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Reviewed Article:

# Embossing Technique between III and II Century BC: Experiments and First Results

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The purpose of this paper is to explain our experience with the process of experimental archaeology, involving the reproduction and field testing of embossed decorations, inspired to archaeological finds. As a re-enactment group focused on Celts and Ligurians of III – II

century BC we reproduce items and/or ornaments often crafted using the embossing technique: helmets, jewels, brooches, belt buckles and various appliques.

> The main aim of the project was to create a didactic activity to engage the public audience, both during the events of historical re-enactment and in more specific events in museums, as well as crafting materials that will then be used for the historical re-enactment itself.

Our association is born in 2004, we celebrated our 15th anniversary few months ago. Popolo di Brig is settled in Vimercate, a small city in the North of Milan. Since our constitution, we decided to focus on Celts (as Teuta Brig) and Ligurians (as Veleiates) of III – II century BC. Our re-enacting experience has allowed us to travel around Italy and Europe, with more than 150 events over the years.

We can summarize as follows our main experimental archaeology projects:

Bardomagus (since 2008) – Latenian Music ensemble and research group;
Preparation of archaeologically and historically - compatible foods/drinks (since 2007);
Historical Trekking (since 2009);
Linen and wool dyeing (since 2010);
Experimental embossing (since 2011).

In spite of the abundance of archaeological finds belonging to these classes of artefacts, archaeology is still facing a noticeable lack of evidence concerning tools that can be plainly identified and interpreted as embossing implements. Even when preservation conditions allow to recognize an archaeological finding as a tool, it is fairly hard to outline its specific function.

The main aim of the project was to create a didactic activity to engage the public audience, both during the events of historical re-enactment and in more specific events in museums, as well as crafting materials that will then be used for the historical re-enactment itself (Mariani, A. forthcoming). The present contribution's scientific and methodological structure stems from these premises. The article will lead through the different design and development stages for each topic or subject according to a consistent, interdisciplinary and participatory method.

## Introduction: the archaeological record

To the extent that sources are available, it is accepted that Celtic the culture named as La Tène (from the main archaeological site in Switzerland) appeared circa 500 BC and its material culture and artistic style gradually started spreading through Europe, involving France and Germany and during a later phase also Italy, Bohemia and Hungary. We refer mostly to III-II century BC for our re-enacting time frame; this period is part of La Tène

chronology (for a general review about some relevant contributions concerning the chronology of Iron Age in Northern Italy, please refer to Kruta Poppi, 1981; Catarsi and Dall'Aglio, 1987; De Marinis, 1988, pp.190–192; Catarsi Dall'Aglio, 2004; Durante, 2004, pp.404-405; Gambari, 2019, Gambari, M. V. and Gambari, F.M., 1988, pp.88-90; Ghiretti and Saronio, 2004, pp. 351- 374; Malnati, 2004, pp.159-165; Moscati, 1991, pp. 206–207).

According to both historical sources and archaeology, these societies were characterised by the presence of a warrior elite; therefore, military gear (Vitali, D., 1982, p.35-49; Vitali, D., 2003, pp.375-381), jewellery, decorations and tableware represent the majority of the main and most outstanding finds (Buchsenschutz, Gruel and Lejars, 2012, pp.191-193; Rustoiou and Berecki, 2014, pp.254-256; Perrin, 1992, p. 217). This phenomenon has very likely been developed by trade, migration exchange and warfare, which contributed to create and enhance a network of contacts and relationships between western European and Eurasian cultures.

This social mobility seems to have reasonably affected not just the prominent figures as the aristocrats or warrior elites, but included likewise traders, mercenaries, artists, blacksmiths and metalworkers (Buchsenschutz, Gruel and Lejars, 2012, pp. 209-210). Concerning central and western Europe, the archaeological record displays a good amount of finds representing examples of the embossing technique used by regional La Tène-influences artisans.

These artefacts belong to different categories: weapons (helmets), jewelry, tableware (See Figures 1, 2, 3, 4, 5).

Above all, our historical group decided to focus on embossing technique because our re-enacting needs various categories of items and artifacts, but also because one of the authors of the present contributions, Andrea Moretti, is an artisan with an extensive experience and expertise with historical craftsmanship and embossing.

Despite an abundance of archaeological evidence concerning the finished products, little is still known about the technologies and the tools characterizing La Tène-period skills applicable to blacksmithing, goldsmithing and jewellery decoration.

To set up and design our research project, we tried to examine the known and published archaeological records, in order to compare the evidence and the material culture, and eventually to establish a likely connection between theory and practice. We have therefore recreated tools using several materials, essentially experimenting them to verify which ones could provide the most similar outcomes to the preserved findings (Comis, 2010, p.10):

> "*The hallmark of experimental archaeology is the attempt to replicate past phenomena to get better understanding of the past. This is just the means through which we wish to gain new data or information. Replicating past objects or phenomena is therefore just*

*the tool of experimental archaeology, not its purpose. Therefore, a reconstruction is by no means an experiment. [...] In actualistic experiments an attempt is made to encompass all the variables that would be involved in a real life activity in the past (Outram, pers. Comm.). In this phase, then, we need to stay as close as possible to the original procedure as it might have been.*"

In between the archaeological cases that have contributed to shed new light on the topic, a remarkable contribution is represented by the so-called blacksmith tomb of Cabezo Lucero (Guardamar de Segura, Alicante, Spain). Tomb 100, part of massive burial ground dating from V to IV century BC, and adjacent to a fortified settlement, contained the remains of a male adult, identified as a warrior (See Figures 6 a-b-c, 7 and 8).

Along with the martial grave goods, the burial contained what has been identified and interpreted as a full goldsmith toolkit, including more than 50 utensils (in heterogeneous state of preservation); the discovered items have been analysed, studied and published, and have represented a very useful reference for the current research (Perea and Armbruster, 2011).

The ownership and use of these implements, alongside with the possession of the image moulds, has made possible to identify the buried person as a prominent individual within the community, with access to cutting-edge knowledge.

Concerning our research, the most outstanding and remarkable items and within the grave good congregation are represented by the embossing punches. The toolkit included these tools, along with copper alloy burin/punch and a gouge in the same material.

Last but not least, the goldsmith equipment of Tomb 100 retained also 31 bronze dies, used to mould golden and silver sheets; the moulds presented a quite varied and wide catalogue, including both abstracted and figurative imagery (Perea and Armbruster, 2009).

Other archaeological findings potentially related to metalworking, blacksmith or goldsmith that have been taken into account are coming from the Iron Age settlement of Larina (Department of Isère, Region of Rhône-Alpes, France), very likely inhabited by the Gaulish tribe of Allobroges (See Figure 9). Archaeological investigations are still trying to identify the settlement typology (hillfort or sanctuary). The published report of archaeological research focuses on the archaeological features and findings excavated and recorded on the site (Perrin, F.,1992, p. 217).

The material culture represents a quite broad and miscellaneous assemblage, including personal adornments, several categories of tools and implements, coinage and weapons. Although the site identification is still discussed, the report author has supposed that the

most reasonable interpretation might be a storage or depot location, where valuable items were hoarded, collected and kept with different purposes (Perrin, F., 1992, p. 217).

The assemblage taken in consideration consists of seven iron tools, interpreted as embossing punches, gouges and metalworking chisels, dated between phase C and D of La Tène Culture (250 – 150 BC/ 150 – 1 BC).

Again from excavations in France, archaeological evidence consistent with metalworking and metal craftsmanship is coming from the rural settlement of Marcè, (Hélouine, Maine et Loire), dating to approximately to III century BC (Nillesse, 2003, pp.153-154).

The tool has been interpreted as a burin or chisel, and its presence – together with a smaller cluster of similar implements, raw materials and iron ore and slag - has been connected with the discovery of a potential blacksmith workshop, adjacent to the settlement (Nillesse, 2003).

Other archaeological evidence is represented by an iron alloy burin (See Figure 11) coming from La Tène settlement of Kolìn (Bohemia, Czech Republic), dated approximately to the beginning and the first half of I century between 100 and 40 BC (Rybovà and Motykovà, 1983).

## The experimentation phase

The evidence of the metalworking techniques that has been taken in consideration for our experimental project dates back between III and II century BC. Metalworking techniques shared simple tools and materials, although allowed artisans to get a wide range of different results. On the other side, metalworking was favoured by the physical properties of the metal (usually retaining its bulk and thickness) and to the chance of recycling the raw materials.

Toreutics is one of the different techniques applied to metalworking or precious metal processing. The term denotes the metalworking technique used to hammering gold or silver (or other materials), engraving, or using repoussé and chasing to create minute detailed reliefs or small engraved patterns.

Sometimes the embossing technique might get confused with repoussage technique, where a malleable metal is shaped by hammering from the reverse side to create a design in low relief.

Chasing, chased work, or embossing refers to a similar technique, in which the piece is hammered on the front side, sinking the metal. The two techniques are often used in conjunction.

Embossing allows the artisan to exploit a relatively small amount of metal, producing relatively large and remarkable finished products; this working method gets advantageous because allows to save raw material, even if the working time is longer due to the technique.

Chiselling is quite similar to embossing, but usually the metalworking is applied to bulk metal, and not to metal sheet. Usually the technique is used to polish or refinish molten products, but it might also be used to create complex and intricate decorative patterns.

Burin technique uses a consists of a rounded handle tool, with metal shaft, coming from the handle at an angle, and ending in a very sharp cutting face, squared or lozenge shaped. A burin can be either used to carve or cutting away portions within a metal surface by removal or also to create a relief print decoration.

To sum up, is clear from the chemical and physical analyses and from the stylistic and artistic examinations, that these kind of techniques were operated by traveling blacksmiths and craftspeople, or that these artisans were working down the same workshops, teaming up different skills to get outstanding and exceptional metalwork, of high economic and artistic value (Rustoiou and Berecki, 2014, pp.249-254).

## The embossing technique

The process of embossing is relatively simple: basically it requires a hammer, a sharp tool (chisel, burin, punch) and a support. The metal plate might need to be annealed in order to get more ductile, as many metal tend to strengthen and get stiff after hammering. The process requires a number of steps.

The metal plate needs to be secured on an appropriate support; a quite common technique is to set the metal sheet over a layer of chasers' pitch, that has been heated until is soft enough to adhere to the metal leaf - holding it in place – but is still plastic enough to decrease the metal resistance.

Nevertheless, the support can be produced using also different materials: lead, wax, wood, sand stuffed bolster. It is meant to prevent the plate from tearing and also to reduce the mechanical resistance during the hammering phase.

It would be interesting and useful to get the chance to inspect the archaeological records pertaining to embossed metalwork in order to investigate the presence of pitch, lead, wax or leather particles, or also for traces of usage consistent with the hammering or chasing phase of production.

Once the plate is firmly held by the pitch, front side up, the outline of the desired design is lightly chased on it by a thin and sharp tool (a liner), that creates narrow raised lines on the other side.

When the chasing phase is complete, the metal sheet is turned over, and firmed again over the pitch, with the back side up. The main repoussé work is then performed, using a variety of punches.

On the other hand, when after the review and comparison phase we decided to plan the operational stage of our research project, we were confronted with a very practical question: how much the historical and functional design of embossing or goldsmith kits did change over time?

For this reason, we had therefore to start from the finished products and, getting backwards, try to speculate which tools could have been used to create them.
Concerning the tools, the plates to be decorated and the support on which the sheet is placed, it has been decided, of course, to use materials available for the historical period in question.

With the exception of the archaeological evidence mentioned above – that is still lacking significant bits of material culture - and reasonably assuming that the function and design modification process didn't excessively affect the tools, we have decided to review iconographic and material reference to design and somehow reverse engineer our embossing tools.

The lacking of archaeological evidence could be very likely connected to the longevity of these tools, alongside with the interpretation complexity.

Hence, between the very wide and complex clusters that represent the archaeological material culture, several not clearly recognisable findings might potentially have been embossing tools. We then have several examples of instrument recycling; therefore, we cannot exclude that some embossing or metalworking tools have been recycled or re-used the same thing could have happened for this group of tools.

## Raw materials, techniques and supports

Concerning the tools, the plates to be decorated and the support on which the sheet is placed, it has been decided, of course, to use materials existing and consistent with the historical period (Iron Age) and geographic area (Italy).

The punches that we selected for the embossing experimental working, all with an initial 0.8 mm diameter drill, were made in:

- *Cornus mas* (cornel/cornelian cherry): the very hard wood from this tree was already praised by Greeks, who used it to craft tools and weapons (Markle, 1977);
- industrial copper alloy, bronze and brass (to simulate the possible various firmness rates of ancient bronze);
- wrought iron, made from a large hand-forged nail from the pre-industrial era.

The efficiency of the metal punches has been tested before and after their hardening.
Metal sheets used:

- bronze (1 mm thick);
- brass (0.5 mm thick); this one to simulate softer but too expensive materials such as gold and silver.

Different types of supports have been tested:

- Leather cushion filled with sand;
- lead foil;
- soft wooden board;
- pitch bowl (See Figure 16).

All three types of embossing techniques were tested, namely:

- Punching (single shot);
- tracing (continuous line with close shots);
- deep drawing (creation of a low relief surface).

The combination of all the variables would have produced a wide number of cases; trying to mitigate the number dispersion, at the current stage of our research project we have decided to focus on the borderline examples, involving the embossing of brass and bronze sheets.

Summing up the results of this first step of research, experimentation showed that bronze alloy tools can be applied to thinner sheets or used with malleable precious metal (such as gold or silver). In this case, the best support looks to be the pitch bowl.

Although punching is possible on any support, tracing is difficult on leather and deep drawing is problematic using wood and leather supports.
With thicker plates and/or in hard metals such as bronze or iron it is possible to carry out the work only with hardened iron tools. The pitch proofed being the most suitable support.

We have no historical evidence or record for motifs printed or sketched on paper, used during the tracing of the decoration (See Figure 12). To perform the tracing, A. Moretti usually copies the decorating pattern from the archaeological find using the freehand drawing technique and a compass with various openings. This technique was very likely a skill or a technical expedient that was part of the skill set of ancient artisans as well, resulting of years of repeated practice and experience. A. Moretti himself observed that, concerning his practice as craftsman and embosser, freehand drawing of decorating patterns comes as a simple and natural training, resulting of many hours of practice.

| Tool | Support | Hammer | Sheet | Initial diameter | Final diameter | Completion | Notes and observations |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Wood | Pitch | 50 gr | Brass 0.5 mm | 0.8 mm | 3.6 mm | No | Sheet breakage at first stroke |
| Copper | Pitch | 50 gr | Brass 0.5 mm | 0.8 mm | 2.4 mm | No | Metal sheet too thick to achieve a homogenous design; continuous tool deformation |
| Brass | Pitch | 50 gr | Brass 0.5 mm | 0.8 mm | 1,6 mm | Yes | Continuous tool deformation |
| Bronze | Pitch | 50 gr | Brass 0.5 mm | 0.8 mm | 1,4 mm | Yes | Continuous tool deformation |
| Iron | Pitch | 50 gr | Brass 0.5 mm | 0.8 mm | 1,0 mm | Yes | Lesser tool deformation while performing the second half of the drawing |

TABLE 1. EXPERIMENTATION OF EMBOSSING PERFORMED USING UNTREATED TOOLS ON 0.5 MM BRASS SHEET (SEE FIGURE 12).

| Tool | Support | Hammer | Sheet | Initial diameter | Final diameter | Completion | Notes and observations |
|---|---|---|---|---|---|---|---|
| Wood | - | - | - | - | - | - | Not performed, due to results achieved with brass sheet (see above) |
| Work hardened copper | Pitch | 50 gr | Bronze 1 mm | 0.8 mm | 2 mm | No | Metal sheet too thick to achieve a homogenous design; continuous tool deformation |
| Work hardened brass | Pitch | 50 gr | Bronze 1 mm | 0.8 mm | 2.2mm | Yes | Lesser tool deformation while performing the second half of the drawing |
| Work hardened bronze | Pitch | 50 gr | Bronze 1 mm | 0.8 mm | 2 mm | Yes | Lesser tool deformation while performing the second half of the drawing |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tempered iron | Pitch | 50 gr | Bronze 1 mm | 0.8 mm | 0.8mm | Yes | No tool deformation |

TABLE 2. EXPERIMENTATION OF EMBOSSING PERFORMED ON 1 MM BRONZE SHEET.

| Tool | Support | Hammer | Sheet | Marking | Tracing | Deep drawing | Notes and observations |
|---|---|---|---|---|---|---|---|
| Tempered iron | Leather cushion filled with sand | 50 gr | Brass 0.5 mm | Successful | Discontinuous | Difficult | The sheet tends to become hollow towards the central part; the mobility from the support does not allow to reach a good work definition |
| Tempered iron | Wood | 50 gr | Brass 0.5 mm | Successful | Successful | Difficult | The irregularity of the veins and knots of the wood does not allow to get a homogeneous processing; the sheet tends to tear rather than deform |
| Tempered iron | Lead | 50 gr | Brass 0.5 mm | Successful | Successful | Successful | Lot of strength and effort are required to accomplish a good result; the sheet struggles to deform in order to follow the pattern of deep drawing |
| Tempered iron | Pitch | 50 gr | Brass 0.5 mm | Successful | Successful | Successful | Versatile and plastic support that follows the sheet through any deformation |

TABLE 3. EXPERIMENTATION OF EMBOSSING PERFORMED WITH VARIOUS SUPPORTS ON 0.5 MM BRASS SHEET.

| Tool | Support | Hammer | Sheet | Marking | Tracing | Deep drawing | Notes and observations |
|---|---|---|---|---|---|---|---|
| Hardened iron | Leather cushion filled | 50 gr | Bronze 1 mm | Successful | Discontinuous | Difficult | The sheet tends to become concave towards the centre, the |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | with sand | | | | | | mobility from the support does not allow a good definition of the work; it is impossible to perform a tracing and a deep drawing |
| Hardened iron | Wood | 50 gr | Bronze 1 mm | Successful | Discontinuous | Difficult | The irregularity of the veins and knots of the wood does not allow a homogeneous processing, the tracing is difficult, the deep drawing is almost impossible |
| Hardened iron | Lead | 50 gr | Bronze 1 mm | Successful | Successful | Successful | Lot of strength and effort are required to perform the tracing and result is poor; lot of strength and effort are required to perform the deep drawing, and the result is poor |
| Hardened iron | Pitch | 50 gr | Bronze 1 mm | Successful | Successful | Successful | Versatile and plastic support that accompanies the sheet in any deformation, easy tracing and deep drawing |

TABLE 4. EXPERIMENTATION WITH DIFFERENT SUPPORTS WITH 1MM BRONZE SHEET (SEE FIGURE 13).

Therefore, in the light of the current stage of field test, pitch looks to be the most functional among the tested supports. A. Moretti and A. Mariani have experimentally tried to craft pitch and pitch bowl, but the first stage of trialling failed to achieve the expected results, mostly due to lack of time, space and resources (See Figure 14).

A second attempt has been performed during a re-enacting in Austria (2012), with a quite improvable outcome (See Figures 15a, 15b, 15c). Our association also started producing the pottery tools (the kit is made of two vessels both with a hole to connect them, the upper one with its lid, and with a spout that enters in the one below) but, as long as the main purpose of this project is the didactic activity and the reproduction of materials for the re-enactment, we decided to adopt a slightly different solution.

Since the production of pitch using historical methodologies would require time and large amount of raw materials, we based our recipe for the pitch on the three different formulations (different for firmness) reported by Herbert Mayron (1912, pp.200–202), whose contribution establishes the use of bitumen instead of pitch of natural origin, mixed with chalk Colophony and tallow.

## Conclusions

As previously stated, and as the archaeological findings would suggest, (together with the experimentation phase), the best performing tool is the iron one and it looks like a simple nail.

For that reason, as mentioned above, our aim was to set up and design a didactic activity for the public audience, both during the events of historical re-enactment and in more specific events in museums, as well as crafting materials that will then be used for the historical re-enactment itself.

We'd like to show some examples of the replicas that we managed to replicate, together with their original. Most of the archaeological findings used as primary source come from various Iron Age burials and settlements from northern and central Italy.

The archaeological findings have been observed, pictured and measured; the next stage has been finalised to the creation of the objects and their decoration. All of these objects are currently used during our re-enactment activities; we took the chance to get good advices from craftsmen and blacksmiths who visited us through the time (See Figures 21, 22, 23, 24, 25, 26, 27).

Keywords material culture
jewellery
weapon

Country Italy

# Bibliography

Buchsenschutz, O., Gruel, K. and Lejars, T., 2012. L'âge d'or de l'aristocratie celtique, IVe et IIIe siècles av. J.-C. *Annales. Histoire, Sciences Sociales*, 67(2), pp.295-324.

Catarsi, M. and Dall'Aglio, P.L., 1987. Il territorio piacentino dall'età del Bronzo alla romanizzazione. Ipotesi sulla formazione dell'ethnos ligure. In: D. Vitali, ed. *Celti ed etruschi nell'Italia centro-settentrionale dal V secolo a.C. alla romanizzazione: atti del colloquio internazionale, Bologna, 12-14 aprile 1985*. Imola: University of Bologna Press. pp.405-414.

Catarsi Dall'Aglio, M., 2004. La seconda età del Ferro nel territorio parmense. In: M. V. Gambari and D. Gandolfi, eds. *Ligures celeberrimi. La Liguria interna nella seconda età del ferro. Atti del Congresso Internazionale (Mondovì, 26-28 aprile 2002).* Bordighera: Istituto Internazionale di Studi Liguri. pp.333-350.

Comis, L., 2010. Experimental Archaeology: Methodology and new perspectives in Archaeological Open Air Museums. *EuroREA*, 7/2010. pp.9-12. Available at: < https://www.academia.edu/3331930/... > [Accessed 1 November 2019].

De Marinis, R., 1988. Liguri e celto-liguri. In: A.M.C. Bianchi, ed. *Italia: omnium terrarum alumna.* Milano: Libri Scheiwiller. pp.159–247.

Durante, A., 2004. *Necropoli di Cafaggio*. In: R.C. De Marinis and G. Spadea, eds. *I Liguri: un antico popolo europeo tra Alpi e Mediterraneo*. Milano: Skira. pp.374-379.

Gambari, M. V. and Gambari, F.M., 1988. Contributi per una definizione archeologica della seconda età del Ferro nella Liguria interna. *Rivista di Studi Liguri* LIII, 1988, pp.88-90.

Gambari, F. M., 2019. De transitu Gallorum haec accepimus. Cronologia, fonti e modelli narrativi dei passi liviani sull'arrivo dei Galli, alla luce dell'archeologia. *Preistoria Alpina*, 49bis, pp.55-63.

Ghiretti A. and Saronio P., 2004. L'età del Ferro nelle valli di Taro e Ceno (Appennino parmense). In M. Venturino Gambari and D.Gandolfi, ed. 2004. *Ligures celeberrimi. La Liguria interna nella seconda età del ferro. Atti del Congresso Internazionale (Mondovì, 26-28 aprile 2002)*, Bordighera, 2004, pp. 351- 374.

Kruta Poppi, L., 1981. La sépulture de Casa Selvatica à Berceto (prov. de Parme) et la limite occidentale du faciés boïen au IIIe siècle avant notre ère. *Études Celtiques*, 18, pp.39-48.

Malnati L., 2004. I Liguri in Emilia. In M. Venturino Gambari and D. Gandolfi, ed.2004. *Ligures celeberrimi. La Liguria interna nella seconda età del ferro. Atti del Congresso Internazionale (Mondovi, 26-28 aprile 2002)*, Bordighera, 2004, pp.159-165.

Mariani, A. Forthcoming., *A promoção da cultura castreja através de living history e arqueologia experimental: uma proposta*. In Atas do I Ciclo de Conferências do Monte Padrão, Camara Municipal Santo Tirso.

Markle, M., 1977. The Macedonian Sarissa, Spear and Related Armor. *American Journal of Archaeology,* 81(3), pp.323-339.

Mayron H., 1912. *Metalwork and Enamelling. A practical treatise on gold and silversmiths' work and their allied crafts*. 5th rev. ed. Reprint 1979. New York: Dover Publications.

Moscati S., 1991. *I Celti.* Venezia 1991, pp206–207.

Nillesse, O., 2003. Les établissements ruraux gaulois de Marcè (Maine-et-Loire) et la hiérarchisation des aedificia. In: B. Mandy and A. Saulce, eds. *Les Marges de l'Armorique à l'Age du Fer. Archéologie et histoire: culture matérielle et sources écrites. Actes du XXIIIe colloque de l'Afeaf, Nantes (13-16 mai 1999).* Revue archéologique de l'Ouest, supplément 10. Rennes: Revue archéologique de l'Ouest. pp.149-172.

Perea, A., and Armbruster, B., 2009. Jeweller's moulds for casting and stamping. New documents from Iron Age Iberia. In: Associazione Italiana di Metallurgia, eds. *Archaeometallurgy in Europe: 2nd international conference, Aquileia, Italy, 17–21 June 2007: selected papers.* pp.361-367.

Perea, A. and Armbruster, B., 2011. Tomb 100 at Cabezo Lucero: new light on goldworking in fourth-century BC Iberia. *Antiquity,* 85(327), pp.158-171.

Perrin, F., 1992. Un dépôt d'objets gaulois à Larina, Hières-sur-Amby, 1990 *Revue du Nord, tome 74,* 296, p.217.

Rustoiou, A. and Berecki, S., 2014. *Celtic Elites and Craftsmen: Mobility and Technological Transfer during the Late Iron Age.* In: S. Berecki, ed. *Iron Age Crafts and Craftsmen in the Carpathian Basin. Proceedings of the International Colloquium from Târgu Mureş 2014, 10–13 October 2013*. Bibliotheca Musei Mariniensis, Seria Archaeologica 7. Târgu Mureş: Mega. pp.249-278.

Rybovà, A. and Motykovà, K., 1983. Der Eisendepotfund der Latenezeit von Kolìn, Praha. *Památky Archeologické*, 74, pp.96–174.

Vitali, D., 1982., L'elmo della tomba 14 di Monte Bibele a Monterenzio (provincia di Bologna). *Études Celtiques* XIX 1982, p.35-49.

Vitali, D., 2003. *La necropoli di Monte Tamburino a Monte Bibele*. Bologna: Gedit. pp.73-77; pp.375-381.

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## Gallery Image

FIG 1. ‘CELTIC’ HELMET FROM TOMB 14 MONTE TAMBURINO, MONTERENZIO MUSEUM MONTE BIBELE (MONTERENZIO, ITALY). RIPRODUZIONE CON AUTORIZZAZIONE DEL MINISTERO PER I BENI E LE ATTIVITA' CULTURALI E PER IL TURISMO - SOPRINTENDENZA ARCHEOLOGIA BELLE ARTI E PAESAGGIO PER LA CITTA' METROPOLITANA DI BOLOGNA E PER LE PROVINCIE DI MODENA, REGGIO EMILIA E FERRARA, RIPRODUZIONE VIETATA A SCOPO DI LUCRO, ANCHE DIRETTO.

FIG 2. ‘CELTIC’ HELMET FROM TOMB 116 MONTE TAMBURINO, MONTE BIBELE (MONTERENZIO, ITALY) MONTERENZIO MUSEUM. RIPRODUZIONE CON AUTORIZZAZIONE DEL MINISTERO PER I BENI E LE ATTIVITA' CULTURALI E PER IL TURISMO - SOPRINTENDENZA ARCHEOLOGIA BELLE ARTI E PAESAGGIO PER LA CITTA' METROPOLITANA DI BOLOGNA E PER LE PROVINCIE DI MODENA, REGGIO EMILIA E FERRARA, RIPRODUZIONE VIETATA A SCOPO DI LUCRO, ANCHE DIRETTO.

FIG 3. CASASELVATICA WARRIOR’S HELMET, (BERCETO, ITALY) PARMA MUSEUM. RIPRODUZIONE CON AUTORIZZAZIONE DEL MINISTERO PER I BENI E LE ATTIVITA' CULTURALI E PER IL TURISMO - COMPLESSO MONUMENTALE DELLA PILOTTA.

FIG 4. GOLDEN GAULISH-ETRUSCAN SNAKE SHAPED BRACELET, (MONTEFORTINO, ITALY) ANCONA MUSEUM

FIG 5. OINOCHOE (JUG/PITCHER) OR DRINKING HORN RIM DECORATION FROM PRINCELY TOMB OF EIGENBILZEN IN BELGIUM, (LIMBOURG, BELGIUM) MUSÉE ROYAUX D'ART ET D'HISTOIRE – BRUXELLES

FIG 6. TOOLKIT FROM BLACKSMITH BURIAL, INCLUDING EMBOSSING PUNCHES WITH DIFFERENT HEADS AND ENDS, CABEZO LUCERO (SPAIN). THE ARCHAEOLOGICAL MATERIALS INCLUDED IN FIGURES 6-7-8 ARE CURRENTLY STORED AT THE DIPUTACION PROVINCIAL DE ALICANTE. IMAGE CREDITS: ARCHIVO AU (BY B. ARMBRUSTER) CCHS, CSIC.

Figura 18. M24

FIG 7. TOOLKIT FROM BLACKSMITH BURIAL, INCLUDING BROKEN COPPER ALLOY BURIN, CABEZO LUCERO (SPAIN). DIPUTACION PROVINCIAL DE ALICANTE. PHOTOGRAPHS: ARCHIVO AU (BY B. ARMBRUSTER) CCHS, CSIC.

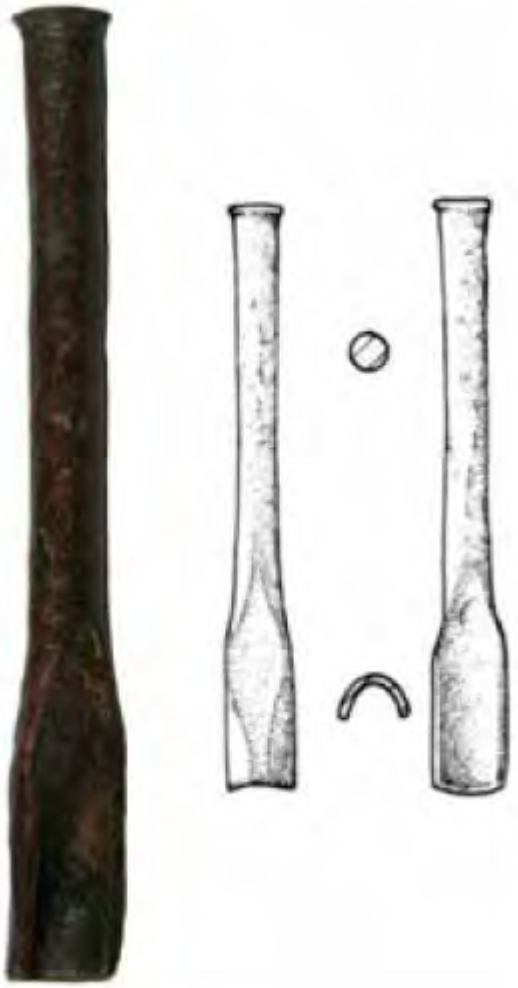

FIG 8. TOOLKIT FROM BLACKSMITH BURIAL, INCLUDING COPPER ALLOY GOUGE, CABEZO LUCERO (SPAIN). DIPUTACION PROVINCIAL DE ALICANTE. PHOTOGRAPHS: ARCHIVO AU (BY B. ARMBRUSTER) CCHS, CSIC.

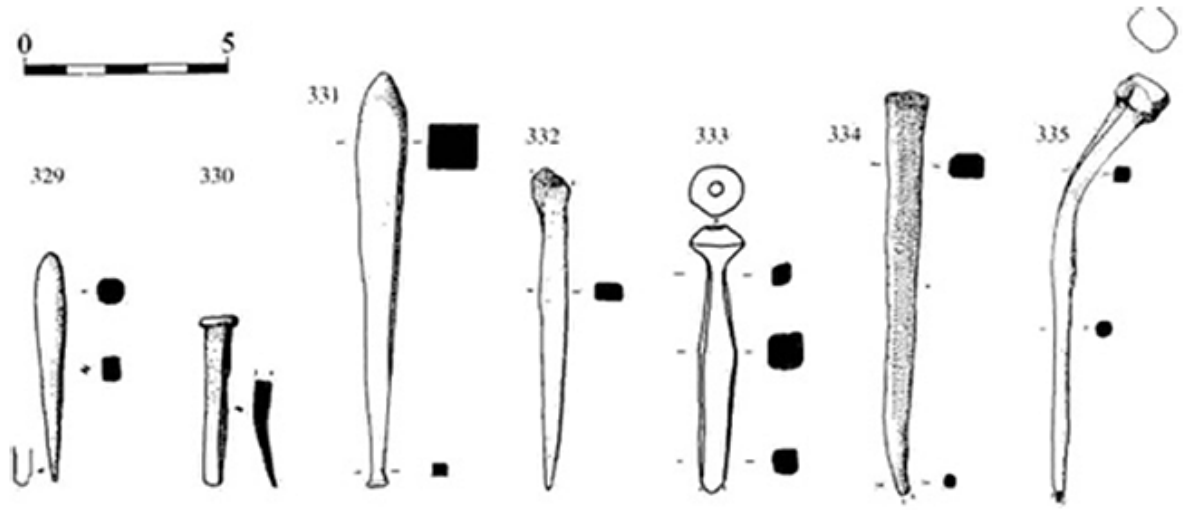


FIG 9. MISCELLANEOUS COLLECTION OF IRON METALWORKING UTENSILS, INCLUDING PUNCHES, MOULDS AND GOUGES, DEPARTMENT OF ISÈRE, REGION OF RHÔNE-ALPES, FRANCE.

FIG 10. IRON CHISEL OR BURIN, RURAL SETTLEMENT OF MARCÈ, DEPARTMENT OF HÉLOUINE, MAINE ET LOIRE, FRANCE.

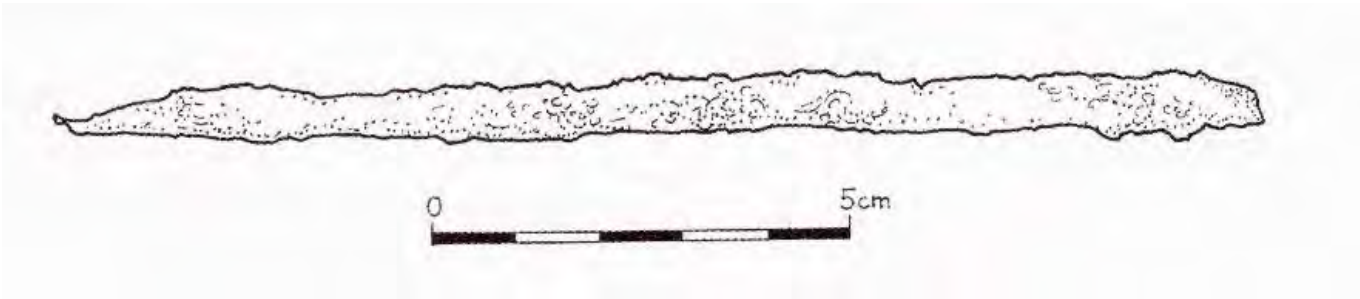


FIG 11. IRON ALLOY BURIN, FROM A LA TÈNE HOARD TOOL EXCAVATED IN 1936 DOWN THE CELTIC OPPIDUM OF KOLÌN, BOHEMIA, CZECH REPUBLIC.

FIG 12. BRASS EMBOSSING EXPERIMENTATION, INCLUDING BRASS, COPPER SHEETS, PAPER PATTERN AND PITCH BOWL. ON THE LEFT IS VISIBLE THE COPPER CHISEL AND THE HARDENED WOOD PUNCH, WITH THE BROKEN AND DEFORMED END. A. MORETTI NOTED ON THE PAPER PATTERN ALSO THE VARIATION OF THE PUNCH DIAMETER, RELATED TO DEFORMATION RESULTED FROM THE CONTINUOUS STRIKING. COPYRIGHT BY ANDREA MORETTI.

FIG 13A. BRONZE EMBOSSING EXPERIMENTATION. THE IMAGE REPRESENTS THE EXPERIMENTATION INVOLVING HEAT-AFFECTED PUNCHES ON METAL SHEETS; THE “SOFT” PUNCH IS IN BRASS AND HASN’T BEEN HARDENED, WHILE THE “HARD” ONE IS IN BRONZE AND HAS BEEN HEAT-AFFECTED, METAL AND CUSHION SUPPORTS. ON THE TOP IS VISIBLE THE BRASS SHEET, THE COPPER ONE IS ON THE RIGHT; THE BOTTOM ONE, IN IRON, SHOWS THE BEST RESULT FOR TRACING; THE LEFT SHEET, IN BRONZE, SHOWS THE COMPLETED EXPERIMENTATION. COPYRIGHT BY ANDREA MORETTI.

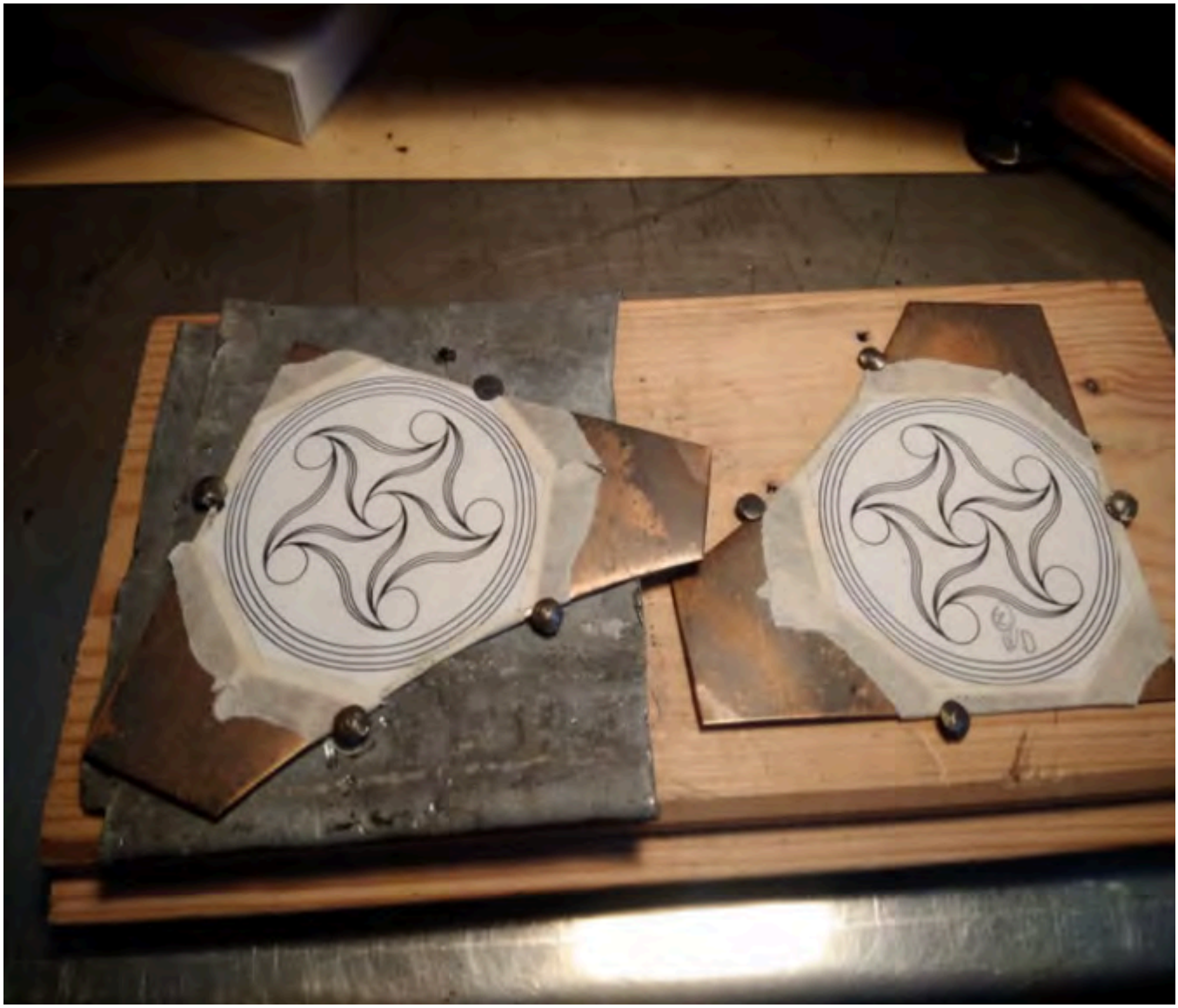

FIG 13B. BRONZE EMBOSSING EXPERIMENTATION. THE IMAGE ON THE RIGHT SHOWS THE PAPER PATTERN LAYING ON THE BRONZE SHEET, PUT OVER A LEAD SUPPORT AND A WOODEN SUPPORT (THE EXPERIMENTATION HAS BEEN PERFORMED WITHOUT THE PITCH SUPPORT. COPYRIGHT BY ANDREA MORETTI.

FIG 14. PITCH CRAFTING EXPERIMENTATION, PERFORMED BY ANDREA MORETTI (DECEMBER 2018). COPYRIGHT BY ANDREA MORETTI.

FIG 15A. VARIOUS STAGES OF PITCH CRAFTING EXPERIMENTATION, PERFORMED BY ANDREA MARIANI IN OPEN AIR MUSEUM OF UTTENDORF, AUSTRIA (AUGUST 2012). COPYRIGHT BY ANDREA MARIANI

FIG 15B. VARIOUS STAGES OF PITCH CRAFTING EXPERIMENTATION, PERFORMED BY ANDREA MARIANI IN OPEN AIR MUSEUM OF UTTENDORF, AUSTRIA (AUGUST 2012). COPYRIGHT BY ANDREA MARIANI

FIG 15C. VARIOUS STAGES OF PITCH CRAFTING EXPERIMENTATION, PERFORMED BY ANDREA MARIANI IN OPEN AIR MUSEUM OF UTTENDORF, AUSTRIA (AUGUST 2012). COPYRIGHT BY ANDREA MARIANI

FIG 16. CASASELVATICA WARRIOR'S HELMET (END IV-BEGINNING III CENTURY BC). REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 17A. HELMETS FROM BURIAL 14 AND 120 MONTE TAMBURINO, MONTE BIBELE (III CENTURY BC). REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

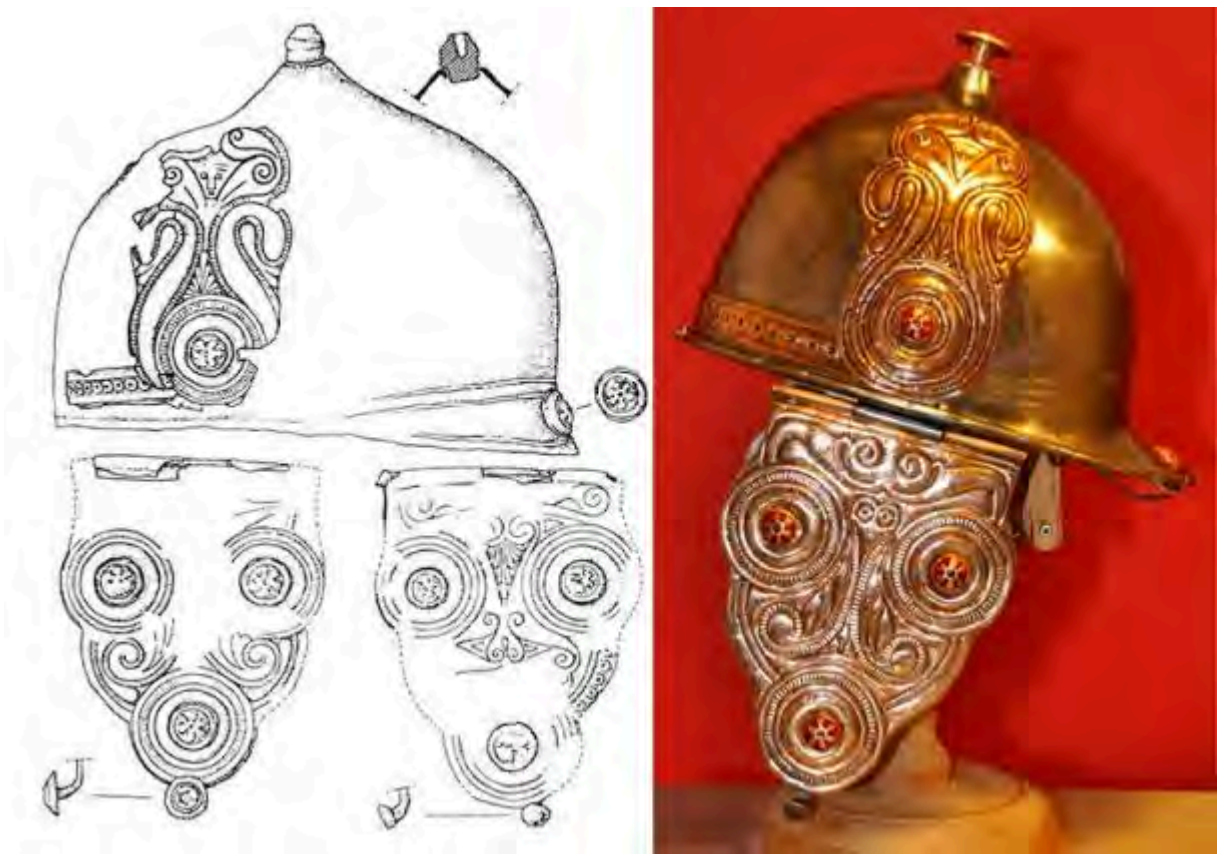

FIG 17B. HELMETS FROM BURIAL 14 AND 120 MONTE TAMBURINO, MONTE BIBELE (III CENTURY BC). REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 18. DRINKING HORN FROM PRINCELY TOMB OF EIGENBILZEN (400 BC CIRCA). REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 19A. BRONZE PROTECTION FOR FOREARM (CHIETI, IV-III CENTURY BC). REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 19B. BRONZE PROTECTION FOR FOREARM (CHIETI, IV-III CENTURY BC). REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

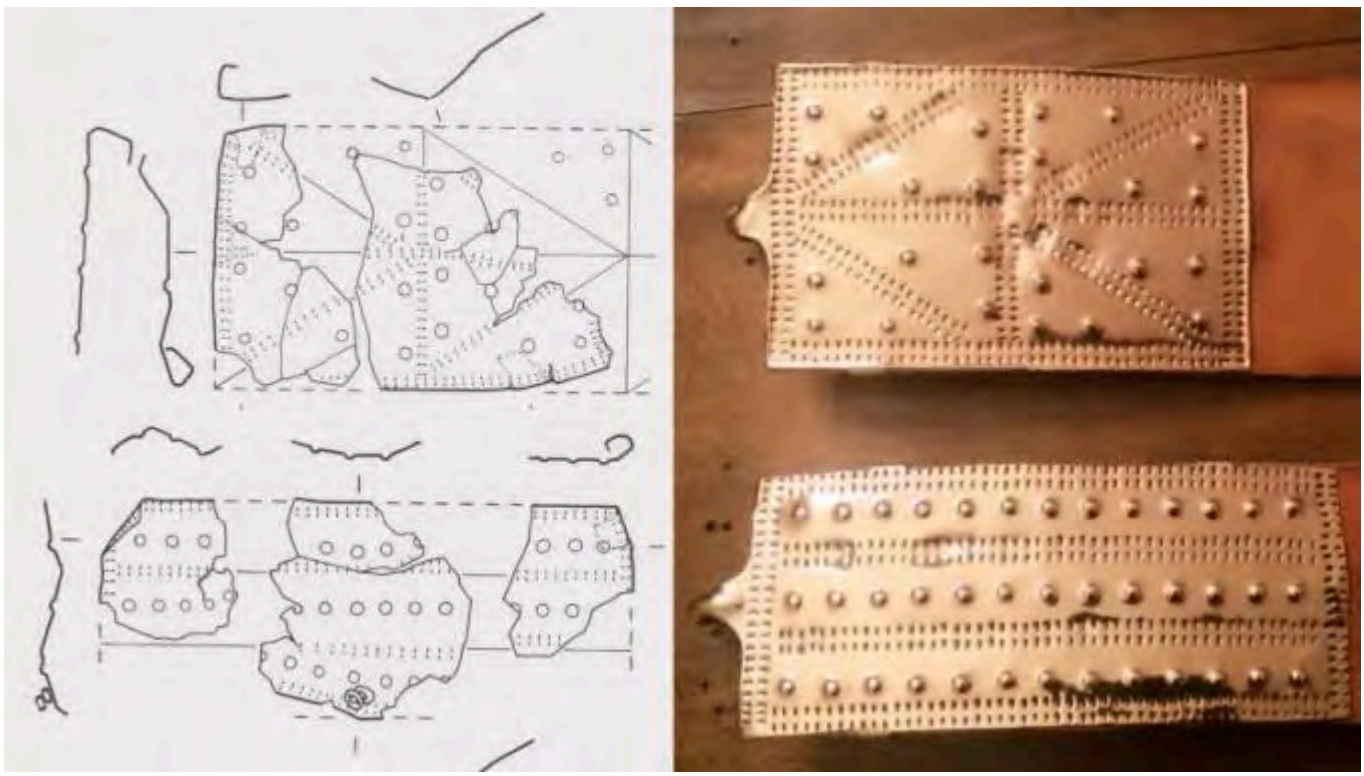

FIG 20. BRONZE PLAQUES FOR FEMALE BELTS FROM THE LIGURIAN BURIAL GROUND OF CAFAGGIO NEAR AMEGLIA, LA SPEZIA (END IV-BEGINNING III CENTURY BC). REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 21. GOLDEN SNAKE-SHAPED BRACELET FROM TOMB 23, MONTERFORTINO (III CENTURY BC). REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 22A. IMAGE SHOWS A MONTEFORTINO TYPE HELMET, WORN BY ANDREA MORETTI DURING AN HISTORICAL RE-ENACTING. REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 22B. IMAGE SHOWS A THE REPRODUCTION OF A DRINKING HORN. REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 22C. IMAGE SHOWS A MONTEFORTINO TYPE HELMET, WORN BY ANDREA MORETTI DURING AN HISTORICAL RE-ENACTING. IMAGES SHOW TWO MONTEFORTINO TYPE HELMETS AND A DRINKING HORN. REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 23. A. MORETTI PERFORMING HISTORICAL EMBOSSING DURING A DIDACTIC ACTIVITY WITHIN RE-ENACTMENT EVENT IN VICENZA (ITALY), 2013. REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 24A. A. MORETTI PERFORMING HISTORICAL EMBOSSING DURING A DIDACTIC ACTIVITY WITHIN RE-ENACTMENT EVENT IN FERRARA MUSEUM (ITALY), 2012 . REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 24B. A. MORETTI PERFORMING HISTORICAL EMBOSSING DURING A DIDACTIC ACTIVITY WITHIN RE-ENACTMENT EVENT IN MONTERENZIO MUSEUM (ITALY) 2017. REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 25. A. MORETTI PERFORMING HISTORICAL EMBOSSING DURING A DIDACTIC ACTIVITY WITHIN A WORKSHOP RELATED TO EXPERIMENTAL ARCHAEOLOGY AND HISTORICAL CRAFTSMANSHIP, RICCIONE MUSEUM (ITALY), 2018. REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 26. A. MORETTI PERFORMING HISTORICAL EMBOSSING DURING A DIDACTIC ACTIVITY WITHIN A WORKSHOP RELATED TO EXPERIMENTAL ARCHAEOLOGY AND HISTORICAL CRAFTSMANSHIP, MODENA MUSEUM (ITALY), 2015. REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.

FIG 27. EXAMPLES OF RECONSTRUCTED ARCHAEOLOGICAL FINDINGS WITH EXPERIMENTAL EMBOSSING DECORATIONS CRAFTED BY ANDREA MORETTI AND USED DURING VARIOUS EVENTS OF HISTORICAL RE-ENACTMENT. IMAGES SHOW THREE MONTEFORTINO TYPE HELMETS USED BY A. MORETTI, L. ASTA AND A. MARIANI. REPRODUCTION'S COPYRIGHT BY APS POPOLO DI BRIG.