

BATTLES OF HIMERA (480 and 409 B.C.): ANALYSIS OF BIOLOGICAL FINDS AND HISTORICAL INTERPRETATION. EXPERIENCES OF RESTORATION IN THE RUINS OF HIMERA 2008-2010

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1. Introduction

Archaeological excavations carried out by the Superintendency of Palermo in the western necropolis of Himera, in Buonfornello, and funded entirely by the Italian State Railways, constitute one of the most important research efforts in the funerary areas of Greek colonization in recent decades [1]. The western necropolis of Himera, located just outside the fortifications of the city, occupies a strip of land parallel to the beach (Figure 1). Another layer of about 3.5 m of alluvial land has accumulated in the centuries after the abandonment of the colony and has provided outstanding protection for both the graves, which have never been subject to problems or violations in modern ages, and also for the conservation of those external signs that characterized the funerary landscape, i.e. grave markers placed on graves to perpetuate the memory of the deceased (in Greek: *semata*). All explored tombs are dated from the beginning of the 6th century B.C. until 409 B.C. when Himera (founded in 648 B.C.) was destroyed by the Carthaginians [1-3]. During the survey, which lasted three consecutive years, 2008-2011, 9,574 graves were discovered, bringing to 12,988 the total number of tombs found in all the Himera necropolises. The site of the research was remarkable and run by an outstanding team, made up of more than 60 workers and 30 specialists including archaeologists, anthropologists, conservators and designers who worked at the excavations daily. The constant presence of anthropologists, led by Prof. Pier Francesco Fabbri, of the University of Salento, enabled important results to be obtained from an anthropological, archeological and historical perspective, as in the case of the graves of the soldiers who died in the battles of Himera in 480 and 409 B.C.

Particular attention was placed on the discovered graves and the restoration of ceramic artifacts, such as funerary items. Although ceramic products can appear particularly firm and compact, over time they too, suffer inevitable "deterioration", with alteration of the technical characteristics of the original ceramic material. The deterioration or "degradation" may be limited to mechanical disruption or also comprise alteration of the material, as a result of processes of a chemical nature, favored by concurrent mechanical disruption. Conservation work must therefore act by slowing down all processes of degradation and decreasing imbalances between the object and

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the environment of future preservation. Nevertheless, any restoration that is carried out prolongs their conservation.

Deterioration factors in ceramic artworks can be divided into two large groups: environmental causes and human interventions. Environmental causes include those aspects that characterize the external environment which is never completely stable and is the main problem in protecting the object from further damage. Of course the importance of environmental factors varies in relation to the environment in which the artifact is stored. Three categories of factors can be identified: physical, chemical and biological [4-7]. Human activity, and therefore the use of the ceramic artifact itself, inevitably causes some transformation of the original characteristics.

In constant environmental storage conditions, the chemical-physical characteristics of ceramic materials behave differently. In practice, the intrinsic features of the material, such as porosity, mineralogical composition, presence of vitreous or amorphous phases, mechanical strength, type of coating, etc. help to preserve the objects during the centuries. These characteristics are determined by the manufacturing technology of the article, but usually vary with progressive degradation and also depend on the type of environment. Porosity, for example, can increase or decrease. This depends mainly on the corrosive effect or filler material from the environment. Overall, however, the degradation weakens the object, so the rate of decay increases. Building on these general data, the most likely causes of degradation in the ceramic artifacts found at the site of Himera will be identified, with particular reference to the artifacts from the necropolis [8]. The characteristic of the Necropolis of Himera is the composition of the layers above the original stratigraphic level of the site. The tombs were generally found at a depth of about three meters below the current level. The overlying layer is characterized by being very compact and homogeneous, which over the centuries has protected the necropolis below; this is due to possible flooding of the sea or flooding of the nearby river. The original layer and the original land of the necropolis consists mainly of sand. This meant artifacts were well-preserved and above all facilitated mining operations, as the sand was easily removed [1-8].



Figure 1. General plan of the site of Himera with localization of the necropolises.

2. Results and discussion

2.1 The tombs

During excavations several types of tombs were found: trenches dug in the sand, wooden chests, sarcophagi, infant depositions as in enchytrismos. Almost all anthropological remains were recovered in burials that accounted for 88% of the tombs discovered (cremation graves were 12%). In many cases, the bones were not in good condition, owing to their fragility, the corrosiveness of the soil, and especially due to the time of infiltration of sand into the empty tomb; this meant the skeleton could undergo a process of consolidation and mineralization that was more or less rapid, or lead to full degradation of the bone tissue. Anthropologists began systematic analysis and we were often able to determine where the bodies were located thanks to taphonomic investigations, with interesting observations on the funeral ritual. After a first analysis of the findings, the bone remains were catalogued and we started research on the age, sex, stature, diseases and nutritional aspects of the findings in the laboratory, built in a container in the area of investigations. Several lines of research were activated: with the Universities of Northern Colorado, Georgia and Salento, on aspects of bioarchaeology, with DNA analysis, to investigate human adaptation to the environment and paleonutrition in Himera and in the Ancient Mediterranean. For example, a study on the skeleton of a dwarf, also from a genetic point of view (Figure 2) is in progress with Prof. Robert Desnik of the Mount Sinai School of Medicine in New York. The contribution of anthropology was particularly significant during the discovery of surgical drilling and infant burials. The discovery of the skull of a girl of 19-21 years, dated between the 6th and 5th century B.C., with a circular perforation (diam. 132 mm) in the right hemifrontal bone of the skull (Figure 3), was particularly significant; it is the oldest use of a type of surgical drill, which Hippocrates of Kos, the father of medicine, speaks about a few decades later. The holes of the drilling are not healed, indicating that people did not survive the operation, unless an improbable *post mortem* drilling was performed. From a historical point of view, these findings are a sign of the presence of a school of advanced medicine [10, 11]. There are also children's graves and those of sub-adults, indicating, as is well known, high infant mortality in the ancient world.

A survey of a significant sample of children's skeletons (91 cases), showed that 55% of cases are related to infant deaths in the first few months of life, 9.9% at around 6 months of age; the mortality curve descends gradually until the sub-adult age. The greatest risk of death, therefore, occurred between birth and the first six months of life, confirming that birth was a high risk factor of mortality. This was due to various reasons related to the trauma of childbirth and hygienic conditions; among the perinatal deaths there are also cases of fetuses with development between the eighth and ninth month of pregnancy. Children, especially those who died in the first year of life, were mostly interred in large containers usually in a hyperflexed or partially flexed position [9] (Figure 4). There are, however, other examples of child burials, such as that cataloged as W6258, in which the skeleton was in a lateral decubitus position with strongly hyperflexed limbs or catalogue number W4739, in which the little corpse was placed on sand in right lateral decubitus with arms and legs flexed; the pit was closed with simple fragments of floor tiling.

Several collective and individual graves were also found of soldiers who died in the great battles between the Greeks and the Carthaginians in 480 and in 409 B.C. These



Figure 2. Grave W3760 of an individual suffering from dwarfism.



Figure 3. Cases of surgical drilling of skulls from eastern necropolis.



Figure 4. Infant burial of pit type (top) and enchytrismos inside Corinthian transport amphoras (bottom).

are two events of great importance for the history of the island and western Greece was frequently mentioned in the stories of Greek historians [12-15]. In the excavation of the western necropolis seven common graves and other single burials were brought to light; from archaeological and anthropological data it can be deduced that they died in this battle (Figure 5). Indeed, only males were found here, leading to the exclusion of mass graves resulting from epidemics, massacres, or tragic natural events, such as earthquakes, which would also affect women and children. The mass graves, oriented towards the North / South, contained from a minimum of two to a maximum of 23 individuals arranged next to each other, side by side, in the dorsal position, with their lower and upper limbs lying generally along the sides or with elbows slightly bent and skulls always oriented towards the East. The partial overlapping of the upper limbs enables us to reconstruct the sequence of deposition of the corpses. As seen in Figure 6 the largest holes were parallel to each other and aligned along the same limits North / South, at a regular distance of about 5-6 meters to facilitate excavation of the pits, the placing of the bodies and subsequent burial. The anthropological study also determined the sex of the individuals (all males), through radiological analysis of the teeth

and the mean ages; in holes 1-4 there were individuals of mean age 28.9 years (from 15 years to 47.1), in the other mass (5-7) the average age was 44.4 years (from 36.9 to 56.7 years). In several skeletons, traces of deep wounds caused by cutting or throwing weapons were found and the presence of weapons still embedded in the skeletons.

Many examples of wounds were found. Among these, for example, in the skull cataloged W482, a lesion caused by a blow was found by removal of the cranial bone in the occipital region (Figure 7). The blow, given during a battle, was probably lethal, as it hit the cervical vertebra.



Figure 5. Mass grave of the dead in the battle of 480 BC.

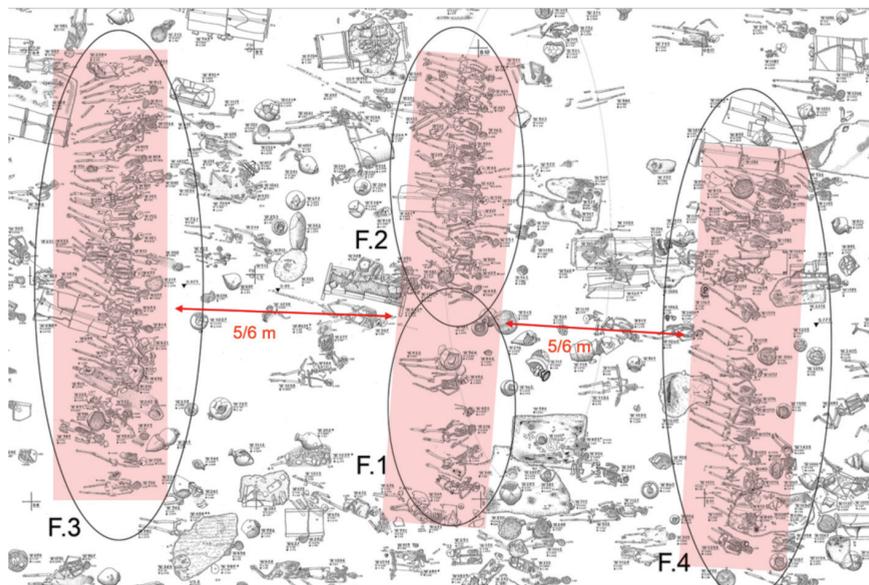


Figure 6. The arrangement of three mass graves of the dead of 480 BC in the general fabric of the necropolis.



Figure 7. Skull with cut caused by a bladed weapon.

Equally significant is the discovery of weapons (arrows, spearheads, swords, daggers) that were not extracted from the bodies before their burial. The analysis of the type of weapons in connection with their position offers good ideas to study the dynamics and modes of the duels between the soldiers and the battle techniques. For example, in tomb W2764 of hole 7, the spear stuck in the shoulder from above, behind the clavicle and fully penetrated into the left, suggests a blow from above, perhaps from a horseman, against a soldier who was standing or kneeling: a pattern of attack that is suggestive evidence in figurative Attic ceramics. Another example is skeleton W336 of pit 1, which was found with two spearheads, one of which came from the back so hard it reached the front of the abdomen; the second strike penetrated from the top to the abdomen (Figure 8). Equally extraordinary cases have also been seen in tombs des-



Figure 8. Reconstruction of the dynamics of the penetration of two spears in an individual from mass grave 1.

ted for monosome burials (containing a single individual) identified in these cases as the graves of soldiers who died in battle in 480 B.C. [3, 13-15]. This battle also includes the burial of thirty horses, for which there is a detailed study of the skeletons that will contribute significantly to the archaeozoological aspect (Figure 9).

The common grave 8/9, located almost at the eastern limit of the necropolis, distant and isolated from the graves of 480 (Figure 10), is dated 409 B.C., when a great Punic army, commanded by the Carthaginian Hannibal, landed once more on the island and destroyed firstly, Selinunte, then Himera, slaughtering its inhabitants and causing a radical geo-political change in central and western Sicily. This pit has a different



Figure 9. Horse grave: probably died during the battle in 480 BC.



Figure 10. Mass grave of the dead in the battle of 409 BC and horse grave.

orientation, from east to west. The skeletons, about 80, are much more numerous than in previous collective burials and have an orderly arrangement in the lower level, while the upper layers are disorderly, probably to make the most of the available area. Finally, in the eastern part of the necropolis, in front of the city walls and mostly in the upper layers, hundreds of chaotically placed skeletons were found; men and women of all ages, often in quite unorthodox locations and the bones sometimes no longer anatomically connected, they probably relate to disorderly burials made by the survivors of the great slaughter of 409. We can say that this type of deep archaeological and anthropological study has allowed a better reading of the history of the colony of Himera and is further confirmation of the story told by Greek historians of these battles.

2.2 Restoration of ceramic artifacts

For each object being restored, it is possible to intervene following a procedure which after pre-consolidation (if necessary), provides for various stages that include: cleaning, consolidation, assembly of fragments, integration of missing parts, final protection and labeling.

2.2.1 Cleaning

We carried out the cleaning step after careful analysis of the fragments and only after having photographically documented the artifact, in order to record the state of conservation before our intervention. This intervention is an irreversible process, so we intervened, initially with the cleaning tests, to check which solution and / or solvents and which application times were the most appropriate for the removal of encrustations and deposits of earth and sand present on the surfaces without damaging the natural patina and original surfaces.

First we washed all fragments with deionized water, in order to remove deposits of earth and sand, then we carried out more effective cleaning tests, with EDTA (salt disodium to different percentages) applied using a supporting paper pulp (Arbocel). After the test, we carried out the cleaning of all surfaces with the appropriate mixture; where necessary, we removed mechanically, by brush, any difficult dirt. After this first cleaning, we stored the objects according to a strict numerical order and according to the dimensions of the warehouses [8].

2.2.2 Consolidation

When necessary, we consolidated the artifact with acrylic resin based on ethyl-metacrylate (Paraloid B72) [8].

2.2.3 Assembly

We performed the assembly of the fragments only after they were thoroughly dry. We used a resin, a diluted polyvinyl alcohol (K60) which, thanks to its characteristics, is a compatible and reversible product for restoration: it is spread with a brush along the fracture lines and junctions of the fragments. Through a flame fueled by an alcohol burner, we speeded up the evaporation of the alcohol contained in the resin, the rise in temperature making the resin adhesive, so that after only a few minutes, the fragments were perfectly joined together. Once completely cool, the resin holds the fragments firmly together [8].

2.2.4 Integration of missing parts

The missing parts at the rim and the gaps were integrated because they represented small surfaces. Integration of the missing parts was carried out using gypsum plaster colored with natural clays and oxides using the technique of undercutting; obviously the color mix must be as close as possible to the colors of the original artifact. These two measures satisfy the concept of distinguishability and recognition of interventions made on the artifact and, at the same time, create a uniform surface which enables a more correct study of the artifact itself as well as greater structural stability in time [8].

2.2.5 Final protection

For a better reading, a microcrystalline wax diluted in oil of turpentine was spread on the surfaces of the restored object.

2.2.6 Restoration environments

There were two restoration laboratories: one (A) for the restoration of large ceramic containers, the other (B) for the restoration of small-sized items, part of the funerary objects. Furthermore, due to the considerable number of artifacts found during the excavation, warehouses used to store the restored artifacts increased exponentially in number up to 10. Once the artifacts arrived from the excavation, after any pre-consolidation *in situ*, if necessary, the large amphorae were subjected to a first cleaning and, according to the directives of the Superintendent, the artifacts that were to be completely restored were selected and identified either for reasons of conservation and / or for reasons of historical importance.

The small ceramic artifacts, on the other hand, were preserved according to a strict numerical order corresponding to the numerical list of the tombs provided by the archaeologists; these same artifacts were all subjected to the necessary conservation work described previously. This organization allowed a first orderly cataloging and conservation of the artifacts found from the excavation to be made. Each restoration was accompanied by a logbook entry with photographic documentation.

All steps in the restoration were followed directly by the restorers, based on the directives of the Superintendent and according to the latest guidelines in best practice in conservation restoration. To date more than 6000 restorations have been carried out (Table 1).

Table 1. Updated list of procedures performed

Small ceramic artifacts (funeral objects)	5.882
Large ceramic artifacts (amphorae...)	665
Metal articles	169
Consolidation and / or restoration of bones	21
Implementation of silicone rubber casts	6
Cuts in skeletons and / or any part thereof	18
Separation of organic materials from others (wood)	7

This list shows that the ceramic artifacts of small dimensions restored so far are about 60% of all those found and the large containers restored to date, such as amphorae, are about 25% of those currently present in the warehouses.

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Biographical notes

Francesco Bertolino is a restorer in stone and ceramic artifacts with a specialization from the Spinelli Institute in Florence. He graduated with a Bachelor's Degree in Conservation and Restoration in Palermo. Since 2001 he is the owner of Studio Art and Restoration Keramos, where restoration work in several sectors is carried out: stone and ceramic materials, canvas paintings, wax and wooden artifacts. He has received numerous commissions and work supervision from the Superintendency and Dioceses of Sicily. In particular, between 2009 and 2011 he was responsible for the restoration workshops at the archaeological excavations in the necropolis of Himera. He teaches at the ANFE institution in professional courses of restoration.

He is a scholar and lover of art objects, especially the history of Sicilian ceramics and he has received consulting assignments for the evaluation and attribution of works of art.

Flavia Alaimo graduated *cum laude* in Conservation of Cultural Heritage at the University Suor Orsola Benincasa of Naples (2004). She has a specialization (*cum laude*) in the History of Medieval Art for the Protection, Management and Enhancement of Cultural Heritage (2008). She qualified as a Restoration Operator of stone materials at the Regional School ANFE of Palermo (2011-2014). She attended a Master's Degree in History and Technology of the Goldsmith's Art at the University of Palermo (2013) resulting in the monograph "Decorative arts in the Lanza Filangeri collection of Palazzo Mirto" (2015). She has been tutor and assistant organizer in restoration projects of frescoes and stone material for UniSOB at the: archaeological site of Pompei, Naples; restoration workshop of San Vincenzo al Volturno (IS); restoration laboratory of the National Archaeological Museum in Naples; hall of the Rectory UniSOB; Old Cabinet "G. Murat" in the Royal Palace of Naples (2005-2010). Assistant consultant for the restoration of Palermo Archaeological Service at the archaeological site of Himera (2009-2012). She has carried out restoration of medieval ceramic artifacts at Palazzo Steri (2012). From 2014 she is professor of art history and a researcher at the Euro-Mediterranean Institute of Science and Technology of Palermo (Cultural Heritage Sector).

Stefano Vassallo is Archaeologist at the Soprintendenza of Palermo. He studied Archaeology at the University of Palermo; at the Graduate School for Classical Archaeology at the University of Rome, and then, for several years, was a volunteer at the Institute of Archaeology of the University of Palermo. Between 1984 and 1985 he received a scholarship in Archaeology at the Soprintendenza Archeologica della Regione Siciliana in Palermo.

Since 1987 he has been employed as a technical manager – archaeologist, at the Soprintendenza Archeologica della Regione Siciliana in Palermo, with several tasks, and where he currently works as head of Unit 5, Sezione Beni Archeologici, coordinating preservation and archaeological research throughout the territory of the province

of Palermo. Research activities: he has participated and directed many archaeological excavations at various sites in the province of Palermo treating several topics and investigations related to different historical periods. Much of his scientific work has been devoted to the investigations at Himera, where he has carried out systematic research both in city contexts (settlement and agora), and at the fortifications, by the eastern and western necropolises. He has also done research in several excavations in Northern Sicily: Colle Madore (Lercara Friddi); Terravecchia of Cuti (Palermo); Mount Kas-sar (Castronovo di Sicilia); Montagna dei Cavalli (Prizzi). For the Soprintendenza he has arranged several exhibitions in Italy and abroad, editing the relative catalogs.

He has given prompt communication of all research conducted in dozens of articles published in scientific periodicals and monographs, among which are:

- Forma Italiae n. 34, S. Caterina Villamosa, Firenze, 1990.
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Summary

Excavations conducted in the western necropolis of Himera by the Superintendence of Palermo, between 2008 and 2011, made it possible to investigate more than 9,500 graves of the 7th and 6th centuries B.C. It is a study of great importance as it gives a detailed historic and archaeological view of the funerary context of a Greek colony. Taphonomic studies of the tombs are of great interest to know the composition of the bodies in the graves and the rituals associated with the burial. Finally, the examination of hundreds of skeletons of children has provided data on child mortality.

This report, briefly, also aims to present the restoration of the artifacts discovered. The article describes the organization of the restoration laboratory, built and equipped directly *in situ* at the excavation, the materials used during the restoration, the main problems presented during the various phases of restoration and several results.

Riassunto

Gli scavi condotti nella necropoli occidentale di Himera dalla Soprintendenza di Palermo, tra il 2008 e il 2011, hanno consentito di indagare oltre 9500 sepolture, del VII e il VI sec. a.C. Si tratta di uno studio di eccezionale importanza che consente di avere un quadro storico e archeologico molto dettagliato della sfera funeraria di una colonia greca. Si accennerà anche allo studio dei reperti biologici attraverso uno scheletro di un individuo affetto da nanismo e prove di interventi chirurgici al cranio. La lettura tafonomica delle sepolture, è di grande interesse per conoscere la composizione dei cadaveri nelle tombe e dei rituali connessi alla sepoltura. Infine, l'esame di centinaia di scheletri di bambini, ha fornito dati sulla mortalità infantile.

Viene inoltre illustrato sinteticamente il lavoro svolto in occasione del restauro dei manufatti rinvenuti. In particolare vengono descritte l'organizzazione del laboratorio di restauro, realizzato ed attrezzato nell'area di scavo; i materiali utilizzati durante gli interventi; le principali criticità presentate dai manufatti sottoposti alle diverse fasi di restauro e alcuni risultati raggiunti.