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Project for the Cataloguing of the Antique Moulds of the Ginori Factory at Doccia

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Abstract— Using the sophisticated digital technologies that have been recently developed, the project that we are presenting here has the objective of cataloguing a vast and varied collection of moulds acquired by the Ginori factory in Doccia (Sesto Fiorentino, Florence) from the 1740s until the first decades of the 20th century. The moulds can be classified into two main categories: those made in the workshops of the sculptors working in bronze, most of whom were Florentine artists active in the 18th century, and those that were made by modelers in the factory using sculptures from private collections (in particular, antique marbles and bronze statuettes) or models that were specially made in the factory. The project is organized according to two workflows and includes the creation of a system for archiving, managing and retrieving the information which is called the *Doccia Digital Archive System* (DDA System). The first workflow is used for the sets of moulds for which we have no information concerning the positive (archetype). For the non-invasive exploration of the moulds we used 3D scans of the inside of the mould followed by the virtual reconstruction of the figure. The second workflow deals with groups of moulds that were part of the documentary campaigns conducted in 1960-1968 and in 2009-2010. For both of the workflows, there is an art historical study that completes the description of the sets of moulds being examined. The input into the DDA System of this vast quantity of heterogeneous data gathered during the development of the two workflows will make it possible for users at the Doccia Museum and the factory as well as ceramic restorers and scholars in Italy and other countries to make use of the information and the images.

Keywords - Plaster moulds, plaster casts, wax casts, porcelain, 3D scanning

I. THE COLLECTION OF PLASTER MOULDS

Marquis Carlo Ginori had founded his factory for the production of porcelain at Doccia (Sesto Fiorentino, Florence) only a few years earlier (1737) when, around 1744, he not only acquired some of the plaster moulds but also commissioned some plaster moulds and wax casts of works by the greatest Late Baroque Florentine sculptors, Massimiliano Soldani Benzi and Giovan Battista Foggini, for the purpose of reproducing them in porcelain. Until his untimely death in 1757 Ginori continued to add to this collection even with models taken from other sculptors [1][2]. Moreover, he was well aware of the passion for

antiquity that had been initiated by travelers returning from the Grand Tour in the 1750s and, along with the reproductions of Late Baroque bronzes, he began to make porcelain versions of classical statues. Ginori had great ambitions for this material which had technical characteristics that were still practically unknown at the time and proceeded with the execution of full scale copies, as is demonstrated by the models in the Museo Richard-Ginori della Manifattura di Doccia (henceforth referred to as the Doccia Museum) like the *Medici Venus, Amor and Psyche, the Knife-Sharpener* and in other museums in Italy and other countries. In order to start this production Ginori focused on Rome and began to collaborate with some of the art dealers who were active there like Giovan Domenico Campiglia – who was famous for being the author of the engraved plates of the *Museum Florentinum* and of some of those of the *Museo Capitolino* – and Filippo Della Valle, author of numerous religious sculptures in Roman churches like Santa Maria Maggiore, Sant’Antonio dei Portoghesi, San Giovanni in Laterano, San Giovanni dei Fiorentini. Through them, Ginori came into contact with other dealers and workshops of sculptors and restorers like that of Bartolomeo Cavaceppi, as well as with the main collectors of antiquities from whom his assistant, Francesco Lici, was able to acquire moulds for the factory from the marble statues in their collections [3][4][5][6]. Among the casts made in porcelain at Doccia in the 1750s, there were some heads of the Capitoline Caesars and a cast of the *Farnese Hercules*, the archetype of which is the marble sculpture which was once part of the now dispersed Verospi collection in Rome [7].

19th century art was greatly influenced by the Fine Arts Academies and saw significant changes in artistic taste, particularly in Florence where, in the 1840s, Lorenzo Bartolini countered the prevailing *Bello ideale* with his *Bello naturale*. At the Doccia factory, where they were very sensitive to artistic trends, they were not indifferent to this evolution and in the 1870s the factory began to collaborate with artists and professors from the Fine Arts Academy in Florence like the painter Giuseppe Benassai and the sculptor Urbano Lucchesi (student of the famous Giovanni Duprè), who first one and then the other, became the “artistic directors” at the factory at the end of the century. In particular, Lucchesi was responsible for the introduction of models with genre subjects based on Macchiaioli paintings (statues of peasants to be used as

flower vases) and whimsical objects (children playing with imaginary animals), which up to that time had never been made at the Ginori factory and for which we believe that they still have all the moulds which were perhaps made by Lucchesi himself, since we know he was an expert in the lost-wax process [8].

The collection of plaster moulds housed at the Richard-Ginori factory continued to increase over time and now consists of several thousand pieces Fig. 1. It represents an extremely valuable resource for the study of the activities of the workshops of the most important bronze sculptors working in the 17th and 18th centuries, including, most likely, that of Giambologna. In particular, the study of the models in plaster, terracotta and even in *biscuit* (unglazed porcelain which has been fired only once at a temperature of 1400°C), most of which are stored in the factory and the Doccia Museum reveals the evolution of the casting techniques that were used by the workers in the factory and by the Academic sculptors that were collaborating with them in the 18th and 19th centuries. With respect to the other public and private collections formed in the 18th and 19th centuries, the feature that makes the Doccia collection unique is its close connection with the factory, which was always sensitive to the changes in taste.

The value of the Doccia collection, in fact, consists in the fact that it represents an archive of international taste which allows us to observe the variations it underwent over the centuries. Perhaps even more than the models, the collection of moulds is able to offer us this unique vision.

The research that was conducted on a limited number of samples of plaster moulds of the 18th and 19th centuries made it possible to follow the evolution of the technique used to create them and to determine the parameters, applicable in particular to the 18th century forms, so that we could place them in three main categories:

- Made in the factory from models that were purchased or made in the factory;
- Made by modelers or sculptors collaborating with the factory directly, using works of art, especially bronzes or ancient marbles;
- Purchased from the workshops of bronze sculptors or made by sculptors collaborating with the factory but who had studied in these workshops (for example, Vincenzo Foggini learned to make bronzes from his father and later became collaborator of Carlo Ginori).



Figure 1. A partial view of the “Vtone”, the storage area above the factory, with some of the moulds in the collection. Sesto Fiorentino, GRG factory (ex-Richard-Ginori factory).

This latter is, without doubt, the most interesting category. From documentary sources we know that Carlo Ginori acquired the moulds employed in the workshops of sculptors to make bronzes using the lost-wax process. If we assume that not all of them were used to make wax casts (positives), of which a significant number are still in the Doccia Museum [2], it is evident that an analysis of the moulds will improve our knowledge of the activities of the factory and, above all, of the workshops of the sculptors active in Rome and in Florence. In particular, we may be able to recover a trace of some of their works that have been lost and the existence of which is demonstrated only by the moulds. Moreover, we may be able to establish with certainty the date of some works of art like the *Pietà* (*The Lamentation of Christ*) by Massimiliano Soldani Benzi, for which the date of execution was determined after the recovery of the original moulds of the artist which bore the date incised in the plaster, at the base supporting the figure of the Christ, which was hidden in the bronze version now in the Seattle Art Museum. The one that is shown here is an example of how, when the model, the archetype or the final version of the work is known, the analysis of the relative mould is still fundamental for the acquisition of information that otherwise would not be available.

The study of the moulds made directly from the archetypes like some of the bronze statuettes, for example that are not in the museum or at the factory, turned out to be fundamental. In this case, like the moulds obtained in the workshops of the master sculptors, these moulds revealed information which is not provided, for example, by the casts made by the modelers in the factory or by the sculptors that were collaborating there. The positives that were made using these moulds, in fact, tend to give an altered interpretation of the archetype which was due to the variations that the modeler added during the assembly of the parts and which was often justified by the fact that the archetype was not present.

A case that was recently examined is that of the *Moor Slave* (*Schiavo ‘Moro’*) inspired by the *Slaves* created by Pietro Tacca for the monument to Ferdinando I de’ Medici in Livorno (about 1601-1623), but based on the version proposed by Giovan Battista Foggini for the miniatures on the equestrian statues of Charles II of Spain in 1698 (Madrid, Prado Museum) and of Joseph of Austria in 1706 (Munich, Bayerisches Nationalmuseum) [9]. If we compare the moulds of the *Giant* (Fig. 2a), which we will discuss later on, with the five moulds that make up the *Slave* (Fig. 2b), there are obvious differences in the ways that they were made. In both cases, we are dealing with a single figure positioned on a rocky support which was made at the factory. However, the mould of the *Slave* has just a few dowels which are anchored with pieces of string and with evident undercuts. Moreover, this particular kind of division of the various parts of the figure for the execution of the mould appear to be unusual for the factory, where the head and the arms are separate from the rest of the body because of the problem of the undercuts which can cause the breakage of the figure which has solidified but is not yet fired and therefore extremely brittle, during the removal from the cavity of the mould.

This fact suggests that this 18th century mould was made directly from a finished model, which might be the bronze version made for the Foggini monuments

(archetype) [9] and therefore not divisible into sections. Consequently, to make these moulds they used a technique that was employed in the 18th century workshops of the sculptors and restorers who made plaster casts of antique statues [10].



Figure 2. Group of plaster moulds of the *Giant N. 1* (a) and group of the *Moor Slave* (b), about 1754 and 1809, Sesto Fiorentino, Museo Richard-Ginori della Manifattura di Doccia, general view of the closed moulds.

The four moulds which make up the figure of the *Giant*, on the other hand, were made in 1809 (as shown on the largest mould) from a terracotta model which is still at the Doccia Museum and was divided into sections according to the method usually used at the factory (the limbs and head individually and separate from the rest of the body, Fig. 3a). By observing them we can see a special hole (feed throat) for pouring in the liquid porcelain which was used at the factory around the end of the 18th century [11]. We can also see the dowels which fit into each other, without the use of strings and the ‘notches’ which were cavities in which the matching positives were inserted in order to secure the two sections of the mould.

This vast, valuable and diverse collection of moulds has never been systematically catalogued in such a way as to reveal the sculptures that are hidden inside of them or their relation to the models that still exist and the contemporary versions in porcelain that are in the Doccia Museum and in other museums and private collections in Italy and elsewhere.

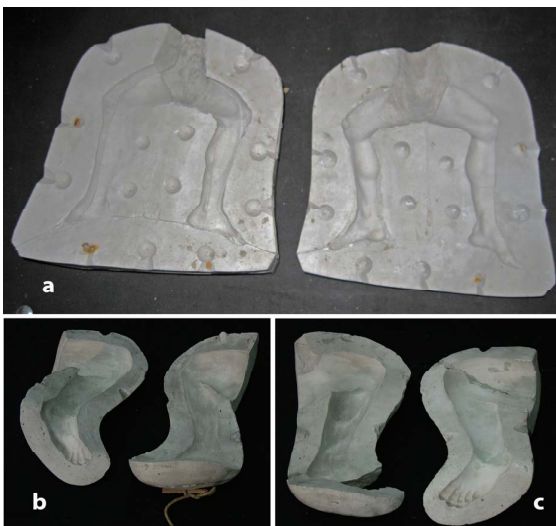


Figure 3. Group of plaster moulds of the *Giant N. 1* (a) and group of the *Moor Slave* (b, c), about 1752 and 1809, Sesto Fiorentino, Museo Richard-Ginori della Manifattura di Doccia, showing the open moulds for the legs.

Only a minute portion of the moulds has been catalogued; this was done during two casting campaigns which were carried out, first in the 1960s and later, in 2009 and 2010. In particular the first campaign (called the *Campana Campaign* after the director of the factory, Gino Campana), included the study of 2250 sets of old moulds which was conducted by pouring liquid porcelain into them. From 2007 to 2010 a photographic campaign was conducted to record the objects that had been made at the time of Campana and the other casts made in 2009-2010.

II. 3D SCANNING AND DATA MANAGEMENT FOR THE CATALOGUING OF THE MOULDS

The project related to the recovery of this enormous and mostly unpublished collection has as its objective the completion of a systematic classification for purposes of documentation, conservation and publication of all the moulds with the exception of the post-Art Nouveau moulds of the 20th century which are the best documented and, in part, still in use in the factory. The project is composed of two workflows, which involve the creation of a storage, management and consulting system called *Doccia Digital Archive System* (DDA System), which is set up to gather information from various sources obtained during the different phases of the project and to cross-reference them [12][13]. The system is composed of a database (DB) which was specifically created for this application and a set of functions for the management and the personalized use of the information and images in the archive [13].

The first workflow considers the moulds for which we have no information on the positive and which cannot be identified except by reproducing it with the mould. The research conducted thus far on the collection of moulds has revealed that those that were not used to make porcelain objects and which are composed of particularly complex sets of pieces are those in the worst condition and consequently require study using minimally invasive techniques like the modern 3D scanning systems. The sophisticated technologies which have been developed in the last few years will make it possible to continue the sampling work initiated by Campana and which we can imagine was interrupted not only due to the enormous quantity of moulds that needed to be examined but also on account of the difficulties encountered in the execution of the positives in porcelain, considering the poor state of conservation of some of them, which the filling with liquid porcelain would only have made worse.

On account of the problem of the undercuts which make it difficult to free the solidified positive in wax or porcelain poured into the mould as a liquid or, in the case of late 18th century porcelain, as a very wet clay, even the simplest figures are made up of sets of moulds. For example, a statuette has at least four moulds: one for the arms, one for the legs, one for the body and one for the head. The 3D scanning method requires the acquisition of the positive images inside of the moulds which, after having been elaborated individually and transformed into partial virtual models, are assembled in order to create the complete 3-dimensional model (3D model), i.e. the complete virtual model.

To illustrate the 3D scanning procedure applied to plaster moulds and the subsequent reconstruction of the 3D

positive, we are presenting an application of this technique to the already cited set of moulds dated 1809 representing a *Giant*, according to the inscription on the largest mould of the set [14][15]. The procedure is illustrated by a block diagram (Fig. 4), at the start of which, along with the start of the scanning system (in this case, the *Laser Scanner Next Engine*), one can recognize the two open sections of the largest mould. In order to acquire all of the features of the two surfaces involved several scans were made and these produced range maps made up of matrices of polygons which were able to show a detailed image of the objects being examined [16][17]. For each polygon information was also obtained about the color. For the largest mould, two sets of range maps, i.e., of data-sets were obtained. The alignment of the range map of each data-set produced the corresponding digital model. From the largest mould, therefore, two digital models were generated, one for the torso and one for the back, which in the subsequent phases of elaboration were aligned and then improved by cleaning off the excess surfaces. The procedure that is described here was repeated on all of the moulds, and produced the single components, namely the complete digital models of the figure (torso, right arm, left arm, right leg, left leg, head).

For each product of the procedures described here we corrected the topological errors and resampled the zones with sharp curves (remeshing) [18][19] by means of appropriate software applications (e.g. Meshlab [20]). The complete digital models obtained from each mould then passed on to the next phase of transfer of the color information and the recomposition of the complete figure. The recomposition of the *Giant* was originally made without any outside information, so that the only references were derived from the surfaces where the single

pieces were in contact and the anatomical features of the model (like the lines of the muscles).

The result of the virtual reconstruction is illustrated at the end of the chain of elaboration shown in Fig. 4.

The effectiveness of this method which was used for the first time for this particular type of application, is demonstrated by the fact that, after recomposing the virtual model (Fig. 5), it was possible to identify the ‘real’ model in terracotta which had been used to make the moulds. The inscriptions that were found on the mould and on the terracotta model allowed us to expand the area of research which led to the discovery of three other figures called *Giant*, all different one from the other and numbered progressively from 1 to 4 [14]. This would suggest that the figures were part of a set which was perhaps used as a table setting or for the decoration of mantles or *consoles*.

The second workflow of the project does not necessarily include the 3D scanning but involves, like the first workflow, the input into the DDA System of the enormous quantity of heterogeneous documentary material gathered on the single groups of moulds that we examined. The purpose, therefore, is to acquire information related to the group of moulds being studied in order to guarantee the knowledge, conservation and use of the collection of historical moulds still stored at the factory.

The DDA System will contain, for example, the images obtained from the aforementioned photographic campaign conducted in 2007-2010, which, like the virtual model and the pictures of the archetypes, make it possible to determine the content of the moulds. After the input of this data we will conduct an art historical analysis with relative general bibliography as well as one specific to the sample.

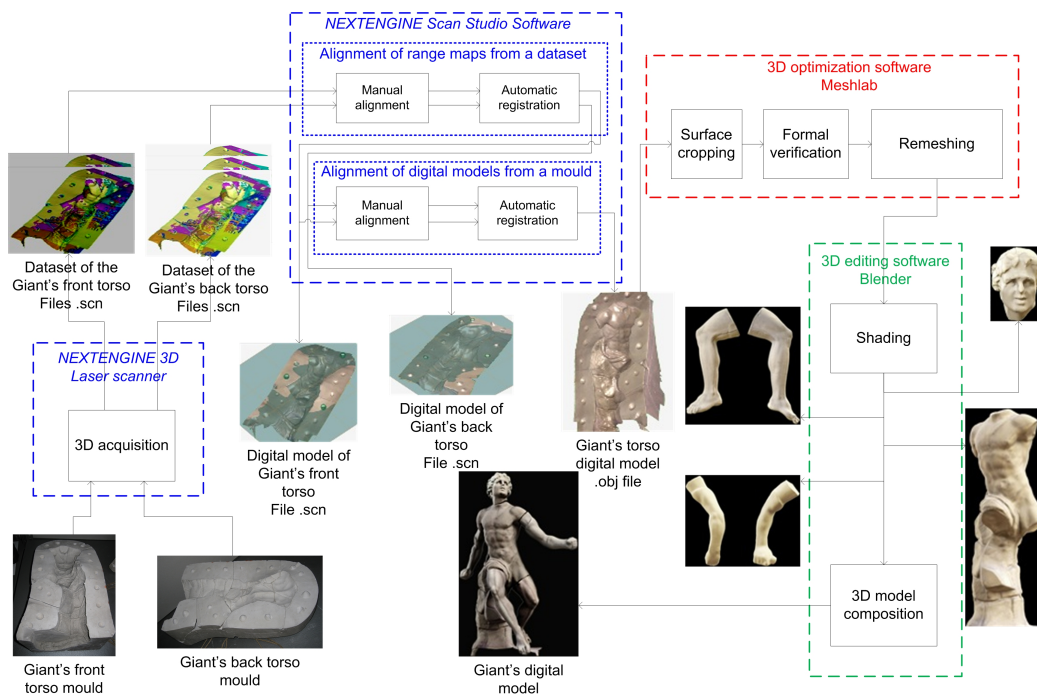


Figure 4. Block diagram of the 3D laser scanning procedure and reconstruction of the virtual model of the *Giant N.1*.

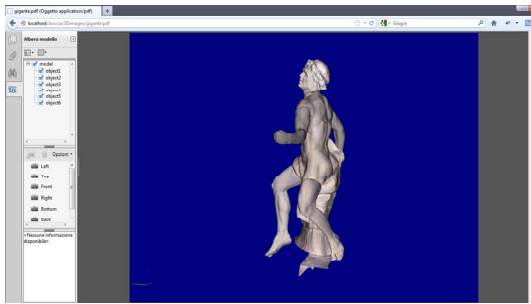


Figure 5. The virtual model of the *Giant N. 1* in pdf 3D format, which can be maneuvered and observed from all sides.

Starting with photographs, acquired from the 2007-2010 campaign, and the virtual model it will be possible to connect the set of moulds being studied with the original model (if it is still at the Doccia Museum or in the factory), with the archival documents (which are in the Doccia Museum as well as in other public and private archives), with the versions in porcelain that are contemporary with the period in which the moulds were executed, with the archetype (antique marble statue, bronze statuette, statuette or group for table settings, *consoles* and fireplace mantles) and, consequently, with the workshop responsible for its creation in the case that the prototype was not invented in the factory. Since it is possible that various versions of the same subject may exist in different sizes or that a single figure may be part of a set (as is the case with the *Giant*), the data put into the DB of the DDA System have been organized so as to allow the user to extract the information related to different samples by means of cross-referenced cards[13].

In fact, the data and images are retrieved by visualizing information cards which are elaborated on the basis of the special requirements of the Doccia Museum, the factory and experts in this field. Each card will supply general information on the piece: inventory number (historical and present), author (if known), date of execution, dimensions, material, state of conservation (for the pieces from the museum and the factory) location and additional observations (for example, the presence of inscriptions) [13].

An example of one of these information cards, in this case, the one for the above mentioned *Pietà* by Soldani Benzi is shown in Fig. 6. The card contains the images and the information on the set of moulds made in the workshop of the master sculptor and stored in the factory, and on the versions in porcelain of the piece that were made during the *Campagna Campagna* and the casting project conducted in 2009-2010, which, as mentioned above, should be considered documentary sources (top part of Fig. 6). The card may also include the addition of documents related to this group which have been found in the Doccia Museum as well as in other public and private archives, and the porcelain versions made at Doccia at about the same time as the set of moulds was acquired by Carlo Ginori. By selecting one of the options shown on the right side of the card (Fig. 6) besides the porcelain version it is possible to see the casts in wax, one of which is believed to be an original work of Soldani, or the bronze version in the Seattle Art Museum. The images of the documents that have been cited, a complete bibliography which includes

both the archetype and any versions in porcelain and an art-history commentary with further details about the information given in the DB will be added to the card.

In the card we have not included any information about the model made by Soldani and used for the execution of the moulds because, as of this time, it has not yet been identified. For this reason we have left an empty space in the middle of the card. In the part of the card where there is information concerning the model there will be a link called "related works". For this particular group the user will find a painting by Giovanni Camillo Sagrestani, in the Uffizi Gallery in Florence (inv. 1890 n. 8373), a terracotta statuette (Chicago, The Art Museum, inv. Richard T. Crane, Jr. Memorial Endowment, 1961.1118) which has several modifications with respect to the bronze in Seattle, and the above mentioned wax casts among which the most conspicuous absence is the sepulcher with two angels. The modeling is not so refined as in other examples believed to be made by Soldani, and it is probably a re-elaboration that is later than the *Pietà* created by Soldani. By clicking on the link "related works" the user may view pictures with descriptive captions which summarize the essential data on the work as well as its relationship to the composition being considered (bottom of Fig. 6).


As has been explained above, the project will make it possible to obtain a complete mapping of the location of the pieces that compose the enormous collection of moulds, models, wax and plaster casts, and versions in porcelain that are now stored in the museum and the factory. In particular, as far as the collection of moulds is concerned, at the conclusion of the two phases of study, each mould will receive a label with a two-dimensional bar code (QR code [21]) which records information like letters, numbers and other characters. In our case, it shows an identification code which is assigned using a method that is unique for this collection. A smartphone which is equipped with free applications for reading a QR code will make it possible to recognize the different parts of a set and the distinction of the various parts of the model without having to look at the inside. The identification code of a set of notched moulds associated with the same model, in addition to what is suggested above, coincides with the code of a passive type RFID (Radio-Frequency Identification) [22], which is applied to the largest mould in the group. The RFID is an inexpensive device which makes it possible to automatically and unambiguously mark and identify objects and persons by radio communication. For the passive implementation which is called passive TAG, it is not equipped with a battery and consists essentially of a microchip connected to a communication antenna mounted on a substrate; when it receives a signal from a special reader at a distance of some meters, even if not visible, it reflects part of the energy emitted and returns its identification code (ID). This system facilitates the retrieval of the groups of moulds inside of the warehouse where they are stored (Fig. 1), and makes it possible to establish a relationship between the DDA System, which offers an image of the moulds and their contents, and the moulds themselves since it acts directly on these latter, through the unique identification code which has been assigned them.

PREV

Pietà (Compianto sul corpo di Cristo)

SUCC

FORME



Q.tà di forme: 54
Esecutore delle forme: Bottega Massimiliano Soldani Benzi
Documenti: *Libro contabile* 1737-1746, 25 novembre 1744, c. 217v: "pagato a Ferdinando Soldani Benzi per prezzo di una forma di un gruppo rappresentante la Pietà", doc. cit. in Lankheit 1962, p. 284, n. 352.
Bibliografia: Lankheit 1962, p. 284, n. 352; Lankheit 1982, p. 100 (2-3: 3); J. Winter, in *Baroque Luxury Porcelain* 2005, p. 468, cat. 316; D. Zikos 2010, p. 23.


[Visualizza scheda delle forme](#)

MODELLO



Nessuna immagine disponibile per questo modello

Autore: **Massimiliano Soldani Benzi**
Note: Del gruppo della Pietà non sono al momento conosciuti studi preparatori e modelli eseguiti da Massimiliano Soldani Benzi e dai quali potrebbe aver ricavato le nostre forme
[Opere Correlate](#)

CAMPAGNE DOCUMENTARIE



Campagna Colaggi 2010
N. inventario: s.n.
Datazione: 2010
Dimensioni: h 62 cm
Materiale: porcellana biscuit
Ubicazione: Museo Richard-Ginori della Manifattura di Doccia
Bibliografie: Lauricella 2010, p. 175.


[Traduzioni in porcellana](#)
[Traduzioni in cera](#)
[Versione in bronzo](#)

PREV

Pietà (Compianto sul corpo di Cristo)

SUCC

FORME



Q.tà di forme: 54
Esecutore delle forme: Bottega Massimiliano Soldani Benzi
Documenti: *Libro contabile* 1737-1746, 25 novembre 1744, c. 217v: "pagato a Ferdinando Soldani Benzi per prezzo di una forma di un gruppo rappresentante la Pietà", doc. cit. in Lankheit 1962, p. 284, n. 352.
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[Visualizza scheda delle forme](#)

MODELLO



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Autore: **Massimiliano Soldani Benzi**
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TRADUZIONI IN CERA



Autore: Anonimo per la Manifattura di Doccia
Datazione: 1744 circa
Materiale: cera
Dimensioni: h 76 cm
Ubicazione: Museo Richard-Ginori della Manifattura di Doccia
N. inv.: 36 (375)
Documenti: *Inventario dei Modelli* 1791-1806 circa: "Un gruppo rappresentante la Pietà, in cera. Di Massimiliano Soldani. L'originale si trova in Casa Costi Bardì. Con forma", doc. cit. in Lankheit 1982, p. 100 (2-3: 3); *Galleria dei modelli* fine XIX secolo, stanza III, n. 375: "Dal Soldani-Benzi-Facci (anno 1744) per sua devozione come inciso nel modello in cera".
Bibliografia: Lankheit 1982, p. 100 (2-3: 3); D. Zikos, in *Baroque Luxury Porcelain* 2005, pp. 445-466, cat. 315; R. Spinelli, in *Il fatto e la ragione* 2009, p. 200, cat. 65. D. Zikos, in *Baroque Luxury Porcelain* 2005, pp. 445-466, cat. 315; Lauricella 2010, p. 179.

[Traduzioni in porcellana](#)
[Campagne documentarie](#)
[Versione in bronzo](#)



Scultore fiorentino, Pietà (su invenzione di M. Soldani Benzi), post 1708, terracotta, 41,9 x 58,4 x 34,3 cm. Chicago, The Art Institute, inv. Richard T. Crane, Jr. Memorial Endowment, 1961.1118 (foto Fototeca Kunsthistorisches Institut in Florenz, inv. 157461). L'esemplare mostra varianti rispetto alla composizione del Soldani. La più evidente è l'assenza del sepolcro con gli angioletti.

Figure 6. Example of the information card as applied to the *Pietà* by Massimiliano Soldani Benzi. At the top, right, the versions in porcelain are shown while at the bottom, the same section shows the casts in wax. In the last card the user can see the window which can be opened by clicking on the link "related works". In this case, the user will be able to view an image of the *Pietà* in terracotta which was perhaps inspired by the original version created by Soldani.

In order to facilitate the identification of the moulds the shelves which hold them will be organized according to a Cartesian reference system.

III. STUDY OF THE MOULDS AND OF THE WORKS HIDDEN INSIDE OF THEM

The project described in this paper is currently in progress. Up until now three sets of moulds, considered representative of the main categories listed above, have been scanned and many sets of moulds, those used in *Campana Campaign* and *Luchi Campaign*, are being cataloged. In the next few months we expect to complete the scanning of the moulds not yet identified, of which there are a limited number. However, the art historical analysis of all the moulds stored in the Voltone may take quite a long time.

The DDA System will be a fundamental tool for the study and cataloguing of a huge quantity of information derived from heterogeneous sources and will be used by the Doccia Museum and the factory in order to learn about the physical and art historical characteristics of the moulds and the shapes that they produced (models, versions in porcelain, etc.), as well as their exact location.

Besides the scholars of sculpture and ceramics in general and those focusing on the Doccia factory in particular, the main users benefitting from this project and, above all from the 3D scanning, will be restorers of Ginori porcelain and of 17th-19th century sculpture, particularly small bronzes. They will be able to acquire information from the moulds that would otherwise not be available. A case in point is that of the *St. John the Evangelist* in the Doccia Museum. This statue has an old restoration on the right hand which has changed its position probably because the prototype from which it was derived was not known, while studies have revealed that it was one of the bronzes made by Leonardo Gagliardi for Flaminio Chigi around 1776 [23], even though it is likely that the plaster cast which is now missing the right hand and which we believe was used to make the moulds at Doccia, was acquired by Ginori in the 1750s, perhaps directly from the workshop of the sculptor. The recovery of the mould for this piece and the 3D scan of the hand would have allowed the restorer to gain a complete idea of how it had been envisioned by the sculptor, in order to proceed with a correct restoration.

3D scanning can be conducted with different levels of resolution; for the purpose of recognizing the model that is hidden inside one can use a lower level of resolution which will produce lighter-weight files. If the model is not available because it has been lost, destroyed or damaged, one must use a high resolution scan. This procedure, moreover, represents a tool that is useful for the creation of moulds and casts in plaster or other materials which can be used by museums to enlarge the areas of their collections also for educational purposes. The presence of the moulds made using the ancient marble statues of the Verospi collection in Rome is a good example.

The information that has been collected in the DB of the system may become a useful tool also for the Ginori company should it decide, as has happened in the past, to revive a certain type of historical production. In this case, the 3D scanning procedure would enable the factory modelers to reconstruct the models and, therefore, the

moulds, while protecting the original ones. This is of particular importance in order to not compromise the state of preservation of the moulds which, as we have seen, in some cases is precarious and which, in general must be considered since most of them were made between the 18th and 19th centuries.

This cataloging method and the 3D scanning technique might be of interest also for activities not strictly related to the manufacture of ceramics, as in the case of the sculptures in the *Studio Galleria Romanelli*, a gallery which was founded in Florence about 200 years ago and began with the works of Lorenzo Bartolini [24].

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