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The Regolini-Galassi Tomb revisited: 3D reconstruction as a research instrument

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ETRUSCANS

EMINENT WOMEN POWERFUL MEN

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 BOOKS

This publication accompanies the double exhibition *Etruscans. Eminent women. Powerful men*, held from 14 October 2011 to 18 March 2012 in the Allard Pierson Museum in Amsterdam and the Rijksmuseum van Oudheden in Leiden.



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**FOREWORD BY THE MINISTERO
PER I BENI E LE ATTIVITÀ CULTURALI, ITALY**

The exhibition on the Etruscans in the Rijksmuseum van Oudheden in Leiden and the Allard Pierson Museum in Amsterdam covers the period of this civilization's greatest success, and presents the results of the latest discoveries and studies.

The history and amazing achievements of the Etruscans are displayed to the public in a thematic configuration, enriched by loans from Italy, Great Britain, Belgium and Denmark. We see how the Etruscans emerged as a people and established themselves as a powerful and influential aristocratic community that dominated a large portion of the Italian peninsula. The Etruscans maintained contacts with other peoples and developed a new model of governance through large and powerful cities. The might of the ruling class was evident in their enormous wealth and display of power, in which women also participated, playing a very different role from that of Greek women in the same period.

We owe much to the Etruscans. Not only their considerable share in the development of temple architecture, but also their cult statues, which furnish evidence of their special relationship with religion and ritual. To the Romans the Etruscans were 'a people more than any others dedicated to religion, the more as they excelled in practising it' (Livy, v. i. 6). The Romans owed all their knowledge of divination and the interpretation of omens to the Etruscans.

Over the past 30 years archaeological research has significantly enriched our knowledge of the Etruscan people, in particular their urbanization, a development which set them acutely apart from the majority of original com-

munities in southern Italy, whom Greek colonists from overseas erased.

During the sixth and fifth centuries BC, united in a federation of *duodecim populi* (twelve polities, *dodekapolis* to the Greeks), the Etruscans founded new cities, with planned public spaces which also provided for the dead. Examples of these cities are to be found in regions such the Po Valley (Marzabotto, plus recent discoveries that include Spina-Valle di Mezzano), Etruria itself (Pyrgi, for example) and Campania (Capua).

The Etruscans can be credited with the Roman ritual for founding a city, ensuring that this would be an *urbs iusta* (a correctly founded city). Their foundation model incorporated the *mundus*, the conceptual centre of the city, within the sacred boundaries of the *pomerium*. Recent research into the founding of Rome has confirmed the use of this ritual.

The Etruscans should also be remembered for their enormous public works to drain land, which earned them their reputation as 'masters of waterworks'. Investments in land by urban aristocracy in the orientalizing period greatly increased the production of wine and oil, to a scale where huge amounts of wine could be exported to the western Mediterranean. The numerous Etruscan transport amphorae for overseas trade discovered in recent excavations show that between the seventh and sixth centuries BC the Etruscans were also masters of the sea.

*Luigi Malnati,
director-general of the Ministero per i Beni e le Attività
Culturali, Italy*

FOREWORD BY THE ITALIAN EMBASSY IN THE NETHERLANDS

The double exhibition *Etruscans*, on display in Leiden and Amsterdam, offers a perfect opportunity to admire the world of the Etruscans, a civilization thousands of years old, yet still fascinating and mysterious, and also to celebrate the 150th anniversary of Italian unification, which tellingly falls this year.

This exceptional exhibition presents the remains of the Etruscans, a puzzling people assimilated and absorbed by the Romans at the beginning of a historical process which eventually produced contemporary Italy. The socio-cultural legacy of the Etruscans still leaves many unanswered questions. Their civilization is one of the most mysterious on our ancient continent. This is certainly true of the Etruscan language, which has only been partially reconstructed with great difficulty, and which is far removed, not only from Latin – the language of the conqueror which completely overshadowed Etruscan and even caused the language to disappear – but also from other languages spoken in the eighth century BC, the period in which Etruscan expansion began. The Etruscan civilization has left us *stelae*, memorial stones, inscriptions and paintings, but no books or the wealth of texts – from Roman law to Livy or Apuleius – that characterize Latin Roman culture. For this reason we still cannot say with any certainty whether the Etruscans were really a European people, as is currently assumed, who first became visible in the Villanova civilization that had its origins in Italy, or whether they came from Asia Minor, as Herodotus and other historians, ancient and modern, contend. DNA analysis of objects from tombs and human remains from the regions inhabited by the Etruscans in antiquity is particularly intriguing, for these analyses do reveal some kind of connection between the genetic codes of the Etruscans and that of contemporary Italians and peoples in the Near East.

Etruscan culture was effaced without leaving us barely a word and absorbed into the civilization of ancient Rome. But the unique artistic expression of that culture continues to fascinate us. And the example of Etruscan culture

may help us to better understand each other as Europeans, that is as a conglomerate of often completely different peoples, formed and evolving in a constant search for a mythic synthesis, in a long, long history of conflicts between diversities and continual movement, fusion and emigration, enrichment and impoverishment. This process of mixing peoples and cultures is still continuing, even after thousands of years. So the theme of this exhibition is actually the history of the formation of Italy and all Europe, from antiquity until the present.

Naturally we will continue to be surprised by how modern the Etruscans were: their science was extremely advanced for the period, their sophisticated architecture was adopted and further developed by the Romans, who were great architects and builders in their own right. However, we shall also continue to lament the fact that Etruscan attitudes on the relations between the sexes and the equality of men and women were not imitated in their period, but only much later; perhaps too late, in our history, with possibly damaging consequences for our European progress.

Nevertheless, we shall continue to gaze in fascination at Etruscan art and the objects that the Etruscans used in daily life, always aware that the many gaps in our knowledge of this highly original civilization, so different from other European cultures, can only be filled by our imagination.

The Rijksmuseum van Oudheden and the Allard Pierson Museum are to be commended for realizing such a tremendous cultural undertaking, for bringing the charms of this lost civilization back to life. As are all the European museums who have made this exhibition possible, especially a number of Italian museums, including the Museo Nazionale Archeologico in Florence, the Museo Civico Archeologico in Bologna and the Musei Capitolini, Musei Vaticani and Villa Giulia in Rome.

*Franco Giordano,
Italian Ambassador in the Netherlands*

**FOREWORD BY THE
ALLARD PIERSON MUSEUM
RIJKSMUSEUM VAN OUDHEDEN**

Etruscans. Eminent women. Powerful men is a collaborative project at bilateral, national and European level. A timely enterprise, for the last major Etruscan exhibition in the Netherlands was held over 20 years ago. In the meantime international research has not stood still and has generated many new finds and insights. The Rijksmuseum van Oudheden (RMO) and the Allard Pierson Museum (APM) have incorporated these results in this, their first joint exhibition, on display at two locations, in Leiden and Amsterdam.

Drs. René van Beek, curator at the Allard Pierson Museum, was responsible for the substance of this exhibition, in collaboration with dr. Patricia S. Lulof and drs. Tanja van der Zon; drs. Marian Schilder (APM) and drs. Tanja van der Zon (RMO) were responsible for the project management, supervised by a steering committee chaired by drs. Steph Scholten (University of Amsterdam). For the accompanying publication a range of international authors were willing to share their knowledge and the results of the latest research. Dr. Patricia S. Lulof and dr. Iefke van Kampen were chief editors, supported by an editorial team comprising dr. L. Bouke van der Meer, drs. René van Beek, drs. Tanja van der Zon and Professor Ruurd Halbertsma. Drs. Paulien Retèl was responsible for production management. In mentioning their names, we also wish to express our special appreciation of everyone who played a role in the realization of this project.

We were able to appeal to our colleagues at many foreign museums for loans of objects for the exhibition. We are extremely grateful to the following individuals: dott.ssa Francesca Boitani, former director, and dott.ssa Patrizia Aureli, Museo Nazionale Etrusco di Villa Giulia, Rome; dott. Claudio Parisi Presicce, director of the Capitoline Museums, Rome; dott. Maurizio Sannibale, Museo

Gregoriano Etrusco, Vatican Museums, Vatican City; dott.ssa Paola Giovetti, director, and dott.ssa Daniela Picchi, curator of the Museo Civico Archeologico, Bologna; dott.ssa Carlotta Cianferoni, director of the Museo Archeologico Nazionale, Florence; dr. Judith Swaddling, senior curator of the British Museum, London; dr. Anne Marie Nielsen, director and dr. Jette Christiansen, research curator Ny Carlsberg Glyptotek, Copenhagen; Professor Cécile Evers, Koninklijke Musea voor Kunst en Geschiedenis, Brussels. Dr. Patricia S. Lulof's and dr. Iefke van Kampen's contacts proved indispensable in arranging loans from Italian museums in particular.

It would be impossible to realize such a prestigious international project without the support of funds and subsidies. For the digital component *Etruscanning* we received a generous subsidy from the European Culture Programme, while the exhibition was granted commensurate support by the Prince Bernhard Culture Fund, the Mondriaan Foundation and the SNS Reaal Fund. Publication of the book received financial assistance from the Stichting Charema – Fonds voor Geschiedenis en Kunst, the Friends of the Allard Pierson Museum, RoMeO (Friends of the RMO) and the Italian Embassy. At the end of 2012 the exhibition will travel to the Gallo-Romeins Museum in Tongeren, Belgium.

We cordially invite you to visit the exhibitions in both cities, *Powerful men* in Amsterdam and *Eminent women* in Leiden. After all, balance is essential in a successful marriage between two partners.

Wim Hupperetz,
director of the Allard Pierson Museum, Amsterdam
Wim Weijland,
director of the Rijksmuseum van Oudheden, Leiden

The Regolini-Galassi Tomb revisited.

3D reconstruction as a research instrument

The Regolini-Galassi Tomb is one of the most remarkable Etruscan tombs we know, not only on account of its rich contents but also because so many of the 327 objects date from the orientaling period. Moreover, the grave goods are varied in character and many of the items are of outstanding quality. The tomb was found in 1836 by Archbishop Alessandro Regolini and General Vincenzo Galassi, who wrote several accounts of their discovery. The first publication on the tomb appeared in the same year, in 1836; the first drawings were produced by L. Grifi, a qualified architect.

Although the tomb has been studied by a large number of scholars, certain mysteries remain unsolved. There is still a great deal of uncertainty regarding the precise positions of the objects in the tomb and how we should interpret the totality of grave goods.

During our 3D reconstruction of the Regolini-Galassi Tomb we were forced to ask ourselves very practical questions about the placement of the objects and their original location. We re-evaluated and reinterpreted all available sources in an effort to find answers to difficult questions. The tomb was discovered and documented a long time ago, but never methodically excavated, and the excavated objects were purchased by the Vatican Museums just a year after the tomb's discovery. As a result, a great deal of information about the precise location of the objects in the tomb was lost. This also explains the many, often contradictory reconstructions.

3D RECONSTRUCTION

In many respects the increasing deployment of 3D visualization techniques has created a new research instrument. To keep this instrument as transparent as possible, we are presenting the major steps in the 3D visualization of the Regolini-Galassi Tomb in an online blog, at <http://regolinigalassi.wordpress.com/>. This is a practical way to document the interpretation, indicate possible revisions in the process, present the uncertainties in our reconstructions, record the information and, finally, enable or

facilitate multidisciplinary research. There are four stages in our formalized approach: the identification, assessment and correlation of sources, and the construction of a hypothesis in the form of a tree diagram.

The innovative 3D visualization techniques we employ also encompass three-dimensional virtual reconstruction. This means that we endeavour to recreate historical structures, built by human hands, in this instance, the Regolini-Galassi Tomb and the objects within. The purpose is not to reconstruct the past, but to create an image of what we know of this past. In other words: a virtual reconstruction constitutes a consistent visualization of structures built by people, based on the available sources, such as information from archaeology, anthropology, history, the natural sciences. As such, creating a virtual reconstruction is a multidisciplinary activity, constantly subject to change.

3D SCAN OF THE TOMB

The project methodology can only be described as complex, from the gathering of existing data to the integration of these data via topographic digital measurement. We used various types of data: point clouds from a 3D scanner, photogrammetric data and GIS-data. A 'time of flight' 3D scanner (Riegl Z390i) measured the tomb in 3D as a high-resolution model (with 6 mm spaces between the dots) and with maximum precision (3-4 mm). Once the 3D scanner had measured objects as three-dimensional point clouds, triangulation was employed to ascribe three-dimensional volumes, determined by surface areas. We then worked the 3D model of the tomb in its present state into a representation of the tomb as it may have looked in Etruscan times, with the objects in their context, based on historical sources and archaeological interpretations.

THE FLOOR PLAN ILLUSTRATIONS

The various floor plans we consulted from publications relating to the Regolini-Galassi Tomb display a large number of significant and substantial differences. Two ex-

cavation reports were published immediately after the excavation in 1836 – which only took five days. However, the first drawings were not published until five (Grifi) and ten (Canina) years later. Various authors have noticed the differences between the two 1836 reports and have pointed out disparities between the nature of the objects as we now know them and what is recorded in the excavation reports.

If we compare the two drawings with the actual tomb, it is clear that these could not have been made inside the tomb. For example, neither represents the ceiling correctly. Canina's rendering of the tomb's architecture and size of the objects is better, perhaps because he was trained as an architect and an archaeologist. However, the most significant difference is that Canina depicts more objects in the tomb than Grifi, probably because interpretation of the archaeological finds was still ongoing in Grifi's time.

THE TOMB

The original tumulus was constructed in the seventh century BC and covered by a second tumulus in the sixth century BC, which created space for additional tombs, probably intended for descendants of the same family. Although these tombs around the outside of the mound proved easy prey for tomb robbers, they protected the older tomb at the centre from almost inevitable plundering.

The tomb has a short *dromos* in the form of a narrow passage, with rectangular blocks rising to form a corbel vault. The most important space at the rear of the tomb was closed off by a wall incorporating a small window. There are also two oval side chambers, carved from the tuff. The lower part of the tomb is cut from the tuff

bedrocks, the upper half built of square blocks which have been used to create a wedge-shaped corbel vault.

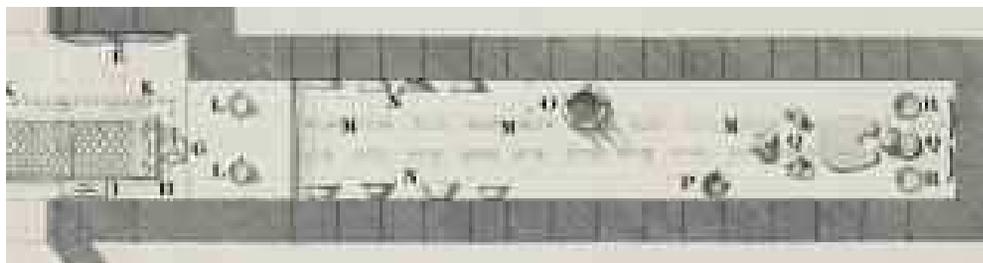
We shall use the five spaces as the starting point for our consideration of the tomb: the entrance passage (*dromos*), the *anticamera* (antechamber), the right side chamber with the interment of the prince, the left side chamber and the closed area where the princess was interred. We intend to present all five spaces in our reconstruction, based on evaluation and integration of the source material.

According to Pareti, who has compiled the most comprehensive catalogue of the tomb, the objects were distributed as follows:

- objects numbered one to 226 came from the chamber where the princess was interred;
- objects numbered 227 to 233 came from the right side chamber where the prince was interred;
- objects numbered 234 to 328 came from the *dromos*, the *anticamera* and the left side chamber (the storeroom).

THE PASSAGE (*DROMOS*). THE HOLMOS

In the entrance passage were three bronze objects: a *holmos* (a cauldron stand), and two large cauldrons, one somewhat smaller than the other. On drawings of the tomb the *holmos* stood at the beginning of the *dromos*. In daily life a ceramic *holmos* was used to prepare food and keep this warm. Charcoal was burned in the conical foot, so heat would rise to the bell-shaped element supporting the cauldron of food. The top of the bronze *holmos* from the Regolini-Galassi Tomb is closed, however, so it could not have been used in this way. This may mean that it was a replica, a model of a domestic implement made especially for the tomb. The material is also unusual, for such



Detail of the plan of the Regolini-Galassi Tomb by Grifi, drawn in 1836 but only published in 1841. It shows the burial chamber, the private space in which the princess was interred with all her personal possessions around her. Far right is the huge gold disc fibula, then the gold pectoral and the two bracelets (Q). The two bronze cauldrons or *lebetes* (P and O) also come from the Near East / display influences from the Near East and underline the aristocratic character of this tomb.



The provisional virtual reconstruction of the *anticamera*. This space between the main burial chamber and the two side chambers functioned as a public space in a home and recalls the atriums in later Roman atrium houses. This is where objects such as the empty bronze bed, the small trolley, and two tripods, enclosed by small bucchero figures of mourners, were found. Hanging on the wall were bronze shields and on the ceiling bronze dishes. There are two triangular windows, one towards the burial chamber of the princess with two silver cups on the sill and a hanging *situla* (a bucket-like vessel), the other, to the right, in the wall to the side room in which the cremated remains of the man were interred in a cinerary urn, also surrounded by small bucchero figures of mourners.

stands are almost exclusively made of ceramic and few bronze examples are known.

THE ANTICAMERA. THE EMPTY BED AS CEREMONIAL FOCUS

In the small *anticamera*, before the wall with a window, which closed off the burial chamber where the princess was interred, there was a bronze bed, accompanied by a series of small bucchero figures of female lamenters or mourners and two iron tripods. Beside the bed was a small cart on wheels, interpreted as an incense burner or food trolley. Also in this space were various bronze and iron skewers; beneath the keystones of the corbel vault hung two rows of *paterae* (libation dishes) on nails.

Although the Romans did not consider themselves descendants of the Etruscans, they adopted a number of practices, such as certain funerary traditions and tomb architecture, from a shared indigenous ancestor. In Etrus-

can culture, as in many ancient civilizations, tombs represented the home in the hereafter. On this premise we may regard the entrance to a tomb as the *vestibulum* (hall), which leads to the atrium. In ancient Latin households the atrium was the symbolic bedroom of the mother, and the bed, the *lectus genialis*, faced the main entrance. In Roman wedding ceremonies, the marriage was consummated in the *lectus genialis*, in honour of the ancestors, the *gens*.

There were no objects or other traces found on the bronze bed to suggest that human remains had ever lain there. If the bed was indeed empty, this would fit the hypothesis that the bed symbolized the sanctity of marriage. The mourning figures around the bed and the urn in the right side chamber, containing the cremated remains of the man, may also support the symbolic meaning of the empty bed.

THE RIGHT SIDE CHAMBER. THE INTERMENT OF A PRINCE

In the right side chamber there was a large cinerary urn containing cremated remains that have been interpreted as that of a prince. Around this urn were several of the 33 small bucchero figures of mourners found in the tomb. Given that these figures also stood around the (empty) bed in the antechamber, there must be a connection between the two. The side chamber further contained a number of metal objects. Pareti also places the two-wheeled chariot (*biga*) found in the tomb in this chamber, together with two iron fire-dogs and an iron dagger. The *biga* must have been taken apart before it was brought into the tomb, as it would otherwise not have fitted through the entrance to the side chamber.

THE LEFT SIDE CHAMBER. A STOREROOM
The left side chamber was probably a storeroom, as it was full of ceramic and bronze vessels, including large bronze cauldrons. Several interpretations also place some silverware in this chamber, although this is uncertain. A bronze biconical urn, often used as a cinerary urn, may have been one of the objects found in the tomb, symbolizing the ancient origins of the deceased's family.

THE CLOSED CHAMBER: THE LEBETES AND THE GOLD SUNDISC CROWN
The closed chamber contained the majority of the gold and silver objects found in the tomb, all associated with



Cross-section of the tomb obtained using a laser scan, made in June 2011. This shows that the passage slopes downwards, although it is possible that the slope was not always as steep. It also shows the remains of the window to the right side room; to the left, in the main chamber, are the stones which formed part of the wall that closed this chamber off from the *anticamera*.

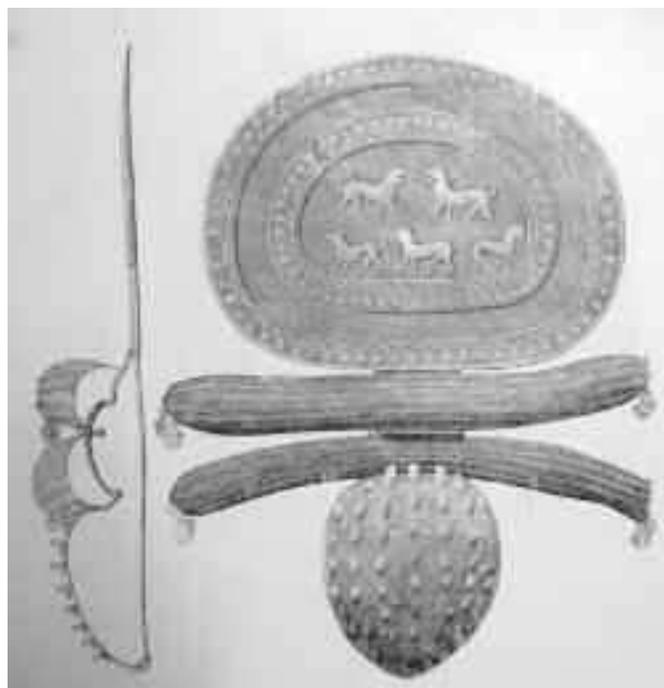
the interment of the princess. This space was separated from the rest of the tomb by a wall incorporating a window in which two silver cups stood. It is also possible that a wooden *situla* (a bucket-like vessel), decorated with silver, hung in the window.

It seems obvious that the body would have been wrapped in a shroud, presumably fastened with the 19 gold fibulae found in this space. A large number of gold jewels were probably wrapped in the shroud, or attached to it, including two gold bracelets and a gold pectoral. The large fibula in the form of a gold disc lay by the deceased's head. It consists of three components: a disc which symbolizes the world, a horizontal part representing the river that must be crossed to reach the underworld, and a curving element, the underworld, in which the pin falls. This fibula may have been attached to the shroud, possibly on the head in the manner reconstructed below. As such it may be interpreted as a solar crown, familiar from Egyptian deities such as Hathor.

Further orientalizing influences are evident in the three *lebetes*, the bronze cauldrons also found in similar form in the Near East. Two *lebetes* are virtually identical, with five lion heads on long necks around the rim. The third *lebes* is smaller and has six griffin heads. There were also decorated silver chargers, probably from a Phoenician



Laser scan of the *anticamera*, with view of the left side chamber and the burial chamber with female interment directly ahead. The latter was closed off by a wall whose stones can be seen to the rear.

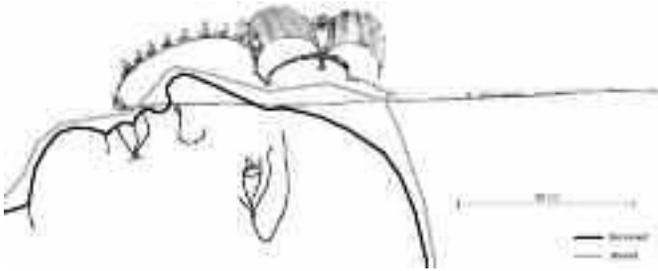


Side view and frontal view of the gold disc fibula from the burial chamber of the princess, drawn by Canina (1846). This fibula comprises three components. The disc represents the world (and the sun?), the hinged parts represent the water or river which give entry to the underworld, represented by the lowest element of the fibula, on which a tiny head of Hathor appears. There are also images of Hathor on the necklace pendants. Hathor is the Egyptian sun goddess and mother of Ra who pilots the solar boat. As a fertility goddess, a bringer of life and an underworld deity, she represents a clear allusion to the hereafter.

workshop, affixed to the wall, and two rows of more than ten bronze *paterae* (libation dishes) nailed to the ceiling.

EVALUATION

3D visualisation of the Regolini-Galassi Tomb will not only prove an essential tool for obtaining more knowledge about the tomb and Etruscan funerary customs, it also supplies an attractive way to present research results. In our multidisciplinary approach to the realization of this 3D visualization, we re-examined and reinterpreted earlier



Hypothetical reconstruction of the position of the large disc fibula on the aristocratic lady interred in a shroud in the burial chamber. The (linen?) shroud was fastened with almost 20 gold leech fibulae. The disc fibula could have functioned as a kind of Egyptian solar crown, familiar from a range of images. On the shroud were also two gold bracelets and the gold pectoral breast ornament), whose rich decoration also displays many eastern influences.

publications on the find context, and reached new conclusions regarding the location of the objects in the tomb. We were able to place the objects virtually in the tomb, allowing us to identify inconsistencies in the source material and to determine the most plausible configuration. Using 3D visualization as our research instrument, we were able to study the tomb on another level. We shall present our results in the form of an innovative, interactive 3D experience, based on natural interfaces (bodily movements and gestures).

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Two archaic bronze figurines of warriors, 600-500 BC. Bronze figurines of warriors are mostly found in votive deposits. Undoubtedly they were offered in an attempt to guarantee a safe return from war. Rijksmuseum van Oudheden, Leiden, inv.nos. CO 110, H III 7.7.

