A 'GOLD CONNECTION' BETWEEN THE ETRUSCANS AND EARLY CELTS ?

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Despite extensive trading links across the Alps between the Celts and the Etruscans, only a small number of Celtic gold ornaments exhibit stylistic or technical features which originated south of the Alps.

From the 6th century BC onwards, the early Celts, established in Europe from Burgundy and Austria, were powerful and rich enough to import considerable quantities of Mediterranean wine, together with luxurious bronze drinking vessels from Etruria, and finely decorated pottery cups from Greece [1]. Extensive trade with the South had developed as part of a new way of life within a stable, structured society, which had emerged over a number of generations, and whose rulers were particularly attracted by precious and exotic goods from the Mediterranean countries. Some of the legendary wealth of the Celtic princes, preserved in their burial chambers, bears testimony to their social status and love of luxury.

The gold jewellery and ornaments worn by the princes were clearly local in character. Indeed, despite the influence of Mediterranean fashions, the goldwork produced by the Celts themselves—as status symbols, personal jewels, or funerary ornaments—incorporates few genuinely southern characteristics. Since the Celtic princes loved Mediterranean products in general, why did this attraction not extend to southern-style gold jewellery?

Fig. 1 Gold gold cover plate of a fibula of 'Greek type', from Hallstatt, burial No. 505. Watercolour from the 19th century *Protocol Hallstatt*, Archives of the St.-Germain-en-Laye Museum

Born of an ancient, indigenous tradition [2], Celtic goldwork has at first sight nothing in common with that of the Etruscan or other Mediterranean cultures. However, certain technical and stylistic features found in some examples of Celtic gold do seem to reflect the existence of communications across the Alps between Celts and Etruscans.

Hardly any imported gold ornaments from the period between 700 and 450 BC have come to light in the Celtic regions, and only very few of those discovered so far can be considered as possessing any 'foreign' features [3]. This article provides an overview of most of these 'borderline' items.

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Foreign Influences in Early Celtic Goldwork

Besides occasional punched figurative human or animal motifs found on Celtic goldwork, most of the so-called 'Mediterranean' features could be considered as arising from the spread of innovations in joining techniques and their applications. Typical examples of this are the methods used for joining together the basic

Fig. 2 Earring from Hallstatt. Hallstatt Museum

Fig. 3 Detail of the granulation on the Hallstatt earring in Figure 2

Fig. 4 Detail of an earring from Hallein-Dürnbach, with superposed joined decorative wires. Hallein Museum

components of an object, or for the application of decorative features like filigree, beaded wire and granulation.

Such technical innovations are found on about 40 items attributed to the period in question. In comparison with the bulk of the production of the early Celtic provinces north of the Alps, this represents very little—only about 10 per cent.

Curiously, this precise stage in the technical development of goldsmithing practice is usually associated with a certain level of civilization. In the very organized societies of the Near East, a number of different joining techniques appeared very early on, as far back as the 4th or the 3rd millennium BC. In Western Europe, however, similar organized and hierarchically structured societies emerged about 2 000 years later, coinciding with the first appearance of granulation and filigree during the mid-8th century BC in Etruria and in Southern Spain, where these techniques were intensively developed and perfected [4]. Granulation and filigree appeared slightly later on in Celtic Europe, in each of the major Celtic regions.

Austria

A few rare finds of Celtic goldwork enable us to establish a link between Austria and Italy which goes back to very early times. From the late Bronze Age a number of gold discs from different locations can be related on the basis of the techniques used in producing them, as, for example, the disks from Gualdo Tadino (Umbria), Innsbruck-Mühlau (Tyrol) and Rothengrub (Lower Austria) [5], which may be dated to around the 9th century BC. A so-called pectoral from the Rothengrub hoard [6] is assembled from many strands of decorative wire, and in particular, conical spirally rolled bronze wire enveloped in thin gold ribbons. A similar technique was used in the construction of some 8th century BC bronze fibulae from Central Italy [7].

In the vast, and well-known cemetery in Hallstatt

(Upper Austria) many interesting gold ornaments have come to light. One of these, a clear example of Mediterranean influence, this time from Greece, is the gold cover plate of two discs for a bronze fibula (Figure 1)—a very characteristic type in 7th century BC Greece, where it was often made of ivory. In fact, some ivory sword handles found at Hallstatt are also evidence of trade with the Near East through the intermediary of Greece. Moreover, gold plate decorated with stamped patterns is also found on a pair of large indigenous earrings from the same burial.

A bracelet from another tomb at Hallstatt is made of a thick ribbon decorated with chiselled lines; its clasp is particularly elaborate, with loops made from two separate plates joined to the ends of the ribbon.

Other examples of assembled jewellery were found at Hallstatt—a large earring (Figure 2) constructed from three thick lengths of twisted square wire (each 2 mm in section). The wires have been flattened at their ends to form a flat surface which is decorated with large granules of 1.6-2 mm in diameter (Figure 3). The earring, which is very smooth on its outer surfaces, shows signs of having been worn for a very long time.

A large ear pendant (Figure 4) found in a warrior's tomb at Hallein-Dürnbach (Salzburg), is made of a thick bent tubing with three sets of superposed decorative wires in the form of an undulating ribbon (1.7 mm wide) covered by smooth, thick filigree. Although similar wavy ribbons do occur in Etruscan goldwork, the basic form of the Hallein pendant is typically local. It is made of gold containing 15-20 per cent silver and 1.3-1.5 per cent copper [8].

Southern Germany

A pair of gold fibulae found on the breast of a Celtic prince buried at Hochdorf (near Ludwigsburg, Württemberg), together with other examples of the same type in bronze, were assembled from seven different parts. This is a unique example of gold brooches or

fibulae being found in a Celtic burial, although other bronze or iron fibulae are known that are decorated with gold strips or with gold foil. For this reason, although they are undoubtedly of Celtic production, these fibulae reflect a tradition observed in male Etruscan tombs of the 8th to 7th century BC, in which gold fibulae regularly accompany the deceased.

In two other 'Fürstengräber'—at Hochmichele and at Grafenbühl (also in Württemberg)—the remains of a gold brocade were found. In both cases the find consisted of large amounts of thin wavy gold wire, which must have been woven into the fabric of clothes worn by the buried rulers. Although similar remains have so far not been found in Etruscan tombs, antique texts do contain references to gold brocaded dress worn by Etruscan princes (like Tarquin, in Pliny, XXXIII).

At Klein Aspergle, near Hochdorf, in a later tomb of the mid-5th century BC, besides Attic cups showing signs of repair and covered with gold foil probably at the request of the Celtic prince, there were found the bases of two drinking vessels in iron and bronze covered with gold [9], each with the end decorated by a ram's head—a theme sometimes also used for necklace pendants in Greece and Italy. This tomb also contained two fragments of a silver chain, which are

among the extremely rare objects made in that metal to be found north of the Alps. Moreover the *loop-in-loop* technique used is typically Mediterranean, in contrast to the traditional circular links of chains from Celtic Europe.

Switzerland

Among the finds from the Chatonnaye burial, near Berne, a typical Celtic gold sheet collar is the only object to be decorated with rows of large, stamped, S-patterns with a small bump in each curve (Figure 6). Although the collar is executed in the proper Celtic tradition, the pattern is similar to those found on contemporary Etruscan brooches from the end of the 6th century BC, on which the S-pattern is in filigree and the bump is replaced by a large granule.

On the other hand, from Unterlunkhofen (Aargau), a pair of tubular silver bracelets with a muff of stamped, gilt silver is another rare example of silver being used, in this case, for making an item of jewellery of indigenous design.

Two Swiss finds, from Jegenstorf and Ins near Berne, feature granulation (Figure 5). The framework of the pendant from Jegenstorf is made completely in 0.1 mm-thick filigree. The seven filigree wires are all soldered together and hammered at the ends to form a flat hook (Figure 7); the gold contains 25-30 per cent silver and 1.4 per cent copper [10]. The Jegenstorf bead, 1.3 cm in diameter (Figure 8), which is thought to have been part of the same jewel, is assembled from two hemispheres, with threading holes which were evidently created by pressing before joining. Smooth filigree decoration has been applied without any great skill along the line of the join, while the granulation is in a large, irregular zigzag pattern.

The bead from Ins, with a diameter of 1.4 cm (Figure 9) has much finer granulation (0.2 mm on the average), also irregular, but with a rather 'molten' aspect, which could be taken as evidence of incomplete mastery on the goldsmith's part of the thermal treatments required for successful granulation. This bead is made in a gold alloy richer in copper (3.8 per cent) than the Jegenstorf gold and contains 15 per cent silver [11].

While the design of Jegenstorf pendant is reminiscent of indigenous bronze fibulae, particularly those from Hallstatt, the bead from Ins, suspended on a very thin *loop-in-loop* gold chain (Figure 10), is unique, and probably represents the only imported item among all the jewellery under discussion. The chain is in two pieces, with a total length of about 40 cm; its composition is roughly the same as that of the bead, with 18 per cent silver and 4.2 per cent copper (but there are differ-

Fig. 5 Jewellery from Ins and Jegenstorf. (Photograph courtesy Bern Museum)

Fig. 6 Detail of the stamped decoration on the collar from Chatonnaye. Fribourg Museum

Fig. 7 Detail of the crescent-shaped frame in filigree (0.1 mm thickness), from Jegenstorf

Fig. 8 Detail of the bead from Jegenstorf

ences in the amounts of trace elements present: Sn, Bi and Hg are found in the chain, while the bead contains Sn and Ni) [12].

Eastern France

The earliest example of applied filigree in Celtic Europe is a ring in the form of twisted wire alternating with smooth, 1.5 mm diameter, wire found in a warrior's burial at Le Chaffois (Doubs, France) and dated to the 7th-6th century BC. A large number of items of Celtic gold jewellery with joined parts or applied decoration dated to the 6th century BC have been found. Many of these, including a thick finger-ring from Cérilly (Côte d'Or), bracelets from Sainte-Colombe (Côte d'Or), a large repaired collar from Eastern France, and pendants from Apremont (Franche-Comté), have been subjected to laboratory investigations [13]. Scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDS) have shown that there is a slightly higher level of copper in the areas where parts have been joined together than in the bulk of the gold, which indicates that the joining technique used may have been copper diffusion bonding.

However, a pair of earrings recently discovered in Burgundy at Gurgy (Yonne) were found to have been fabricated in the same way as the Hallstatt earring (Figures 11-12). In this case, though, SEM analysis did

not reveal any difference in copper content between the bulk of the metal and the join region.

Very fine beaded wire and smooth filigree (0.2 mm in diameter)—similar to that used by the Etruscans—is found on the neckring, or torc, of Vix (Côte d'Or).

In Alsace, at Ensisheim, a curious tubular bracelet was discovered in a male burial together with other traditional gold jewellery. The bracelet is characterized by highly original decorative elements soldered to the tubular body: two large beads made of soldered hemispheres with a thick granule on top. A gold pin with a conical head serves as a clasp and is decorated by five granules (each 1.7 mm in diameter) disposed in a pyramidal or bunch-of-grapes fashion (Figures 13-14).

Regions Linked with the Early Celtic Centres

Some goldwork found north of the Alps, but outside the main Celtic centres, also incorporate such non-traditional features. For example, cremated remains found in a *stamnos* in La Ronce (Loiret) included an item of gold jewellery made of two small discs with very thin beaded wires and globules, which were probably soldered. The beaded wires are very thin, with a diameter of no more than 0.2 mm; wire as fine as this has also been found at Vix.

Further to the west, in Brittany, a hoard found in the 19th century, at St-Marc-le-Blanc (Ille-et-Vilaine) in-

Fig. 9 Detail of the granulated decoration on the bead from Ins

Fig. 10 Detail of the chain from Ins, made from wire of 1.4 mm thickness

Fig. 11 Pair of earrings (2 cm in diameter) from Gurgy (Yonne), Auxerre Museum

Fig. 12 Detail of the granulated terminal of an earring from Gurgy, Auxerre Museum

Fig. 13 Bracelet from Ensisheim, Colmar Museum (Photography courtesy St.-Germain-en-Laye Museum)

Fig. 14 Detail of the pin-clasp with pyramidal granulation of the Ensisheim bracelet in Figure 13

cludes three curious pieces of jewellery, which are made of several rows of wires or twisted filigree soldered together and terminated with transversally wound ribbon. One item is a fingering or an earring, and is made of seven twisted lengths of 1.1 mm square-section wire. Of the two bracelets, one is particularly interesting, being constructed of four rows of three twisted rods, also of 1.1 mm section. The third piece is a bracelet (Figure 15) made of six superimposed smooth round wires (0.8-0.9 mm in diameter).

Also in Brittany, a recent find at Tréglonou (Finistère) includes a beaded gold necklace, probably dating from the 6th-5th century BC. Twelve of its large beads (Figure 16) were examined in the Louvre laboratory. [15]. They are made in a silver-rich gold alloy (33-40 per cent silver, 1.5 per cent copper). Along the line of the joint between the two halves of a bead, a slight but typical rise in the copper content of the alloy (2.5 per cent) could

be observed, which suggests that copper diffusion bonding was used as the joining technique (Figures 17a and b).

A small earring (Figure 18) found in a tomb in Central France, at Lanouaille (Dordogne) is made of six wires (three lengths folded over), alternately twisted and smooth and 0.8-1.0 mm in diameter [16]. Again, the hook was made by hammering the wires together at the ends, and is reinforced with a transversal soldered ribbon, reminiscent of the ends of some rings from St-Marc-le-Blanc. Originally ten granules 1.5 mm diameter granules were soldered pairwise in five groups on the outside of the ring. Analysis reveals the metal to be a kind of electrum with 82.5 per cent silver and only 17.5 per cent gold.

Finally, a bracelet found more to the south, at Le Frouzet, near Montpellier (Hérault), is worth mentioning. It is constructed of five rather thick (1.5-1.8 mm diameter) rods, alternately smooth and twisted. Around this body, wavy, transversally wound smooth filigree wire (0.8 mm) serves to hold the rods together in two places. Large embossed discs have been soldered to the ends of the rods. The bracelet closely resembles some examples in silver from southern Spain [17].

Fig. 15 Bracelets from the hoard of St-Marc-le-Blanc, Cluny Museum, Paris (Photograph by courtesy of R.M.N., Paris)

The Problem as Viewed from the Etruscan Side

The oldest trade links established by the Etruscans with the Celtic world would seem to have been across the eastern Alps into Austria. By between the 7th and the early 5th century BC, decorative techniques such as coarse granulation and filigree were being applied to locally made goldwork from Hallstatt to Burgundy and Alsace. However, similar decoration, but much finer, as in Etruscan jewellery, is seen on only four Celtic ornaments—those from Ins and Jegenstorf (6th century BC), and those from La Ronce and Vix (around 500 BC). Their manner of decoration is closer to Etruscan styles,

Fig. 16 Beads from Tréglonou. Quimper Museum (Photograph courtesy S t.-Germain-en-Laye Museum)

Fig. 18 Earring from Lanouaille, Dordogne (Photo Laville)

but apart from the Ins jewel, they cannot be unhesitatingly considered as being of Etruscan origin.

Moreover, there are some peculiarities which separate the goldwork of the Celtic region from that of the Etruscans. For example, in the orientalizing period, gold-plated silver (i.e., silver covered with gold foil) was often used in Etruscan jewellery, but later and only rarely by the Celts north of the Alps. And beaded wire seems to have been preferred by Celtic goldsmiths over twisted filigree, which was popular in Etruria.

On the other hand, the application of joining processes was not restricted to Celtic centres enjoying a close relationship with the South. They were also used in Brittany (see above), and by the Atlantic cultures in the production of pieces like the Sintra collar [18] as well as a variety of composite rings.

The appearance of several types of joining processes in Bronze Age Europe could be the logical result of the emergence of goldworking technology from a common origin. It is possible, however, that the process of copper

Fig. 17a The join region of a bead from Tréglonou. The dark 200 μ m rectangle is the area analysed by EDS (see Fig. 17b)

Fig. 17b Distribution map of copper (dark areas) in the rectangle shown in Figure.17a; the width of the central dark line of copper is 40 μ m width. (Photos 17a and b courtesy L.R.M.F.)

diffusion bonding is linked more with the Mediterranean region than with Celtic Europe.

Although the situation is not very clear, we can, however, say that the 'foreign' or 'new' characteristics of some of the jewellery found in the Celtic and neighbouring regions are confined to details of construction or decoration. The influence of Mediterranean techniques was sporadic and did not affect the basic forms of the Celtic jewellery, which remained essentially indigenous. Perhaps a few Celtic craftsmen, who had been able to travel south of the Alps, or had seen jewellery worn by eminent foreign visitors, began to apply what they had seen to their own goldwork.

Several laboratory studies have been carried out on Etruscan gold jewellery. In one of these, E. Formigli [19] showed that the technique of copper diffusion bonding had been in use in Etruria since at least the 7th century BC. His investigations of jewellery from the orientalisering period (7th century BC) have clearly revealed that this process was used in filigree and granulation, and that the bulk of the gold alloy was rich in silver. However, this does not rule out the likelihood that other joining processes were also used by the Etruscans, particularly in jewellery from a later period (6th-5th century BC), where the gold alloy used contains less silver, and is relatively high in copper. In studies conducted by Echt and Thiele in Saarbrücken [20],

surface analysis by SEM seems indicate that bonding was by sintering or surface welding.

The results of recent laboratory analyses of the composition of Celtic and Etruscan gold jewellery are summarized in Tables I and II.

Concluding Remarks

During the Celtic/Etruscan period, the development of the craft of goldsmithing in each region depended very much on their cultural and political allegiances. Its brilliant flowering in Celtic Europe reinforces the idea that the Celts were selective in their imports. Thus, from Etruria, they imported mainly such goods as they did not produce locally, like wine, while the Etruscan drinking sets made a welcome addition to their own bronze vessels. But they had no need at all for foreign produced gold jewellery and ornaments.

Table I
Analytical Data for Jewellery from France

Cérilly (6th cent. BC) (SEM/EDS [22])			
Ring body	Au 97	Ag 2-3	Cu 1
joining spot	Au 94	Ag 2-3	Cu 3 (on 200 µm)
Eastern France (6th cent. BC) (SEM/EDS [22])			
Collar	Au 87	Ag 12-13	Cu 0.5
joining spot	Au 83	Ag 14	Cu 3 (on 400 µm)
Apremont (6th cent. BC) (SEM/EDS [23])			
Pendant	Au 95	Ag 5	Cu 0.5
joining spot	Au 90	Ag 5	Cu 5
Ste Colombe (6th cent. BC) (SEM/EDS [23])			
Bracelets	Au 92	Ag 8	Cu 0.5
joining spot	Au 90	Ag 8	Cu 2
Tréglonou (6th-5th cent. BC) (SEM/EDS [24])			
Beads	Au 60-67	Ag 33-40	Cu 1.5
joining spot			Cu 2-2.5 (40 µm)
Gurgy (6th-5th cent. BC) (SEM/EDS [25])			
Earrings	Au 87	Ag 10	Cu 3
joining spot	Au 87	Ag 10	Cu 3

Table II
Analytical Data for Jewellery from Italy

Vetulonia, Circolo di Bes (7th cent. BC) (SEM/EDS [26])			
Bracelet	Au 69	Ag 28	Cu 3
joining spot			Cu 9 (on 100 µm)
Wires	Au 69	Ag 28	Cu 3
joining spot			Cu 10 (on 130 µm)
Wires	Au 74	Ag 23	Cu 3
joining spot			Cu 10 (on 130 µm)
Vetulonia, Pietrera di Vetulonia (7th cent. BC) (SEM/EDS [26])			
Bracelet	Au 70	Ag 28	Cu 1.5
joining spot	Au 68	Ag 28	Cu 4-5 (on 50 µm)
Marsigliana d'Albegna (7th cent. BC) (SEM/EDS [27])			
Serpentine fibula		Au 65	Ag 32
joining spot			Cu 3 (on 50 µm)
Comb fibula	Au 68	Ag 30	Cu 1.3
joining spot			Cu 5 (on 50 µm)
Populonia (6th cent. BC) (SEM/EDS [28])			
Earring body	Au 92.9	Ag 7	Cu -
granulation	Au 91.7	Ag 8.2	Cu -
joining spot			Cu 1
Asciano (6th cent. BC) (SEM/EDS [28])			
Earring body	Au 96.8	Ag 2.7	Cu 0.4 (maxi)
joining spot	Au 95.9	Ag 2.9	Cu 1.1
Vetulonia, tomba della Fibula d'Oro (end 7th cent. BC) (SEM/EDS [28])			
Fibula body	Au 77.1	Ag 22.8	Cu -
granulation	Au 90.6	Ag 9.4	Cu -
joining spot	Au 73.7	Ag 26.2	Cu -

Unlike the Celts, however, the Etruscans had few sources of gold of their own. Tuscany was rich in silver, copper, iron, lead, zinc, mercury, etc., but there was scarcely any gold. Although some gold did come from the Po valley, sources were rare in the rest of the peninsula. On the other hand, there was plenty of gold in the Alps, in the Napfgebiet in Switzerland, in Vorarlberg, and in Salzburgerland and Kärnten in Austria. Would it therefore be unreasonable to imagine a traffic of gold from the Celtic countries north of the Alps supplying the Etruscan goldsmiths?

In contrast to the situation with Celtic goldwork, relatively few analyses have been made of the compositions of Etruscan gold jewellery alloys. Available information seems to indicate that the gold used in the 7th century BC on both sides of the Alps was often rich in silver (mostly around 30 per cent), while during the 6th century, the average silver content was significantly lower (about 10 per cent) [21]. This difference may well be fortuitous, but the possibility remains that the distribution, or redistribution, centres for gold might have been the same for both sides of the Alps. Indeed, at that time, there were few links with the Iberian peninsula, and while the Near East played an important role in the emergence of the Etruscan civilization, there is no evidence for gold being imported from such distant countries, which themselves needed to gather it from different sources.

A traffic in gold ingots, or, more probably, in gold dust, across the Alps, would be a plausible explanation for the sporadic signs of Mediterranean influence in Celtic goldwork. The present lack of minor-element analyses of the gold alloys used by the Etruscans and the Celts prevents us from seriously following up this hypothesis. Let us hope that one day it will be possible to find the answers to this fascinating question.

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