Some notes on horse-riding in the Irish Later Bronze Age

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The rise of equitation in the Later Bronze Age (i.e. Dowris) Ireland, evidenced by a small but significant group of artefacts, is suggested to have contributed to the socioeconomic instability that led to the Dowris 'dark age'. The horse significantly increased the range over which people could travel in a day and would have increased the catchment area for raiding for livestock and slaves, as well as the recruitment area for potential allies. This discussion is confined to the period before c. *700 BC and does not discuss the role of the horse in Iron Age society and beyond.*

INTRODUCTION

No consideration of any real depth has yet been given to horse-riding in Ireland in the centuries before the appearance, towards the end of the first millennium BC, of the finely decorated pieces of copper-alloy horse tack of the Early Iron Age. While the antiquity of the presence of the horse in Ireland has been discussed, the apparent paucity of evidence for equitation has led to the subject mostly being referred to in passing only. It is possible to provide strong indications that there was horse-riding in the Later Bronze Age through identification of some tack items of demonstrably early date. This paper is divided into three sections: a brief — and admittedly speculative — discussion of tackless equitation and organic tack; a description of items of Irish provenance relating to equitation; and a discussion — again, admittedly speculative — of the implications for our understanding of aspects of mobility in Ireland from the latter part of the second millennium BC through to the beginnings of familiarisation with iron technology and the transition from use of copper alloy as the primary industrial metal to use of ferrous metal around the start of the eighth century BC. The catalogue presented here is based on information from those collections that I have been able to search, either in person or online. Given the wide dispersion of Irish material to museums outside Ireland, it is quite likely incomplete.

The beginnings of horse-riding on the Eurasian steppes some time in the fifth millennium BC may have resulted in part from attempts being made to mount animals kept for their meat and milk, as a form of sport (e.g. Anthony and Brown 2014, 58ff). However, it would have become apparent quite quickly that, with the right approach, a horse could be ridden using the legs as prompts and the mane as a handhold. Indeed, that is how bareback riders control a horse today (Fig. 1). For antiquity, a clear depiction comes from the eighth–seventh-century-BC rock-carving panel at Sellero in Val Camonica, Italy, which appears to show a hunting scene (Fig. 2: Fossati 1992, 15, fig. 5).

Very early depictions of riding without tack and 'hands free' are known from the Middle East — for example, on a Sumerian cylinder seal dated to the end of the third millennium BC (Fig. 3a: Anthony *et al.* 2006, 146, fig. 7). The Late Bronze Age/Early Iron Age panel of rock-carvings from Tegnebyhällen at Litsleby, Bohuslän, Sweden (cf. Almgren 1987, 52 and fig. 174) is of particular interest (Fig. 3b: Coles 1990, 83, fig. 98) since, as we shall see below, the Nordic region provided influence on Later Bronze Age Ireland. The panel shows warriors riding, wielding spear and shield without any form of tack, including reins, and would seem to depict a confrontation between two groups. Each has a figure without weapons on a smaller mount, again with no tack, but the theme has, perhaps, been idealised (e.g. Falkenstein 2007, 48). The riders on the well-known seventh-century-BC wagon from Strettweg, Austria are also depicted on horses without any form of tack, with the most complete of the four carrying a shield in one hand, the other probably having held a spear (now lost).

We see images of freestyle riders in seventh–sixth-century-BC rock-carvings at Val Camonica — for example, at Capo di Ponte, Naquane (Fig. 3c) and Foppe di Nadro (Fig. 3c, right: Fossati 1992, 35, fig. 51, 41, fig. 64). Similar depictions occur on ceramics — for example, in hunting scenes (e.g. Pare 1992, 208, fig. 144B; Trebsche 2018).

And much later, in the third–second centuries BC, images of armed, naked women riding bareback on horses without any harness (Fig. 4) appear on coins

Fig. 1—Riding bareback without tack (© Reneefotografie NL, photograph by Renee Zandbergen).

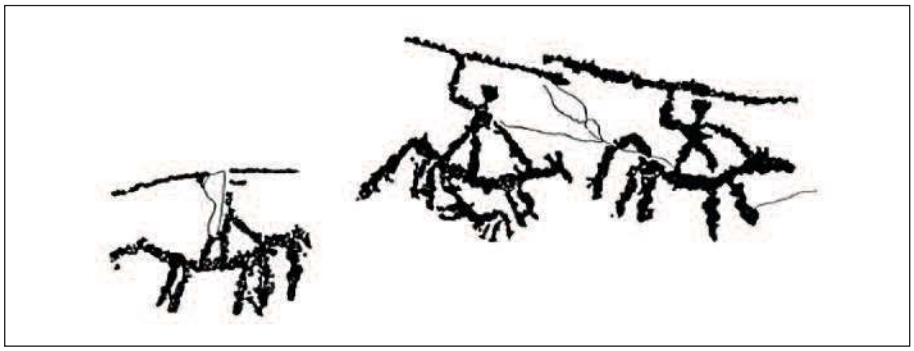


Fig. 2—Horsemen with spears raised, balancing themselves by holding on to the manes of their horses. The middle rider appears to be accompanied by a dog (after Fossati 1992).

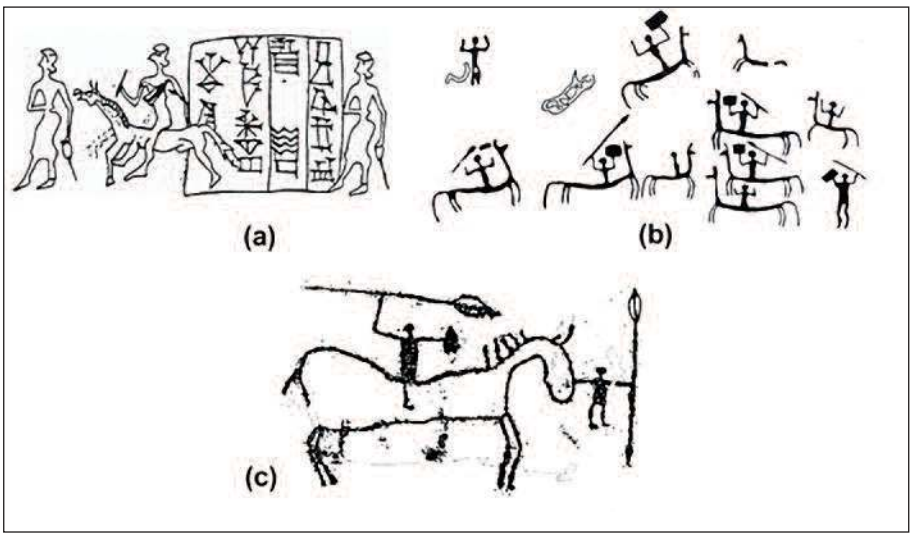


Fig. 3—Riders without any tack from (a) the seal of Figakalla, Ur III, dated 2050–2040 BC (after Anthony *et al.* 2006); (b) Tegnebyhällen, Sweden (after Coles 1990); (c) Val Camonica (after Fossati 1992).

of the Redones, from the area around Rennes, and of the Ambiani from the vicinity of Amiens (Duval 1987, 54f.; Beck 2009, 282–4; Waddell 2018, 13). These would appear to indicate that the tradition persisted until times when comprehensive metal and organic (leather, rope) tack configurations were long established. Particularly interesting in this context are the depictions on the coins of the Redones. Here the horses seem to be at a gallop (esp. Fig. 4a–c: cf. Fig. 1), with the backward-leaning postures of the riders implying the speed and wild, perhaps ecstatic, energy emphasised by the lightning symbols below the horses' hooves and the total control of the mounts by their riders.

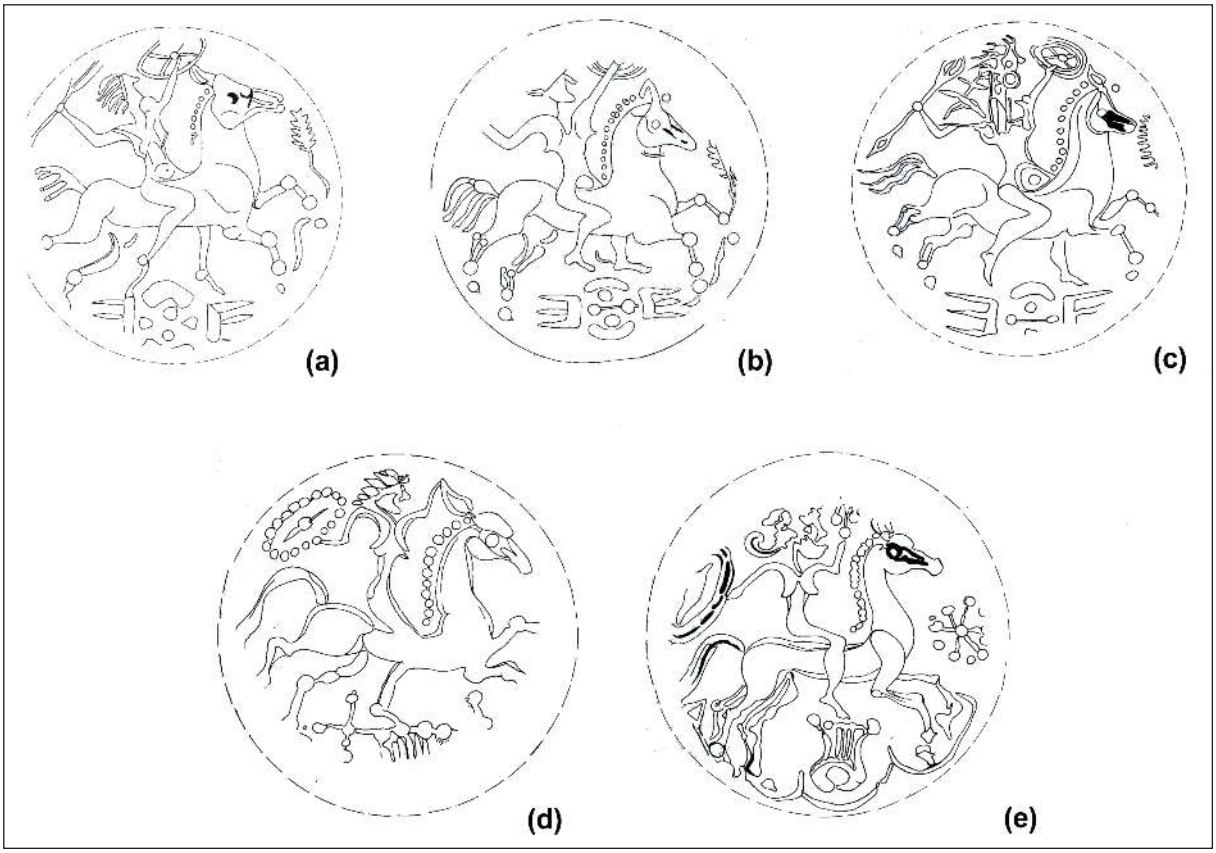


Fig. 4—Coins of the Redones (after Duval 1987: (a) BN6756; (b) BN6757; (c) BN6757A; (d) BN6711; (e) BN6759).

These examples, though, merely illustrate the widespread practice of riding without tack, a style of horsemanship that has left no archaeological record other than depictions. And so, to posit it for the Irish Later Bronze Age is, obviously, entirely speculative. When the horse becomes visible in Ireland through physical remains (McCormick 2007, 86), albeit at low levels throughout the prehistoric period, the scene is set for consideration of the use of simple, organic tack that may well have left no traces, as evidenced by finds from other regions and periods. For example, the wholly organic horse tack that survives from frozen tombs of the Pazyryk culture includes exquisitely carved wooden cheek-pieces (e.g. Argent 2010, 145–6, esp. 146, figs 6.4 and 6.5). Similarly, a rare rope halter on the skull of a horse survived in a Viking-period boat burial from Årby, Rasbokil in Uppland (e.g. Sundqvist 2001, 71, fig. 4:1). A modern configuration is shown in Fig. 5a, while the 'Indian war bridle' of the American Plains Indians (Fig. 5b) is even simpler (e.g. Jennings 1866, 21–3; Ewers 1955, 75–8, esp. 76, fig. 11).

The earliest physical survivals from equitation come in the form of antler cheek-pieces that would have been combined with organic mouthpieces — including rope or leather. Again, these would leave little or no trace in the record. There are two clear examples so far from Later Bronze Age contexts in Ireland (see section on cheek-pieces below). A recent Irish example of wholly organic tack, a pack-saddle made of hay rope, was published by Lucas, who remarked on the antiquity in Ireland of horse furniture fashioned from grasses and rushes (1961, 16). The Inner Hebrides Isle of Tiree produced another example of modern tack made wholly from organics, a *brangas* (An Iodhlann Cat. no. 2007.9.2; Fig. 6), the cheek-pieces of which were fashioned from whisky-barrel staves, the harness of rope (Holliday 2017). These were used to tether both horses and cattle but, since they were easily made, were also the tack of poorer folk. It raises the possibility that, previously, in assessing organic remains from waterlogged contexts in Ireland, similar elements of harness might well have been overlooked.

Organic tack could be combined with simple metal rings (Fig. 7a), whose purpose, when recovered in hoards or as stray finds, will not be easy to determine, although wear on internal surfaces will provide some indication (see Fig. 29). There are some large rings that average around 9–10cm in diameter

Fig. 5—(a) Bitless rope bridle (© Sunset Halters, courtesy of Karen Welch); (b) 'Indian war bridle' (© Tiffany's Braided Tack, courtesy of Tiffany Norris).

Fig. 6 (below)—A *brangas* from the Isle of Tiree. The cheek-pieces measure 29cm each (© An Iodhlann).

from Later Bronze Age hoards, some with smaller rings attached (see section on rings below), which could have functioned as side-rings for organic or metal mouthpieces and rein attachments (Fig. 7b). Finally, the appearance in Ireland of metal components some time after 800 BC heralds the beginning of the visibility of horse-riding in the archaeological record. While it is impossible to pin down when the practice was introduced, the strong possibility that horses were being ridden significantly earlier without tack, or with wholly organic tack, cannot be ignored. Given that, in the Later Bronze Age, Ireland received influences —

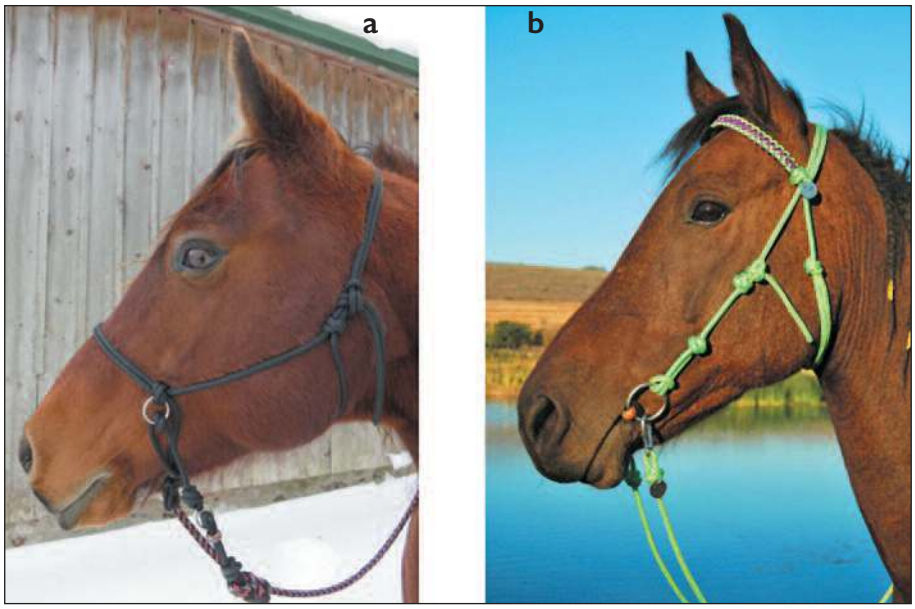


Fig. 7—(a) Rope bitless bridle with minimal metal elements (© Rope Horse Tack, courtesy of Lorie S.); (b) metal bit and attachment rings (© Lucky Horse).

including on weaponry — from regions where horse-riding had become the norm amongst the elite, it seems entirely unreasonable to believe that, when sophisticated bits made their appearance at some point in the third century BC or so, equitation sprang fully bridled from the forehead of Macha.

THE EVIDENCE OF ARTEFACTS

In considering the earliest equitation in Ireland, there is an elephant — albeit spectral — in the room, namely the Irish Later Bronze Age horse-drawn vehicle, two- or four-wheeled. It might be thought that, if the vectors for transmission of the notion and knowledge of horse-riding were from the near continent and southern Scandinavia, where wheeled vehicles were well known and widespread by the Late Bronze Age, then in contemporary Ireland we should expect at least some evidence for horses used for traction, either singly or in pairs. The question was addressed over 60 years ago by Jope (1955, 37–8) in his seminal paper on chariotry and paired draught in Ireland. He placed what little evidence he could find as pointing to the first centuries of the first millennium AD, allowing the possibility of the last centuries BC, but no earlier than the third, and thus — by definition — not Dowris. He noted its paucity, commenting in particular on the absence of chariot and wagon components — in particular, spoked wheels, iron tyres and linchpins. There is a wooden block-wheel fragment from Edercloon, Co. Longford, which has a date of 1206–970 BC (Moore and Chiriotti 2010, 59) and several wooden withers yokes with Late Bronze Age dates are known (e.g. Stanley *et al*. 2003). However, the projected size and weight of the Edercloon wheel and the configuration of surviving yokes indicate draught with oxen (cf. Lucas 1972, 44–5, on the wheels from Doogarrymore, Co. Roscommon, and Timahoe East, Co. Kildare, and Raftery, B. 1996, 71–8). Thus it would seem that nothing has been found to alter Jope's overall conclusion.

Another feature of Late Bronze Age vehicle-using cultures elsewhere, burials containing items of harness and/or vehicle parts, whether for chariots or wagons, while common in Atlantic Europe and further east (e.g. Milcent 2017, 91), are missing entirely in Ireland. Thus, it seems only reasonable to wield Occam's razor and conclude that, in the light of present evidence, those items of Later Bronze Age tack that survive represent horse-riding only. From this, it is argued below that the adoption of horse-riding in the latter part of the second millennium BC added to the panoply of a warrior elite and extended the geographical range over which contacts could be made.

A small but significant body of material (see Table 1), when considered as a whole, moves the evidence for equitation in Ireland back at least to the start of the Dowris phase, around 900 BC (e.g. Becker 2012, 8, table 1). It was probably introduced several centuries before (*pace* O'Brien and O'Driscoll 2017, 401), as far back as the latter part of the second millennium BC. The elements comprise one half of a badly corroded iron snaffle bit from Aughinish, Co. Limerick, and two antler cheek-pieces, one from Moynagh Lough, Co. Meath, and another from Ballinderry Crannog no. 2, Co. Offaly. Along with these are ten rattle pendants, four phalerae, at least two tack-buttons and a number of rings from hoards — which, on the basis of wear on their internal surfaces, indicate significant use, potentially as part of some form of tack. Some bipartite and tripartite chain

Fig. 8—Fragmentary horse-bit from Aughinish, Co. Limerick (NMI E134:8 — with kind permission of the NMI).

links as well as some chains might, along with rattle pendants, have formed part of what Sandars (1957, 294) neatly described as 'tintinabula'. Today, they could perhaps be referred to as 'equine bling'.

Although unperforated, it could be that the boars' tusks from the Rathtinaun, Co. Sligo, hoard (Eogan 1983, 132–3, 300, fig. 84) and Kilgreany Cave, Co. Waterford (Dowd 2002, 84f.; found as part of what might originally have been a hoard, although not admitted by Eogan to his 1983 corpus), were intended to function as tack decoration or components. Boars' tusks were used as cheek-pieces — seen, for example, from the Únětice horse burial at Nebra (Hüttel 1981, 17–19), during the Koban period in the Caucasus (Roes 1960, 69), in Late Bronze Age central Europe (e.g. Kozubová 2011), and from the later-seventh-century-BC copper-alloy bit with tusk cheek-pieces from Grave 278 in the Benvenuti Cemetery, Este, Veneto (Crouwel 2012, 47).

It is difficult to follow the suggestion by Piggott (1983, 134 and references therein) that pieces such as the Dunaverney 'flesh fork' might not have had culinary use but rather were 'goads' used in horse-riding or paired draught. This has been disposed of effectively by Needham and Bowman (2005) and these pieces are not considered here. A flanged and perforated object from the workshop area at Rathgall, Co. Wicklow, suggested by B. Raftery as a possible phalera (1976, 346) is more likely to be intrusive and of medieval date (Katharina Becker, pers. comm.).

(a) Snaffle bits

The badly corroded half of a two-piece iron snaffle bit (Fig. 8) was recovered from excavations at Aughinish, Co. Limerick, Site 1 (Kelly 1974; Scott 1991, 44–5), with saddle querns, a tanged chisel and a variant form of bulb-headed pin — the former of Dowris date, the latter a type with a broad geographical and chronological spread. Although some doubt has been expressed about the association (e.g. Becker 2009), the excavator's description (Kelly 1974) of a single-period site with a sealed layer from which the finds came is not easy to challenge.

Close examination of the bit indicates that the loops of the surviving square-sectioned cannon were at 90° to one another, which precludes a one-piece bit. The ring measures *c.* 4.5cm in exterior diameter, and the length of the cannon, which shows a longitudinal split, at *c.* 7.5cm (allowing for the loops), gives an approximate 11cm within the mouth of the horse. Figure 9 shows the correct length of the mouthpiece to be measured for estimating horse size and the points between which measurement should be taken. Following Maguire (2018, 73 and table 3.2), the approximate mouthpiece length of the Aughinish bit would indicate an animal standing perhaps between 11 and 13 hands — i.e. roughly between 110cm and 130cm high at the withers and corresponding in size to a modern Dartmoor or Connemara pony. This is fairly close to McCormick's conclusion (2007, 86–9) that horses in Bronze Age Ireland were likely to be in the range of 1.1–1.2m (11–12 hands) high at the withers. It should be remembered that this is an approximation since, amongst other things, there are comparatively small horses with comparatively large heads and vice versa (cf. Maguire 2018, 16f.).

Balkwill (1973, 439–40) suggested that, for European Urnfield assemblages, the distance between the side links of bits was around 8–10cm, indicating horse heights of 11 hands or less. It is not clear whether

Fig. 9—A modern three-link bit, showing the portion of the bit (between the red arrows) inside the mouth of the horse, which is used to estimate height (after Maguire 2018).

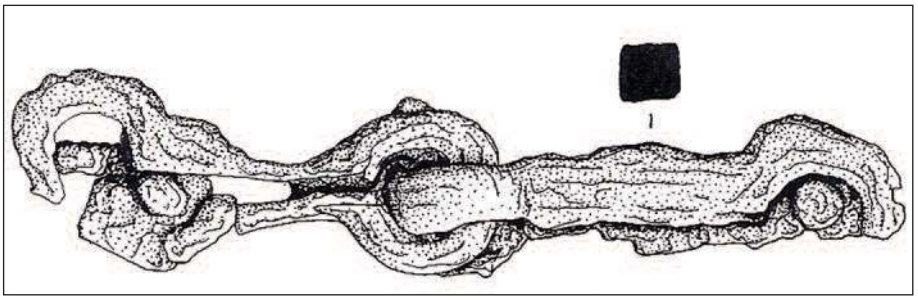


Fig. 10—Blotzheim, Lisbühl (after Pare 1992).

the measurements came from the positions as indicated in Fig. 9 or whether they represent the entire length of the cannons combined, in which case the estimates of height would require revision. Balkwill also suggested that Early Iron Age bits recorded by von Hase (1969) from northern and central Italy could reach *c.* 15–16cm inside the mouth of the horse (suggesting an animal, such as a Shire, of 16 hands or more). Pare (1992, 138) drew attention to Kossack's contention that Hallstatt C1 bits represented an increase in size of equine stock, possibly from the north Pontic steppes, whereas bits associated with Gündlingen swords tended to be smaller and made from copper-alloy, and could be interpreted as being for use with a smaller breed native to central Europe (cf. Pare 1991, 10). Overall, von Hase's drawings indicate that the norm in Italy would have been around 13–14cm. Allowing for the difficulties of measuring from drawings, the bits illustrated by Kossack (1954), Hüttel (1981) and Pare (1992) appear to be in the lower range of 10–13cm for the width inside the mouth, perhaps matching the likely original dimensions of the Aughinish bit.

Iron two-link bits are known from European contexts from at least Hallstatt B3 onwards, although far outnumbered initially by copper-alloy types (e.g. Kossack 1954; Balkwill 1973; Pare 1992, 136f.). Iron as the primary material for bits gradually took over from the start of Hallstatt C, which Balkwill (1973, 427) suggests results in part from late-Urnfield developments in the Swiss lake settlements. Iron bits are represented, for example, in Hallstatt C grave assemblages in southern Germany and Bohemia (Kossack 1954), in association with phalerae and other tack-related artefacts. They are more common than copper-alloy specimens in wagon burials (Pare 1992; van der Vaart-Verschoof 2017, 54ff).

Although it is now difficult to determine with precision because of the highly corroded nature of the piece, it would appear that the cannons were produced by drawing down the centres and ends of pieces of square-sectioned stock, folding them in two, one centre over the other, thus creating the central loops, and welding the free ends together to form the side loops. This method of manufacture can be seen, for example, in bits from wagon-burial assemblages from Blotzheim, Lisbühl, Haut-Rhin (Fig. 10), Dietfurt a.d. Altmühl, Neumarkt, and Nennslingen-Wengen, Mittelfranken, all ascribed by Pare to Hallstatt C2 (Pare 1992, 222–3 and pl. 8B, no. 12, 281–4, pl. 65, no. 8, 303–4, pl. 85B, no. 4). The Aughinish bit, along with these, corresponds to Trachsel's Mundstücke Type 12c (Type Deising: Trachsel 2004, Vol. 1, 49 and 55, fig. 25, Vol. 2, 488–90). Trachsel also dates them to the later part of Hallstatt C2/D1, *c.* 700–600 BC.

An unprovenanced rattle pendant (NMI 1881:331, Table 1) is attached to a slightly bent and distorted copper-alloy ring that shows significant wear (see discussion of rattle pendants below). The attachment loop also shows significant wear (Fig. 11). With an external diameter of approximately 5.7cm the ring, much larger than normal for simple suspension, would be in the range to have been the cheek-ring part of a bridle. It is slightly larger than the Aughinish cheek-ring.

The Late Bronze Age (Period V) Bækkedal hoard, from Himmerland in Denmark, produced a mouthpiece of whipped cord threaded through ornate cheek-pieces (Sauraw 2016, 6–7, fig. 11). The central perforation of a cheek-piece among the assemblage of horse-gear from Ückeritz on the Baltic Sea island of Usedom, Pomerania, also dating from Period V, contained the remains of a leather strap that would

Fig. 11—Rattle pendant (NMI 1881:331) attached to the possible side-ring of a horse-bit (with kind permission of the NMI).

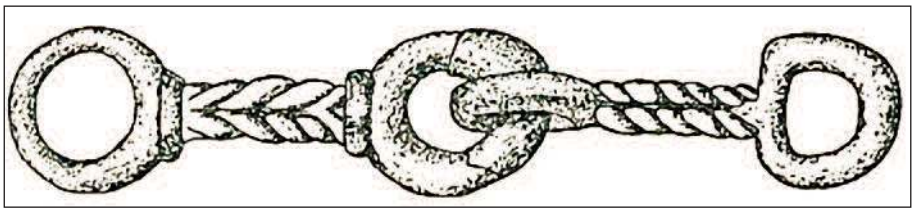


Fig. 12—Mouthpiece from Pullach (Nord), Oberbayern, Germany, possibly repaired (after Kossack 1954).

have served as the mouthpiece of a bridle (Lampe 1982, 42, 100, pl. 44c). Lampe (*ibid*., 38) and Sauraw (2016, 14) pointed out the absence of Periods IV and V metal mouthpieces from southern areas of the Nordic region, indicating that the norm there at this time was organic — something, perhaps, to be expected at the beginnings of horse-riding in Ireland.

Pare (1991, 9, 21, figs 9.3 and 9.4) noted that some copper-alloy horse-bits, his Type B, cast with a 'plaited' decoration of tightly opposed twists, could be skeuomorphic of organic mouthpieces made from plaited or braided leather or rope (Fig. 12).[1] These correspond to Trachsel's Types 1a, 3b and 3d (for a full list of comparanda, see Trachsel 2004, Vol. 2, 480–3: Types Wallerfangen, Köml d and Zaborów), which he would date from late Hallstatt B3 to early Hallstatt C1. A similar form was found in the Eskelhelm hoard from Denmark (Pare 1992, 190, fig. 131.2). It is not unreasonable to extend the interpretation of skeuomorphism to Pare's Type E (1991, 9, 22, fig. 9, no. 8) and Trachsel's Types 5 and 7a (2004, Vol. 2, 481–5: Types Regelsbrunn and Grebbin), dated similarly from late Hallstatt B3 to early Hallstatt C1 (Regelsbrunn) and middle to late Hallstatt C1 (Grebbin), albeit in a somewhat abstracted form. Such bits would seem to indicate that organic mouthpieces were commonplace for a time across a wide swathe of Europe and the southern Scandinavian area.

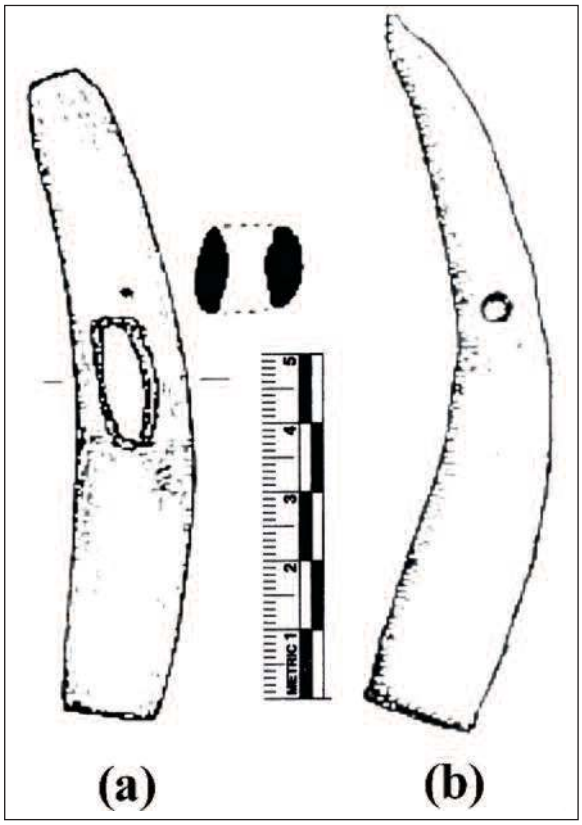
One cannot agree with Lampe's suggestion (1982, 38) that, since a horse would chew through a leather mouthpiece fairly quickly, such tack would have been reserved for 'ritual' processions and the like, not 'normal' riding. As the experimental work of Brown and Anthony (1998, 340ff; cf. Taylor *et al*. 2015) has demonstrated clearly, once organic mouthpieces are placed comfortably in the mouth of the horse they have a reasonable length of use in normal riding. In their experiments, once the horses became accustomed to the materials, the various mouthpieces (leather, horsehair rope, hemp rope and bone: *ibid*., 342, table 4) lasted for up to 150 hours of use and could have performed further. Thus, it is unnecessary to see mouthpieces of rope or rawhide as restricted to some nebulous form of occasional procession.

(b) Cheek-pieces

Two artefacts made from deer antler may be identified as cheek-pieces, one in the process of fabrication. The first derives from the Late Bronze Age levels at Moynagh Lough, Co. Meath (Fig. 13a: Bradley 1991,

Table 1—Items of tack of Later Bronze Age date from Ireland. (BM = British Museum, HMC = Hunt Museum Collections, NMI = National Museum of Ireland).

Collection	Type	Material	Dimensions	Provenance	Publication
Horse-bit					
NMI E134:8	badly corroded two-link bit represented by one side-ring and remains of one cannon	iron	~4.5cm ring external diameter, ~5.6cm surviving length of cannon	Aughinish, Co. Limerick	Kelly 1974; Scott 1991, 44–5
Cheek-pieces					
Bradley 1991, 11, fig. 4, no. 252	cheek-piece	antler tine		Moynagh Lough, Co. Meath	Bradley 1991; 2004
NMI E6:344	cheek-piece	antler tine	11.1cm length, 1.2cm thickness	Ballinderry Crannog no. 2, Co. Offaly	Hencken and Stelfox 1942, 14, fig. 5, nos 422 and 667
Rattle pendants					
private collection	3 rattle pendants	copper alloy	–	Lissanode, Co. Westmeath	Rynne 1962; Higgins 2002
NMI 2001:14	rattle pendant	copper alloy	63.3g, 6.1cm diameter, 1.2–1.5cm thickness	Cloon, Co. Galway	
NMI 1881:331–4	4 rattle pendants (Perry Collection); 1881:331 loop very worn, matching wear on ring	copper alloy	1881:331 71.3g with ring, ~5.7cm diameter of ring, 6.8cm diameter of pendant; 1881:332 53.7g, 6.9cm diameter; 1881:333 46.7g, 6.6cm diameter; 1881:334 44.3g, 6.9cm diameter	Ireland(?)	
NMI P804	rattle pendant	copper alloy	73.6g, 6.8cm diameter	Ireland(?)	
NMI 1881:335	rattle pendant	copper alloy		Ireland(?)	
Phalerae					
HMC HCA 662	phalera Type Stolzenberg	sheet copper alloy	22.3cm diameter, 3.1cm height,<1mm thickness of metal	Toomebridge, Co. Antrim	–
BM 1868, 0709.4	phalera	cast copper alloy	12.1cm diameter, 2.1cm height of central boss	Inis Cealtra, Co. Clare	O'Connor 1975, 220; Piggott 1983, 176–7
NMI P607	phalera	cast copper alloy	12.2cm diameter, 2.1cm height of central boss from upper surface	Inis Cealtra, Co. Clare	Coffey 1913, 92–3, fig. 78
location unknown	phalera Type Lengenfeld/ Morgenitz	sheet(?) copper alloy	~8.5cm diameter, ~1.25cm height of central boss	Mullagh, Co. Cork	Cahill 2006, 323–6, 323, pl. D1, 324, pl. D2
Tack-buttons					
NMI E21:1897	tack-button	cast copper alloy	3.1cm diameter,1.2cm height from underside of rim, 2.2cm loop width, 0.9cm height of attachment loop, 0.2cm thickness of metal	Crannog no. 61, Lough Gara, Rathtinaun, Co. Sligo	unpublished as such: formerly identified as a phalera by B. Raftery (1994, 34) and Waddell (1998, 275)
NMI 1881:521	tack-button	cast copper alloy	2.9cm diameter, 1.1cm height from underside of rim, 2.1cm loop width, 0.8cm loop height	unprovenanced	Coffey 1913, 92, fig. 79
various hoards	rings	solid cast copper alloy		e.g. Tooradoo, Co. Limerick	Eogan 1983, 104–5, 274, fig. 58A



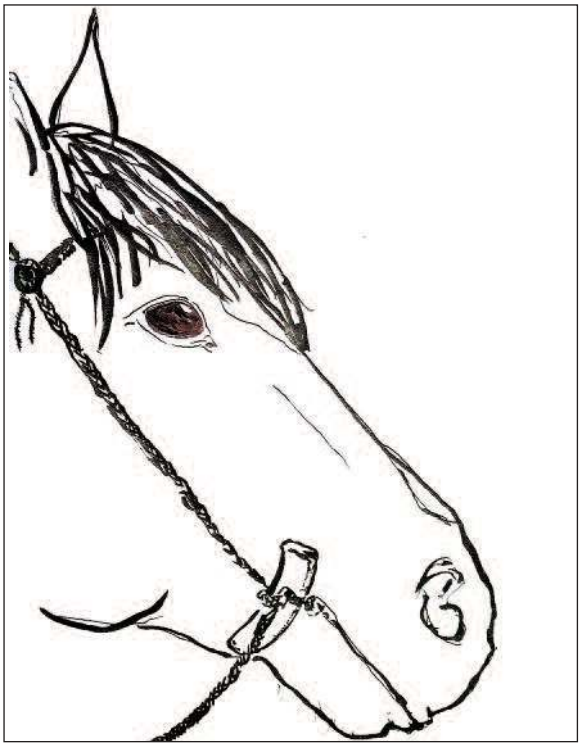


Fig. 13 (top)—(a) Moynagh Lough; (b) Ballinderry Crannog no. 2 (after Bradley 2004; Hencken and Stelfox 1942).

Fig. 14 (above)—Simple tack configuration with a single-perforation antler cheek-piece modelled on the Moynagh Lough piece (drawing by Rena Maguire).

11, fig. 4, no. 252, 12; 2004, 94, fig. 13.3, no. 62), the second from the Late Bronze Age stratum at Ballinderry Crannog no. 2, Co. Offaly (Fig. 13b: Hencken and Stelfox 1942, 14, fig. 5, no. 442, 15).[2]

Cheek-pieces with single perforations, formed from the tips of antler tines, are known from the earliest stages of equitation on the Eurasian steppes in the fifth millennium BC (e.g. Mallory 1989, 200; Levine 1999, 9; Rassamakin 1999, 145–8). Of the six antler cheek-pieces published from the Sredny Stog site at Dereivka, Kirovohrad, Ukraine, where horses formed a key part of the economy, five are of the single-perforation type (Telegin 1986, 82, 83, fig. 51). They occur across southern and central Europe in the late second millennium BC (Bökönyi 1953; Woytowitsch 1978, 118 and pl. 53; Hüttel 1981, 66ff; Boroffka 1998),[3] in the southern-Nordic region (e.g. Lampe 1982, 41), and Britain in the Later Bronze Age — as seen, for example, from Heathery Burn Cave, Co. Durham (BM 1911, 1021.28), Hunsbury Camp, Northamptonshire (BM 1896, 0411.100), and Potterne, Wiltshire (Seager-Smith 2000, 230, fig. 93, nos 50–1). They differ from the more common type, which has three perforations, not one — one central main aperture, one aperture above and one below at 90° (Britnell 1976), indicating a different tack configuration.

Identifying the function of those with a single perforation has been somewhat contentious (e.g. Dietz 1992; Levine 2005, 9, 10, fig. 1.3; Güneri 2016, esp. 160–1), the principal arguments against being that they are only rarely found in association with horse remains and that the form is too general to be linked to one specific purpose. Despite objections, however, it is perfectly possible to offer simple reconstructed tack, using antler or bone with single perforations as cheek-pieces (Fig. 14), that works in the real world, as indicated by experiment without saddle and stirrups by researchers such as Brown and Anthony (1998, 341, fig. 11) and Brownrigg (2006, esp. 167, fig. 2). Early results of experimentation by Maguire (2019), with the entirely organic tack configuration sketched in Fig. 14, provide further confirmation of the viability of such a simple form.

The Moynagh Lough cheek-piece (based on the description by Bradley 1991, 11, fig. 4, no. 252, 12) is 9.9cm long and an average of 1.15cm thick, with the single, roughly elliptical, perforation measuring 2.2cm by 0.9cm. This would put it squarely in the median size range of antler cheek-pieces of Type Füzesabony (Mozsolics 1953; 1960; Hüttel 1981, 66ff; Boroffka 1998, 99ff), which have wide distribution across Europe and the Nordic region. The Ballinderry piece, 10.3cm long and 1.2cm thick, is less certain, although examination indicates that it was a piece in the making.[4]

(c) Rattle pendants

Ten rattle pendants, unfortunately without any firm associations but probably dating by comparison from the earlier first millennium BC, have been identified over the years (Thrane 1958; Rynne 1962; Higgins 2002). One nineteenth-century find of a group of three, from Lissanode, Co. Westmeath (Fig. 15), was made in association with 'what were loosely described as bronze stirrups or bridle-bits, long since lost' (Rynne 1962, 383). The suggestion by Britnell (1976, 30) that copper-alloy cheek-pieces and/or horse-bits were found with Late Bronze Age rattle pendants at Lissanode, Co. Westmeath, is ill founded (see Rynne 1962, 383).

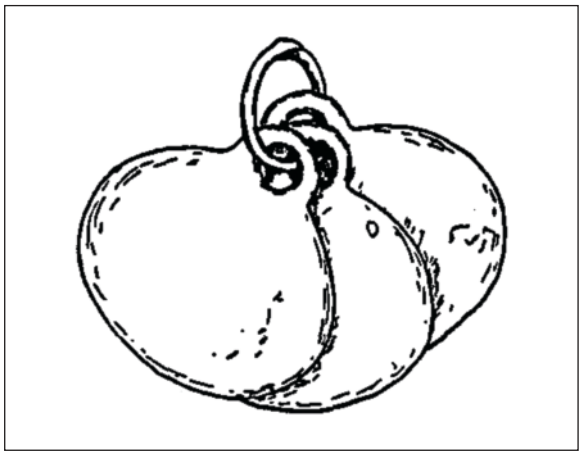


Fig. 15—Rattle pendants from Lissanode, Co. Westmeath (after Eogan 1964).

Rattle pendants were attached to the bridle or other parts of tack, as seen, for example, in the decorative mount from Svartarp, Sweden (Sprockhoff 1956, 239, fig. 56.9; Piggott 1983, 134, fig. 81), and among the hoard from Bækkedal, Denmark (Sauraw 2016, 4, fig. 5), both from Period V. The idea that rattle pendants were mounted on harness to create noise, arguably to draw attention, is mirrored by the fact that bells and pendants were hung onto harness in the Middle Ages (e.g. Clark 2004, 63f.).[5]

Some, at least (such as NMI 1881:331 — see above), could have been hung directly from the cheek-ring or from the smaller of a ring pair forming part of the bit. Thrane (1958), considering the pendants from the Parc-y-Meirch hoard (Sheppard 1941, 2–4, pl. 1; Savory 1980, 187, fig. 39, no. 269:2), suggested that pieces found in Britain derived from contacts with France. Rynne (1962) broadened the discussion with the Irish pieces, including the group from Lissanode that Thrane had been unable to study, arguing convincingly for Nordic-region origins. In view of the parallels both in northern Germany and the south of the Nordic region, Rynne's assessment seems the more likely. This view could, perhaps, be reconsidered in the light of the inclusion of a fragmentary Scandinavian-style rattle pendant in the large hoard from Mérezel, Belle-Île, Morbihan, France (Bordas 2019, 172, fig. 2, no. 9, 173), which includes elements associated with wagons. A similar piece came from the major hoard of Vénat, Saint-Yrieix, Charente, France (Coffyn 1985, 117, carte 11, no. 4), and Bordas *et al*. (2018, 209) list a number of others. Thus we might see such ornaments as the products of influences from the broader Atlantic province.

Maguire (2016) has drawn attention to a small, first-century-AD, cast-copper-alloy figurine from Norton Disney, on the boundary between Lincolnshire and Nottinghamshire in England. It is a depiction of a figure on a horse with an exaggerated gait, which she identified with that of a modern 'pacing' horse. It is similar, in particular, to Icelandic ponies which, when racing, display this distinctive and startlingly elegant locomotion. Horses can be trained to attain the exaggerated high lift of the 'pacing' horse by, amongst other things, attaching weights around the forelegs, and also the modern equivalent of the rattle pendant, which makes a jingling sound. The horse will lift its forelegs higher as it moves both to try and shake off the irritation of the weight and to get rid of the noise.[6] Thus we might conceivably look at some rattle pendants not only as sound accessories, but also possibly as training aids for a form of dressage, as Kristiansen remarked (2018, 23). Green (1997, 16–17) noted a Gallo-Roman figurine from Neuvy-en-Sullias, Loiret, France, depicting a horse with a similarly exaggerated gait. Much later, this is also depicted on Irish high crosses, such as those from Banagher, Co. Offaly, and Bealin, Co. Westmeath, and from the Market Cross at Kells, Co. Meath.

Metalworkers of the Irish Later Bronze Age reached heights of excellence in the casting and shaping of copper alloys. Thus most weapons, and especially the spearhead, would have been not only deadly — through a high degree of slash and penetrative trauma — but also aesthetically pleasing in their own right. As Frie (2018, 26) noted in discussing the horse and the warrior in the Hallstatt Dolenjska culture of Slovenia:

> 'While horses certainly played a role in displays of warrior and elite status, they also provided something far more valuable — they allowed the actual embodiment of distinction, allowing certain men to set themselves apart from the rest. This was not only because possessing a horse indicated their wealth or position in the social hierarchy, but also because riders were able

> to physically and perhaps even ideologically distinguish themselves through their extraordinary abilities — demonstrating their mastery not only over people, but also over the natural world.'

This would match the ethos of a martial stratum in Later Bronze Age Ireland (Scott 1991, 43f.), in which the prowess and status of a warrior would be measured no less by the quality of and skill with his arms than by his skill as a horseman. A pacing mount would have been a prized counterpart to splendid weaponry, elevating a warrior's reputation, just as being seated on a horse elevated him physically above the rest. And what currently appears to be the small number of horses represented in the archaeological record for the period (e.g. McCormick 2007, 86) indicates that ownership of these animals by elites was another form of aggrandisement of the warrior, who would nonetheless have fought on foot.

(d) Phalerae

The phalera is a decorative plate or dish shape, made either of sheet or cast copper alloy, which was attached to tack straps or, in some cases, nailed to the woodwork of wagon burials (e.g. Hradenín Grave 28, below; Dvořák 1938, 41, pl. 38; Pare 1992, 33ff). Examples from the Atlantic islands have been discussed by O'Connor (1975; 2007) and Osgood (1995). Several are known from Ireland (Eogan 1964, 307; O'Connor 1975, 220), but there is a little confusion over the number of pieces supposedly found on the island of Inis Cealtra in County Clare and obtained by the nineteenth-century collector and dealer Richard Brackstone (1852). O'Connor (1975, 220) cited the acquisition entry from Salisbury Museum (from where, subsequently, it went to the British Museum):

> 'Bronze umbo of shield found Oct. or Nov. 1851 at Inis Kaltra [Inis Cealtra] an island in Lough Derg between Clare and Galway — Underwood from whom I purchased it says it is of the utmost rarity — as far as I can learn the first of the class discovered in Ireland — there is not one in the Royal Irish Academy — in a letter subsequently he informs me of another precisely similar being found in same locality — this I failed to obtain.'

In fact, another — a precise match — ended up in the collections of the National Museum of Ireland (NMI), the records of which contain a note by George Petrie that includes the following:

> 'This interesting article which, with *two others* [emphasis added] exactly similar, and found along with it in the Co. of Galway and was obtained from Mr. Brakstone [*sic*] […]'

However, no third piece has been identified in the NMI, and in his study of the Bronze Age in Ireland, Coffey (1913, 92–3, fig. 78) referred to one only, without giving a provenance.

The Hunt Museum, Limerick, collections include a phalera found at Toomebridge, Co. Antrim, while Cahill (2006, 324–5) drew attention to records amongst the Windele archive in the library of the Royal Irish Academy, Dublin, recording the find of a hoard of Late Bronze Age artefacts from Mullagh, Co. Cork, the whereabouts of which is now unknown, but which included a phalera. A phalera was reported to be amongst the finds from Rathtinaun, Co. Sligo (Raftery, B. 1994, 34; Waddell 1998, 275), but, with a diameter of just 3.2cm, this would put the artefact at the very bottom of the range and, following Trachsel (2004, Vol. 2, 443), who set a lower limit of 4cm for the diameter of phalerae, this and a similar piece of Irish provenance are better considered as a form of *Ringfussknopf*, an ornamental tack-button with an attachment loop (see below).

Of the four definite examples of phalerae from Ireland, that recorded in the Windele archive is the easiest to parallel (Fig. 16a). If the sketches by Roger Dawson preserved in the Royal Irish Academy Windele archive (Cahill 2006, 323–5) of the phalera from Mullagh, Co. Cork, are at all accurate, then we may with some confidence identify it as of general *Krempenfalere* form ('brimmed phalera': von Merhart 1956, 29f.), and more specifically to Gleirscher's Type Lengenfeld (Gleirscher 1993, 56–7, List 2), Trachsel's Type 7a Morgenitz (Trachsel 2004, Vol. 2, 445, 448), with its flat rim and domed centre with two rivet holes and, from the description, sheet-metal composition. It was reported as having been found with two socketed axes and what appears to have been a tanged chisel with expanded blade,[7] a type considered by Eogan (1964, 317) to be of Continental origin. The phalera seemingly lacked the sharp break of slope of so many of the Lengenfeld/Morgenitz examples, with the dome appearing to rise smoothly from the flat rim. The drawing does not show whether the edge of the rim was rolled (as with the Toomebridge specimen — see below).

There are two strong Continental parallels for the paired perforations (Fig. 16b) from a grave at Kissing, Aichach-Friedberg, Bavaria, dated to the earlier part of Hallstatt C1, later eighth century BC (fragments of a third were not preserved: Gleirscher 1993, 44, fig. 11.1–

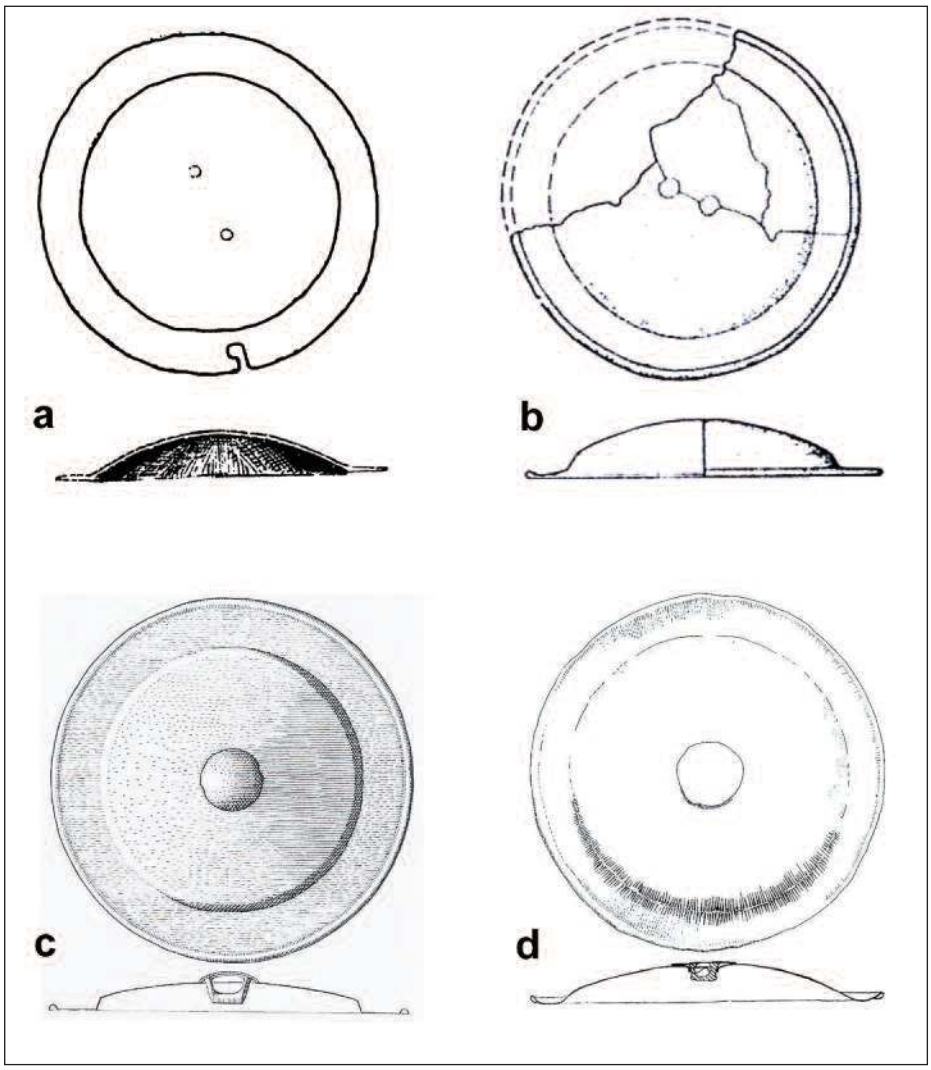


Fig. 16—(a) Mullagh, Co. Cork (after Cahill 2006); (b) Kissing, Swabia (after Gleirscher 1993); (c) Morgenitz, Wolgast, Germany (after Lampe 1982); (d) Llyn Fawr, south Wales (after Savory 1980). Not to scale.

3, 6, 56, List 2.7), which also contained a copper-alloy Gündlingen sword and a winged Büchenbach chape. The better preserved of the Kissing phalerae has two holes, centrally placed, and a plain rim, both features of the Dawson sketches of the Mullagh find.

The estimated diameter of 8.5cm and height of 1.25cm for the Mullagh phalera compare favourably with the surviving Kissing pieces, which are 10.5cm in diameter and approximately 1.75cm high. Phalerae of this type normally have a cast knop, and it would seem that both the Mullagh and Kissing specimens had knops mounted through two perforations, as opposed to the more common single attachment aperture (cf. von Merhart 1956, 29–30, 31, fig. A). This feature, which Gleirscher (1993, 42) and Trachsel (2004, Vol. 1, 56) suggest characterises the earlier of two forms, is found also (amongst others) on phalerae from Lengenfeld, Oberpfalz, Germany (Kossack 1954, 151–2), Poiseul-la-Ville, Côte-d'Or, France (Gleirscher 1993, 43, fig. 10.4), and the hoard from Morgenitz, Wolgast, Germany (Fig. 16c: Lampe 1982, 16–17, pls 8–9, 13h–j). It is possible also that this two-hole arrangement is found on one of the phalerae from the splendid hoard of tack from Bækkedal in Denmark (Sauraw 2016).

Allowing for the relatively scant information from the Dawson sketch, it would seem that parallels closer to home include two of the three phalerae from Llyn Fawr, south Wales, that also belong to Type Lengenfeld/Morgenitz (Fig. 16d: Savory 1980, 124, no. 14, 193, fig. 45, 291.14), dated to Hallstatt C1. It is not clear, however, whether their rectangular attachment loops originally passed through two holes, or whether the tears in the sheet bronze through which they now pass are modern or original — i.e. whether or not they belong to the earlier form or the later. This find also contained another two pieces of tack, namely kidney links (Boughton and Maguire 2015). These previously have been thought of as cheek-pieces (e.g. Mariën 1958, 24–5, fig. 3; Trachsel 2004, Vol. 2, 541, 545 and references therein), but the Boughton and Maguire identification seems the more secure.

Fig. 17—Phalera from Toomebridge, Co. Antrim (with kind permission of the Hunt Museum, Limerick).

O'Connor (1975, 222) suggested that the two Llyn Fawr phalerae (Savory 1980, 124, 193, fig. 45, nos 14 and 15) and his London nos 1 and 2 (*ibid*., 215, 216, fig. 1, 217, fig. 2) are Hallstatt C imports from Bavaria, although not all Bavarian phalerae have an apical depression into which a circular knop fits. For example, at Lengenfeld Grave 2 (Kossack 1954, 173, fig. 24b) the knops are formed to match the curvatures of the domes. Thus it would seem quite likely that the lost Mullagh specimen is a contemporary from the same general area, which ended up in the company of artefacts from different regions.

The phalera from Toomebridge, Co. Antrim (Fig. 17), also falls into the *Krempenfalere* category, with its brim overturned at the edge, forming a slight lip on the upper surface, and a low dome of unbroken slope surrounded by a raised ridge at its base.

The phalera seems originally to have been in the collection of one W.W. Robinson, and was purchased from that collection for £7 10s 0d at Sotheby's by Augustus Pitt-Rivers in 1890. It ended up in his private 'Pitt-Rivers Museum' at Farnham in Dorset, the collections of which were dispersed in the 1970s and from which John Hunt acquired it. The Pitt-Rivers record ledger of his 'Second Collection' (Cambridge University Library MS Add. 9455, Vol. 2, 648–9) records that it was one of a group from the Robinson collection provenanced along with a spearhead, a 'dagger' and a 'rapier' to 'the [River] Bann at Toomebridge' (*pace* O'Connor 1975, 220, who gave the location as 'Toome Bar'). The small sketch in the 'Second Collection' shows the wire loop inserted through the aperture at the top of the dome.

The decorative layout is not easy to parallel precisely, despite a superficial resemblance to the Athenry, Co. Galway, shield (Coles 1962, 190, pl. 33 (upper)). This, presumably led to its being wrongly identified by Hodges (1956, 44), amongst others, as a shield (Coles 1962, 170, n4). At 22.3cm in diameter and formed from sheet copper alloy, it is the largest of the Irish specimens and, in European terms, near the top of the range for its type. It is comparable with Sprockhoff's Type Stolzenberg. The type can reach 25cm in diameter (Sprockhoff 1956, Vol. 1, 265) and has a narrow brim in relation to its size and often an unbroken slope to the dome, with the knop attached through an apical aperture. As can be seen from Fig. 17, it is in very good condition, apart from minor damage to the rim and a small puncture at the base of the dome.

The roughly circular perforation some 0.5cm in diameter indicates that the central knop was originally fitted with a stud passing through and attached to a cast-on loop, a characteristic of Gleirscher's Type Pfatten (Gleirscher 1993, 32f.), seen also on its sole British representative from Llyn Fawr (Savory 1980, 124, 193, fig. 45, no. 16), also of Type Stolzenberg (Kossack 1954, Vol. 1, 265–6, Vol. 2, pl. 60, nos 3 and 8a). It lacks the central depression into which the knop fits, found on some Type Pfatten phalerae, while others,

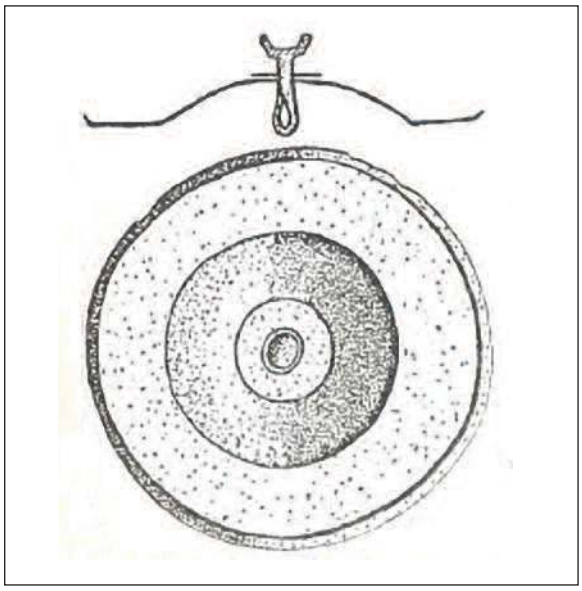


Fig. 18—Phalera from Gernlinden, Oberbayern, Germany (after Kossack 1954: not to scale).

such as those from Pullach, München, Mound 1 (*ibid*., 169, fig. 20C, nos 12–14), have their knops formed to match the curvatures of the domes. Stolzenberg knops are hemispherical.

A piece of flat, rectangular-sectioned wire, bent into a loop with long tails, has been inserted. This was certainly present when the piece was sold at auction in 1890, but could be modern — an aid, perhaps, to mounting the object in a Victorian display. However, it is possible also that an original fixture for a lost knop was misunderstood, removed and reinserted upside down. Although this would not fit into the list of attachment forms presented by von Merhart (1956, 31, fig. A), there is a possible (though not especially convincing) parallel from Gernlinden, Oberbayern (Fig. 18: Kossack 1954, 155, no. 22, 168, fig. 19B, no. 17).

Twenty-five repoussé pellet-and-ridge ornamental elements are positioned around the perimeter, between the overturned and strengthened rim and the raised rib at the base of the dome. Their spacing around the circumference is not entirely even, nor are the dimensions of the circular ridges equal (Fig. 19). The sizes of the pellets are uniform, showing the use of a single punch, but the enclosing ridges vary in regularity. This perhaps indicates that the metalworker who produced the piece was competent but not excellent.

There are basic similarities in overall design between the Toomebridge phalera and two (very much smaller) examples from Tumulus 16 at Chavéria, Jura, France (Fig. 20a: Vuaillat 1977, 89f., 92, fig. 58),[8] and with the find from the River Thames at Sion Reach (Fig. 20b: O'Connor 1975, 218, 219, fig. 3, no. 3), although these have borders of pellets without enclosing circles.

As noted by Eogan (1974, 95), raised pellet and ridge and dot and groove are well-known motif elements on Irish material, such as gorget terminals, gold boxes and disc-headed pins. On Irish Late Bronze Age metalwork, however, the repoussé pellet-and-ridge/graved-dot-and-groove motif usually consists of the central pellet, or depression, surrounded by two or more concentric ridges or grooves.[9] The decorative

Fig. 19—Detail of the Toomebridge, Co. Antrim, phalera (with kind permission of the Hunt Museum, Limerick).

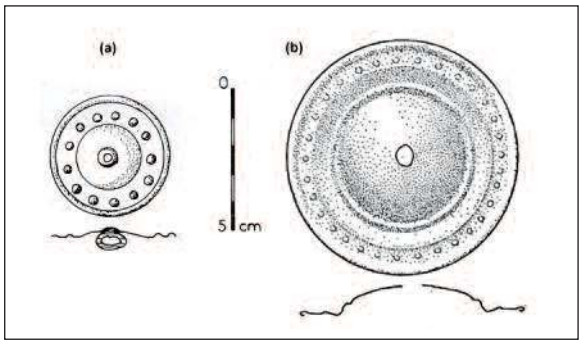


Fig. 20—(a) Chavéria, Jura, France; (b) the Thames at Sion Reach (after Vuaillet 1977 and O'Connor 1975).

element on the Toomebridge phalera comprises pellets enclosed by single, circular ridges, quite uncommon in Later Bronze Age Ireland. The 17 examples of Eogan's Class 14, which he related to Sompting axes and thus dated to Dowris B (Eogan 2000, 194f. and pl. 104), feature decoration with vertical ribs ending in circular ridges, pellets or pellets enclosed by one or two ridges. Of these, four have ribs that each end in a pellet and encircling ridge (nos 1,949, 1,953, 1,955 and 1,959), while two others have ribs ending in pellets enclosed by two concentric ridges (nos 1,947 and 1,948). The Heathery Burn Cave assemblage produced a tack-button with a shape close to those discussed below — circular and domed, with a single pellet and ridge at the apex of the dome (BM WG.1347).

It is, however, one that occurs regularly — for example, on European Hallstatt C metalwork from sheet-metal belt plates (Fig. 21: e.g. Traubing, Starnberg, Germany — Kossack 1959, Vol. 1, 224, Vol. 2, pl. 92, no. 1; Hallstatt Grave 676, Kromer 1959, Vol. 1, 143, Vol. 2, pl. 60, no. 1, 156, no. 4), wagon woodwork decoration (e.g. Býčí skála, Blansko, Czech Republic — Pare 1992, 320–1, pl. 106.6), the axle caps in wagon burials (*ibid*., 219 and pl. 4), fibulae (*Brillenfibeln*: e.g. Sprockhoff 1956, Vol. 2, 142, pls 49–51) and ceramics (e.g. Kossack 1959, Vols 1 and 2, *passim*).[10] There are variations on a theme in the different media — for example, the almost phalera-like form along with the stylised horses from Grave 367 (Fig. 25) and the groove in the central pellet from Grave 676, but they are essentially still the simple pellet-and-ridge motif. For this reason, it is tempting to see the Toomebridge specimen as a later Hallstatt C import from central Europe of *c.* 750–650 BC, as opposed to a local copy, perhaps even following a similar route to that along which, some centuries earlier, the bearers of a Fuchsstadt cup and a Jenešovice cup travelled to the area of Tamlaght, Co. Armagh (Warner 2006).

As O'Connor remarked (1975, 223), although the Inis Cealtra phalera that he studied shares production by casting and the relatively rare bar attachment with the phalera from Osgodby, Lincolnshire (which he dated to Hallstatt C), the pronounced ridges of both it and its NMI twin are hard to parallel (Fig. 22).[11] However, both were clearly intended to be mounted on a strap of some sort, and, unlike the majority of phalerae, are completely flat. The outer three ribs, comprising the raised edge, are spaced evenly, as is the concentric pair surrounding the conical central boss. That the two phalerae are a pair is further evident from their near-identical dimensions and from the fact that their front surfaces are finely burnished, while the backs are in the rough, as-cast condition.

There seem to be no immediately comparable items from the Atlantic island. However, a cast phalera in the hoard from Darsekau, Salzwedel, Germany (Sprockhoff 1956, Vol. 1, 17–18, 267, Vol. 1, 147, pl. 63, no. 4), five in the hoard from Karolinenhof, Greifenberg, Germany (*ibid*., Vol. 1, 34, 267, Vol. 1, 147, pl. 63, nos 8 and 9), dated to Hallstatt B3/C1,[12] and one from an unknown locality in 'Weimar', Sachsen-Weimar (von Brunn 1968, Vol. 1, 343, no. 223, Vol. 1, pl. 175, no. 6), dated to Hallstatt B1 (Fig. 23), might indicate an ancestry for the Inis Cealtra pieces. The first three, which von Merhart (1956, 53, 55–6, 104) placed in his undifferentiated 'Nordgruppe', and the 'Weimar' example were cast with prominent ridges (though more rounded in section as opposed to the sharp, triangular sections of the Inis Cealtra examples) and have a similar form of bar attachment. Unlike the Inis Cealtra examples, they are slightly domed rather than flat.

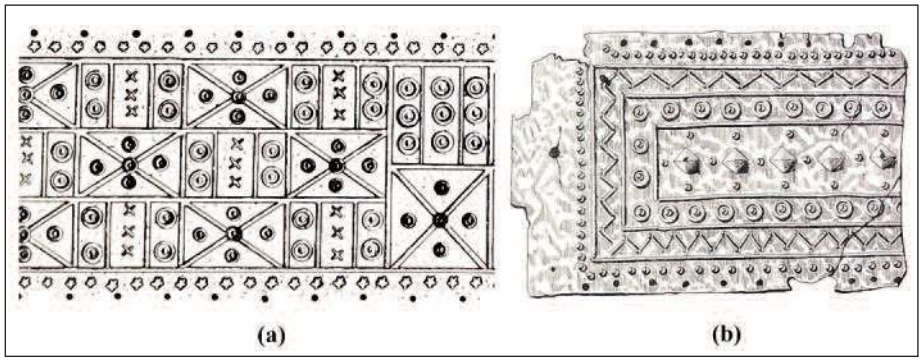


Fig. 21—Pellet-and-ridge motif on Hallstatt C belt plates: (a) Traubing, Starnberg, Germany (after Kossack 1959); (b) Hallstatt Grave 676 (after Kromer 1959).

Fig. 22—Matching phalerae found on the island of Inis Cealtra in Lough Derg, Co. Clare (courtesy of the trustees of the British Museum and the NMI).

The ribbed and cast-copper-alloy phalerae of Hallstatt D1 date from Wagon Grave 28 at Hradenín, Kolín, Czech Republic (Fig. 24a: Dvořák 1938, 37, 41, pl. 38, nos 15 and 16; Pare 1992, 324–6; Trachsel 2004, Vol. 1, 392) are flat, like the Inis Cealtra examples. However, they differ in that they were attached by a central rivet to the structure of the wagon with which they were interred. Widespread similarities in design indicate strong contact and continuity. We may note the piece with a rounded as opposed to conical boss, from Koppenow, Lauenburg, Germany (falling just below Trachsel's cut-off of 4cm in diameter: Sprockhoff 1956, Vol. 1, 39, pl. 72, no. 14), and similar designs and with conical bosses on pieces from Schwennenz Grave 2, Randow, Germany (*ibid.*, Vol. 1, 61, pl. 72, nos 11–13).

Finally, we may note that the discoidal head of an axle-socket included in the Mérézel, Belle-Île, Morbihan, France, hoard (Fig. 24b: Bordas 2019, 172,

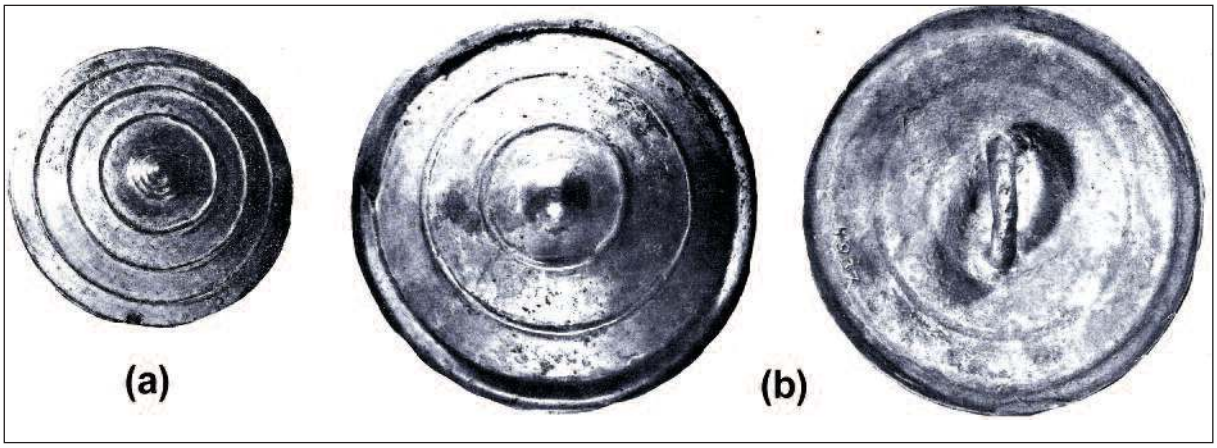


Fig. 23—Cast phalerae with pronounced ridges and bar attachments: (a) Darsekau, Salzwedel, Germany; (b) Karolinenhof, Greifenberg, Germany (after Sprockhoff 1956: not to scale).

Fig. 24—(a) One of the seven ribbed phalerae from Grave 28, Hradenín, Kolín, Czech Republic (© Regionální muzeum v Kolíně); (b) discoidal head of an axle-socket from the Mérézel, Belle-Île, Morbihan, France, hoard (after Bordas 2019).

fig. 2, no. 14) is very similar in design, with its ribs and central conical boss. This is one of a small group of such vehicle parts from Brittany, the others unpublished. Another example comes from the hoard from Sablière à Saint-Georges-d'Oleron, Charente-Maritime (Gomez 1980, 78, fig. 69, no. 12).

Without specifying examples, Coffey (1913, 92–3) suggested a possible link between the Inis Cealtra phalera, of which he was aware, and the design of some disc-headed pins. This was on the basis of the sharp, conical central boss and the ribbing seen, for example, on specimens from Derryhale, Co. Armagh, Newport, Co. Mayo, and Trillick, Co. Tyrone (Eogan 1983, 59, 110, 161, 239, fig. 23, nos 17 and 18, 276, fig. 60, nos 7 and 8, 306, fig. 90, no. 3). At 12.1cm and 12.2cm in diameter, they are matched for size by the heads of some pins (e.g. Eogan 1974, 90, fig. 9). However, it seems most likely, once again, that the phalerae are not of Irish manufacture, date from the later eighth century BC (cf. Piggott 1983, 176–7) and come from central or northern Europe. Nevertheless, in view of the strong design similarities with the axle-sockets from Atlantic France, we should consider this as a possible origin also. In his discussion of a bronze ring from County Londonderry, which he identified as of Italian type from the east of the Appenines, Jope (1958, 15–16, n11) raised the possibility that the Inis Cealtra phalera in the collections of the NMI (seemingly, he was not aware of its twin in the British Museum) came originally from this region also (along with the buttons discussed below). However, this seems unlikely.

It is accepted that phalerae formed part of the decorative suite associated with horse tack (Kossack 1954; von Merhart 1956; O'Connor 1975; Osgood 1995), as well as for wagons and paired draught (Pare 1992). The association seems strengthened by the motifs on a belt plate from Hallstatt Grave 367 that, in association with the stylised horses, seem remarkably like depictions of phalerae (Fig. 25: Kromer 1959, Vol. 1, 95, pl. 60, no. 1).

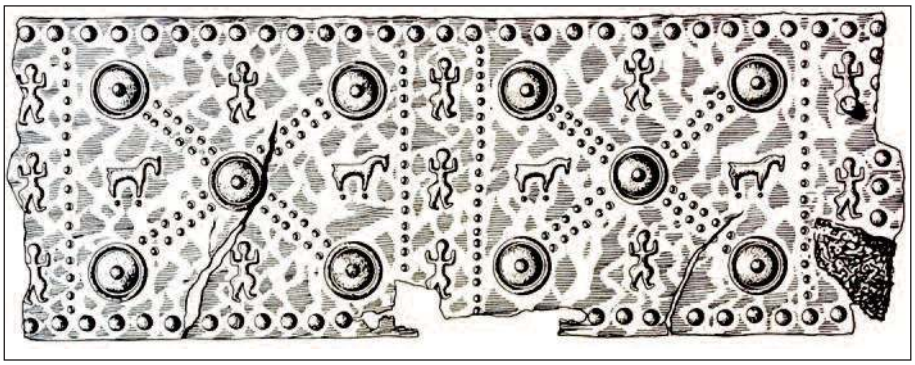


Fig. 25—Hallstatt Grave 367 (after Kromer 1959).

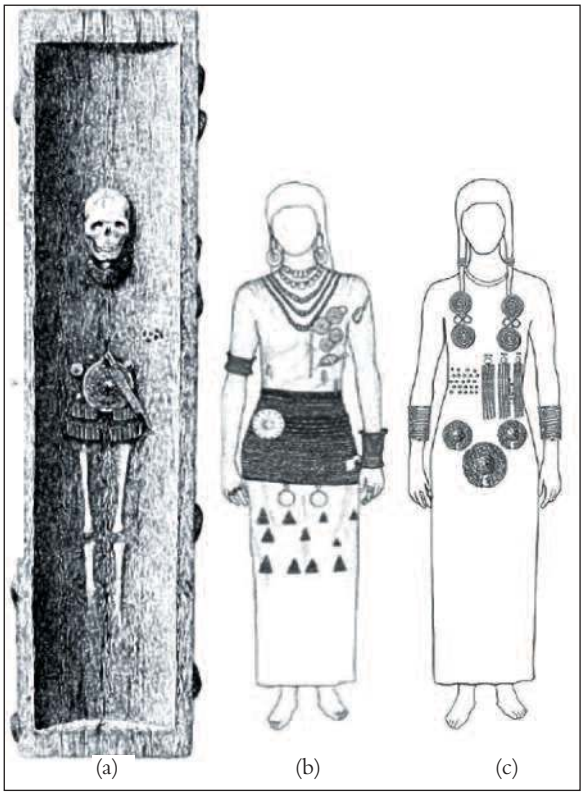


Fig. 26—Phalera-like dress ornaments: (a) Ølby, Denmark (after Bergerbrant 2014); (b) Alianello Cazzaiola, Italy (after Kavur 2012); (c) Vergine, Macedonia (after Kavur 2012).

It is also known, however, that phalera-like artefacts had a long history of forming part of female dress (e.g. Sprockhoff 1956, Vol. 1, 263), as exemplified by the belt-decoration of the young women from Egtved, Denmark, dated to 1370 BC (Broholm and Hald 1940, 80, fig. 102; Bergerbrant 2007, 54, fig. 39), and the Ølby burial of Period II date, also in Denmark (Fig. 26a: Bergerbrant 2014, 74, 75, fig. 1), and also south of the Alps in burials from northern Italy and the Balkans (Figs 26b and 26c) in the tenth–eighth centuries BC (Kavur 2012). It is possible also to point to the small, ribbed buttons with a central boss, seemingly in the form of miniature shields, from the Portuguese hoards at Fortios and Outeiro da Cabeça (Harrison 2004, 133, fig. 7.8) as parallels in design. However, in the current state of our knowledge, there is nothing to suggest that a female or females brought the Inis Cealtra examples from abroad as part of their wardrobe, and their identification as phalerae seems secure. Also, while Gleirscher suggested that some phalerae at least formed part of body armour as well as bosses for leather shields (1993, 35–6), this is disputed on a variety of grounds (O'Connor 1975, 224; Osgood 1995, 56–7).

(e) Tack-buttons

The finds assemblage from unpublished excavations in the 1940s by Joseph Raftery at Rathtinaun Crannog, Co. Sligo, included a cast copper-alloy object that more recently has been misreported (e.g. Waddell 1998, 275) as a phalera (Fig. 27). The piece is circular, with a hollow, central pyramidal boss surrounded at its base by a trough bounded by a circumferential ridge.

On the underside is a rectangular loop that is an integral part of the casting. There is another, near-identical but unprovenanced piece (Coffey 1913, 92, fig. 79), also in the collections of the NMI (Fig. 27: NMI 1881:527). It is clear that these buttons were designed to be mounted on straps for decorative rather than functional purposes. Burley (1956, 153) noted Kossack's suggestion that some British buttons could, in fact, be the bosses for phalerae, but this seems most unlikely. Rather, they are similar in purpose to finds of tack-buttons (called 'rein-knobs' by Pare — 1992, 148, fig. 102) in assemblages containing horse gear from central Europe and the south of the Nordic area. The precise shapes differ (e.g. the tack-buttons in the Bækkedal hoard — Sauraw 2016, 4, fig. 5), but their decorative functions are the same. A button of very similar form, close to those from Ückeritz (Lampe 1982, 40, fig. 30a–c), was recovered from Late Bronze Age levels at Traprain Law, Scotland (Burley 1956, 148, fig. 1, T43, 153). One of the Parc-y-Meirch tack-buttons seems similar to the Irish examples (Sheppard 1941, 5, pl. 5A, no. 84), while another was found in Heathery Burn Cave, Co. Durham (Greenwell 1894, 103, fig. 23), and a group of four were reported from

Fig. 27—Tack-buttons: (a) Rathtinaun, Co. Sligo, NMI E21:1897; (b) unprovenanced, NMI 1881:521 (with kind permission of the NMI).

Fig. 28—Worn rings, possibly tack items, from the Tooradoo, Co. Limerick, hoard (courtesy of the NMI).

the Reach Fen hoard, Cambridgeshire (Evans 1881, 400, fig. 499). All illustrate that the Irish tack-buttons did not exist in isolation.

Returning to the notion put forward by Coffey (1913, 92–3) of a relationship between discs, buttons and pins, it is noticeable that substitution of a bent pin for the button attachment loop would produce a perfectly respectable swan's-neck pin comparable to Eogan's nos 10 and 34 (1974, 83, Fig. 4, 88, Fig. 7). It is possible that there was some degree of stylistic crossover between these simple objects and disc-headed pins. The upper valve of a mould — interpreted as being for the head of a disc-headed pin — was recovered during excavations at Dún Aonghasa, Co. Galway (Devlin 2013), although the reconstruction indicates that it could also have been for a tack-button.

(f) Rings

Irish Late Bronze Age hoards regularly contain rings of various sizes and forms — solid and hollow cast — and their purpose is usually not explored in any detail. However, it is quite evident from significant one- and two-directional wear on some, such as those from Tooradoo, Co. Limerick (Fig. 28), Grange, Co. Kildare, and Portlaoise, Co. Laois (Eogan 1983, 104–5, 274, fig. 58A; 94–5, 264–5, fig. 92, 100–1, 270–1, figs 54 and 55), that they were a part of some form of harness, and such rings would be of perfect size to be part of a halter arrangement (see Fig. 7). Many of the rings in the Grange and Portlaoise hoards, in particular, appear to show significant wear as illustrated, and could be interpreted as collections of tack rings, large and small, particularly in view of the perforated, hollow-cast rings with buffer projections in the Portlaoise hoard (Cotter and Sandes 2013), types that exhibit elements with parallels in central European Hallstatt C tack assemblages.

Hoards from Grange, Co. Kildare, Bootown and Seacon More, both in County Antrim (Eogan 1983, 94–5 and 264–5, figs 48–51, 233, fig. 17, 55–6, 236, fig. 20), include large, solid-cast rings that might have acted as side-rings for organic mouthpieces. Those that have smaller rings attached would have provided attachment points for rattle pendants or reins (cf. Fig. 7b).

The bipartite and multipartite chain links that are assembled to form chains in the hoards from the Boolybrien, Co. Clare, and County Sligo hoards (Eogan 1983, 67, 242, fig. 26, nos 11–21, 153, 274, fig. 58B; 2001, 233f.) have firm analogues in at least two central European (possibly) Hallstatt C wagon graves — from Meßkirch-Ringgenbach, Sigmaringen, Germany, and Neuhausen ob Eck, Mound 5, Tuttlingen, Germany (Zürn 1987, Vol. 1, 182–3, 206–8, fig. 88.2, Vol. 1, fig. 367, nos 1, 5 and 6, pl. 436, no. 21). It is not impossible that these were intended as decorative additions to tack.[13]

We can tentatively sketch a configuration incorporating the elements discussed above, showing how an Irish Dowris B tack assemblage might have looked (Fig. 30).

DISCUSSION

Distinction must be drawn in Ireland between evidence for the domesticated horse (McCormick 2007, 86), which appears in the Bronze Age, and the

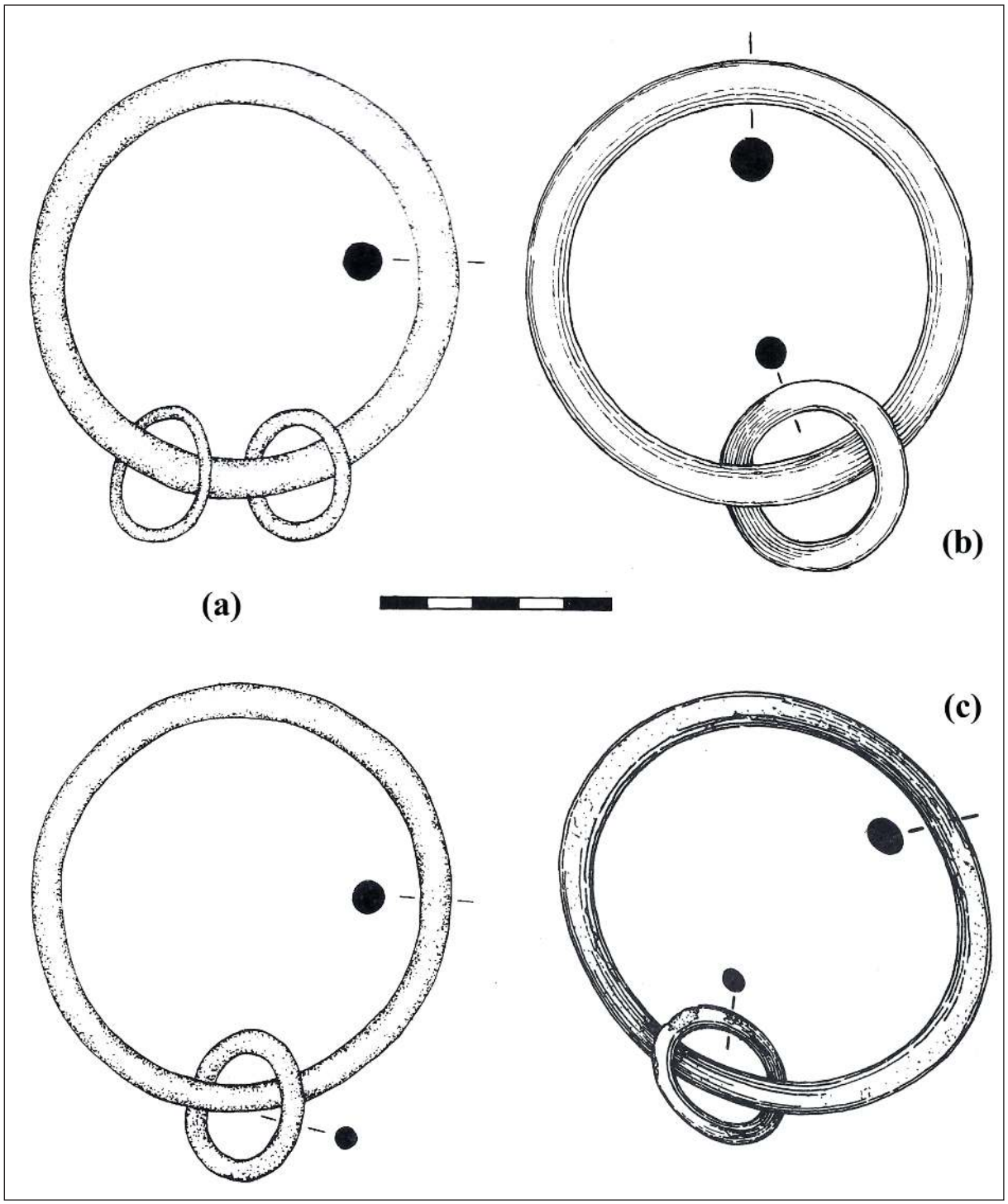


Fig. 29—Large ring pairs from Irish hoards: (a) Grange, Co. Kildare; (b) Bootown, Co. Antrim; (c) Seacon More, Co. Antrim (after Eogan 1983).

earliest evidence for horse-riding. Equid remains occur, albeit in small quantities, on sites throughout the Irish Bronze Age (*ibid*., 86ff, 103, table 3; Cleary 2016, 142, table 5.1, 143, table 5.2, 144–5), including the well-known horse-hair tassel in the Dowris-period hoard from Cromaghs, Co. Antrim (Eogan 1983, 52–4). The remains from the base of the ditch at Haughey's Fort, Co. Armagh, dating from the period *c.* 1200–950 BC (McCormick 1991, 31), show breakage patterns indicating the horse as a source of food as well as labour (Murphy and McCormick 1996, 49–50). As Eogan noted (1964, 315–16, 319), Dowris metalworking

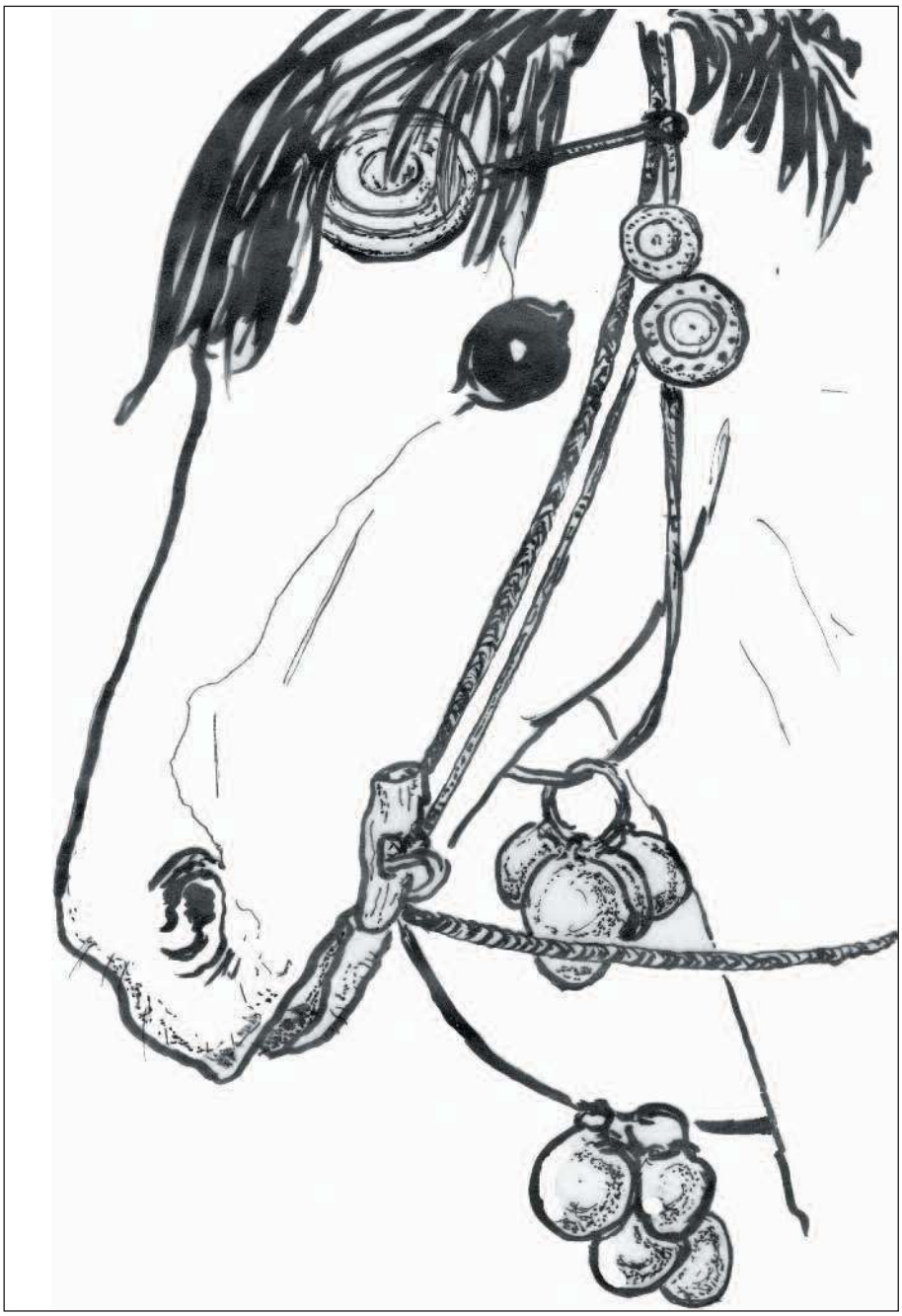


Fig. 30—Simple tack arrangement incorporating antler-tine cheek-pieces, rattle pendants, tack-buttons and phalerae (drawing by Rena Maguire).

tradition provides the first material evidence of elements of horse tack and thus of horse-riding. The finely cast tack items of the mature Irish Iron Age that appear after the Dowris C 'dark age' (Haworth 1973; Raftery, B. 1983, Vol. 1, 11ff; Scott 1991, 41ff; Maguire 2014) and the evidence of tooth wear caused by metal bits on two equid premolars from Newgrange dating from the last century BC to the second century AD (Bendrey *et al.* 2013, 92–3, 96f.) provide the evidence for its continuation and development.[14] B. Raftery (1974, 9) noted the postulate that the horse-bit of the Irish Iron Age was introduced in a single, short-lived phase and developed thereafter in its distinctly insular style. If this is indeed the case, it raises the question of whether this new and sophisticated equestrian bitting technology (e.g. Maguire 2018) arrived as a result of trade or was brought by incomers or returning travellers, perhaps in response to changes in the ways in which horses were to be exploited and deployed.

Over 40 years ago, the author advanced the hypothesis that the Dowris C 'dark age', beginning somewhere around 600 BC (today, possibly late in the range 800–700 BC: e.g. Becker 2009, 176), was the final stage in a long process of decline and eventual collapse of a martial society whose elite had been overconsuming resources and the socioeconomic

instability that this inevitably engendered (Scott 1974; cf. 1991, 41ff). It was suggested that from the early first millennium BC a marked overall deterioration in climate exerted significant population stresses, as availability of productive land for crop-growing and livestock-grazing diminished. This can be compared to more recent climatic events, notably the 'little Ice Age' of the late sixteenth and seventeenth centuries AD (e.g. Parker 2013). Further, it was argued that the rise of the hillfort around the last centuries of the second and the opening of the first millennium BC, and its less conspicuous but equally (if not more) defensive counterpart, the crannog, provided evidence of significant communal unease and anxiety. At the same time, large hoards of metalwork showed conspicuous consumption. Since then, evidence of growing aggression amongst groups in Ireland in the centuries leading up to the 'dark age' has increased substantially. For example, this was recently expressed graphically in the evidence for the violent destruction of large 'defensive' structures such as Clashanimud, Co. Cork, Rathnagree, Co. Wicklow (O'Brien 2016, 20f.), and Toor More, Co. Kilkenny (O'Brien *et al*. 2015, 23f. and discussion therein), or their abandonment. Either would signify the rupture of local power structures.

However, recent studies by researchers such as O'Brien and O'Driscoll have demonstrated that this author probably significantly overestimated the defensive capacity of many Irish hillforts, as opposed to their positions as highly visible and often ostentatious manifestations of local power. If, for example, O'Brien's estimate (2016, 21) of a 2m-high palisade around Clashanimud is accurate, coupled with the current absence from his excavations of any evidence for any form of internal, substantial and concentric platform to allow defenders to actually see over the palisade and out of the enclosure, then we are faced with the absurdity of a majority of defenders not easily being able to see attackers and vice versa. Furthermore, to man and defend perimeters totalling some 1.74km (O'Brien and O'Driscoll 2017, 39), as at Clashanimud, would have required a substantial force, with a similar number in reserve against sections of the palisade being overrun. However, the fundamental argument that the decline and fall were as a result of competition for increasingly scarce resources has withstood the test of time.

It is acknowledged also that the author failed to consider the potential effects of the introduction of horse-riding to Late Bronze Age Ireland. In his seminal study of the rise of equestrianism, Anthony (2007, 223ff) detailed the significant increase brought about by the adoption of horse-riding in the number of animals that could be herded, noting that it would also have increased the efficiency of livestock theft. Raiders could arrive and seize prey, then drive the animals off at speed.[15] Cattle-raiding, of course, is a theme that we see reflected much later in the Ulster Cycle tales. Equally, it would have improved the efficiency of and range for slave-raiding. In terms of hostilities, as elsewhere, horses would have increased mobility significantly and allowed aggressors to range over greater distances than before — and to withdraw expeditiously when the situation demanded. This mobility would certainly have enhanced the capacity to cover ground and guard territory and resources, to move against the territory and resources of others and, obviously, to interdict the activities of competitors and enemies, introducing a further potentially disruptive element to those who were eroding socioeconomic stability.

While noting the exploitation of copper ore at Derrycarhoon, Co. Cork, in the period *c.* twelfth–tenth centuries BC, O'Brien (2013, 191–3) highlighted the seeming paradox of an apparent overall decline in copper-mining — in the south-west of Ireland, at least — with a possible cessation by around 1000 BC, against a steep rise, island-wide, in the use of copper-alloy artefacts from around the same time or somewhat before. A significant problem, obviously, is that at the time of writing, apart from Derrycarhoon, we have no real evidence that mining continued into the first millennium BC in Ireland as a whole. And so, despite the fact that in surveys of the nineteenth and early twentieth centuries outcrops of copper ores of content usable in antiquity have been recorded throughout the island, with occasional references to 'old' workings (e.g. Kane 1845, *passim*; Cole 1922, *passim*), currently we are thrown back onto the somewhat unsatisfactory notion that recycled and imported metal supplied the manufacturing stock for the latter stages of the Irish Bronze Age.[16] As Northover (1988, 131–2) has demonstrated, however, the casting of swords, for which we have sound evidence, was a highly skilled craft that would stand in stark contrast to an industry that somehow had lost the ability to seek out and smelt at least the requisite copper.

Disruption of any imports of tin from outside would have been a disturbing factor, as would aggressive competition between groups for the control of imported metal and any indigenous ore and scrap sources.[17] If imported scrap and/or ingots were the primary source, then their landing places would have constituted pinch-points from which a group would channel out product through trade networks, or where an aggressor could seize cargoes by raiding. In the latter case, horses would have acted as a means of speeding up transmission of information on incoming material, assembly and hastening the arrival of a raiding party.

However, adequate supplies of ore, scrap and

imported raw metals would not have been the only prerequisites for a thriving and stable metal industry. It is usually forgotten that lack of access to sources of suitable refractory clays for moulds (and furnace linings) that could withstand temperatures in excess of 1,000°C without slumping would have hamstrung production of cast artefacts as effectively as lack of ores to smelt, metals to cast or charcoal for smelting and melting (cf. Söderberg 2004, 115). Moreover, as noted by Metzner-Nebelsick for the Carpathian Basin region at the end of the Late Bronze Age (2010, 130–1), significant pressures on contiguous groups would have been exerted by unsustainable exploitation of woodland. In Ireland, this would have resulted from the building of large, ostentatious wooden structures — for example, the oak palisades at Clashanimud, Rathnagree and Toor More (O'Brien 2016, 21; O'Driscoll 2017, 5f.; O'Brien and O'Driscoll 2017 and discussions therein), and large houses (e.g. Lisnalinchy, Co. Antrim: Gilmore 2009, 59f.) — along with charcoal for smelting and melting, not to mention cooking, heating and lighting. All of these would have helped to reduce available timber stocks significantly within individual territories, even had there been any form of careful husbandry. To this could be added the effect in the Later Bronze Age of what, by the end of the second millennium BC, was the long-established practice of cremation (e.g. McSparron 2018, Vol. 1, 123ff). In Hindu ritual today, reducing an adult corpse of average size completely often requires some 400–600kg of dry wood (Scott and O'Neill 2012, 92).[18] Within the highly constricted environment of the island of Ireland, such depletion of mature stock would have caused problems. It would not have stimulated the mass movement of population to fresh areas (unless by coercion). Rather, it would have forced the need to reach accommodation with neighbours, or else to dispossess them.[19]

While a horse and man can walk at roughly the same speed of 4mph, even on rough ground a horse may manage up to 10–12mph. Thus, horse-riding extended the range of contacts that could be reached relatively quickly, allowing a greater range of potential alliances (and, of course, enemies) to be brought into the immediate sphere of horse-riding groups. Alliances formed over greater distances than before allowed for more numbers to be amalgamated for offence or defence. This is highlighted by the illuminating viewsheds, coupled with consideration of travel paths and speeds on foot, revealed in most recent studies of Irish hillforts (O'Brien and O'Driscoll 2017, *passim*). Obviously, it is not possible to determine whether or not defenders and attackers in such numbers might have come from single groupings, but the possibility cannot be ignored that alliances — whose formation was expedited through the increased range of contacts made possible by the horse — allowed for more than simple, localised conflict.

Thus, it is not difficult to see how that new mobility could have fuelled aggression and exacerbated inter-group strife, introducing another destabilising factor contributing to the Later Bronze Age decline into the 'dark age'. As noted by Anthony *et al.* (2006, 149), 'Riding cannot be cleanly separated from warfare'. This is emphasised for continental Europe in the Late Bronze Age by Kristiansen (2018, 23f.). There is currently no evidence for warriors fighting on horseback rather than on foot at that time. One can see, however, horses used to carry warriors on raids further afield than would previously have been possible on foot, increasing pressure on boundaries. The horse would have been a contributor to a *casus belli*, but not an integral part of the action. It is interesting to note in this context the recovery of horse bones amongst the faunal assemblage associated with the conflict site in the Tollense Valley, in Mecklenburg-Vorpommern, north-eastern Germany. Isotope studies on human and equid remains indicate that two groups of combatants fought there — one local, the other from some distance away. The $^{87}Sr/^{86}Sr$ values suggest that the horses may have come with the 'foreigners' (Price *et al.* 2019), with elite warriors on horseback each leading a troop.

In summary, the rise of regular horse-riding in Ireland possibly from the latter centuries of the second millennium BC would have created a new dynamic, bringing with it a significant increase in range and speed of movement and thus potentially increasing the dimensions of spheres of influence and of aggression. It is not hard to envisage a well-trained and decked-out mount enhancing the reputation of the hero as another attribute of an elite (e.g. Milcent 2015). Horses would have allowed raiders to travel more swiftly than those on foot, thus increasing the element of surprise. However, a band of attackers would most likely have used horses to get close to their objective, then dismounted to engage the enemy. Any form of organised combat on horseback seems quite improbable. Given increasing socioeconomic pressure on Later Bronze Age Irish groups, canny elite leaders would have recognised the advantages horses offered to enhance martial status, to improve the effectiveness of efforts to protect the resources in their territories and/or to dispossess their neighbours of theirs.

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NOTE ADDED IN PRESS

It would appear that a small phalera, possibly European and of Ha C date, was found during excavation (licence no. AE/08/04) of a multi-period site in Derry Beg td, Co. Down, in 2005. I am most grateful to Rena Maguire and Ken Neill, Historic Environment Division, Department for Communities, for drawing this to my attention.

REFERENCES

Almgren, B. 1987. *Die Datierung bronzezeitlicher Felszeichnungen in Westschweden*. Uppsala Universitets Museum för Nordiska Fornsaker.

Anthony, D.W. 2007. *The horse, the wheel and language: how Bronze Age riders from the Eurasian steppes shaped the modern world*. Princeton University Press, Princeton and Oxford.

Anthony, D.W. and Brown, D.R. 2014. Horseback riding and pastoralism in the Eurasian steppes. In V.H. Mair and J. Hickman (eds), *Reconfiguring the Silk Road: new research on east–west exchange in antiquity*, 55–71. University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia, PA.

Anthony, D.W., Brown, D.R. and George, C. 2006. Early horseback riding and warfare: the importance of the magpie round the neck. In S.L. Olsen, S. Grant, A.M. Choyke and L. Bartosiewicz (eds), *Horses and humans: the evolution of human–equine relationships*, 137–56. British Archaeological Reports, International Series 1,560. Archaeopress, Oxford.

Argent, G. 2010. At home, with the good horses: relationality, roles, identity and ideology in Iron Age Inner Asia. Unpublished Ph.D thesis, University of Leicester (https://www.academia.edu/8928632/; accessed 5 January 2019).

Balkwill, C.J. 1973. The earliest horse-bits of western Europe. *Proceedings of the Prehistoric Society* 39, 425–52.

Beck, N. 2009. Goddesses in Celtic religion, cult and mythology: a comparative study of ancient Ireland, Britain and Gaul. Unpublished Ph.D thesis, Université Lumière Lyon and University College of Dublin (http://theses.univ-lyon2.fr/documents/lyon2/2009/beck_n#p=0&a=top; accessed 1 November 2018).

Becker, K. 2009. Defining the Early Iron Age: new evidence for the introduction of ironworking to Ireland. *Beiträge zur Ur- und Frühgeschichte Mitteleuropas* 65, 173–80.

Becker, K. 2012. The dating of Irish Late Bronze Age Dowris phase metalwork: a pilot study. *Journal of Irish Archaeology* 21, 7–15.

Bendrey, R., Thorpe, N., Outram, A. and Van Wijngaarden-Bakker, L.H. 2013. The origins of domestic horses in north-west Europe: new direct dates on the horses of Newgrange, Ireland. *Proceeedings of the Prehistoric Society* 79, 91–103.

Bergerbrant, S. 2007. *Bronze Age identities: costume, conflict and contact in northern Europe 1600–1300 BC*. Stockholm Studies in Archaeology 43. Bricoleur Press, Lindome.

Bergerbrant, S. 2014. Ordinary or extraordinary? Redressing the problem of the Bronze Age corded skirt. *Current Swedish Archaeology* 22, 73–96.

Bökönyi, S. 1953. Reconstruction des mors en bois de cerf et en os. *Acta Archaeologica Academiae Scientiarum Hungaricae* 3, 113–22.

Bordas, F. 2019. Et de quatre! Un nouveau dépôt de l'horizon de Vénat découvert à Belle-Île. *L'Association pour la Promotion des Recherches sur l'Âge du Bronze* 17, 171–5.

Bordas, F., Boulud-Gazo, S. and Taraud, T. 2018. Deux dépôts métalliques du Bronze final atlantique 3 récent découverts à Belle-Île-en-Mer (Morbihan): Calastrène à Bangor et Bordustard au Palais. In S.

Boulud-Gazo and M. Mélin (eds), *Contributions à l'archéologie de l'Âge du Bronze dans les espaces atlantiques et Manche-Mer du Nord,* Vol. 2, 183–222. L'Association pour la Promotion des Recherches sur l'Âge du Bronze, Le Poiré-sur-Vie.

Boroffka, N. 1998. Bronze- und früheisenzeitliche Geweihtrensenknebel aus Rumänien und ihre Beziehungen. *Eurasia Antiqua* 4, 81–135.

Boughton, D. and Maguire, R. 2015. British Early Iron Age horse harness fittings: a reinterpretation of the winged objects from the Llyn Fawr hoard *c.* 800–600 BC. *Later Prehistoric Finds Group Newsletter 2015* (6), 9–13.

Brackstone, R.H. 1852. A large collection of Irish antiquities […]. *Archaeological Journal* 9, 199–201.

Bradley, J. 1991. Excavations at Moynagh Lough, County Meath. *Journal of the Royal Society of Antiquaries of Ireland* 121, 5–26.

Bradley, J. 2004. Moynagh Lough, Co. Meath, in the Late Bronze Age. In H. Roche, E. Grogan, J. Bradley, J. Coles and B. Raftery (eds), *From megaliths to metal: essays in honour of George Eogan*, 91–8. Oxbow, Oxford.

Britnell, W.J. 1976. Antler cheekpieces of the British Late Bronze Age. *Antiquaries Journal* 56 (1), 24–34.

Broholm, H.C. and Hald, M. 1940. *Costumes of the Bronze Age in Denmark: contributions to the archæology and textile-history of the Bronze Age*. Nyt Nordisk Forlag, Copenhagen.

Brown, D. and Anthony, D. 1998. Bit wear, horseback riding and the Botai site in Kazakstan. *Journal of Archaeological Science* 25, 331–47.

Brownrigg, G. 2006. Horse control and the bit. In S.L. Olsen, S. Grant, A.M. Choyke and L. Bartosiewicz (eds), *Horses and humans: the evolution of human–equine relationships*, 165–71. British Archaeological Reports, International Series 1,560. Archaeopress, Oxford.

Burley, E. 1956. A catalogue and survey of the metal-work from Traprain Law. *Proceedings of the Society of Antiquaries of Scotland* 89, 118–226.

Cahill, M. 2006. John Windele's golden legacy: prehistoric and later gold ornaments from Co. Cork and Co. Waterford. *Proceedings of the Royal Irish Academy* 106C, 219–337.

Clark, J. 2004. *The medieval horse and its equipment* (2nd edn). Museum of London.

Cleary, K. 2016. Burial practices in Ireland during the late third millennium BC: connecting new ideologies with local expressions. In J.T. Koch and B. Cunliffe (eds), *Celtic from the west 3: Atlantic Europe in the metal ages — questions of shared language*, 139–78. Oxbow, Oxford.

Coffey, G. 1913. *The Bronze Age in Ireland*. Hodges, Figgis and Co., Dublin.

Coffyn, A. 1985. *Le Bronze final atlantique dans la Péninsule Ibérique*. Boccard, Paris.

Cole, G.A.J. 1922. *Memoir and map of localities of minerals of economic importance and metalliferous mines in Ireland*. Stationery Office, Dublin.

Coles, J. 1962. European Bronze Age shields. *Proceedings of the Prehistoric Society* 28, 156–90.

Coles, J. 1990. *Images of the past: a guide to the rock carvings and other ancient monuments of Northern Bohuslän*. Bohusläns Museet, Bohuslän.

Collin, Y. R.-H. 2017. The relationship between the indigenous peoples of the Americas and the horse: deconstructing a Eurocentric myth. Ph.D thesis, University of Alaska Fairbanks (https://scholarworks.alaska.edu/handle/11122/7592; accessed 14 July 2019).

Cotter, C. and Sandes, C. 2013. Appendix 8: Irish transversely perforated hollow bronze rings with lateral buffer-shaped projections. In C. Cotter, *The Western Stone Forts Project: excavations at Dún Aonghasa and Dún Eoghanachta*, Vol. 3, 261–77. Discovery Programme, Dublin.

Crouwel, J.H. 2012. *Chariots and other wheeled vehicles in Italy before the Roman Empire*. Oxbow, Oxford.

Devlin, G. 2013. Digitally reconstructing an object cast in a clay mould found at Dún Aonghasa. In C. Cotter, *The Western Stone Forts Project: excavations at Dún Aonghasa and Dún Eoghanachta*, Vol. 3, 259–60. Discovery Programme, Dublin.

Dietz, U.L. 1992. Zur Frage vorbronzezeitlicher Trensenbelege in Europa. *Germania* 70, 17–36.

Dowd, M.A. 2002. Kilgreany, Co. Waterford: biography of a cave. *Journal of Irish Archaeology* 11, 77–97.

Duval, P.-M. 1987. *Monnaies gauloises et mythes celtiques.* Hermann, Paris.

Dvořák, F. 1938. *Knížecí pohřby na vozech ze starší doby železné*. Prehistorický Ústav Karlovy University, Prague.

Eogan, G. 1964. The Later Bronze Age in Ireland in the light of recent research. *Proceedings of the Prehistoric Society* 30, 268–351.

Eogan, G. 1974. Pins of the Irish Late Bronze Age. *Journal of the Royal Society of Antiquaries of Ireland* 104, 74–119.

Eogan, G. 1983. *The hoards of the Irish Later Bronze Age*. University College Dublin.

Eogan, G. 2000. *The socketed bronze axes in Ireland*. Prähistorische Bronzefunde Bd. 22. Steiner, Stuttgart.

Evans, J. 1881. *Bronze implements, weapons, and ornaments, of Great Britain and Ireland*. Longmans, Green and Co., London.

Ewers, J.C. 1955 (reprinted 1985). *The horse in Blackfoot Indian culture*. Smithsonian Institute Press, Washington DC.

Falkenstein, F. 2007. Gewalt und Krieg in der Bronzezeit Mitteleuropas. *Bericht der bayerischen Bodendenkmalplege* 47/8, 33–52.

Fossati, A. 1992. L'età del ferro nelle incisioni rupestri della Valcamonica. In Comune de Milano, *Immagini di una aristocrazia dell'Età del Ferro nell'arte rupestre camuna*, 11–72. Settore cultura e spettacolo raccolte archeologiche e numismatiche, Milano.

Frie, A.C. 2018. Horses and the embodiment of elite masculinity in the Dolenjska Hallstatt culture. *Oxford Journal of Archaeology* 37 (1), 25–44.

Gilmore, S. 2009. The excavation of a Bronze Age settlement at Lisnalinchy, County Antrim. *Ulster Journal of Archaeology* 68, 47–63.

Gleirscher, P. 1993. Der bronzene 'Schildbuckel' von der Gurina (Kärnten): Zu den hallstattzeitlichen Krempenfaleren in West- und Mitteleuropa. *Germania* 71 (1), 31–57.

Gomez, J. 1980. *Les cultures de l'Âge du Bronze dans le bassin de la Charente*. Fanlac, Périgueux.

Green, M.A. 1997. The symbolic horse in pagan Celtic Europe: an archaeological perspective. In S. Davies and N.A. Jones (eds), *The horse in Celtic culture: medieval Welsh perspectives*, 1–22. University of Wales Press, Cardiff.

Greenwell, W. 1894. Antiquities of the Bronze Age found in Heathery Burn Cave, County Durham. *Archaeologia* 4, 87–114.

Güneri, A.S. 2016. An antler cheek piece from Konya Karahöyük, Turkey: some remarks on horse and horse-drawn vehicle. In A.P. Derevyanko and V.I. Molodin (eds), *Altai among the Eurasian antiquities*, 152–68. Institute of Archaeology and Ethnography, Siberian Branch, Russian Academy of Sciences, Novosibirsk.

Harrison, R.J. 2004. *Symbols and warriors: images of the European Bronze Age*. Western Academic and Specialist Press, Bristol.

Haworth, R. 1973. The horse harness of the Irish Early Iron Age. *Ulster Journal of Archaeology* 34, 26–49.

Hencken, H. O'N. and Stelfox, A.W. 1942. Ballinderry Crannog no. 2. *Proceedings of the Royal Irish Academy* 47C, 1–76.

Higgins, J. 2002. A Bronze Age rattle pendant from Cloon townland, Co. Galway. *Journal of the Galway Archaeological and Historical Society* 54, 221–6.

Hodges, H.W.M. 1956. Studies in the Late Bronze Age in Ireland, 2: the typology and distribution of bronze implements. *Ulster Journal of Archaeology* 19, 29–56.

Holliday, J. 2017. *2007.9.2: wooden and rope bridle for tethering a horse*. An Iodhlann: Tiree's Historical Centre (http://www.aniodhlann.org.uk/object/2007-9-2/; accessed 4 January 2019).

Hüttel, H.-G. 1981. *Bronzezeitliche Trensen in Mittel- und Osteuropa: Grundzüge ihrer Entwicklung*. Beck, Munich.

Jennings, R. 1866. *Horse training made easy being a new and practical system of teaching and educating the horse*. John E. Potter and Co., Philadelphia, PA.

Jope, E.M. 1955. Chariotry and paired-draught in Ireland during the Early Iron Age: the evidence of some horse-bridle-bits. *Ulster Journal of Archaeology* 18, 37–44.

Jope, E.M. 1958. A heavy bronze ring of Italian type from Co. Derry. *Ulster Journal of Archaeology* 21, 14–16.

Kane, R. 1845. *The industrial resources of Ireland* (2nd edn). Hodges and Smith, Dublin.

Kavur, M.B. 2012. Ukrašene brončane falere s trnom: ornament kao amblem. *Godišnjak Centar za balkanaloška ispitivanja* 41, 43–66.

Kelly, E.P. 1974. Aughinish Island, Co. Limerick. *Excavations 1974*, 20–1.

Kossack, G. 1954. Pferdegeschirr aus Gräbern der alteren Hallstattzeit Bayerns. *Jahrbuch der Römisch-Germanisch Zentralmuseums Mainz* 1, 111–78.

Kossack, G. 1959. *Südbayern während der Hallstattzeit* (2 vols). Römisch-Germanisch Kommission Forschungen 24. De Gruyter, Berlin.

Kozubová, A. 2011. Súčasti konskych postrojov z lokalít vekerzugskej kultúry na juhozápadnom Slovensku (Časť I). *Zborník Filozofickej Fakulty Univerzity Komenského Musaica* 27, 69–100.

Kristiansen, K. 2018. Warfare and the political economy: Europe 1500–1100 BC. In C. Horn and K. Kristiansen (eds), *Warfare in Bronze Age society*, 23–46. Cambridge University Press.

Kromer, K. 1959. *Das Gräberfeld von Hallstatt*. Sansoni, Florence.

Krüger, J., Nagel, F., Nagel, S., Jantzen, D., Reinhard, L., Dräger, J., Lidke, G., Mecking, O., Schüler, T. and Terberger, T. 2012. Bronze Age tin rings from the Tollense Valley in northeastern Germany. *Prähistorische Zeitschrift* 871, 29–43.

Lampe, W. 1982. *Ückeritz, ein jungbronzezeitlicher Hortfund von der Insel Usedom*. Deutscher Verlag der Wissenschaften, Berlin.

Larsson, L. 1974. The Fogdarp find: a hoard from the Late Bronze Age. *Meddelanden Från Lunds Historiska Museum* (1973–4), 169–238.

Lesimple, C., Fureix, C., Menguy, H. and Hausberger, M. 2010. Human direct actions may alter animal welfare, a study on horses (*Equus caballus*). *PloS ONE* 5 (4), 1–8.

Levine, M.A. 1999. The origins of horse husbandry on the Eurasian steppe. In M.A. Levine, Y. Rassamakin, A. Kislenko and N. Tatarintseva (eds), *Late prehistoric exploitation of the Eurasian*

steppe, 5–57. McDonald Institute for Archaeological Research, Cambridge.

Levine, M.A. 2005. Domestication and early history of the horse. In D.S. Mills and S.M. McDonnell (eds), *The domestic horse: the origins, development, and management of its behaviour*, 5–22. Cambridge University Press.

Levine, M.A., Whitwell, A.E. and Jeffcott, L.B. 2005. Abnormal thoracic vertebrae and the evolution of horse husbandry. *Archaeofauna* 14, 93–109.

Littauer, M.A. 1969. Bits and pieces. *Antiquity* 43, 289–300.

Lucas, A.T. 1961. A hay-rope pack-saddle from County Louth. *Journal of the County Louth Archaeological Society* 151, 13–16.

Lucas, A.T 1972. Prehistoric block-wheels from Doogarymore, Co. Roscommon, and Timahoe East, Co. Kildare. *Journal of the Royal Society of Antiquaries of Ireland* 102 (1), 19–48.

McCormick F. 1991. The animal bones from Haughey's Fort: second report. *Emania* 8, 26–33.

McCormick F. 2007. The horse in early Ireland. *Anthropozoologica* 421, 85–104.

McSparron, C. 2018. Statistical analysis of the single burial tradition in Early Bronze Age Ireland and some implications for social structure, Vol. 1. Unpublished Ph.D thesis, Queen's University Belfast.

Maguire, R. 2014. The Y-piece: function, production, typology and possible origins. *Emania* 22, 77–98.

Maguire, R. 2016. Our lovely horse. *Archaeology Ireland* 303, 10–12.

Maguire, R. 2018. Irish Iron Age horse tack in its insular and continental context of design, function and depositional practice. Unpublished Ph.D thesis, Queen's University Belfast.

Maguire, R. 2019. Let's do the tine warp again: reconstructing a Late Bronze Age bridle from Moynagh Lough, County Meath, Ireland. *EXARC* 2019/3.

Mallory, J.P. 1989. *In search of the Indo-Europeans: language, archaeology and myth*. Thames and Hudson, London.

Mariën, M.-E. 1958. *Trouvailles du champ d'urnes et des tombelles hallstattiennes de Court-Saint-Etienne*. Monographies d'Archéologie Nationale 1. Musées Royaux d'Art et d'Histoire, Brussels.

Metzner-Nebelsick, C. 2010. Aspects of mobility and migration in the Eastern Carpathian Basin and adjacent areas in the Early Iron Age, 10th–7th centuries BC. In K. Dzięgielewski, M.S. Przybła and A. Gawlik (eds), *Migration in Bronze and Early Iron Age Europe*, 121–52. Jagiellonian University Institute of Archaeology, Krakow.

Milcent, P.-Y. 2015. Bronze objects for Atlantic elites in France and beyond (thirteenth–eighth century BC). In F. Hunter and I. Ralston (eds), *Scotland in later prehistoric Europe*, 19–46. Society of Antiquaries of Scotland, Edinburgh.

Milcent, P.-Y. 2017. Hallstatt C sword graves in continental Gaul: rise of an elite or new system of representation of self in a context of crisis? In R. Schumann and S. van der Vaart-Verschoof (eds), *Connecting elites and regions*, 85–108. Sidestone Press, Leiden.

Moore, C. and Chiriotti, C. 2010. Reinventing the wheel: new evidence from Edercloon, Co. Longford. In M. Stanley, E. Danaher and J. Eogan, *Creative minds: production, manufacturing and invention in ancient Ireland*, 57–68. National Roads Authority, Dublin.

Mozsolics, A. 1953. Mors en bois de cerf sur le territoire du Bassin des Carpathes. *Acta Archaeologica Academiae Scientiarum* 3, 69–111.

Mozsolics, A. 1960. Die Herkunftsfrage der ältesten Hirschgeweihtrensen. *Acta Archaeologica Academiae Scientiarum* 12, 125–35.

Muret, E. and Chabouillet, L. 1889. *Catalogue des monnaies gauloises de la Bibliothèque Nationale*. Librarie Plon, Paris.

Murphy, E. and McCormick, F. 1996. The faunal remains from Haughey's Fort, third report: 1991 excavation. *Emania* 14, 47–50.

Needham, S. and Bowman, S. 2005. Flesh hooks, technological complexity and the Atlantic Bronze Age feasting complex. *European Journal of Archaeology* 8 (2), 93–136.

Northover, P. 1988. Appendix 1: the analysis and metallurgy of British Bronze Age swords. In I. Colquhoun and C. Burgess, *The swords of Britain*, 130–46. Prähistorische Bronzefunde 4, Band 5. Beck, Munich.

O'Brien, W. 2013. Copper mining in Ireland during the Later Bronze Age. In P. Anreiter, K. Brandstätter, G. Goldenberg, K. Hanke, W. Leitner, K. Nicolussi, K. Oeggl, E. Pernicka, V. Schaffer, T. Stöllner, G. Tomedi and P. Tropper (eds), *Mining in European history and its impact on environment and human societies: proceedings for the 2nd Mining in European History Conference of the FZ HiMAT, 7–10 November 2012, Innsbruck*, 191–7. University of Innsbruck.

O'Brien, W. 2016. Clashanimud and the Bronze Age hillforts of Munster. *Emania* 23, 5–30.

O'Brien, W. and O'Driscoll, J. 2017. *Hillforts, warfare and society in Bronze Age Ireland*. Archaeopress, Oxford.

O'Brien, W., Hogan, H. and O'Driscoll, J. 2015. Archaeological investigations at Toor More Corrandhu Hillfort, Co. Kilkenny. *Journal of the Royal Society of Antiquaries of Ireland* 144–5, 7–26.

O'Connor, B. 1975. Six prehistoric phalerae in the London Museum and a discussion of other phalerae from the British Isles. *Antiquaries Journal* 552, 215–26.

O'Connor, B. 2007. Llyn Fawr metalwork in Britain: a review. In C. Haselgrove and R. Pope (eds), *The Earlier Iron Age in Britain and the near continent*, 64–79. Oxbow, Oxford.

O'Driscoll, J. 2017. Hillforts in prehistoric Ireland: a costly display of power? *World Archaeology* 491, 1–20.

Osgood, R. 1995. Three bronze phalerae from the River Avon, near Melksham. *Wiltshire Archaeological and Natural History Magazine* 88, 50–9.

Pare, C. 1991. Swords, wagon-graves, and the beginning of the Early Iron Age in central Europe. *Kleine Schriften aus dem Vorgeschichtlichen Seminar Marburg* 37.

Pare, C. 1992. *Wagons and wagon graves of the Early Iron Age in central Europe*. Monograph 35. Oxford Committee for Archaeology.

Parker, G. 2013. *Global crisis: war, climate change and catastrophe in the seventeenth century*. Yale University Press, New Haven and London.

Piggott, S. 1983. *The earliest wheeled transport from the Atlantic coast to the Caspian Sea*. Cornell University Press, New York.

Podborský, V. 1970. *Mähren in der Spätbronzezeit und an der Schwelle der Eisenzeit*. University J.E. Purkyné, Brno.

Price, T.D., Frei, R., Brinker, U., Gundula, L., Terberger, T., Frei, K.M. and Jantzen, D. 2019. Multi-isotope proveniencing of human remains from a Bronze Age battlefield in the Tollense Valley in northeast Germany. *Archaeological and Anthropological Sciences* 11 (1), 33–49.

Raftery, B. 1974. A decorated Iron Age horse-bit fragment from Ireland. *Proceedings of the Royal Irish Academy* 74, 1–10.

Raftery, B. 1976. Rathgall and Irish hillfort problems. In D.W. Harding (ed.), *Hillforts: late prehistoric earthworks in Britain and Ireland*, 339–57. Academic Press, London.

Raftery, B. 1983. *A catalogue of Irish Iron Age antiquities* (2 vols). Vorgeschichtliches Seminars, Marburg.

Raftery, B. 1994. *Pagan Celtic Ireland*. Thames and Hudson, London.

Raftery, B. 1996. *Trackway excavations in the Mountdillon Bogs, Co. Longford, 1985–1991*. Crannog Publications, Dublin.

Raftery, J. 1942. Knocknalappa Crannog, Co. Clare. *North Munster Antiquarian Journal* 1, 53–71.

Rebay-Salisbury, K. 2017. Rediscovering the body: cremation and inhumation in Early Iron Age central Europe. In J.I. Cerezo-Román, A. Wessman and H. Williams (eds), *Cremation and the archaeology of death*, 52–71. Oxford University Press.

Rassamakin, Y. 1999. The Eneolithic of the Black Sea Steppe: dynamics of cultural and economic development 4500–3200 BC. In M.A. Levine, Y. Rassamakin, A. Kislenko and N. Tatarintseva (eds), *Late prehistoric exploitation of the Eurasian steppe*, 59–182. McDonald Institute for Archaeological Research, Cambridge.

Roe, F.G. 1955. *The Indian and the horse*. University of Oklahoma Press, Norman, OK.

Roes, A. 1960. Horn cheek-pieces. *Antiquaries Journal* 40, 68–72.

Rynne, E. 1962. Late Bronze Age rattle pendants from Ireland. *Proceedings of the Prehistoric Society* 28, 383–5.

Sandars, N. 1957. *Bronze Age cultures in France*. Cambridge University Press.

Sauraw, T. 2016. The Late Bronze Age hoard from Bækkedal, Denmark: new evidence for the use of two-horse teams and bridles. *Danish Journal of Archaeology* 2016, 1–18.

Savory, H.N. 1980. *Guide catalogue of the Bronze Age collections*. National Museum and Galleries of Wales, Cardiff.

Scott, B.G. 1974. Some notes on the transition from bronze to iron in Ireland. *Irish Archaeological Research Forum* 1 (1), 9–24.

Scott, B.G. 1985. The blast-furnace in Ireland: a failed industry. In G. Magnusson (ed.), *Mediaeval iron in society*, Vol. 1, 286–98. Jernkontorets Forskning H34, Stockholm.

Scott, B.G. 1991. *Early Irish ironworking*. Ulster Museum, Belfast.

Scott, B.G. and Ó Néill, J.J. 2012. The Bronze Age. In W. Forsythe and R. McConkey, *Rathlin Island: an archaeological survey of a maritime landscape*, 85–101. Northern Ireland Environment Agency, Belfast.

Seager-Smith, R. 2000. Worked bone and antler. In A. Lawson (ed.), *Animal husbandry in later prehistoric Wiltshire*, 222–40. Wiltshire Archaeology, Salisbury.

Sheppard, T. 1941. The Parc-y-Meirch hoard, St. George Parish, Denbighshire. *Archaeologia Cambrensis* 96, 1–10.

Söderberg, A. 2004. Metallurgic ceramics as a key to Viking Age workshop organisation. *Journal of Nordic Archaeological Science* 14, 115–24.

Sprockhoff, E. 1956. *Jungbronzezeitliche Hortfunde: der Südzone der Nordischen Kreises (Periode V)* (2 vols). Römisch-Germanischen Zentralmuseums, Mainz.

Stanley, M., McDermott, C., Moore, C. and Murray, C.

2003. Throwing off the yoke. *Archaeology Ireland* 17 (2), 6–8.

Stöllner, T. 2002. Die Hallstattzeit und der Beginn der Latènezeit im Inn-Salzach-Raum. *Archäologie in Salzburg* 3 (1).

Sundqvist, A. 2001. *Hästarnas land: aristokratisk hästhållning och ridkonst i Svealands yngre järnålder*. Uppsala Universitet.

Taylor, W.T.T., Bayarsaikhan, J. and Tuvshinjargal, T. 2015. Equine cranial morphology and the archaeological identification of riding and chariotry in Bronze Age Mongolia. *Antiquity* 89 (346), 854–71.

Telegin, D.Y. 1986. *Dereivka: a settlement and cemetery of Copper Age horse keepers on the Middle Dnieper*. British Archaeological Reports, International Series 287. Archaeopress, Oxford.

Thrane, H. 1958. The rattle pendants from the Parc-y-Meirch hoard, Wales. *Proceedings of the Prehistoric Society* 24, 221–7.

Thrane, H. 1963. The earliest bronze cheekpieces in central and northern Europe. *Aarbøger* 1963, 50–99.

Trachsel, M. 2004. *Untersuchungen zur relativen und absoluten Chronologie der Hallstattzeit* (2 vols). Universitätsforschungen zur prähistorische Archäologie, Universität Zürich, Bonn.

Trebsche, P. 2018. Die hallstattzeitlichen Jagddarstellungen der Kalenderberggruppe: zu einem Altfund von Rauheneck bei Baden Niederösterreich. *Annalen des Naturhistorischen Museums in Wien* 120, 211–44.

Tuvshinjargal, T. and Bayarsaikhan, J. 2016. Reconstructing equine bridles in the Mongolian Bronze Age. *Journal of Ethnobiology* 363, 554–70.

van der Vaart-Verschoof, S. 2017. *Fragmenting the chieftain: a practice-based study of Early Iron Age Hallstatt C elite burials in the Low Countries*. Leiden Papers on Archaeology of the Leiden Museum of Antiquities 15. Sidestone Press, Leiden.

von Brunn, W.A. 1968. *Mitteldeutsche Hortfunde der jüngeren Bronzezeit* (2 vols). De Gruyter, Berlin.

von Hase, F.-W. 1969. *Die Trensen der Früheisenzeit in Italien*. Beck, Munich.

von Merhart, G. 1956. Über blecherne Zierbuckel (Faleren). *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz* 3, 28–116.

Vuaillat, D. 1977. *La Necropole tumulaire de Chaveria, Jura*. Annales Littéraires de l'Université de Besançon, Paris.

Waddell, J. 1998. *The prehistoric archaeology of Ireland*. Galway University Press.

Waddell, J. 2018. Equine cults and Celtic goddesses. *Emania* 24, 5–18.

Warner, R.B. 2006. The Tamlaght hoard and the Creeveroe axe: two new finds of Late Bronze Age date from near Navan, Co. Armagh. *Emania* 20, 20–8.

Woytowitsch, E. 1978. *Die Wagen der Bronze- und frühen Eisenzeit in Italien*. Beck, Munich.

Zürn, H. 1987. *Hallstattzeitliche Grabfunde in Württemberg und Hohenzollern* (2 vols). Theiss, Stuttgart.

NOTES

1 Skeuomorphs are normal products to be expected when technologies shift from one material to another (Scott 1991, 34f.).

2 Perforated, rectangular pieces formed from split long-bone (Littauer 1969, 298) and antler have been identified as cheek-pieces on the basis of the pair found *in situ* on the jaw of a horse from Kurgan 5 at Komarovka, Kujbyšev (Hüttel 1981, 24ff), albeit distanced greatly both chronologically and geographically from Ireland. It is possible that two roughly rectangular artefacts of similar dimensions might also have functioned as cheek-pieces — one of ox bone from Knocknalappa, Co. Clare (J. Raftery 1942, 61–2, 70, fig. 3.5), the other of antler from Ballinderry Crannog no. 2 (Hencken and Stelfox 1942, 14, fig. 5, no. 667), described as a 'toggle'. There is clear wear polish on the margins of the perforation of the Ballinderry piece, suggesting friction with organic material such as rope or thong. There is a similar piece, of antler, from the Terramara site of Casaroldo di Samboseto (Woytowitsch 1978, 118, no.18, pl. 53,no. 18) and another, also described as a 'toggle', was recovered from excavations at Potterne, Wiltshire (Seager-Smith 2000, 230, fig. 93, no. 52).

3 We may note the apparent survival of the design in a pair of iron skeuomorphs of single-perforation antler cheek-pieces in the Hallstatt C1 burial assemblage from Beratzhausen, Oberpfalz, Grave 3 (Kossack 1954, 152, 173, fig. 24A, nos 3–5; cf. Thrane 1963, 97–8). The Ückeritz hoard of horse tack has both single- and triple-perforation antler cheek-pieces (Lampe 1982, 27–8, 86, pl. 30, t and u, 99, pl. 43, g–i).

4 In his description of the Dowris hoard from County Offaly, Eogan (1983, 141, 295, fig. 79, no. 174) noted that a tubular piece with opposing rivet holes in the collections of the British Museum (BM 1883, 0218.15) might have been part of a cheek-piece.

5 There is a degree of similarity of form between Later Bronze Age rattle pendants from Ireland and some medieval pendants. It is necessary to sound a note of caution when ascribing pieces such as the unprovenanced finds to the Later Bronze Age when firm context and associations are ambiguous or absent. Another point to be borne in mind is that foreign comparanda, including Parc-y-Meirch (Savory 1980, 187, fig. 39, no. 269.2), Eskelhelm, Denmark (Pare 1992, 131, fig. 131.5), and Fogdarp, Sweden (Larsson 1974, 189, fig. 14), mostly have a distinctly thickened edge and thickened loop, something the Irish examples lack.

6 The practice has a dubious reputation in the USA, where extreme forms of training are known as 'soring'. A light chain, loosely sitting on the front pasterns, will affect the gait of a horse, while something heavier will cause painful irritation through chafing (https://www.avma.org/KB/Resources/Reference/AnimalWelfare/Pages/soring-horses.aspx; accessed 17 August 2019). Current legislation requires attachments on the pasterns to weigh no more than 150g, which would represent at most three or four rattle pendants similar to those listed above.

7 Cahill (2006, 324) describes the piece as a 'socketed chisel', but it SEEMS clear from the form of the blade that this is in fact a tanged chisel.

8 At 4.3cm in diameter, these two are just large enough for Trachsel's (2004, Vol. 2, 443) boundary of 4cm for classification as phalerae.

9 For example, the gold bulla and gold cap for a sunflower pin from the Arboe/Killycolp(y), Co. Tyrone, hoard (Eogan 1983, 159, nos 5 and 7, 304, fig. 88A).

10 Von Merhart (1956, 73–4, 105, fig. 1, no. 9) illustrated a phalera from Eaux-Vives, close to Lake Geneva, in his *perl- und buckelverzierte* group, which has a ring of pellet-and-single-ridge elements amid a jumble of other motifs. A ring of pellet-and-single-ridge elements occurred on a (now-lost) phalera, possibly from Mecklenburg in northern Germany, but inside the brim (Sprockhoff 1956, Vol. 1, 267–8, Vol. 2, 147, pl. 63.1). A sheet-metal phalera from a hoard at Polkovice, Přerov, in the Czech Republic, shows pellet-and-single-ridge decoration randomly distributed over the surface (Podborský 1970, 29, pl. 31), while a phalera from the wagon burial at Kladruby, Rokycany, shows concentric circles of dot and single groove (Pare 1992, 329, pl. 116A.1).

11 A cast-copper-alloy phalera from Gilgenberg, Oberösterreich, Austria, Grave 2, an early Hallstatt C1 assemblage that included elements of tack (Kossack 1954, 155, 177, fig. 28, A5; Stöllner 2002, 113), exhibits a bar attachment and pronounced ribbing — not, however, mirrored on the underside.

12 Sprockhoff gives diameters of *c.* 7.5cm for Darsekau and either 10cm or 12cm for the illustrated Karolinenhof examples.

13 These two were excavated in 1856–7 and 1874 (Meßkirch) and 1891 (Neuhausen), and many of the finds have been lost.

14 To date, no work has been done in Ireland on those few surviving prehistoric and later horse skulls to seek evidence of deformation of the nasal bones that would indicate regular wearing of a halter or bitless bridle (e.g. Taylor *et al.* 2015). Similarly, there has been no study of the abnormalities of vertebrae that could be caused by a horse being ridden regularly (e.g. Levine 2005, 14f., and Levine *et al.* 2005; cf. Lesimple *et al.* 2010 for a study of such evidence in modern horses), primarily because of the scarcity of material.

[15] It is instructive to consider the long-term social and economic impacts, in the period between *c.* AD 1700 and 1880, attributed originally to the introduction of the horse and spread of horse-riding to the Plains Indians of North America (e.g. Ewers 1955, 20ff; Roe 1955, 175ff). For a contrary view of the history of the horse in the Americas, however, see Collin (2017, 2ff).

[16] While the author is unable to demonstrate otherwise, it is difficult to accept the notion that Irish metalworkers lost the ability — or the motivation — to seek out new sources of copper ores, particularly in the County Wicklow complex, and/or were unable to exploit mixed pyritic ores. However, in the current absence of evidence, we must be resigned to accepting that Irish Late Bronze Age metalworkers rose to heights of excellence in the casting and shaping of non-ferrous metals, while seeming unable to either identify or smelt ores other than those found in the south-west of Ireland. This too begs the question of their ability to recognise, mine and smelt ores of the lead that starts to appear in artefacts from this time, unless once again we fall back on the unhappy 'recycle and import' hypothesis.

[17] It is worth noting the presence of three solid-cast tin rings, weighing in total some 765g, in the hoard from Rathtinaun, Co. Sligo (Eogan 1983, 151–2, 300, fig. 84, nos 6–8), and the two tin torcs from Kilsallagh, Co. Longford (Cahill 2006), weighing 84.2g. Other tin rings noted by Cahill (*ibid*., 7–8) are coated with gold foil. Would the plain rings and torcs be two of the forms in which imports of tin were divided up for local distribution? For a 10% copper/tin alloy, the Rathtinaun rings could have been used to produce some 7.6kg of plain tin-bronze, enough perhaps to cast 12 or 13 Class 5 swords, while from the Kilsallagh torcs, dating from *c.* 1200–1100 BC, it would have weighed some 840g, sufficient for three or four palstaves. A similar interpretation has been put forward for tin ornaments recovered from the Tollense Valley conflict site in Germany (Krüger *et al.* 2012, 37, 41).

[18] However, as Rebay-Salisbury notes (2017, 56), the most efficient pyre construction might use as little as 45–75kg.

[19] A significant parallel is the deforestation of Ireland caused by the introduction of blast-furnace technology to Ireland in the later sixteenth century — the reason why, today, Ireland still has some of the lowest hardwood cover of anywhere in Europe (Scott 1985).