irish axes of type A, 120 have find-spots as to province or country, a reasonable sample which is not too unevenly distributed (Fig. 1, top right).

They may first be classified roughly according to their sides, whether they are more or less straight in plan (*e.g.* Fig. 4, nos. 1 and 2) or have more or less continuous concave curvature (*e.g.* Fig. 5, nos. 1–6).

Axes with straight sides show some resemblance to continental trapeze-shaped axes⁷ and comprise about 30 per cent of the sample (Fig. 1, upper left). They are most numerous in Munster; that province contains nearly half as many again as Ulster (Fig. 1, central left). But nearly twice as many Irish axes of type A, about 52 per cent of the sample (Fig. 1, upper centre) and spread proportionately evenly throughout the provinces (Fig. 1, central) have sides with a more or less continuous concave curve from the barb of the cutting-edge to the shoulder⁸, a feature which distinguishes Irish type A axes sharply from most of the continental trapeze-shaped ones.

Axes from which this feature of sides with more or less continuous curvature was imitated are not far to seek. Such have been found frequently in Ireland (*e.g.* Fig. 5, nos. 7, 8; Fig. 8, nos. 2–4), and belong to a general type which I have defined as thin-butted (Coghlan & Case, 1957, p.91). They differ strongly from the type A, which are generally of arsenical-copper, in being generally of tin-bronze. Flat, unflanged and undecorated examples of these thin-butted axes are plotted on Fig. 6 as type B.

Fig. 5. 1–6, Hoard at Cappeen, Cork; 7, Ireland; 8, Draperstown, Derry; 9, Killala, Mayo; 10, River Scariff (after Armstrong); 11, Ireland; 12, Ballydehob, Cork; 13, Killykeen, Cavan; 14, Shanagolden, Limerick; 15, Swanlinbar, Cavan. (1–6, 8–10, 13–15, *National Museum, Dublin*; 7–12, *Ashmolean*; 11, *Pitt-Rivers, Oxford*). Scale 1: 3.

THIN-BUTTED AXES: THE IMPACT-PHASE

The type B axe appears in shape to have been obviously if indirectly modelled on Únětician or Saxo-Thuringian Early Bronze Age axes, which are likewise of tin bronze; and both the Irish and central European axes were probably hammered up from cast blanks (*e.g.* Fig. 5, no. 11) of very similar form (*cf.* von Brunn, 1959, pl. 59, no. 9). The powerful influence of Saxo-Thuringian axes is hardly surprising; they were products of the most advanced metallurgical region of central and western Europe, made of an advanced alloy, and adapted to the use of a lighter and more easily made haft than the type A or trapeze-shaped type. The haft was the split type⁹ in which the thin butt made a snug fit, contrasting with the club-haft needed for the thick-butted axe and its relatives¹⁰. The Únětician or Saxo-Thuringian axes were of course typically finished with low flanges appropriate to the split haft, whereas the Irish derivatives, the thin-butted axes, show some difference in being more often left unflanged.

The most remarkable examples of both flanged and unflanged Irish variants of the thin-butted axe are the decorated examples, of Megaw's and Hardy's (1938) type I; another interesting variant (*e.g.* Fig. 5, no. 9) has bevelled sides¹¹. A few Irish thin-butted axes (*e.g.* Fig. 5, nos. 7–9) show the typical continental waisted shape in plan¹² and even the tongue-like butt (no. 9); the waisted forms significantly occur only in Ulster, with the exception of a miniature example coated in gold foil (Fig. 5, no. 10) from the river Scariff, Clare (Munster)¹³.

The significance of Ulster becomes clear as one proceeds to determine in which provinces the influence of the thin-butted axe (type B) had the most marked effect on the thick-butted type A. This is seen if one makes a summation of those forms of axe which show obvious hybrid features (30 per cent of the total sample). Such are type A with flanges (*e.g.* Fig. 13, no. 7; Fig. 8, no. 12); axes of type A shape in plan but with thin butts (*e.g.* Fig. 4, no. 7; Fig. 5, nos. 12, 13) or bevelled sides (*e.g.* Fig. 7, no. 3) or with waisted plans (*type A iii*, *e.g.* Fig. 5, no. 6); and those with thick butts but with shapes in plan otherwise resembling the thin-butted form (*type AB*, *e.g.* Fig. 5, nos. 14, 15).

These axes with hybrid features are most frequent in Ulster with Leinster not far behind (Fig. 2, upper right). The same impression is obtained if one compares the overall distributions of types A and B (Fig. 6). Type A is fairly evenly spread, with associated finds most numerous in Munster. Type B is markedly centred in Ulster and Leinster; and the same is true of the thin-butted types as a whole¹⁴. Since morphological analysis suggests a strong influence of type B on type A, these types seem likely to have been largely synchronous and their distributions complementary¹⁵.

A few hoards or associated finds¹⁶ confirm the impact of the thin-butted axe on the thick-butted (type B on type A) and help to clarify what I define as the *impact-*

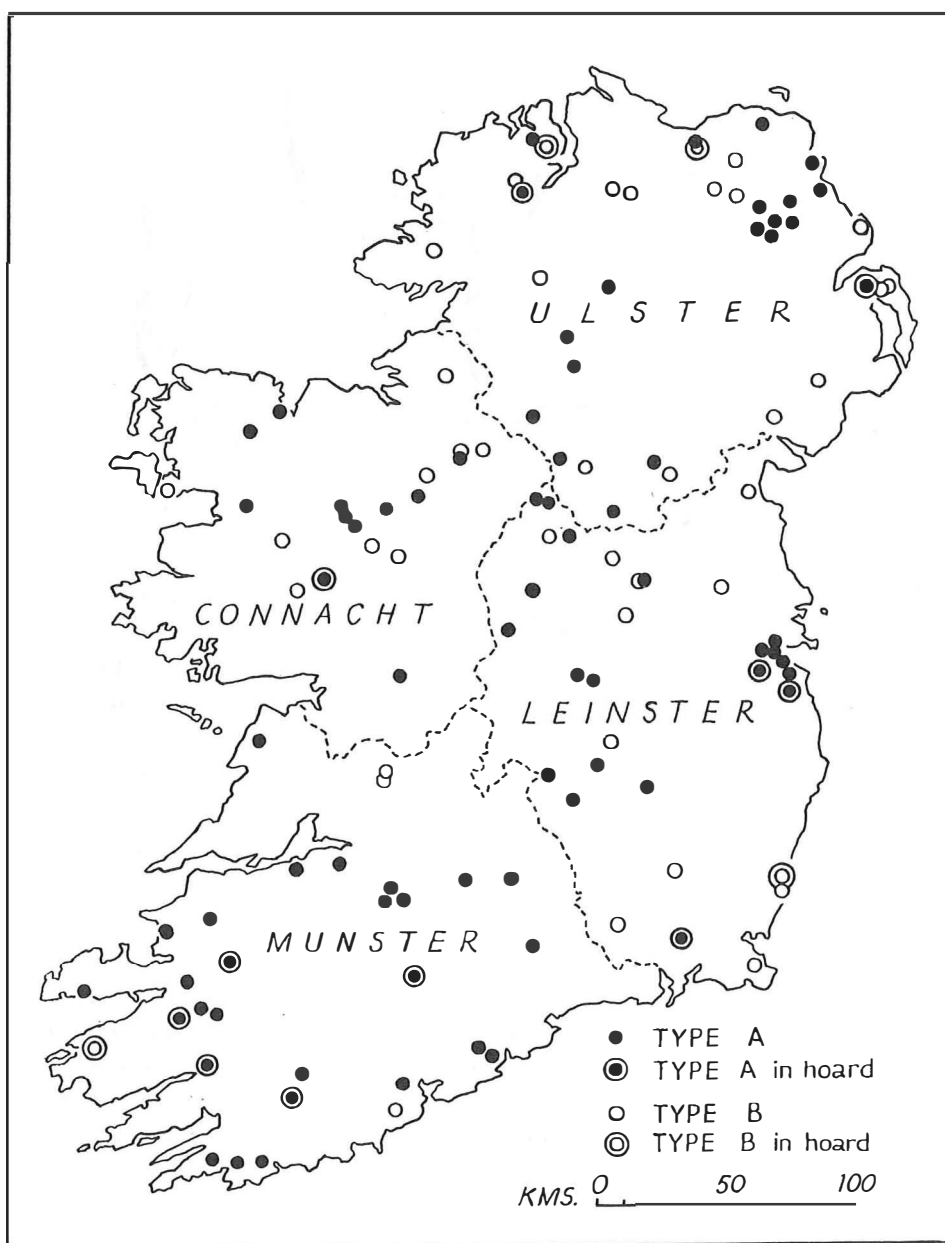


Fig. 6. Provisional distribution of flat axes of types A and B.

phase, during which it took place. The hoard from Cappeen, Cork (Munster) (Fig. 5, nos. 1-6) shows the waisted form of type A (A iii) associated with other axes of type A (Coffey, 1913, p. 8). The hoard from Nash, Wexford (south Leinster) shows type

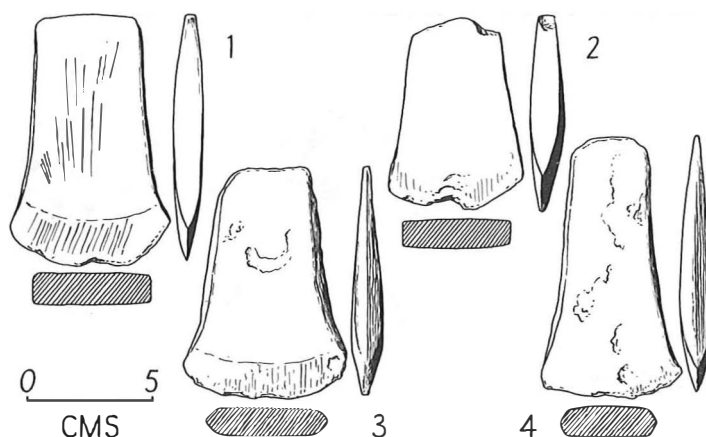


Fig. 7. Axeheads from hoard at Nash, Wexford. (*National Museum, Dublin*). Scale 1: 3.

A (Fig. 7, nos. 1, 2) with the thin-butted bevelled type (no. 4) and pieces of unfabricated copper. The find of axes from Letterkenny, Donegal (Ulster) is also of interest (Fig. 8, nos. 1-4); in the hoard of type B (nos. 2-4) one axe shows hybridisation with type A (no. 2), and there is the possibility that a type A (no. 1) in fact belonged to the find or came from the same workshop¹⁷. Finally, the dispersed find from Birr, Offaly (Leinster)¹⁸ contained an asymmetrical but otherwise normal type A (Fig. 8, no. 6), a type A iii with thick butt (no. 7), a similar form flanged and with thin butt (no. 8), a knife with rivet-notches (no. 9) and a type 5 halberd (no. 5).

HALBERDS

The Birr find suggests that the halberd belongs to the same phase of impact of the thin-butted on the thick-butted axe. Raftery (1951, p. 143-145), ApSimon (1945, p. 40), myself (Coghlan & Case, 1957, p. 103), Evans (1955/6, p. 66) and Butler (1963, p. 20-25) have claimed that Ó Ríordáin's postulate of an Irish origin for north and central European halberds should be reversed; ApSimon and I claimed an Italian origin, but Raftery, Evans and Butler favoured a Saxo-Thuringian one. The question was considered at length by Butler, and Evans made the highly interesting suggestion that the halberd originated in an area "where the battle-axe was a traditional weapon and the idea of hafting copper dagger-blades ... in a similar manner would ... come naturally".

The elements of the halberd were present around the east Mediterranean from a remote period. Riveted daggers of appropriate size with thickened sections and mid-ribs belong to the Early Bronze Age in Anatolia, and can be dated before the

close of the 3rd millennium (Stronach, 1957, p. 89 ff.); and long riveted daggers with mid-ribs or thickened sections were made before the end of the Early Minoan period in Crete (Xanthoudides, 1924, p. 26–27). On the other hand, fat rivets, with which halberds were sometimes but not invariably hafted in central Europe, did not appear until Middle Minoan III and had a short life lasting into but not surviving Late Minoan I (Seager, 1912, p. 107) which, with Late Helladic I saw their *floruit*¹⁹; and daggers with ornate triple mid-ribs which recall the simpler arrangements on the halberd or dagger from Montemerano (Jungmans *et al.*, 1960, p. 22, no. 616, associated with halberd no. 617) and the halberd from Feuersbrunn (Benninger, 1934, p. 132 ff.) also appeared in Middle Minoan III (Seager, 1912, p. 37).

From an European view-point, it is reasonable to assume a generally progressive spread from south-east to north-west of the techniques and ideas to be associated with long metal daggers with thickened sections. Thus, an origin in the far west for a modification such as the halberd seems most unlikely. Central Europe has altogether better claims, and from there the innovation may have spread in several directions. No central European halberd is of Irish metal, but at least one British specimen (Fig. 11, no. 1) seems of central European (Coghlan & Case, 1957, p. 99). Saxo-Thuringia is the likeliest immediate source for the British and Irish halberds, as it is for the British and Irish thin-butted axes.

In that case, halberds of types 3 and 4 in Ó Ríordáin's typology (those which are generally most similar to continental finds) are likely to be the earliest and types 1, 2, 5 and 6 mostly local variations. Provenanced types 3 and 4 are densest in Ulster²⁰, with Ulster and Leinster predominant as with thin-butted axes (cf. proportionate distributions, Fig. 1, lower right). This pattern of distribution is unaltered if selection is confined to halberds of types 3 and 4 closest to continental forms – those with 3 rivet-holes or rivet-notches, and straight or concave sides.

The geographical coincidence of halberds and thin-butted axes is a further suggestion that the Birr find is reliable. Furthermore, an axe of the Migdale group, similar to Irish thin-butted axes, was found associated with a halberd in the Edenkillie hoard (Moor of Sluie), Morayshire, Scotland²¹. Here is not the proper context to pursue the matter, but the fact that halberds, thin-butted axes and penannular rings, three types reminiscent of the Saxo-Thuringian hoards, may be linked in Scotland through the Edenkillie and Auchnacree hoards²², taken together with the mere geographical proximity of Ulster, suggest that a major route by which technological influence from Saxo-Thuringia reached Ireland, was through Scotland.

In any event, there seems no convincing internal reason to separate the initial period of the thin-butted axe in Ireland from that of the halberd, and thus part of the impact-phase is unlikely to be earlier than the first phase of the Wessex Culture in southern England. Part of the currency of the thick-butted axe may therefore have overlapped with that culture.

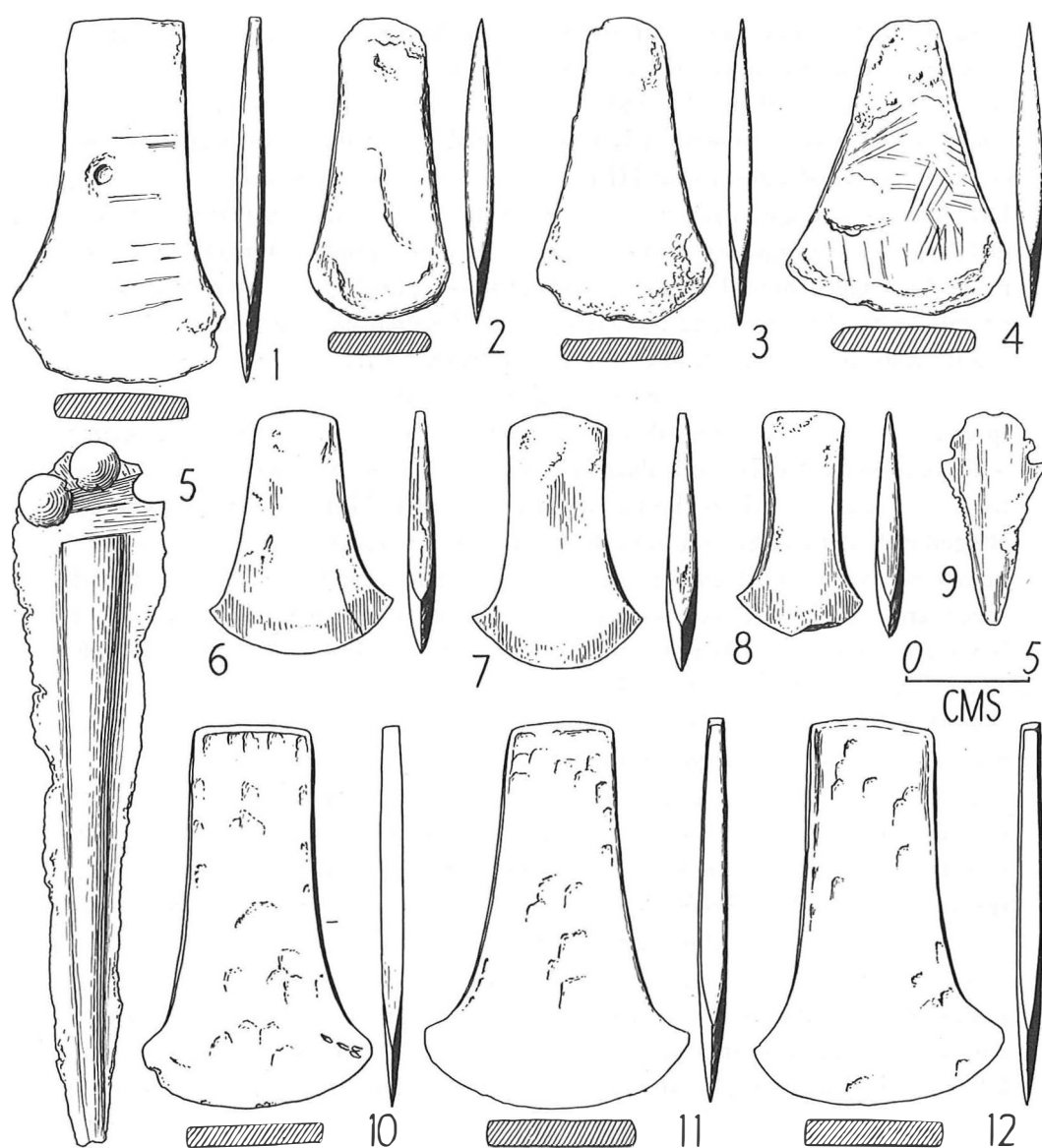


Fig.8. 1-4, Find at Letterkenny, Donegal; 5-9, Find at Birr, Offaly (after Coffey); 10-12, Hoard at Cordal, Kerry. (1-4, 10-12, *National Museum, Dublin*; 5-9, *Dispersed*). Scale 1: 3.

SURVIVAL OF THICK-BUTTED AXES

This conclusion is confirmed if one returns once more to morphological analysis of the type A axes. Apart from classification according to the form of their sides, they may be roughly arranged according to the proportionate form of their cutting-edges²³ whether they are small (*e.g.* Fig. 4, no. 8), large (*e.g.* Fig. 5, nos. 4–6; Fig. 8, nos. 11, 12), or normal. Axes with normal edges (about 57 per cent of the total sample) are appropriately evenly spread geographically (Fig. 1, bottom right), with Leinster and Connaught containing the larger proportions. Those with small, in effect narrow edges (about 16 per cent) are concentrated in Ulster (Fig. 1, bottom centre), and these account for about a third of the axes from the province; none with narrow edges come from Munster. These narrow edges may be accounted for possibly by a strong existing tradition of the porcellanite axe in Ulster.

Axes with large cutting-edges (about 25 per cent) are concentrated in Munster (Fig. 1, bottom left), and are more interesting in the present context, since they are reminiscent of similar edges on thin-butted axes, as in the Willerby hoard, Yorkshire (Megaw & Hardy, 1938, p. 286, Fig. 12*d*), and on the high-flanged axes of the second phase of the Wessex culture, belonging to the Arretton tradition defined by Britton (1963, p. 284 ff.), among them the decorated axes of Megaw's and Hardy's type III. These Wessex culture axes, like continental axes with massive and deep cutting-edges (*e.g.* the Straubing type), correspond to Reinecke A2. Irish axes like those in the Cordal hoard (Fig. 8, nos. 10–12), are well matched by the north-west Iberian *Barcelos* type defined by MacWhite (1951, p. 47 ff.). These *Barcelos* axes and the lunulae and sun-discs found in the same region are surely rightly considered as showing contact with Ireland; the same may be true of the sheet ear-rings. The origin of the *Barcelos* axes may be Argaric in date, but related examples seem to survive exceedingly late²⁴. In Argaric context they appear as advanced products, some being of tin-bronze while the mass of Argaric finds in southern Spain are of arsenical copper²⁵. The occurrence of segmented faience beads in an Argaric grave suggests that part of that culture is synchronous with the second phase of the Wessex culture (Siret, 1887, Pl. 68).

Manufacture of the thick-butted axe is likely to have extended into the period of the Wessex culture, probably into its second phase.

ENGLISH BELL-BEAKER CULTURE KNIVES AND ASSOCIATIONS

One must now see how typical finds associated with bell-beakers are to be associated with the impact-phase and the thick-butted axe.

Spectrographic analyses (Coghlan & Case, 1957, p. 99–100) strongly suggest that two of the earliest surviving copper objects introduced into southern England, the

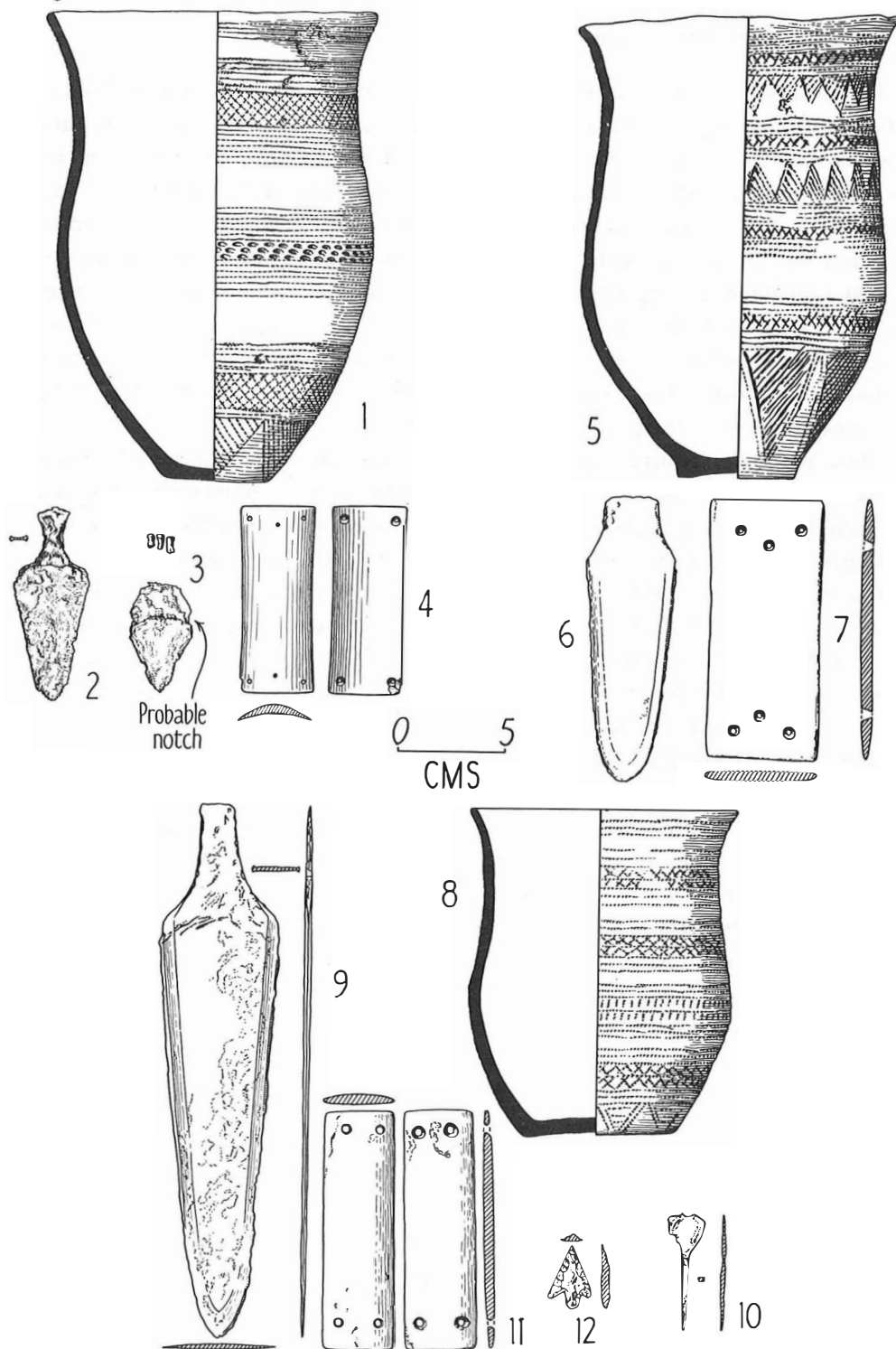
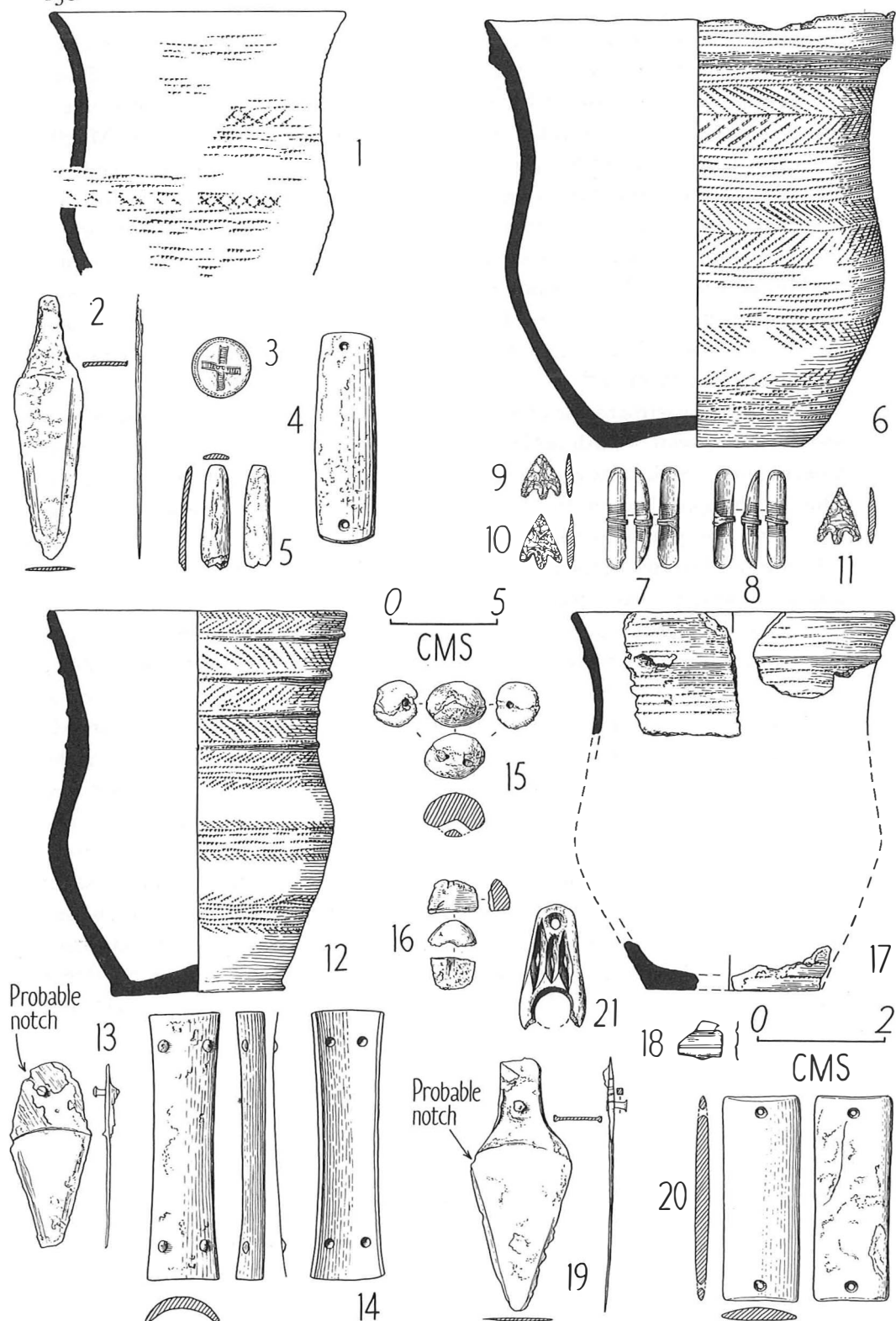


Fig. 9. Southern English beaker-culture grave-groups. 1-4, Dorchester, Oxon.; 5-7, Winterslow, Wilts.; 8-12, Roundway, Wilts. 1, 5, 8, bell-beakers; 2, 3, 6, 9, 10, copper; 4, 7, 11, slate; 12, flint. (1-7, *Ashmolean*; 8-12, *Devizes*). Scale 1: 3.

tanged knives from beaker-culture graves at Dorchester, Oxfordshire, and Roundway, Wiltshire (Fig. 9, nos. 2, 9), were made of central European copper. These knives were associated with bell-beakers decorated with basal zones of pendant triangles (Fig. 9, nos. 1, 8), a type of vessel which has been claimed as having a Middle Rhenish origin (de Mallet Morgan, 1959, p. 43; Piggott, 1963, p. 66; and see here, p. 187), not greatly distant from the nearest plausible easterly source of British and Irish metallurgy. The riveted knife from the Dorchester grave (Fig. 9, no. 3) one of the rivets of which has been recently found to be of 6.6% tin-bronze, points beyond the Middle Rhine to Saxo-Thuringia (Case, 1965); a basically central European origin for the metal objects in the Dorchester and Roundway graves seems emphasised by the occasional occurrence of tin-bronze in Bell-Beaker culture associations in Bohemia and Moravia²⁶.

In contrast, spectrographic analysis has also shown that a tanged knife from a grave at Winterslow, Wiltshire (Fig. 9, no. 6) associated with the same type of bell-beaker as in the Roundway and Dorchester graves (Fig. 9, no. 5), was of Irish copper. Thus, Irish copper became available in southern England during the same phase as the central European imports.

Knives with riveted tangs are likely to have been introduced into south and east England during the same phase; one from a grave with a short-necked beaker at Shrewton, Wiltshire (Fig. 11, no. 3) and another from the Thames have been analysed, and both are probably of central European copper. Noteworthy associations of such knives include those of a truly international character from a cist-grave at Driffield, Yorkshire (Fig. 10, nos. 12–16), the beaker (no. 12) and cist with parallels in north Britain, the beaker²⁷ and the amber buttons (nos. 15, 16) recalling the Veluwe beaker-complex, gold and amber recalling the Odoorn grave-group (see here, p. 50), and the arched wristguard (no. 14) pointing to central Europe. The tanged knife from Driffield also had a rivet-notch²⁸, like those on the knife from Dorchester (Fig. 9, no. 3) mentioned above and on the tanged knife from Faversham (Fig. 11, no. 2) – another shown by analysis to be probably of central European copper. Other associations of knives with riveted tangs are in a grave at Sittingbourne, Kent (Payne, 1883/85, p. 29–30) (Fig. 10, nos. 19–21), where the girdle-fastener (no. 21) emphasises the Early Bronze Age, thus late beaker-culture context (Clark, 1963, p. 77–78 and refs.).



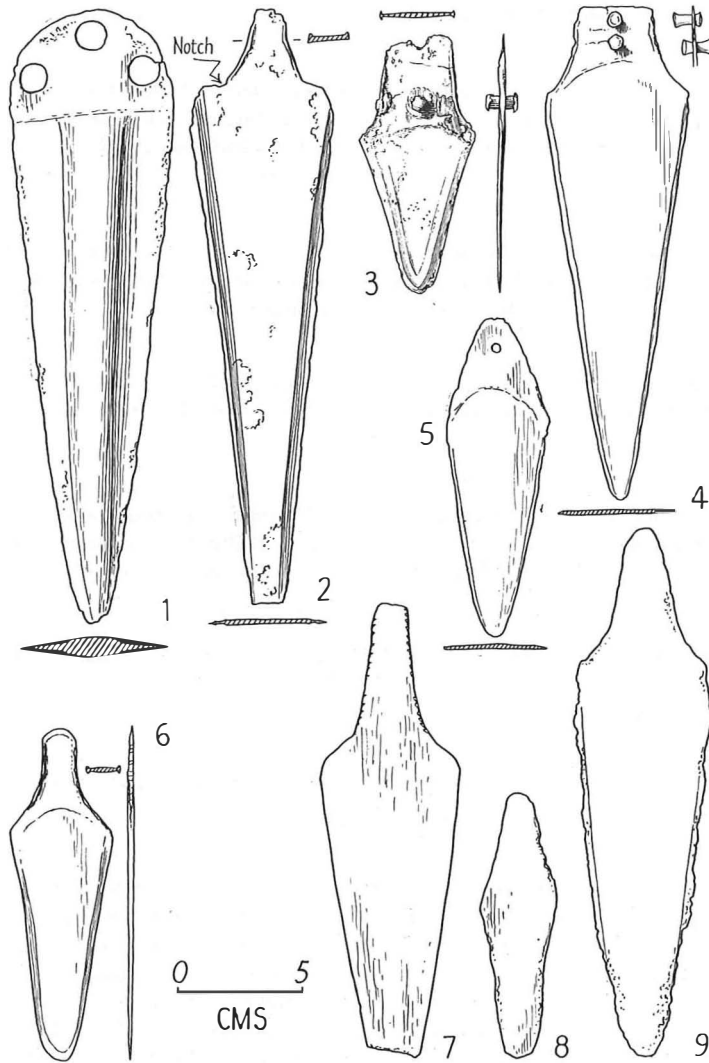


Fig. 11. 1, 2, Faversham, Kent; 3, Shrewton, Wilts.; 4, Listack, Donegal; 5, River Shannon at Jamestown, Leitrim; 6, Kilnagarnagh, Offaly; 7, Ireland; 8, Clontymore, Fermanagh; 9, Dunshaughlin, Meath. (1, 2, *Ashmolean*; 3, *Salisbury*; 4-9, *National Museum, Dublin*).

Scale 1: 3.

← Fig. 10. English beaker-culture grave-groups. 1-5, Mere, Wilts. (4 after Colt Hoare); 6-11, Radley, Berks.; 12-16, Driffield, Yorks.; 17, 18, Sales Lot Long Barrow, Glos. ; 19-21, Sittingbourne, Kent. 1, 6, 12, 17, beakers; 2, 13, 19, copper; 18, copper or bronze sheet; 3, 7, 8, -ad studs of 14, gold; 15, 16, amber; 4, 14, 20, slate; 5, 21, bone; 9-11, flint. (1-3, 5, *Devizes*; 6-11, *Ashmolean*; 12-16, 19-21, *British Museum*; 17, 18, *Mrs. H. O'Neil*; 4, *dispersed*.) Scales: 18, actual size; Remainder 1: 3.

Fig. 12. Provisional distribution of beaker-culture finds, related finds, and copper ores.

Bell-beaker pottery (left-hand symbol): Gortcorbies, Derry; Largantea, Derry; Loughash (Cashelbane and Giant's Grave), Tyrone; Moytirra, Sligo; Dalkey Island, Dublin; New Grange, Meath; Caherguillamore, Grange Circle, Knockadoon (sites C and D) and Lough Gur Megalith, Limerick.

Beaker-pottery, possibly bell-beaker (right-hand symbol): Dundrum, Down; Lyles Hill, Antrim; Ardcloon, Mayo; Ballyedmonduff, Dublin; Ballingoola, Rathjordan, Rockbarton, Limerick; Labbacallee, Cork; Moneen, Cork.

Rockbarton pots: Dundrum, Down; Dalkey Island, Dublin; Ballyedmonduff, Dublin; Caherguillamore, Geroid Island, Knockadoon (sites C and D) and Lough Gur Megalith, Limerick.

Copper knives: Clontymore, Fermanagh; Listack, Donegal; Tirliffin, Cavan; Toome bridge, Antrim; Whitespots, Down; Jamestown, Leitrim; Kilbannon, Galway; Dunshaughlin, Meath; Kilnagarnagh, Offaly; Annagh, Kerry.

Awls (cf. Fig. 13, nos. 2-4): Kilbannon, Galway; Carrigillihy, Cork; Knockadoon (site C), Limerick.

Wristguards: Corran, Armagh; Glenwhirry, Antrim; Maghera, Derry; Portna, Antrim; Co. Antrim (right-hand symbol); Carrowkeel, Sligo; Longstone Rath, Kildare; Rathmore, Meath.

Flint arrowheads (not longer than 3 cms., convex sides, barbs not longer than tang, cf. Fig. 10, no. 9): Aghanaglack, Fermanagh; Ballintoy, Antrim; Ballymena, Antrim; Boviel, Derry; Culbane, Antrim; Dunaghy, Antrim; Dundrum, Down; Galdonagh, Donegal; Loughash (Cashelbane), Derry; Lyles Hill, Antrim; Magheracloone, Monaghan; Newcastle, Down; Skerry, Antrim; Tordree, Antrim; Co. Antrim (right-hand symbol); Clonfert, Galway; Churchtown, Kildare; Dunmanoge, Kildare; Moylagh, Meath; Ballingoola, Grange Circle, Knockadoon (sites C and D), Rathjordan, Limerick; Harristown, Waterford; Kilmeen, Cork; Knockane, Kerry.

Gold finery: Ballyshannon, Donegal; Corran, Armagh; Deehomed, Down; Tedavnet, Monaghan; Ballina, Mayo; Co. Roscommon (right-hand symbol); Belleville, Cavan; Kil-muckridge, Wexford; Co. Cavan and Co. Wexford (right-hand symbols); Douglas, Cork.

Copper ores: After Tylecote, *Metallurgy in Archaeology* (1962), 18.

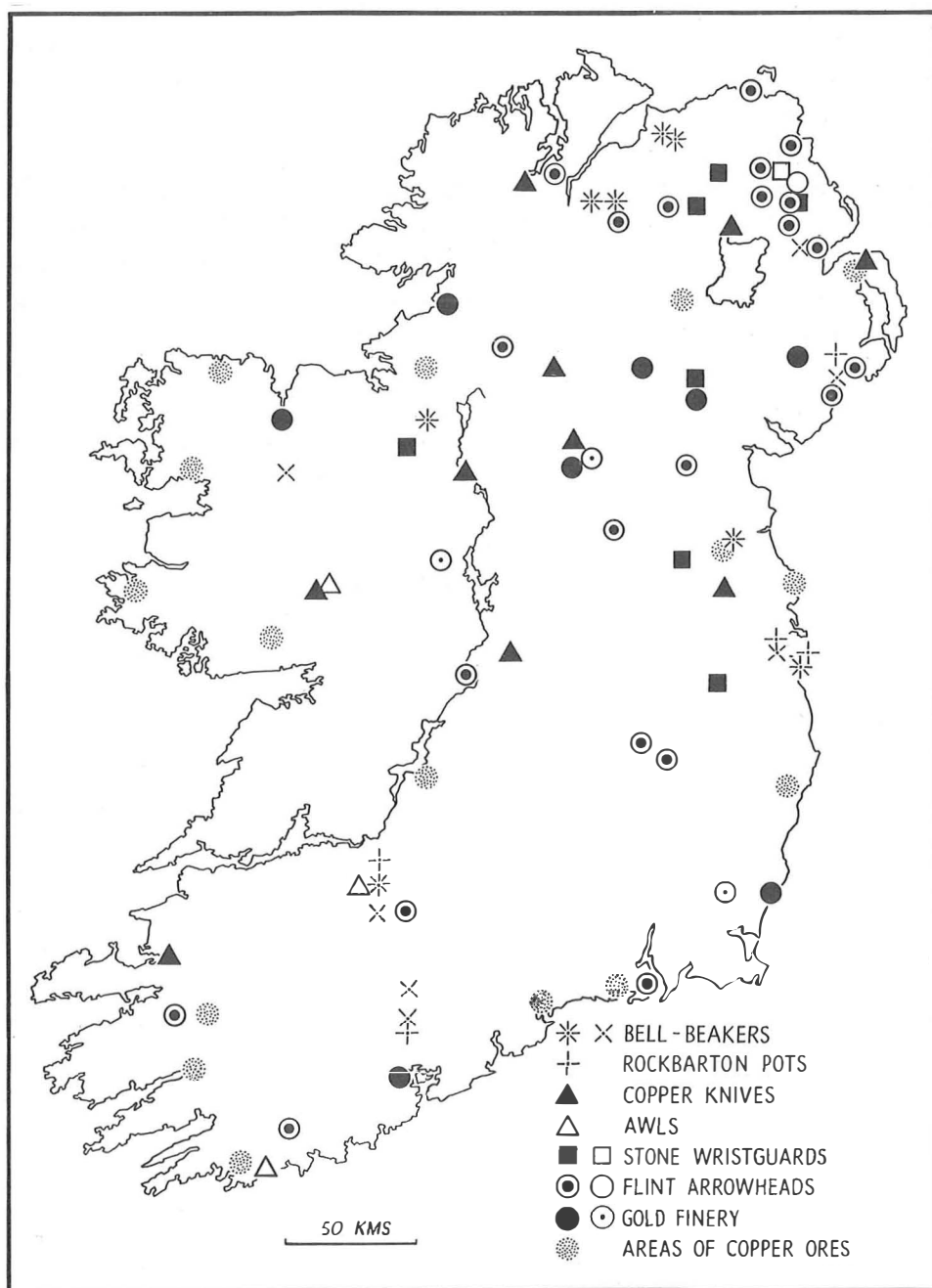


Fig. 12.

IRISH BEAKER-CULTURE KNIVES AND OTHER OBJECTS, AND ASSOCIATIONS

Simple tanged knives (Fig. 11, nos. 6–9), those with riveted tangs (Fig. 11, no. 5), and the type (Fig. 13, no. 1) with rivet-notches have all been found in Ireland. Taken together with sherds of bell-beakers and other finds which have been associated with bell-beakers in Britain, *e.g.* arrowheads, wristguards, awls, gold sun-discs and earrings²⁹, they go some way to suggest considerable beaker-culture settlement (Fig. 12). In order not to appear to prejudge the argument here, Fig. 12 has been confined to bell-beakers, and finds appropriate to bell-beakers. But the inclusion of necked beaker pottery would not alter the pattern³⁰. (Irish bell-beaker pottery displays no Maritime element³¹; some features can be matched in the Netherlands and the Rhineland, but general resemblances are towards Great Britain).

Beaker-culture copper objects have been found in association at Kilbannon, Galway (Connacht; Fig. 13, nos. 1–7) and Whitespots, Down (Ulster; Fig. 13, nos. 8–10). The Kilbannon find (Coffey, 1901, p. 276, Pl. XXXII) comprised a tanged knife with rivet-notches at the base of the tang (no. 1), three double-pointed awls with square centre-sections and rounded end-sections (nos. 2–4), and three type A axes (nos. 5–7); one axe (no. 7) is flanged and has a few strokes of rather haphazard punching on both faces. The awls are of beaker-culture type³². The Kilbannon knife is best matched by that from Faversham, Kent (Fig. 11, no. 2), which was possibly associated with a type 4 halberd (Fig. 11, no. 1); both knife and halberd from Faversham were of central European metal. Various resemblances to the knives from Dorchester, Driffield and Shrewton likewise point the way to central Europe and to the earliest copper-using phase in south and east England. The Kilbannon finds are all of Irish copper and cannot therefore be far removed in date from the Winterslow knife; yet the flanged axe clearly suggests that the find belongs to the impact-phase.

The Whitespots hoard shows a similar situation. Here a fragmentary corroded blade, probably a tanged knife (Fig. 13, no. 8), was found with a triangular knife (no. 9), having two rivets-holes and a rivet-notch and grooves parallel and near to the cutting-edges. Its asymmetry suggests a halberd but the curve on the hafting-plate is appropriate to a dagger or knife. The rivet-notch recalls those of the knives discussed above (*e.g.* that from Kilbannon and Fig. 9, no. 3; Fig. 10, no. 13; Fig. 11, no. 2) and those of many halberds; the knife from Birr (Fig. 8, no. 9) also appears to have had rivet-notches. The grooves are also appropriate to beaker-culture knives (*e.g.* Fig. 9, nos. 6, 9; Fig. 10, no. 2; Fig. 11, no. 2) and to halberds. The third object in the Whitespots hoard was an axe of hybrid form AB (Fig. 13, no. 10), well matched in plan by a bevelled axe from the hoard at Nash, Wexford (Fig. 7, no. 3), already mentioned above (p. 152). Bevelled axes overlap with the Wessex culture³³.

Both the Kilbannon find and the Whitespots hoard thus show metal objects of

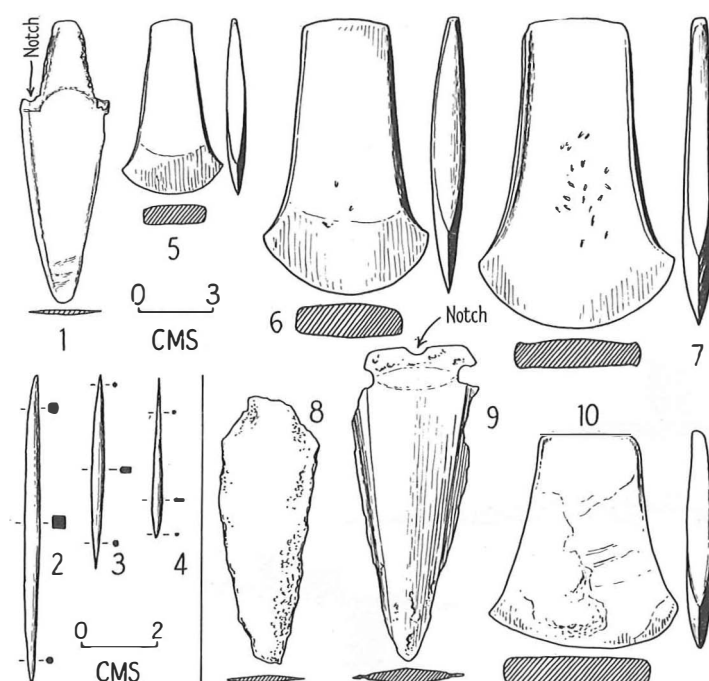


Fig. 13. 1-7, Find at Kilbannon, Galway; 8-10, Hoard at Whitespots, Down. (*National Museum, Dublin*). Scale nos. 2-4, 1: 2; nos. 1, 5-10 1: 3.

bell-beaker type associated with the impact-phase inspired by the technological advances of central Europe. Such objects may be associated with the phase not only typologically, but also metallurgically. The initial programme of metallurgical analyses of halberds and type A axes disclosed a typically Irish early copper with major traces of arsenic, antimony and silver and minor traces of other elements³⁴. The programme which followed and included analyses of several types of axes and objects of the bell-beaker culture has confirmed the absolute predominance of this typical copper. A survey of ores by Coghlan has shown the existence in Munster of deposits from which such a copper could have been smelted (Coghlan *et al.*, 1963). But Coghlan's survey, based on specimens in museums, was of necessity not absolutely complete; it is possible that ancient workings had been exhausted or buried under later tips before the specimens were obtained.

Another possibility which cannot be ignored in studying Coghlan's invaluable publication is that this typical Irish metal may be a *regulus alloy* (Maréchal, 1963a, p. 21-22), in which a small quantity of a *fahlerz*, apparently typical of Munster, rich in arsenic, antimony and silver, was alloyed with a much purer copper smelted from

carbonate or pyritic ores from Munster or elsewhere. In this way, small traces of tin in certain implements and their absence in specimens of Munster *fahlerz* could be explained (Coghlan *et al.*, 1963, p. 14).

Thus, in attempting to distinguish sub-groups in the mass of analyses of the typical Irish metal, attention should be paid not only to major traces, but also to certain

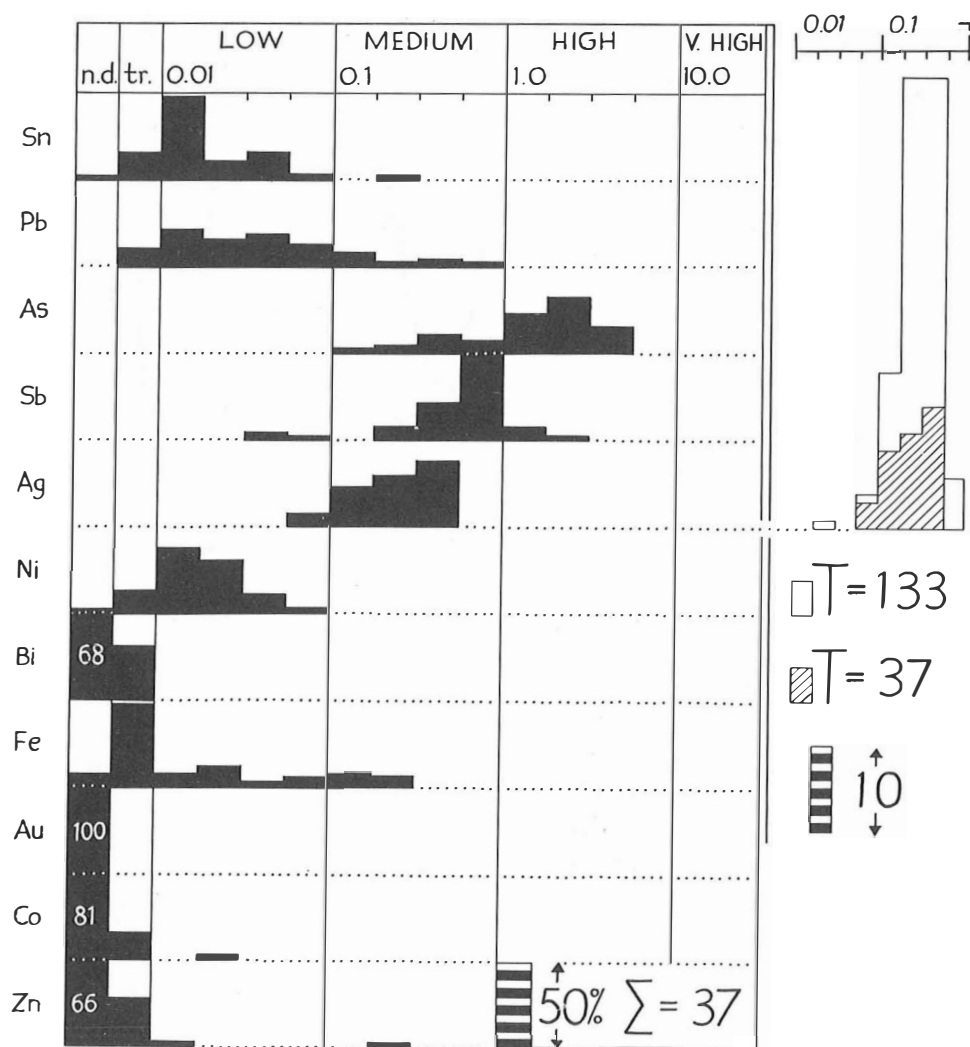


Fig. 14. *Left*: Sub-group of 37 Coghlan-Case Group I coppers. Presentation by Waterbolk-Butler method slightly modified. Relevant normal limits of detection: Sn, Pb, Ni, Bi, Fe, Co, Zn = 0.01; Au = 0.005. Tr = detected below normal limits but not quantitatively determinable. N.d. = not detected below normal limits. *Right*: Ag in sub-group compared with Ag in sample of 133 Group I alloys.

minor ones (Coghlan *et al.*, 1963, p. 8 ff.; Maréchal, 1963*b*, p. 33 ff.) which show significant variations in the analyses. In this way, a distinct sub-group of the typically Irish metal becomes apparent with a minor content of tin, minimal bismuth and remarkably uniform composition generally. Fig. 14 (left) shows this group confirmed by the graphical presentation evolved by Waterbolk and Butler (1965). The anomalies in zinc and cobalt and the diffuse spread of iron are unlikely to be significant in the present context. The skew distribution of silver is however noteworthy. To some extent (Fig. 14, right) it follows the pattern of this element in Group I metals generally, but also suggests that the 37 analyses in the diagram may under-represent the sub-group; others may be concealed in the significant number of Group I metals deliberately alloyed with tin (*e.g.* Coghlan & Case, 1957, no. 31).

The sub-group includes the metal from which the following were made: the tanged knife from Winterslow and four out of the six analysed Irish tanged knives, including the fragment from the Whitespots hoard³⁵; also the axe from Whitespots, axes from the Kilbannon find, the Nash hoard and the Cordal hoard; unfabricated fragments from Nash; and five halberds (four of which are type 3 or 4, including that from Falkland, Fife). It comprises a small proportion of type A axes with straight sides, but includes or is associated with about a quarter of those with hybrid features; it includes two thin-butted axes and includes or is associated with about one sixth of those with large cutting-edges.

It is thus a metal-group *par excellence* of the impact-phase, and has no tendency but to confirm that the Winterslow knife must be closely associated with that phase, together with the earliest imports of copper from central Europe into southern England. Whether or not it is the product of more than one ore-body, the remarkable uniformity of the group appears to suggest one or very few centres of manufacture operating over a limited period of time.

Comparative study of some of the objects other than of copper, which may be associated with beakers in Ireland or elsewhere, does nothing to dissociate the bell-beaker culture in Ireland from the impact-phase.

The narrow stone wristguard, flat in cross-section with two holes, is quite typical of Ireland³⁶, also of Brittany. According to Sangmeister, it is by no means an early bell-beaker type but more truly Early Bronze Age³⁷. This type of wristguard was found in the well-known bell-beaker grave at Mere, Wiltshire (Fig. 10, no. 4), and possibly in a find at Corran, Armagh³⁸, on both occasions with gold sun-discs, also a typically Irish find. These sun-discs and others from Ireland have cruciform patterns (*e.g.* Fig. 10, no. 3) which match patterns on the disc-headed pins of the mature Únétician culture³⁹. A bone tool from the Mere grave (Fig. 10, no. 5) has been found several times associated with long-necked beakers, but once with a bell-beaker with a basal zone of pendant triangles, comparable to that from Roundway⁴⁰; at barrow G. 51, Amesbury, Wiltshire, a bell-beaker which it would be typologically difficult

to separate from that from Mere⁴¹ appears to have been secondary to a long-necked beaker, which has obvious affinities with Veluwe beakers of type 2^{Id}⁴².

Similarly, the basket-shaped gold ear-rings (Armstrong, 1920, nos. 348–350) cannot be separated from the impact-phase in view of the occurrence of a fragment of a similar bronze or copper ear-ring in the Migdale hoard, Sutherland (*Inv. Arch.*, GB 26 (1958), no. 60). Similar bronze or copper ear-rings were associated with long-necked beakers at Stakor Hill, Derbyshire, probably (Fowler, 1955, Fig. 3, 75) and at Tallington, Lincs⁴³. The well-known grave at Radley, Berkshire (*Inv. Arch.*, GB 2 (1955)) shows gold versions (Fig. 10., nos. 7, 8) associated with a cordoned bell-beaker (Fig. 10, no. 6), and a similar bell-beaker (Fig. 10, no. 17) at Sale's Lot Long Barrow, Gloucestershire, was found with a fragment of embossed sheet copper or bronze (Fig. 10, no. 18) plainly in the same tradition as a larger fragment from the Migdale hoard⁴⁴. The Bennekom gold ornament associated with a Veluwe beaker seems appropriate to the same phase (Glasbergen & Butler, 1956, p. 53 ff.).

A PUTATIVE PRE-BEAKER METAL INDUSTRY

An aspect of the bell-beaker culture in Ireland then is to be associated with the impact-phase of ultimately central European inspiration. The definition of the impact-phase presupposes an earlier industry, making thick-butted axes of the straight-sided variety (*e.g.* Fig. 4, no. 1), reminiscent of the continental trapeze-shaped kind. Thus if the impact-phase is to be associated with the Early Bronze Age in Saxo-Thuringia and with the beaker culture in Ireland, one may ask which earlier culture or type-fossil in the archaeological record may be associated with an earlier industry. Three considerations must always be borne in mind here. First, no answer is likely to be very satisfactory without further extensive field-work. Second, any putative early industry in Ireland was probably established first in Munster. Third, any interval between the impact-phase and an earlier industry may have been very short. This last point has been suggested by the morphological analysis, and is confirmed to some degree by the hoard of type A axes from Castletown Roch, Cork (Munster). Both axes which survive were made of typically Irish metal, but not typical of the impact-phase. One (Fig. 4, no. 1) is the most convincing example in Ireland of the continental trapeze-shaped axe. The other (Fig. 4, no. 2) has similar slightly S-curved sides but differs in having the typically Irish deep cutting-edge; it also bears oblique parallel punch-marks on one face as found more haphazardly on both faces of the flanged axe in the Kilbannon find (Fig. 13, no. 7) and on various axes with large

cutting-edges from Munster, all of which should belong to the impact-phase. The trapeze-shaped axehead from Castletown Roche is best matched on the continent with axeheads in a find from the river Loire at Trentemoult; and one of the axes from the Trentemoult find can be matched by Argaric examples⁴⁵.

In the present state of knowledge, two sets of cultural material might be associated with a putative early industry. First, the passage-grave and its complex. This suggestion has often been made; two possible variations, a westerly and an easterly derivation for the associated metal industry were mentioned on p. 142. But any suggestion associating the passage-grave with the earliest Irish copper industry can be strongly opposed. No metal object has been found in primary context in an Irish passage-grave. The lack of any precise resemblances between the Irish type A axe and the continental trapeze-shaped kind has already told against the association (see above p. 146). It seems more unlikely still in view of the virtual absence from Munster, both of passage-graves and apparently of passage-grave art (Ó Riordáin & Daniel, 1964, Figs. 24–25), but still possible if one takes account of Anati's view that the Munster rock-scribings contain a substantial element of such art⁴⁶. Builders of passage-graves who had their main settlements in the north Midlands, may thus have established seasonal mining and smelting camps in Munster. But this does not seem likely to have occurred early in the development of the Irish passage-grave and there the question must be left at the moment, including the problem as to whether these putative metallurgists were of western or eastern origin (see p. 142).

An alternative suggestion has not previously been made that a pre-beaker stage of Irish copper metallurgy might be associated with the wedge-shaped gallery-grave and its complex, including Class II ware (Case, 1961, p. 196–198). Both the wedge-shaped gallery-grave and Class II ware appear prevalent in Munster, and their distributions strongly suggest that of a metal-using culture, in their densities in districts well-suited for settlement, where siliceous and other rocks suitable for cutting tools were not abundant (De Valéra, 1961a, p. 112; Case, 1963, p. 15). Both have associations with metallurgy – but generally of the fully developed Bronze Age⁴⁷. Chronologically they might conceivably be acceptable for our purpose, since radiocarbon dates suggest a fashion at the turn of the third and second millennia near the north continental shore for such coarse pottery as Class II ware and the Kilhoyle pots of Ulster. Both tombs and pottery may have been introduced from abroad; gallery-graves with matching features have been claimed from Brittany (De Valéra, 1961a, p. 115), although resemblances there, or elsewhere in northern Europe, to Class II ware are exceedingly vague⁴⁸.

But an outstanding objection to the association of very early metallurgy with the wedge-shaped gallery-grave is that few of the gallery-graves excavated to date, in north or south Ireland, have not also been found to contain beaker pottery, both bell- and long-necked. Thus the earliest phase of the wedge-shaped gallery grave and its

associated wares cannot be clearly disentangled from the impact-phase⁴⁹, and there too the question must be left.

Were beaker-using people the first metallurgists in Ireland? On present evidence as in 1957 (Coghlan & Case) the best answer seems: Yes.

Some evidence leaves the question open; but other data strongly suggest that the arrival of beaker-using people in Ireland coincided with the dissemination of advanced metallurgical ideas derived from central Europe. It may be quite fallacious to assume that changes in pottery style and in other material culture marched in step with innovations or changes in metallurgical processes. The simplest and least contradictory hypothesis is that both the earlier industry and the industry of the impact-phase were introduced by beaker-using people. In other words, beaker-using exponents of an old-established pan-European tradition of metallurgy included in their numbers a few influential innovators (p. 157) closely in touch with central Europe.

PHASES OF THE EARLY BRONZE AGE

Three stages in the early development of metallurgy in Ireland may be inferred. We have an archaic industry (stage I) overtaken by the events of the impact-phase (stage II), the first part of which (stage II*a*) was prior to the Wessex Culture of southern England, and the second (stage II*b*) contemporary with that culture's first phase. We may summarize thus:

Stage I. Industry in Munster making thick-butted axes of copper-arsenic alloys, an industry with indefinite cultural or geographical affinity, but difficult to believe not connected ultimately with the technologically advanced central European area. This industry rapidly overtaken by events of stage II, although continuing in modified production into the duration of the second phase of the Wessex culture in southern England.

Stage II (the impact-phase). (a) Technical innovations brought to Ireland by beaker-using people, at a time when both bell- and necked-beakers (ApSimon, 1958, p. 36) were in use (although probably in use by different groups). More widespread centres of production making thick-butted, thinbutted and hybrid types of axe, gold finery, tanged knives from start of phase, and halberds and type I decorated axes towards end; use of copper-arsenic alloys, copper-arsenic-tin alloys, and occasionally tin-bronzes. The mining centres may have remained largely southern, and the

centres of fabrication more northern, as suggested by the distributions of halberds, type B and hybrid axeheads⁵⁰. The derivation of the major features of this phase must be sought in central Europe, but once established in Ireland, the resultant industries probably had international contacts, for example with north-west Iberia. Associated finds: Letterkenny, Kilbannon, Whitespots, and possibly Nash.

This stage (*a*) of the impact-phase probably developed internally without drastic external intervention into (*b*), broadly contemporary with the first phase of the Wessex culture and the start of the popularity of the Food Vessel in Ireland, which saw more general use of the thin-butted axe and tin-bronze alloys, and the *floruit* of the bevelled and the type I decorated axes, and possibly of the halberd. To this stage II*b* also belong the five Bush Barrow type daggers listed by Flanagan (1961, p. 284*ff*), including one with inhumation-burial, food-vessel and gold pommel-binding from Topped Mountain, Fermanagh, Ulster. Scrap metal probably began to be used freely. Associated finds: Birr, Killaha East, Topped Mountain, and possibly Cordal. Wide international contacts pertained, as exemplified in the Wageningen hoard (see p. 81-2).

A final stage of the Early Bronze Age, corresponding to the second phase of the Wessex Culture, is outside the scope of this paper, featuring *inter alia*, high-flanged and type III decorated axes, with various spearheads and daggers representing continuing European contacts (Flanagan, 1961, p. 286*ff*). Halberds and probably thick-butted axes were still made.

Chronological opinion influenced by radiocarbon dating needs no persuading that the impact-phase was prolonged and in no sense a *coup de theatre*. But precise fractions of a century cannot be properly estimated from present data. Stage I, if it is to be distinguished chronologically from stage II, may possibly have been not earlier than the 19th century, and stage II*a* in the same century but more probably in the 18th (Case, 1965, p. 222). Making allowance for the longer chronology advocated by Butler and Van der Waals (1964, p. 20) and for the radiocarbon determinations of the Helmsdorf grave (1663 \pm 160, Bln-248: Kohl & Quitta, 1966, p. 29) and even for the Great Trilithon, Stonehenge (1720 \pm 150, BM-46; Barker & Mackey, 1960, p. 27), phase II*b* may have been in progress around the turn of the 17th and 18th centuries; it may not have begun to be overtaken by the innovations corresponding to the second phase of the Wessex Culture until the 16th.

Many of the objects claimed as providing evidence for an Irish Copper Age seem synchronous with the Early Bronze Age of southern England, and in Ireland itself axes of tin-bronze were plainly used alongside halberds of copper, as in Saxo-Thuringia⁵¹ and apparently in north Italy (Junghans *et al.*, 1960, nos. 582, 583). Only the rather indefinite stage I merits description as a Copper Age and even here the term seems precious, since carefully contrived alloys with arsenic were obviously used almost exclusively.

A revised three-fold division of the Irish Early Bronze Age is therefore proposed:

	EBA 1	EBA 2	EBA 3
<i>Technological terms used in this paper:</i>	Stage I Stages I & IIa	Stages I & IIb	
<i>Chronological terms used by Hawkes (1960) for Ireland and Britain:</i>	Copper Age	EBA 1	EBA 2
<i>Southern English cultural divisions:</i>	Beaker	Wessex I	Wessex II

TRADE

A ready assumption is that central European technology was brought to Britain and Ireland in a quest for minerals and metals. Butler has suggested the rare and valuable tin – but very tentatively since the surviving evidence for trade is slender (Butler, 1963, 203 ff.). But the reality of exactly contemporary commerce in metals and how it was organised in detail, and, on the other hand, the slight material evidence which would survive from illiterate societies, may be seen and inferred from the archives of the so-called *Karum* of Kanis (Kültepe), an Assyrian trading establishment in central Anatolia (Garelli, 1963).

The *Karum* was a semi-independent hierarchical organisation existing alongside the local principalities, sharing their material culture except in personal ornaments⁵². Among other activities, it operated a metals exchange and probably imported tin. Different grades of copper⁵³ were determined and priced, but ingots are elusive. Transport was by pack-animals (asses) and sometimes carts.

Obviously complex interchanges involving records and accounts did not pass between barbarian European societies. The *Karum* nonetheless shows a plausible contemporary pattern of a few representatives of a higher culture contributing greatly to the flow of commodities and ideas in a lower one, and leaving few traces of commerce or foreign origin except written records.

One of the major commodities handled by the *Karum* was textiles, including imported varieties. In this context, one recalls the Saxo-Thuringian textiles portrayed in the Göhlitsch cist⁵⁴; and recalls the motives in rock art of South-west Scotland, on the Badden cist for example (Campbell, Scott & Piggott, 1960/61, p. 54–5); then those associated with another cist-burial (and beaker and Kilhoyle pottery) at Lyles Hill in Ulster; and the significant similarities between the Lyles Hill motives and those on type I decorated axes and some Irish Food vessels (Evans, E. E., 1953, p. 31). May not all these illustrate the impact on the west of rich and dazzling finery, bartered from central Europe for prospecting rights?

[Revised September, 1966.]

NOTES

¹ Preliminary publication of analyses by Coghlan and Case (1957). A further long series of analyses, on which the conclusions in this paper are partly based, has since been made, due to the kind co-operation of the staff of the National Museum, Dublin, in particular Dr. J. R. Raftery and Miss E. Prendergast.

² Defined as *thick-butted* in Coghlan and Case, 1957, p. 91 ff.

³ Discussed by Sangmeister (1957). I am grateful to Mr. R. E. Linington for examining this beaker for me. The degree to which beaker-pottery and an axe of relevant type were associated at the passage-grave of Entretérminos, Madrid, must remain uncertain (Loriana, Marques de, 1942).

⁴ Cypriot axes were omitted to avoid weighting the sample unevenly.

⁵ For the purposes of this paper generally and for Fig. 1-3, and 6, I have used an unpublished corpus of Irish axes, originally prepared by Mr. John Burke for the M. A. degree at University College, Dublin. Mr. Burke has since made additions but the corpus which I have used remains representative. I am most grateful to Mr. Burke for generously letting me use his material here, for numerous discussions and much helpful advice, particularly on the associated finds. I have adopted Mr. Burke's term type A and type B. I am grateful to Mr. Burke and Mr. George Eogan for commenting on this paper in draft and to Mr. Eogan, Professor M. J. Kelly and to Mr. Etienne Rynne of the National Museum, Dublin and Mr. Lawrence Flanagan of the Ulster Museum for much help.

⁶ But the influence of metal types on its various forms seems to have been slight (Jope, 1952, p. 46).

⁷ The straight-sided axes include two variants which are not easy to distinguish sharply and which appear also among the continental trapeze-shaped axeheads: those of which butt and sides, apart from the splay at the edge, form fairly well-defined linear planes (Fig. 4, no. 1), and those of which the sides have a very gentle and fairly smooth double curvature (Fig. 4, no. 2).

⁸ 18 per cent are unclassified on Fig. 1, either being anomalous, or having one side more or less straight and the other concave (e.g. Fig. 8, no. 10).

⁹ As seen in the well-known skeuomorph from Kütten-Drobitz, Saale region, von Brunn, 1959, Pl. 57, no. 2.

¹⁰ May we see the thick butt and broad shoulder as being in an adze-blade tradition of east Mediterranean origin, whereas the central European thin butts are appropriate to true axe-heads?

¹¹ All these axes of the thin-butted group (type B, thin butted flanged, type I, and the bevell-ed kind) correspond to those British examples, classified as "flat axes of the Migdale group" by Britton (1963, p. 263, 270).

¹² Resembling most the north German variant quoted by von Brunn (1959, Pl. 27, nos. 5-7).

¹³ Armstrong (1922, p. 135); it is Tray Q Q, no. 8 in Wilde (1857, p. 524). This identification is entirely due to Mr. Burke.

¹⁴ The moulds await complete study. Coghlan and Raftery (1961, p. 225-6) list three examples (two Leinster, one Munster) in the National Museum, Dublin.

¹⁵ The greater density of finds implied for the north and north-east is not surprising, taking account of the likely distribution of population in the early 2nd millennium B.C. (Case, 1961, p. 215-9, Figs. 27-30; de Valéra, 1961b, p. 250).

¹⁶ The documentation is generally less than absolutely desirable. In this paper where the association is definitely stated in museum-records or consistently elsewhere the term "hoard" is used. "Find" is used in cases where the association is not definitely stated on *each* occasion or where doubt has been expressed in print.

¹⁷ Fig. 8, nos. 2-4, were published by Armstrong (1917, p. 512, 514) as an association from

a bog at Letterkenny. Fig. 8, no. 1 is of similar preservation, and came to the National Museum Dublin, from the same vendor at the same time, as also from a bog at Letterkenny. It is of virtually identical arsenical copper to that of Fig. 8, nr. 3. In Fig. 8, no. 3 this copper had been alloyed with tin. Nos. 2 and 4 are also tin-bronze alloys, but from a different copper.

¹⁸ Coffey, 1901, Pl. XXXIII; Coffey, 1913, p. 7-8. There seems no absolutely compelling reason to question (as did Ó Ríordáin, 1937, p. 196-8) the view of such a conscientious scholar as Coffey that the objects were associated. The association is not surprising since an axe similar to type A iii with thin butt was found in a grave at Butterwick, East Riding, Yorkshire, which chronologically approached the first phase of the Wessex culture in southern England, if it did not overlap it. Apart from the finds illustrated by Piggott (1963, p. 87, Fig. 20, nos. 6-10) the grave contained sherds of a Food Vessel (Greenwell, 1877, p. 189).

¹⁹ I am grateful to Dr. H. W. Catling for discussion of this point.

²⁰ Distribution after Ó Ríordáin, 1937, p. 307-8, 321; Raftery, 1951, Fig. 140; Coghlan & Case, 1957, Fig. 1.

²¹ *Inventaria Archaeologica* (1958), GB 30. The halberd was apparently classified as type 6 by Ó Ríordáin through having 4 rivet-holes.

²² Auchnacree hoard, Angus. *Inventaria Archaeologica* (1958) GB 27. Furthermore, the riveted knife resembles that in the Birr find.

²³ 2 per cent of the sample were found unclassifiable.

²⁴ Cf. *Inventaria Archaeologica* (1962), E 8.

²⁵ I am most grateful to Dr. Junghans and Professor Sangmeister for their continued kindness in giving me copies of unpublished Iberian analyses.

²⁶ Information most kindly given by Dr. L. Háek. Tanged knife from Bohemia, about 6.1 per cent tin-bronze, square-sectioned awl from Moravia 2.5 per cent.

²⁷ Cf. van der Waals & Glasbergen, 1955, Pl. XIII, no. 38; cf. also Pl. XII, no. 37.

²⁸ Rivet-notches indicate (as should be obvious) that the handles of these beaker-culture knives were originally wider than their tangs. The purpose of the rivets was to keep the tangs registered with the handle-plates. These plates were probably bipartite and had broad shallow tenons which fitted between the flanges normally found on the tangs. Without rivets, registration was presumably by binding.

²⁹ Included with the gold sun-discs and ear-rings are the obviously related sub-rectangular plates of gold foil (Armstrong, 1920, nos. 391-4). Embellishments of leather wristguards or simply spangles? Armstrong's entries do not agree completely with those of Wilde (1862, p. 39, 40, 44), according to whom three were found together at Belleville, Kilmore, Co. Cavan (Leinster), and another in Co. Cavan with fragments of what appears to have been at least one diadem (Armstrong, 1920, no. 395). Such diadems are known from north-west Iberia, and this is evidence for contact additional to that listed by MacWhite (1951). Among examples quoted by Monteagudo (1953, p. 269 ff.) is one from a cist-grave at Montilla, Córdoba, with fragments possibly of gold bracelets, a western European tanged knife, and four Palmella points. Another diadem may have been found at Entretérminos (note 3 above).

³⁰ The short-necked beaker has only appeared once and in degraded form: Loughash, Giant's Grave, pot D. (Davies, 1939, p. 264).

³¹ Sherds from Moytirra (Piggott, 1963, p. 62-63) may conceivably be Breton but scarcely Maritime; those from Lough Gur are neither Breton nor Maritime.

³² Variants of double-pointed types such as Eynsham, Oxfordshire (Case, 1956, Fig. 1) and Lough Gur, Site D (Ó Ríordáin, 1954, p. 412, Fig. 43, nos. 1, 2). The square section appears in Bohemia and Moravia.

³³ One in a grave at Aylesford, Kent, may be a little earlier than the first phase of the Wessex culture (Piggott, 1963, p. 84, note 5), but the flanged example from barrow no. 7, The Ridgeway, Dorset, belongs to that phase (Drew & Piggott, 1936, p. 25) and examples with a type 5 halberd in the hoard at Killaha East, Kerry (Munster) (Ó Ríordáin, 1946, Pl. XII) are contemporary.

³⁴ Coghlan & Case, 1957, p.98-9, Group I and some of Group II.

³⁵ The other three are Jamestown, Shannon (Fig. 11, no. 5), and Listack, Donegal (Ulster, no. 4), both with riveted tangs; and Kilnagarnagh, Offaly (Leinster, no. 6).

³⁶ But found unassociated to my knowledge except at Corran (see below p. 165); and at the Longstone Rath, Furness, Kildare (Leinster) with washer beads, small sherds which Abercromby pronounced "may have been parts of a cinerary urn" and cremated burials in a cist by a standing stone within a banked and ditched enclosure (Macalister, Armstrong & Praeger, 1913, p. 351 ff.).

³⁷ Sangmeister, 1964, p. 96 ff. Of the quoted Dutch contexts, four out of the five straight-sided and one of the two convex-sided are associated with the Veluwe beaker-group. But elsewhere one may wonder whether an over-strong EBA emphasis has not been given by including objects which are not strictly alike, some of which show various differences from the Irish examples plotted on Fig. 12, and which in Argaric contexts Siret listed not without good reason as whetstones (Siret, 1887, p. 119), and which have been similarly classified in Middle Minoan context (possibly beginning in EM III: Xanthoudides, 1924, p. 20, 66, 80, 105). Compare one in a box, surely appropriate to a whetstone, from Anghelu Ruju, Sardinia (Guido, 1963, Pl. XIII).

³⁸ I am most grateful to Mr. Etienne Rynne for this information (Wilde, 1857, p. 89).

³⁹ But the bronze or copper fragment with square tang from Roundway (here Fig. 9, no. 10) is surely rightly to be compared not with a pin, but as in *Inventaria Archaeologica* 1958, GB 32, with fragmentary tanged blades, from a late beaker-culture grave at Kircaldy, Fife, and from the wedge-shaped gallery-grave at Largantea, Derry (Ulster), where found with a sherd of an Early Bronze Age urn of Caltragh type.

⁴⁰ Stanton Harcourt, Oxfordshire: Case, 1963b, p. 21-25. The pendant triangle motive appears on necked beakers, for instance at the settlement at Easton Down, half a mile only from the grave at Winterslow, discussed above (Stone, 1932, p. 367-9).

⁴¹ My drawing (Fig. 10, no. 1) is an attempt to restore the original shape of this beaker, at present somewhat obscured with plaster.

⁴² Abercromby I, 1912, no. 2; Cf. van der Waals & Glasbergen, 1955, Pl. XIV, no. 42. I am most grateful to Mr. Paul Ashbee for information about G 51.

⁴³ Welland Valley Research Committee Report no. 7, unpublished.

⁴⁴ Sales Lot Long Barrow: I am most grateful to Mrs. H. O'Neil, the excavator for permission to illustrate finds from a secondary burial, in advance of her publication. Migdale hoard: *Inventaria Archaeologica* (1955), GB 2, no. 54.

⁴⁵ I am grateful to Dr. J. Briard for drawings of the Trentemoult find. A tanged blade reminiscent of a Palmella point like one from a passage-grave at Kercadoret, Morbihan, with barbed and tanged arrowheads (Briard and L'Helgouach, 1957, p. 6-7) was dredged from the river Loire with the axes. Similar blades, differing in proportion, occur in the Argaric culture.

⁴⁶ Anati, 1963, p. 14. Motives typical of the Munster scribings have also been found in primary position at the passage-grave, New Grange, Meath (Leinster), where beaker-culture settlement-debris was secondary (O'Kelly, 1964, p. 288 ff.).

⁴⁷ *Largantea*: Tanged bronze blade and bone hilt-plates (Herring, 1938, p. 175-8). *Loughash (Giant's Grave)*: Mould for palstave; copper ring (smaller than from Odoorn beaker-culture grave), and bronze blade with sherds of Kilhoyle pot (Davies, 1939, p. 257, 259, 266). *Moylisha*: Mould for looped spear-head in body of cairn (O h-Iceadha, 1946, p. 125-6). *Knockadoon, site D, House I*: Mould for palstave and fragments of one for spear-head and of crucibles (O Riordáin, 1954, p. 390, 400-1). *Knockadoon, site F*: Fragments of moulds for looped spear-heads and rapiers (*loc. cit.*, 420-2). The radiocarbon date from the gallery-grave, Island, Cork (Munster) would not be surprising in some of these contexts. D 49: 1150 ± 140 B.C. Watts, 1960, p. 115.

⁴⁸ Including one or two from the uncertain context of the Camp of Lizo, Morbihan, from a region where other Irish connections have been claimed (Case, 1963a, p. 12). Class II ware

cannot be compared with S.O.M. ware, except in the most generalised way. One may note at the second settlement at Le Pinnacle, Jersey, the association of S.O.M. pottery, an arciform stone pendant and Grand Pressigny arrowheads, with a trapeze-shaped copper axe; but also with sherds of Maritime bell-beaker pottery (as noted above, p. 144) and barbed and tanged arrowheads.

⁴⁹ As small circumstantial details, suggesting infiltration by eastern influences, one may note in Clare, with its dense concentration of gallery-graves, the axe coated with gold foil from the river Scariff (Fig. 5, no. 10), possibly reminiscent of the gold axe from the Dieskau 1 hoard (von Brunn, 1959, Pl. 12) and from near Scariff a flint dagger of Long Stone Cist type (Day, 1895, p. 176); in the more accessible Ulster, rock art from the court-cairn, Goward, Down, and associated with the cist-burial at Lyles Hill, Antrim (p. 170 below, and refs.) points to central Europe. Both Ulster monuments yielded Kilhoyle pots.

⁵⁰ Polishing stones in some degree similar to those described on p. 63 ff. have been found in Ulster, but their affinities are doubtful; cf. fig. 17, p. 73.

⁵¹ Metal compositions of Saxo-Thuringian hoards discussed by von Brunn (1959, p. 36-44).

⁵² And possibly specifications? Such as regulus alloys?

⁵³ This provides an interesting commentary on the "Oriental fashions in personal adornment" appearing in central Europe during the Early Bronze Age (Childe, 1957, p. 129 and refs.).

⁵⁴ Generally interpreted thus rather than as painted or incised plaster.

ADDITIONAL NOTES

p. 153. *Daggers with triple ribs*. Two in Britain belong to Britton's Arreton tradition (Britton 1963, 286) equivalent to Wessex Culture phase II, but one from a cist-burial at Blackwaterfoot, Arran, Scotland is surely earlier (*loc. cit.*, 292).

p. 167. *Wedge-gallery graves*. Terminal cells compared with those of Breton *allées couvertes* by L'Helgouach in *Bulletin de la Société Préhistorique Française* 63 (1966), 330.

p. 169. *Stonehenge*. Following further radiocarbon dates, Atkinson concludes that the most probable date for the Stonehenge II/IIIa transition lies in the 17th century B.C. (*Antiquity* 41 (1967), 64).

p. 170. *Tin*. Charles points out that tin was a safe alloying material compared with the use of the dangerously poisonous arsenic salts (*American Journal of Archaeology* 71 (1967), 26).

p. 170. *Rock art of South-West Scotland*. Its connection with the impact phase is emphasized by the carvings of thin-butted axed and possibly a halberd on the cist at Ri Cruin (Campbell of Kilberry *et al.*, 1960/61, 59); compare the matrices of a similar axe and a tanged beaker-culture knife on a possible mould from Ireland (Megaw and Hardy, P. 53c).

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