Types and gesture. The jewellery of the Copper age in the Alps in a techno-typological study

VIOLA, Stefano, et al.

Abstract

This contribution aims to compare jewellery artefacts from some northern Italy archaeological sites, dated to different periods: the Copper age and Early Bronze age. Through a techno-typological and functional study that takes into account several morphometric, morphological and specific trace parameters (indicators of anthropic and/or wear activity), the methods, techniques and tools are reconstructed and compared. On one hand, with the typological analysis, jewellery has been looked at as a cultural marker allowing to gather information (raw material, forms, and measures) on different aspects of past life, such as style, territories, and traditions. On the other hand, with the technological analysis, interpretative hypotheses are proposed based on the comparison between production traces and experimental data, in order to reconstruct (in part or completely) manufacture procedures and fabrication techniques. Finally, a functional analysis enabled to distinguish wear traces from technological traces and to recognize if the object has been used or not.

Reference


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MATERIALS, PRODUCTIONS, EXCHANGE NETWORK AND THEIR IMPACT ON THE SOCIETIES OF NEOLITHIC EUROPE

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Marie Besse and Jean Guilaine
MATERIALS, PRODUCTIONS, EXCHANGE NETWORK AND THEIR IMPACT ON THE SOCIETIES OF Neolithic Europe

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UISPP has a long history, starting with the old International Association of Anthropology and Archaeology, back in 1865, until the foundation of UISPP itself in Bern, in 1931, and its growing relevance after WWII, from the 1950’s. We also became members of the International Council of Philosophy and Human Sciences, associate of UNESCO, in 1955.

In its XIVth world congress in 2001, in Liège, UISPP started a reorganization process that was deepened in the congresses of Lisbon (2006) and Florianópolis (2011), leading to its current structure, solidly anchored in more than twenty-five international scientific commissions, each coordinating a major cluster of research within six major chapters: Historiography, methods and theories; Culture, economy and environments; Archaeology of specific environments; Art and culture; Technology and economy; Archaeology and societies.

The XVIIth world congress of 2014, in Burgos, with the strong support of Fundación Atapuerca and other institutions, involved over 1700 papers from almost 60 countries of all continents. The proceedings, edited in this series but also as special issues of specialized scientific journals, will remain as the most important outcome of the congress.

Research faces growing threats all over the planet, due to lack of funding, repressive behavior and other constraints. UISPP moves ahead in this context with a strictly scientific programme, focused on the origins and evolution of humans, without conceding any room to short term agendas that are not root in the interest of knowledge.

In the long run, which is the terrain of knowledge and science, not much will remain from the contextual political constraints, as severe or dramatic as they may be, but the new advances into understanding the human past and its cultural diversity will last, this being a relevant contribution for contemporary and future societies.

This is what UISPP is for, and this is also why we are currently engaged in contributing for the relaunching of Human Sciences in their relations with social and natural sciences, namely collaborating with the International Year of Global Understanding, in 2016, and with the World Conference of the Humanities, in 2017.

The next congress of UISPP, in Paris (2018), will confirm this route.
Foreword

Jean Guilaine
Collège de France

Marie Besse
Université de Genève, Department F.-A. Forel for Environmental and Aquatic Sciences,
Laboratory of Prehistoric Archaeology and Anthropology

Scholars who will study the historiography of the European Neolithic, more particularly with regards to the second half of the 20th century and the beginning of the 21st century, will observe a progressive change in the core understanding of this period. For several decades the concept of “culture” has been privileged and the adopted approach aimed to highlight the most significant markers likely to emphasise the character of a given culture and to stress its specificities, the foundations of its identity. In short, earlier research aimed primarily to highlight the differences between cultures by stressing the most distinctive features of each of them. The tendency was to differentiate, single out, and identify cultural boundaries. However, over the last few years this perspective has been universally challenged. Although regional originality and particularisms are still a focus of study, the research community is now interested in widely diffused markers, in medium-scale or large-scale circulation, and in interactions that make it possible to go beyond the traditional notion of “archaeological culture”. The networks related to raw materials or finished products are currently leading us to re-think the history of Neolithic populations on a more general and more global scale. The aim is no longer to stress differences, but on the contrary to identify what links cultures together, what reaches beyond regionalism in order to try to uncover the underlying transcultural phenomena. From culturalism, we have moved on to its deconstruction. This is indeed a complete change in perspective. This new approach certainly owes a great deal to all kinds of methods, petrographic, metal, chemical and other analyses, combined with effective tools such as the GIS systems that provide a more accurate picture of the sources, exchanges or relays used by these groups. It is also true that behind the facts observed there are social organisations involving prospectors, extractors, craftsmen, distributors, sponsors, users, and recyclers. We therefore found it appropriate to organise a session on the theme “Materials, productions, exchange networks and their impact on the societies of Neolithic Europe”.

How is it possible to identify the circulation of materials or of finished objects in Neolithic Europe, as well as the social networks involved? Several approaches exist for the researcher, and the present volume provides some examples.

Let us take the case of the white painted ware in the Early Neolithic of the Balkan Peninsula.

D. Stojanovski shows how several cultural groups exhibited this particular pottery decoration. However, according to D. Stojanovski, it is not very likely that such a technique would have been transmitted by migrants who carried with them the “Neolithic package”. In this particular case we are instead dealing with a borrowing process adopted (or not) in various ways according to distinct factors: the attractiveness of its visual effect, traditions, needs, environmental context.

It is a known fact that obsidian is a perfect marker of exchange relationships across the Mediterranean basin throughout the Neolithic. T. Quero however points to differences with regards to these transfers, based on two examples in Italy. The first site, in Northern Sicily, near the lava flow of Lipari, is a place of obsidian redistribution throughout the Neolithic. This material is abundantly used, although the characteristics of production change over time: over-exploited nuclei generating mainly a flake industry during the Stentinello, rise of blade production by pressure during the Diana stage. At the
second site, in Northern Italy, far away from the sources of supply, the imported material is rare and has only exotic value.

D. Gheorghiu develops an original example stemming from the Chalcolithic period in South-East Europe. Here the elites display wealth by using valorised objects of allochthonous origin. The wealthy dead of the Varna cemetery, for example, are distinguished by an authentic “package” of objects revealing a real ideology of prestige. This model, conveying both concepts of ideas and technical transfers, will be exported again towards peripheral cultures such as the Tripolje culture. When groups that settled at the margins were not able to acquire pieces from the source, they replace these original pieces with similar creations (skeuomorphs) that make it possible, through its productions, to maintain a hierarchic social model.

T. Orozco Köhler and L. Bernabeu Aubán provide some examples of circulation networks during the Neolithic on the Iberian Peninsula. They first emphasise the progress achieved with regard to the identification of sources of supply: flint mines of de Casa Montero (Madrid), open-air exploitations of Andalusian obsidian at Pico Centero (Huelva). Several axes of circulation are mentioned: shale bracelets in the south, amphibolite axes around Valencia, Sardinian obsidian brought to Catalonia. The authors highlight the variations affecting these networks in space and time. They also emphasise their possible superimposition. They demonstrate that these circulations were not restricted to the dissemination of objects but involved displacements of individuals within a context governed by social motivations (alliances, relationships between individuals).

The establishment of an agro-pastoral economy in the Alto Ribatejo, in the Centro region of Portugal, was studied by N. J. Almeida, C. Ferreira, S. Garcês, A. Cruz, P. Rosina, and L. Oosterbeek. The archaeological data demonstrates a great variety of situations in the distribution of the sites, depending on space and time. It is thought that this research can be improved by applying new methods likely to better reflect the reality of settlements throughout the Neolithic. After reviewing the evolution of the environmental setting under the effect of human pressure (opening of the landscape, fauna), the authors point to the impact of coastal arrivals, vehicles of the neolithisation dynamic, but also, in parallel, to the role of more continental areas which have their own specificity in the emergence of cultural productions.

M. P. Prieto Martinez and O. Lantes Suárez look at the example of pottery as an element which makes it possible to assess the existence of circulation networks in Galicia from the Neolithic to the Bronze Age. Based on the typology and on archaeometric analyses, these authors attempt to estimate the distance that separates sites of discovery from the elaboration space of the ceramics. This method proposes an alternative for the simple local/non-local alternative. The authors propose five models for this grid (ranging between 0 and more than 200 km), with the district scale (between 7 and 50 km) being the most frequent. This approach also provides a more appropriate picture of the true mobility of the groups (for example possible settlement instability during the Middle Neolithic).

An alternative way of analysing mobility is based on the technical analysis of the ornaments. The example cited by S. Viola, M. A. Bernabò Brea, D. Delcaro, F. Gonzato, C. Longhi, G. Gaj, R. Macellari, L. Salzani, A. Serges, I. Tirabassi, and M. Besse, refers to the stone ornaments of the Alpine Chalcolithic. The operational sequence of manufacturing, distinct technical details, and even use wear are all specific markers of an object during its displacements. These remains are also identifiers of the definition of territories and of cultural groups.

By giving preference to various aspects of raw material or finished product analyses, it is obvious how current research makes it possible to draw a more accurate and a more complex picture of the Neolithic circulation networks, as well as simultaneously producing a more balanced one of the distances covered at the time. The examples cited in this volume confirm that the first agricultural communities, through the establishment of networks of varying and sometimes contrasting scales, were authentic “exchange-based societies”.

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Abstract

This contribution aims to compare jewellery artefacts from some northern Italy archaeological sites, dated to different periods: the Copper age and Early Bronze age. Through a techno-typological and functional study that takes into account several morphometric, morphological and specific trace parameters (indicators of anthropic and/or wear activity), the methods, techniques and tools are reconstructed and compared. On one hand, with the typological analysis, jewellery has been looked at as a cultural marker allowing to gather information (raw material, forms, and measures) on different aspects of past life, such as style, territories, and traditions. On the other hand, with the technological analysis, interpretative hypotheses are proposed based on the comparison between production traces and experimental data, in order to reconstruct (in part or completely) manufacture procedures and fabrication techniques. Finally, a functional analysis enabled to distinguish wear traces from technological traces and to recognize if the object has been used or not.

Key words: Copper age, Functional analysis, Italy, Jewellery, Technology

Résumé

Cette contribution vise à comparer les objets de parure provenant de certains sites archéologiques de l’Italie du nord, datés à différentes périodes: âge du Cuivre et Bronze ancien.

Grâce à une étude techno-typologique et fonctionnelle qui tient compte de plusieurs paramètres morphométriques, morphologiques et des traces spécifiques (indicateurs de l’activité de fabrication et/ou de l’utilisation) les méthodes, les techniques et les outils sont reconstruits et comparés. D’une part, la parure a été considérée, du point de vue typologique, comme un marqueur culturel permettant d’obtenir des informations (matière première, formes, mesures) sur les différents aspects de la vie du passé, tels que les styles, les territoires et les traditions. D’autre part, d’un point de vue technologique, des hypothèses interprétatives sont proposées sur la base de la comparaison entre les traces de fabrication et les données expérimentales dans le but de reconstruire (en partie ou complètement) les procédés de fabrication et les techniques employées. Enfin, une analyse fonctionnelle a permis de distinguer les traces d’usure des traces technologiques, et de reconnaître l’utilisation ou non de l’objet.

Mots clés: Age du Cuivre, Analyse fonctionnelle, Italie, Technologie, Parure

Introduction

This paper aims to show a technological study of some elements of ornaments in stone. These artefacts belong to northern Italy inhumation burials and are dated from Copper to Early Bronze Age (see table 1). This study is part of a doctoral thesis at the University of Geneva, under the direction of prof. M. Besse (Viola 2016).
The sites selected for the study offer a reliable chronological attribution and a set of homogeneous and numerically limited materials (166 beads in total), which makes this a suitable sample for techno-functional study. The materials of the first two sites, i.e. the grave 37 of the necropolis of Remedello Sotto and the grave 2 of the necropolis of Scaluce di Molina, although coming from old excavations (nineteenth century) are certainly attributable to the Copper age (Farioli et al., 2015; Valzolgher, Lincetto 2001-2002). Both are funerary contexts of great importance and, in particular, the site of Remedello is a reference for the chrono-cultural articulation of the period, since it is the largest necropolis in northern Italy (de Marinis 2013). The materials of the other two sites come from very recent excavations (last ten years) and are chrono-stratigraphically reliable. While the beads of the tomb of via Guidorossi in Parma certainly date back to the Copper age, before the Bell Beaker Culture, those of the necropolis of Arano come from the most vast necropolis of Early Bronze age of the northern of Italy (Bernabo’ Brea, Miari 2013; de Marinis, Valzolgher 2013).

**Methods**

The techno-functional study aims to apply an analytic investigation procedure that is effective to the identification of drilling marks – a very delicate stage with different variables – and at least of some aspects of the final phase of the manufacture through the use of a “portable instrumentation.”

The interpretive work is based on the identification of criteria distinguishing drilling as well as surface modification techniques (Viola 2016). We tried to identify and record:

- Raw materials (determinations by the study of macroscopic characteristics).
- Main traces of manufacture.
- Main traces of use-wear.
- All possible tools involved in the production through the identification of some mark of wear and any associated archaeological objects (points, plate, etc.).

The techno-functional analysis was carried out through several stages:

1. Observation of objects (devices: stero microscope Seben Incognita, magnification: 620x, 40x, 50x; ocular x10, x20; lens: x2, x4; USB digital microscope Dino-Lite PRO digital microscope AM-413-T, magnification: 20x-220x, resolution: 1280x1024 pixels; Megapixels: 1.3 MP);
2. Photographic documentation of traces (device: USB digital microscope);
3. Comparison with traces of experimental tests. These tests are essential to create an experimental corpus of reference using raw materials, techniques and instruments chronologically and culturally compatible.

In addition to the morphological comparison of techno-functional use-wear marks, we considered some morphometric parameters (diameter, length, width, thickness, etc.). We also proposed some hypothesis based on the state of the surfaces according to macroscopic and microscopic features.
Methodologically, the technological study is based on the recognition of the marks (macro and micro marks) present on different surfaces. The overlap of the marks allows to reconstruct the manufacturing sequences. Each sequence has been described in terms of techniques, methods and tools used. Assuming that traces produced by different techniques and tools can be identified in archaeological materials, the study is based on an experimental framework around two different aspects: perforations and surface treatment. Both of them take into account several variables (see table 2). In total, about 200 tests were carried out on stones of different degrees of hardness.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.- S.T.</td>
<td>Worked raw material</td>
<td>soapstone, limestone, calcite, marble</td>
</tr>
<tr>
<td>S.T.</td>
<td>Movement</td>
<td>transversal, longitudinal, etc...</td>
</tr>
<tr>
<td>P.- S.T.</td>
<td>Mechanism and instrument</td>
<td>hand drill, bow drill, pump drill, brace drill, polisher, grooved stone</td>
</tr>
<tr>
<td>P.- S.T.</td>
<td>Instrument raw material</td>
<td>bone, metal, stone, thorn, wood</td>
</tr>
<tr>
<td>P.- S.T.</td>
<td>Instrument morphology</td>
<td>axial, dejete, etc...</td>
</tr>
<tr>
<td>P.- S.T.</td>
<td>Abrasive (yes, no)</td>
<td>river sand, quartzite</td>
</tr>
<tr>
<td>P.- S.T.</td>
<td>Lubricant (yes, no)</td>
<td>water</td>
</tr>
<tr>
<td>P.- S.T.</td>
<td>Posture</td>
<td>sitting, standing</td>
</tr>
</tbody>
</table>

Table 2. The experimental tests: aspects, variables and descriptions.

Results: experimental framework

As an illustration of the results achieved in the experimental framework, we suggest the exemple of the tools used in the manufacturing processes. We show data obtained in a highly specific field concerning the wear during drilling phase. In the case of the hole-making tools, experiments were performed on lithic and metal tips (see table 3 and figure 1).

<table>
<thead>
<tr>
<th>N°drill bit</th>
<th>Raw material</th>
<th>Worked raw material</th>
<th>Time</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>silex</td>
<td>soapstone</td>
<td>2’</td>
<td>bow drill</td>
</tr>
<tr>
<td>4</td>
<td>silex</td>
<td>marble</td>
<td>33’</td>
<td>hand drill/bow drill</td>
</tr>
<tr>
<td></td>
<td></td>
<td>soapstone</td>
<td>4’</td>
<td>hand drill</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TOT. 37’</td>
</tr>
<tr>
<td>12</td>
<td>bronze</td>
<td>soapstone</td>
<td>20’25”</td>
<td>bow drill</td>
</tr>
</tbody>
</table>

Table 3. The perforation tests.

Typologically, the lithic borers are axial, symmetrical and with a well-defined retouched bit (P4, P17) while the metal borers are axial, symmetrical and with a faceted bit (P12).

By comparing the tips before and after use, some specific features emerged according to some previous works (Bains 2013; Calley, Grace 1988; Chelidonio 1988; Coskunsu 2008; Gurova et al., 2014, 2013).

In the case of non-perishable tips, these features can be divided in two types:
morphological features:

- the tool shape must be developed along its axis
- the proximal end must be suitable to be handled in the rod

microscopic features – (either or any combinations of these features)

- Concentric circle on cross-section of drill bit
- Rounded tip
- Intensive surface polish
- Edge damage – only on lithic tips
As a practical application in the field of archaeology, these characteristics can help us to recognize the tips from archaeological context. At the same time, they could suggest the type used for perforations.

**Results: techno-functional study**

The techno-functional study allowed us to identify both the working and use-wear traces. In particular, some objects have clear working traces attributable to specific stages of the manufacturing sequence. This allows us to offer some reference operating ranges for each studied site. Below, we illustrate the results obtained in a schematic form through the proposal of a *chaîne opératoire* and some use-wear interpretations.

**Copper age: disc and cylindrical beads, medium size** (figure 2)

**Archaeological context:** grave 37-Remedello Sotto

**Raw material:** 11 carbonate, 1 soapstone

**Morphometry:** objects fairly standardized (11 disc, 1 cylindrical)

**Manufacture sequences:**

1. Roughing. Individual by abrasion (irregular outline of the beads) and mass calibration (side straight).

![Diagram](image)

**Figure 2. Manufacture sequence of Copper Age, disc and cylindrical beads—medium size.**
2. Perforation. Lithic drill bits (conical and stepped profile of the hole, mark following the edge); several drill bits (diameters not standardized) and methods (unipolar and bipolar); not reamed; no use of hand perforator and bow drill, probably use of hand drill (circular outline of perforations)

3. Finishing. Well finished by lustring

*Use wear:* normally beads show use wear (modifications of the perforation’s outline).

**Copper age: disc and cylindrical beads, small size** (figure 3)

**Archaeological context:** grave 2-Scalucce di Molina

**Raw material:** 124 carbonate

**Morphometry:** objects fairly standardized (68 disc, 54 cylindrical)

**Manufacture sequences:**

1. Roughing. In series by abrasion (longitudinal striations, sides and edges straight). Probably from rod (difficulty in centring the holes).
2. Perforation. No lithic or organic with abrasive drill bits (Axial with parallel sides tip); at least 2 drill bits (2 distinct peaks on the diagram of holes diameters) in majority unipolar methods and after reamed; no use of hand perforator and bow drill, probably use of hand drill (circular outline, concentric and parallel striations);
3. Slicing. The geometry (hole and sides) has compatibility with the method that alternate perforations and slice actions with lithic instrument.
4. Calibration. First a regularization of the faces by abrasion; after in series on “wire”
5. Finishing. Well finished by lustring

*Use wear*: intense use wear (modifications of the perforation’s outline).

**Copper age: long beads** (figure 4)

*Archaeological context:* grave 37-Remedello Sotto

*Raw material:* 1 carbonate

*Morphometry:* not very regular

*Manufacture sequences:*

1. Roughing. Individual by abrasion, first by transversal action (polygonal outline) and after by longitudinal action.
2. Perforation. Compatibility with metal tip without abrasive (perfect outline); bipolar method not reamed; no use of hand perforator and bow drill, probably use of hand drill (circular outline)
3. Finishing. Well polished

*Use wear:* light use wear (modifications of the perforation’s outline).

![Copper Age: long beads](image)

*Raw material:* carbonate

**Figure 4. Manufacture sequence of Copper Age, long beads.**
Bell Beaker Culture: **biconical, globular, medium size**

**Copper age: biconical, globular, medium size** (figure 5)

*Archaeological context:* grave 3-via Guidorossi

*Raw material:* 17 carbonate

*Morphometry:* not very standardized (14 biconical, 1 globular)

**Manufacture sequences:**

1. Roughing. Individual by abrasion
2. Perforation. 2 drill bits: lithic with hand drill (multiple axis) and bipolar method; a cylindrical, thin, unipolar perforation compatible with a metal tip; all perforations are not reamed; no use of hand perforator and bow drill
3. Finishing. Lustred and well polished.

*Use wear:* intense use wear (ovalization of the perforation’s outline).

**Early Bronze age: archaeological data: disc, cylindrical, medium size** (figure 6)

*Archaeological context:* grave 49-Arano

*Raw material:* 12 carbonate (calcite)
Early Bronze age: discoids, cylindrical, medium size

Morphometry: not standardized (5 discoid, 7 cylindrical). In this case, the typological types seem to be technological types.

Manufacture sequences:

1. Roughing. Individual by abrasion, to obtain 2 typological types: discoids
2. Perforation. 2 lithic drill bits (conical cross-section and large diameter and tronco-conical and thin diameter); bipolar method, not reamed; no use of hand perforator and bow drill.

Use wear: very light or no use wear (modifications of the perforation’s outline).

Discussion

The techno-functional study has highlighted several key aspects for the understanding of past societies from the point of view of their technology.

The first important aspect concerns raw material. As regards the studied sites (literature review and direct observation), there seems to be a clear choice in all sites belonging to the very similar raw materials, mainly, to the group of carbonate (calcite, marble, etc.) with very light colours that can be between the light and the white light yellow/gray.
In fact, the studied assemblages are very homogeneous. They are quite common in the geographical areas where the sites are located. So in the absence of quantitative compositional analysis, we cannot make an assumption about networks and methods of supply. While the soapstone is very easy to work, the carbonates are medium hardness materials. In the case of calcite, it tends to flake and is quite well suited to be polished and illustrated (in particular marble). Recently, it has been suggested that the raw material used for beads of Scaluce of Molina is not carbonate, but enstatite and very probably of synthetic origin (for details: Viola 2016, section 6.2). The exact determination requires appropriate quantitative analytical investigations, but if it were confirmed, it would provide new data on the good level of specialization in these processes during the Copper Age.

In any case, the homogeneity of the corpus may be the result of one or more factors still interacting as: ease of acquisition of raw material; certain technical criteria such as the relative ease of machining; but also less practical and more aesthetical criteria.

The second key aspect concerns craft specialization. During the Copper Age, in particular on smaller objects, we have good morphological standardization of supports (as tools of the drill) as well as a choice between different types (sometimes, perhaps, in combined use with loose abrasive) according to the objectives (for example the 2 clear peaks in the diameters of the perforations on Scaluce elements). The use of unipolar drilling seems usually prevalent but, in some cases, we also recognized complex methods of drilling such as multistage, or reaming, or the use of tips produced with complex processes (metal tips also for long perforations). The presence of metallic points during the Copper Age is quite probable (Viola 2016, ch. 6.4). For smaller elements (Scaluce di Molina site), it has been recognized as a complex mode of shaping with an in series method starting from a few rod, then processed through drilling and subdivision of sequences cycles.

Concerning the evaluation of the production volumes, it is not possible to express a precise estimation. Nevertheless, although the method of manufacturing in series is certainly much more difficult because it requires a good skills (in particular to produce very regular elements), it is also faster than the individual production because there is less raw material to be removed and drilled. So, in series method is suitable for large production of objects typical of specialized contexts. A very significant aspect in the production of small parts lies in the solutions adopted for overcoming technical difficulties imposed by the small size (for example, difficulty in avoiding erosion and risks of fracture during drilling). Those solutions are technological indicators of specialized craftsmanship. The degree of finish seems to be much more accurate during the Copper Age with extensive use of fine grinding or polishing of surfaces.

Overall, Early Bronze products are much less standardized and poorly finished, with less smooth surfaces and coarse perforations produced with faster methods (bow drill). Even when a more polished product is intentionally produced (short cylindrical beads of Arano site), it is still made with a lithic V profile tip without reaming. The drilling method selected in the latter site is clearly a bipolar method, perhaps to better manage the risks of typical calcite fractures.

The most interesting aspect concerns the various manufacturing sequences identified. In all cases, the initial stage of preliminary reduction is not observable since all objects are finished. The final finishing phase avoids the observational capabilities of the method. The steps that have been better recognized and offers the most information potential are the full production phases (shaping and drilling) in their various aspects (both morphological and morphometric).

In technological terms, the first techno-cultural variable lies in the choice of the drilling mechanism. In all cases, it never used the perforator hand. Indeed, this would have produced an irregular morphology of the holes. For the Copper Age, a generalized use of hand drill seems more likely. The cylindrical long bead of Remedello Sotto is the only object that can be excluded with certainty since it shows the use of the drill string. For the remaining elements of the necropolis, the morphologies
are influenced by the deformations due to the use. However, for all other objects (thick or thin) from the Copper Age, it seems more likely that the hand drill was used and we can exclude the use of fast alternating movement drills or “not rotary movement” through hand perforator.

For the Early Bronze Age site of Arano, depending on morphological type, it seems to have used a different mechanism: the cylindrical type with fine hole is most likely due to a slow movement while the discoid type to more flared hole is due to a fast moving product, perhaps with a bow drill.

Finally, the elements of Via Guidorossi, dated from the Copper Age before the Bell-Beaker culture, show some typical characteristics of the other two sites of Copper age (for example: heavy wear, be well refined, the use of different tips) but also a low morphological standardization. The information in some technological characteristics dimensions (for example the holes produced with bipolar method) may derive from the thickness of the support rather than to cultural reasons (most advanced stage of the Copper Age?).

In terms of technological traditions, the Copper Age shows:

- Selection of a specific raw material (homogeneous in nature and coloring).
- Objects smaller and with much standardized morphological relations.
- The sequence provides individual production of elements of larger size and production in series for smaller elements. These are produced with a method in series from rod.
- The drilling is done with a piercing mechanism to slow movement, most likely a hand drill employed with unipolar method. In this case, there is also no lack methods which deviate from the simple need to perform a perforation but require more complicated artisan knowledge as multistage or reaming. To do this, several tools have been used: different types of drills and abrasive.
- Finishing phase shows an aesthetic research towards better finished objects and tends to obtaining shiny surfaces.

We must add that if it was confirmed the determination of the synthetic origin for the raw material of the Scalucce di Molina site would be a documented case of highly specialized production.

The Bronze Age shows instead:

- Objects of larger size and less standardized forms.
- The sequence is divided into individual productions but differentiated in two technology types.
- The drilling phase occurs in two ways depending on the type: through the use of a perforating mechanism in fast motion (bow drill) and one in the slow movement (hand drill) with bipolar method. The mechanisms are armed only with lithic tips.
- The finishing is much less cared.

They are all elements in discontinuity with the previous period, except for the choice of raw material. Indeed, we see continuation of the selection of a specific stone (generally homogeneous in nature and light coloring).

Finally, aspects of the use wear of the beads. The functional study has shown that objects dated from the Copper Age are largely used and, in some cases, show obvious modifications, in particular on the edge and the contour of the perforations. To sum up, Copper Age jewelleries are worn objects (even intensively) and should reflect the finery of everyday life.

We have a completely different situation in Arano (Bronze Age site) where use wear is generally absent. It is reasonable to assume that the phenomenon may be related to a few changes in Bronze Age rituals: the studied objects could be jewellery made specifically for the burial and reflect more the codes of the rite than those of everyday life.
The context data do not allow us to issue any kind of attribution of specific jewellery to a genre, to an age group or the composite jewellery. The only certainty is that the ornamental elements are present in both the male and female burials.

**Conclusion**

The formal choices of themes, of manufacturing techniques and sequences, and the production contexts are strongly intertwined with each other and actively interact with the social context. Particularly in the case of stone beads, the *parure* is a concrete form of perpetuation and dissemination of social identity through the cultural groups in different chronological phases (Bains 2013).

The jewelry as a cultural product is the product accession to a set of specific rules of each human group. If we consider culture as part of the process by which societies adapted themselves to reality, then the ornamentation study is a way to deal with the daily life of the past (Viola 2016). Depending on demand and on the available raw material form, there are different ways of working that can be recognized on the finished objects: the physical plot is also a network of gestures, concepts, values and symbols.

Normally, in technological studies, the analysis of archaeological materials from production contexts (*ateliers*) is preferred, and their observation is made with high-magnification observation instruments (scanning electron microscope SEM). In the case in question, well finished objects have been studied, which could not be moved from the places of custody.

Therefore, a specific techno-functional analysis protocol for technological interpretation of some selected materials has been created, which could cope with such limitations. This protocol is based on an important bibliographic reference corpus (archaeological, ethnographic, ethno-anthropological), and led to the construction of an experimental research project, involving some aspects not investigated in the archaeological field, as yet

- Subdivision techniques
- Serial shaping modality
- Microperforations with different tips
- Types of reaming methods
- Tools and their wear

From a methodological standpoint, the proposed approach (ok?) has also attained the practical result of successfully testing a method of observation and recording based on portable instrumentation.

The archaeological materials chosen for the study come from recent excavations and are therefore unpublished to the scientific community (necropolis of Arano-Verona, Grave 3 via Guidorossi-Parma), or belong to cultural contexts of considerable importance in the history of research, but have never received a complete publication (necropolis of Remedello-Brescia, necropolis of Scaluce-Verona).

The results of the techno-functional study have lived up to expectations. In fact, not only, for each site, have some important aspects of the manufacture sequencies (methods of shaping, of drilling and some used tools) been identified, but in many cases it was possible to gather the almost complete manufacturing sequences, and to determine whether each object was brought or not.

In the field of techno-economic interpretations, the study has confirmed a basic assumption of the northern Italian reconstructive framework: during the Copper age there the development of a specific specialized craft produces standardized and well finished products (see in Cocchi Genick 2011). However, also opposite results were achieved, such as the fact that in the Copper Age, in burials...
there was no use of specifically created objects for the deceased, but rather belonging to the sphere of everyday life. We can say this because these objects show wear to different degrees.

Some continuity between the Copper Age and the Bronze Age are nevertheless highlighted, such as the taste for certain types of composite objects, some raw materials and clear colors.

Also evident are at least two very significant discontinuities between the Copper Age and the Bronze Age: the jewels are produced in different ways, and the most recent objects were not used. In particular, these two discontinuities can be interpreted as a conflict between an ancient technological tradition (Copper Age) with a new tradition (Early Bronze Age). The latter leads to much less finished productions and especially in objects produced specifically for burial. This, probably, to meet a need linked to a new funeral rite.

**Foreword for reading the manufacture sequences:** when the clear sequence of the gesture is identified an arrow (figures) or a number (text) links the phases to indicate sure and direct relation between them.

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**References**


