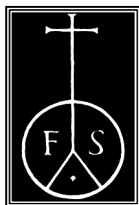


MARMORA

AN INTERNATIONAL JOURNAL
FOR ARCHAEOLOGY, HISTORY
AND ARCHAEOOMETRY OF
MARBLES AND STONES

12 / 2016

OFFPRINT



PISA / ROMA
FABRIZIO SERRA EDITORE
MMXVII

Direttore · Editor

LORENZO LAZZARINI · Università I.U.A.V. (Venezia)

*

Comitato scientifico internazionale · *International Scientific Committee*

Archeologia e Storia dell'Arte · *Archaeology and History of Art*

CLAYTON J. FANT · Università di Akron (OH, U.S.A.)

ANNA MARIA GIUSTI · Opificio delle Pietre Dure (Firenze)

OLGA PALAGIA · Università di Atene

PATRIZIO PENSABENE · «Sapienza» Università di Roma

ISABEL RODÀ · Università Autonoma di Barcellona

CARMELO G. MALACRINO · Museo Archeologico Nazionale di Reggio Calabria

Archeometria · *Archaeometry*

AURELIO ÁLVAREZ PEREZ · Università Autonoma di Barcellona

VINCENT BARBIN · Università Reims-Champagne-Ardenne (F)

CLAUDIO D'AMICO · Università di Bologna

JAMES A. HARRELL · Università di Toledo (OH, U.S.A.)

MARINO MAGGETTI · Università di Friburgo (CH)

MYRSINI VARTI-MATARANGAS · I.G.M.E. (Atene)

*

«Marmora» is an International Peer-Reviewed Journal.

The eContent is Archived with *Clockss* and *Portico*.

TYPE, SCHEME AND EXECUTION:
THREE BASIC CONCEPTS FOR THE DEFINITION
OF A PERSONAL STYLE. AN EXPERIMENT
HELPED BY VIRTUAL 3D-MODEL ANALYSIS

ÁGNES BENCZE* / PÉTER GYURIS*

ABSTRACT

As a second part of the methodological reflections exposed in the previous volume of «Marmora», in this paper we analyze two acroteria of the Temple of Artemis in Epidauros. The two statuettes, created at the end of the 4th century BC, follow the same general design (*scheme*), but seem to be executed by two different masters. The comparison by free eye, measurements and juxtaposition of determinate sections of drapery helps to point out different levels of the process of sculptural creation and thus to define some basic criteria to be taken into account, when speaking about personal style and workshop tradition in ancient sculpture. Moreover, the experiment sheds some light on the possibilities and on the limits of the virtual 3D-model technology for stylistic analysis of sculpture.

KEYWORDS: 3D scanning, analysis of virtual 3D models, acroteria, Nike, Temple of Artemis in Epidauros.

THIS paper continues the methodological reflections exposed in the previous volume of «Marmora», based on the comparison of 3D models obtained by scanning two pieces of sculpture. While previously we compared an ancient sculpture and its quasi-free-hand modern replica, in this part we analyze similarities and differences between two early Hellenistic acroteria, which follow the same pattern, but seem to be executed by two different masters. The two statuettes, made of Parian marble and representing the goddess Nike in the moment of land-

ing decorated the pediments of the Temple of Artemis in Epidauros and are displayed now in the National Archaeological Museum in Athens. They were scanned in 2016 as a part of a wider campaign of digitization of ancient sculpture and of a research project focused on the development of new methods for stylistic analysis helped by computer technology.¹ We choose them for the purposes of this experimental study because of their evident unity of general design and difference of details of the *execution*, which make them a perfect subject for

* *Addresses for correspondence:* Department of Ancient History, Faculty of Humanistic Studies, Eötvös Loránd University, Múzeum krt. 6-8, H 1088 Budapest (Hungary); bencze.agnes@btk.ppke.hu. Department of History of Art, Faculty of Humanistic Studies, «Péter Pázmány» Catholic University, Egyetem u. 1, H 2081 Piliscsaba (Hungary); peter.gyuris@geonardo.com

¹ Hungarian National Research Fund (OTKA), ref. no. NF 101755. For further details see PATAY-HORVÁTH 2016 and here below.



FIG. 1. Athens, National Archaeological Museum, three acroteria from the Temple of Artemis in Epidauros, inv. 161, 159 and 160 (photo by Á. Bencze).

a case study on the problems of sculptural project and workmanship.

THE DOCUMENTS:
THE ACROTHERIA OF THE TEMPLE
OF ARTEMIS IN EPIDAUROS

The Temple of Artemis in Epidauros is a minor monument of proto-Hellenistic Greece: a small building, of which the hexastyle prostyle plan can be recognized from remnants, dated to the last third of the 4th century BC on the ground of historical and stylistic considerations.¹ From the sculptural decorations of the temple four fragmentary acroteria statuettes are preserved, three of which are on display in the National Archaeological Museum of Athens

(FIG. 1); the fourth one, reduced to a mere fragment of an upper body, has never been exhibited.²

All the four fragments belong to statuettes representing Nike landing on the temple roof in lively movement, accentuated by their drapery, a Laconian peplos exposing one leg and one breast of the goddess and billowing back on the sides. Their dating is based, within the chronological limits provided by their find context, on stylistic considerations, and oscillates from the middle of the 4th century to the beginning of the 3rd century BC in the sparse literature dedicated to them.³ After some initial uncertainties, N. Yalouris convincingly reconstructed the original disposition of the four statuettes on the temple, as

¹ DINSMOOR 1975, 221.

² The three statuettes on display are Athens, Nat. Mus. inv. 161, 159 and 160, from left to right. KALTSAS 2002, 179, nos. 355-357. For a detailed presentation of the fourth fragment, inv. 2188, see ΓΙΑΛΟΥΡΗΣ 1967, 30-31, no. 4, figs. 30-31.

³ ΓΙΑΛΟΥΡΗΣ 1967, 34-37 summarizes all the preceding contributions and concludes that they belong to the last fourth of the 4th century, on the midway between Skopas's Maenad and the Muses of the Mantinea base. GOULAKI-VOUTIRA, in *LIMC*, VI, 1992, 883 places them to the beginning of the 3rd century BC.

four side acroteria, after having recognized the fourth piece, inv. 2188 as belonging to the same complex as the three better preserved ones.

Although there is not any sculptor's name, nor any other specific external historical data linked to this monument, the case of these acroteria, especially inv. 159 and 161, which will be analyzed in detail here below, seems to be particularly instructive for the sake of some methodological reflections concerning the working method of ancient teams of sculptors, employed for the decoration of temples and the conceptual framework we can apply, when dealing with problems of stylistic attribution. Our main concern was to exploit the possibilities offered by the technology of 3D scanning, providing rotatable virtual models, which permit more relevant and comfortable free-eye comparison, more precise internal measurements and objective comparison of shapes by superimposition and/or analysis of linear sections. In this respect this study is to be considered a continuation of the methodological experiment presented on the pages of the last issue of this periodical,¹ and a first endeavor to answer some of the questions raised by A. Patay-Horváth at the 2015 CAA conference in Siena.²

OBSERVATIONS, PROBLEM AND A METHODOLOGICAL PROPOSAL FOR THE READING OF FORMAL EVIDENCE

The most important new acquisition of Yalouris' reconstruction was that the statuette inv. 161 had not been a central acroterion, as previously supposed by

Kavvadias,³ but the one on the left corner of the ϵ pediment. The former misunderstanding was due to the fact that, while inv. 159 and the headless inv. 160 seem to be specularly symmetrical replicas of each other, inv. 161 was judged to be slightly larger in scale, and sensibly different in detail. As Yalouris identified inv. 2188 as a fragment of a fourth acroterion, it turned out that it must have been closer in scale and detail to inv. 161 than to the two other statuettes, and thus it was to be identified with inv. 161's counterpart on the same pediment. Moreover, Yalouris observed that the posture of inv. 159 and inv. 161 was perfectly identical, with the right leg stepping forward, the arm on the same side pulled back and the left shoulder pushed forward, and concluded that both had to be the ornament of the left corner of their respective pediments.

To sum up, we have three considerably well preserved acroterion statuettes, out of which inv. 159 and inv. 160 are close in execution and perhaps identical in scale, and show the same posture in opposite (specularly symmetrical) direction; on the other hand inv. 159 and inv. 161 reproduce exactly the same posture, but seem to be different in execution. The first two might have decorated the left and the right corner of one pediment (on the *w*, *i.e.*, the back), while inv. 161 was the left corner acroterion on the ϵ pediment, corresponding in the main features to the back acroteria, but perceptibly different in detail, as it is immediately revealed at first sight, once the two pieces are observed side by side (FIGS. 2-3). A

¹ BENCZE 2015.

² PATAY-HORVÁTH 2016. The experiments presented in this paper were carried out in the framework of the team project announced in that paper, however, our conclusions will nuance to some extent the assertions formulated in that occasion.

³ CAVVADIAS 1893, 22 (cited by ΓΥΛΑΟΥΡΗΣ 1967, 32).



FIG. 2. Digitized model of the acroterion
inv. 159, frontal view.

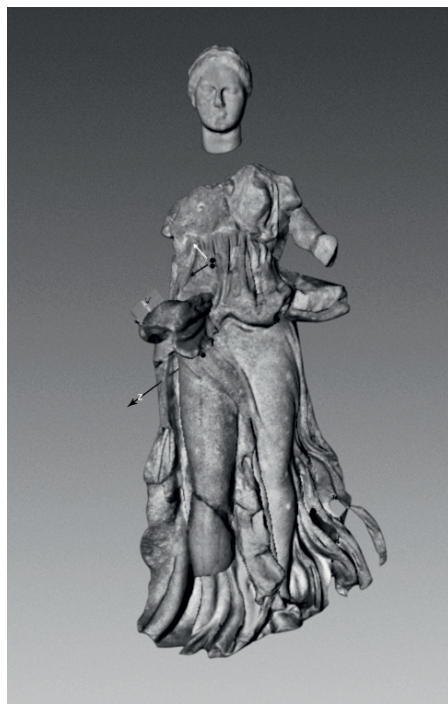


FIG. 3. Digitized model of the acroterion
inv. 161, frontal view.

plausible working hypothesis could be that the whole system of acroteria, consisting of four figures of landing Nikai, represented in the same posture on the four corners, with the specular inversions required by the harmony of composition, was projected by one master, who determined all the main elements of the design, but evidently executed by two different individuals on the E and on the W pediment. In the following pages we will try to define some objective categories and elements, upon which such an assertion could be based in a trustworthy manner. For the sake of this experiment we compare here below the virtual 3D models of inv. 159 and inv. 161.

As a first step, it seems to be useful to define three different levels of analysis, which can provide a conceptual frame-

work for the interpretation of visual observations.

The upmost level is the category of *type*, to be understood here in the sense of 'iconographical type', that is to say the abstract concept of how a determinate content can be represented in sculpture (or in the visual arts in general). At this level a simple description can fulfill its duty, with the use of only a few simple words: 'Nike landing, winged, wearing a Laconian peplos, billowing back as if it were blown by the wind, leaving one leg and one breast naked'. The description also includes an attitude towards movement and the treatment of drapery, which could not have been imagined before the last quarter of the 5th century BC. As a matter of fact, it seems plausible that this conception of the figure of

the goddess of victory depends on the innovative artistic idea represented by one major work of art, which is fortunately preserved to us, even if in fragmentary condition: the Nike made by Paionios in Olympia, about 420 BC.¹ This statue was not an acroterion, but realized by a sculptor who had previously won the competition for making acroteria for the Temple of Zeus, and one is tempted to imagine that these or at least one of these was analogous in subject and type.

Anyhow, the invention of this way of representing the winged goddess of victory gave birth to a sort of tradition, or habitude: it became one of the accepted ways of representing the deity. Although there are not many extant examples from the intermediate decades, it can be assumed nevertheless that the master who projected the four acroteria of the Temple of Artemis in Epidauros elaborated his own version with reference to this type.²

This secondary version, a personal creation within the framework of the iconographical type, represents the second level of artistic creation and can be called a *scheme*. It cannot be defined verbally in such a concise manner as the *type*, but we can still attempt to describe it with some degree of precision. To determine a scheme is the ensemble of features like the posture (in our case: contrapost with the right leg stepping forward, the left arm pulled back, the head slightly turned again to the left), the kind of garment (Laconian peplos, open on the left side, with a high belt and a long apotygmata, leaving one breast uncovered), the hairdo (wavy

locks gathered in a bun on the back of the head, framing the face with an oval contour), and all what can be reported verbally about the disposition of such elements as the folds of drapery or the single hair-locks. All that we can say about the antithetical movement of the body and about the disposition of the drapery belong to this level: they are certainly elements of a style, but they depend on a conscious selection of motives and thus they reflect the relationship of the designer to the general artistic culture of his historical period and milieu. For this reason, the elements belonging to this level, *i.e.*, the criteria used for the definition of the scheme can be used as primary elements of dating, just as Yalouris did in the case of our statuettes.³

However, the comparison of the statuettes inv. 159 and inv. 161 shows that the elements used for the definition of their scheme cannot give a full account of their style. There is, in fact, a third level of stylistic specificities that lies below and can hardly be verbalized. This level could be called the one related to personal style, but perhaps it is more objective and cautious to speak about a personal modelling or way of execution. In any case this is the most difficult to seize and for this reason it is at this level that we may hope to gain some more factual elements from the use of a mathematical method.

In our experiment, consisting of free-eye observation, measurements, and sectioning, we tried to make evident the coincidences of scheme and the differences of execution between the two statuettes.

¹ STUDNICZKA 1898, 16-18, figs. 28-31; LIMC, VI, 1992, s.v. Nike, no. 137; THÖNE 1999, 117-118.

² It must be mentioned that one famous version from the first half of the 4th century BC comes exactly from Epidauros, and it is again an acroterion, *i.e.*, the Nike of the Temple of Asklepios: see LIMC, VI, 1992, s.v. Nike, no. 144.

³ ΓΙΑΛΟΥΡΗΣ 1967, 34-37.

ANALYSIS

Technical remarks

The work of scanning, treatment of data, measuring and sectioning of the virtual models was carried out by P. Gyuris. Both statuettes were scanned with the Artec EVA scanner during the same field survey period. The 3D data resulting have the accuracy between 0.1-0.3 mm (following fine registration, see below). The object data consist of individual frames captured with a rate of 15 frames per second.¹ Our comparison is based on the models that were preprocessed with Artec Studio 9 subsequently.

The workflow in Artec Studio was the following:

- after scanning fine serial registration automatically runs (texture and geometry algorithm for relative positioning of frames);
- global registration fits the individual frames into the same coordinate system (default settings);
- after alignment of the recordings (scans) of the whole statue, global registration run again to put the frames into the same coordinate system;
- run one of the fusion algorithms in order to get a single surface of the 3D model.

Measurements of point to point distances and section profiles were then taken on 3D models produced with this method. Artec Studio «Measures» toolbox was used to perform the linear distance measurements and create the sections we made on the fused models. The uncertainty of the data based on the above accuracy information and the

processing steps is around 0.5 mm. The theoretical resolution of the 3D models by Artec EVA is 0.5 mm.

Both statuettes are in fragmentary condition, they have been restored from several fragments and integrated with plaster.² While fractures are clearly visible on the models, the scanning process makes no difference between marble and plaster surfaces, thus the virtual models include also the plaster additions. Moreover, even if in some cases the current state of restoration may be questionable, we had evidently no opportunity to avoid problematic elements in scanning (*e.g.*, the position of the lower part of the left leg of inv. 161). In any case, as far as the digitized analysis is concerned, we made sure to include only intact sectors of evidently original parts. Finally, it will be remarked that scanning has not been completed on all sides of the pieces. The main reason of this is that we avoided all generally damaged or roughly worked out surfaces: this was the case with the back of both statuettes and with the top of the head of inv. 161. These considerations have to be taken into account for a correct interpretation of the following illustrations.

Stylistic observations

A first glance to the frontal views of the two Nike acroteria reveals why these two pieces offer an excellent example for the discussion of the different levels of sculptural work, as it was exposed above. It becomes evident at a first sight that the two statuettes follow the same scheme, *i.e.*, they must have been real-

¹ For more information on scan settings see Artec Studio manual: <http://www.artec3d.com/files/pdf/ArtecScanners-Booklet-EURO.pdf>.

² For a detailed description see ΓΙΑΛΟΥΡΗΣ 1967, 25-26, 29-30.

ized so as to meet a number of detailed prescriptions inherent to a general project imposed on the sculptors, while they interpreted freely all what lied beyond this prescription, from the execution of minor details of the drapery to the proportions of the body and to the stylization of the two faces. We will not analyze all of these features, since the objective of this paper is to illustrate the possibilities offered by the comparison of digitized volumes and for this sake we chose only some particularly clear and unquestionable elements.

The comparison must start, however, with some general statements concerning the scheme. In the first place, we have to consider the question of the dimensions. The older publications assumed that inv. 161 is considerably taller than inv. 159. This statement is rather difficult to prove, however, given the different state of fragmentation of the statuettes and some degree of uncertainty concerning their original position. Kaltsas' catalogue gives approximate values: 81 cm for inv. 159, and 86 cm for inv. 161, it should be remarked however, that in the fragmentary state of inv. 161 does not permit to determine with certainty the actual distance of the head from the shoulder.¹ For the same reason the more precise measures published by Yalouris do not permit either to decide the real difference of height: according to his description inv. 159 would be 80.5 cm high, while her counterpart 69.5 cm (body), plus 14.8 cm (head), plus the unknown height of the lacking sector of the neck; in sum, somewhat taller than 84.3 cm. All in all

there could be assumed a difference of 4-5 cm, which can be considered moderate, for this scale.²

We tried to arrive to more precise values with the help of the virtual models, measuring internal distances between corresponding points, which were chosen taking into account the degree of preservation of both fragmentary figures and preferring the clearest demarcation lines between volumes. The longest vertical distance thus measured (Appendix 1.1) shows a difference of 1.1 cm between the two bodies, while in the case of the main measurement chosen for the evaluation of the scale of the heads (Appendix 1.2) the difference remains below 0.5 cm.

The system of measurements could be developed further, and might become an essential tool for a more precise definition of the system of proportions used by the sculptors. For the moment we contented ourselves with these basic measurements, which suggest that there could have been only a slight difference of dimensions between the two statuettes and on the whole they seem to have been meant to remain within the same scale.

It is all the more interesting to remark that the distance measured between the eyes, the most relevant section for the definition of the width of the face, is shorter on the taller inv. 161 than on inv. 159 (Appendix 1.3). This confirms what could have been stated only on the ground of a first, superficial observation: the two female heads, although they follow the same iconographical type, are constructed in essentially dif-

¹ KALTSAS 2002, 179.

² In any case, the difference certainly did not reach one eighth of the height of the smaller statuette, as it was presumed by the authors who tried to assign inv. 161 to the center of the pediment, with reference to a rule recorded by Vitruvius, according to which the middle acroterion should be one eighth higher than the two others placed on the corners (*De architectura*, III, 12): cf. ΓΙΑΛΟΥΡΗΣ 1967, 32.

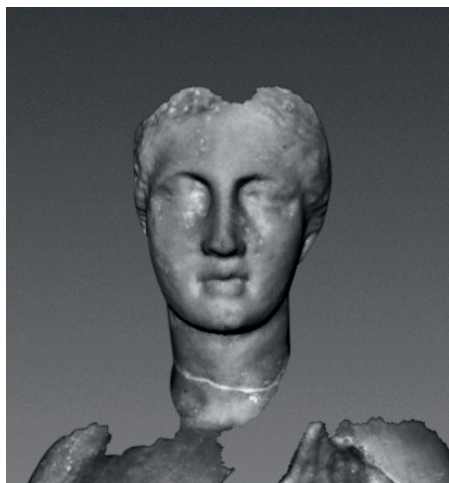


FIG. 4. Digitized model of the acroterion
inv. 159, frontal view.



FIG. 5. Digitized model of the acroterion
inv. 161, frontal view.

ferent ways. As a matter of fact, the two heads could not have been more disparate, remaining within the chronological limits of the second half of the 4th century BC and in the cultural framework of mainland Greece. That of inv. 159 (FIGS. 4 and 6) is characterized by the natural balance of traits and volumes typical of the kind of late classical heads that are usually called Praxitelian, while inv. 161 (FIGS. 5 and 7) is closer to the head of the riding Aura from the *Asklepieion* of Epidauros,¹ to point out a geographically close-by analogy.

The two views of the two heads (frontal and three-quarter), obtained by snapshotting the rotatable virtual 3D models in the same position, shed some light also on the different use of optical distortions adopted by the two sculptors: on inv. 161 it is barely perceivable, mostly through the observation of the outline of the hair around the forehead and in the more elongated depression of the right orbit; by contrast, the face of inv. 151 is wholly asymmetrical in the

frontal view, so much to become unpleasant, while it becomes perfectly balanced in the three-quarter view, illustrated here by Figure 6.

If the observation of the two heads suggests that the two statuettes must have been realized by two sculptors, following an identical plan, but most probably trained in two different artistic milieus, the exam of the drapery will only confirm this impression. The frontal views of the whole figures (FIGS. 2-3) give a first idea about the similarities and the differences. The scheme is identical: there is not only exactly the same posture, with the same disposition of limbs and identical torsion of the head, and not only the same type of robe, but the disposition of the windblown folds seems to have been meticulously prescribed, too. The snapshot pictures of Figures 8 and 9 show that the two masters followed precisely the same design in all the main compositional elements, such as the long oblique fold running on the thigh from the loin area towards

¹ Athens, National Museum, inv. 157: KALTSAS 2002.



FIG. 6. Digitized model of the acroterion inv. 159, three-quarter view.



FIG. 7. Digitized model of the acroterion inv. 161, three-quarter view.

the left knee, or the rendering of the floating drapery in the form of four, parallel, S-shaped folds behind the shank. On the other hand, in both the frontal and the side view it is evident that this unique scheme has been executed in two deeply different ways in the two cases. The treatment of minor details of folded drapery is conspicuous in both views: large, continuous curves, gently enveloping the volumes of the body on inv. 159, in contrast with the nervous modelling of thin, crispy folds, divided and sometimes interrupted by deep grooves on inv. 161. In the frontal view (FIGS. 2-3) it becomes evident that these two different sculptural approaches resulted on the whole in a differing general outlook: in spite of all the coincidences of the principal compositional elements, the different modelling of folds altered the relationship between the drapery and the volumes of the body, produced even different proportions (see in particular the distance of legs at the level of knees and the position of the left shanks) and, most evidently, a different general out-

line, with the drapery curving inwards in at the feet of inv. 159, while it is widening downwards on inv. 161.

We tried to render at least some aspects of these two different ways of modelling with an easily understandable graphic representation, which can eventually permit an objective mathematical description, too. For the sake of this experiment, we isolated two sectors of the best preserved parts of the drapery, the floating strip on the side of the left leg (FIGS. 8-9) and the richly folded surface of the apoptygma below the belt (FIGS. 10-11). The most difficult task was to find a sufficiently long sector, which is equally well preserved on both statuettes and follows the same pattern, so as to permit to define two sections that would represent, ideally, the same part of the *scheme*. Hereby we present one linear section taken from the folds of the left side, cut directly above the knee (Appendix 2. 1), and a section of the apoptygma, taken from the zone below the belt (Appendix 2. 2).

The comparison of these two lines confirms what we have observed by eye



FIG. 8. Digitized model of the acroterion inv. 159, detail of drapery on the left side.



FIG. 9. Digitized model of the acroterion inv. 161, detail of drapery on the left side.

here above, in the summary description of the two characteristic treatments of draperies. The fluent outlines and thicker volumes of inv. 159 can be distinguished from the more fragmented surfaces of inv. 161 also in the curves of the section lines: larger, more balanced and rounded on the left, and crispy on the right.

SOME REMARKS
ON THE POSSIBILITIES
OF INTERPRETATION

The observations described above, helped by the measurements and visual interpretation of volumes executed on digitized 3D models, allow us to confirm what has been formulated at the beginning as a working hypothesis: the two acroteria of the Temple of Artemis seem to have been realized by two different sculptors, who worked following one scheme, meticulously elaborated for the representation of the same kind of figure, corresponding to the same

iconographical type. The profound divergence in the treatment of minor folds, in the stylization of the face and in the use of optical corrections suggest that the two individuals had had different training, in other words, they came from different milieus, even if both belonged naturally to the world of late classical or proto-Hellenistic Greek art. We cannot decide if one of them was also the designer of the scheme imposed on them for the Nike acroteria or he was a third person, someone responsible for the planning of the whole decoration of the temple, who did not carve any of the sculptures personally. Both possibilities can be taken into account, also because the execution of the two figures, with no regard to their differences, bears evidence of high quality craftsmanship, as well as of personal artistic sensibility. On the other hand, the recognition of the fact that one artistic concept (the scheme of our Nike acroteria) could have been executed by two collaborators with such a



FIG. 10. Digitized model of the acroterion inv. 159, detail of drapery on the chest.



FIG. 11. Digitized model of the acroterion inv. 161, detail of drapery on the chest.

degree of difference shows how difficult it is to capture the artistic personality of the main designer, *i.e.*, the leading master of a workshop working on a temple decoration, even in the case of a smaller monument, like this temple. In any case, the experiment shed some interesting new light on the working method of such workshops. One of the next connected questions should concern a more precise understanding of the mechanisms of creation, from the elaboration of the scheme (in the form of drawings, three dimensional models or both?) to the method of reproduction, which allowed collaborators to realize it with some degree of personal freedom.

Our experiment can be regarded also as a successful attempt at the isolation of diagnostic elements, likely to help recognizing different hands of sculptors. It has to be noted, however, that in the case of the two acroteria the analysis of minor sectors, susceptible to reveal personal differences, was permitted by a firm common base: the identical scheme of the two statuettes, which seems to have been so strictly regulatory as to determine even the number of folds on the sides of the legs. Within

this well-defined framework we were able to isolate corresponding sectors, and reveal important differences of detail. This means that the method promises a good possibility of relevant observations in all those cases, where we have to do with intentional reproductions of the same model. The question arises, however, whether a similar mathematical interpretation of forms is possible in the case of sculptures that follow different patterns, where the definition of comparable areas can be more arbitrary.

Finally, the logical distinction between the designer of the complete system of decoration and the executors of his models warns us about a fundamental problem of interpretation. It shows, in fact, that the diagnostic method based on the meticulous recognition of typical features on the basic level of material execution can provide a good amount of information about the individual who was responsible for the actual carving, but can be misleading as far as the author of the general design is concerned. As a rule, it can be stated that the description of the *execution* level can be relevant only in those cases, when we can be assured to have

to do with a sculpture wholly executed by the designer himself. In the case of temple decorations, this kind of direct personal involvement is naturally not to be excluded, however it is too accidental to be relied upon, or at least needs to be confirmed by valuable additional arguments.

ACKNOWLEDGEMENTS

The researches presented in this article were carried out in the framework of a project financed by the Hungarian National Research Fund (OTKA ref. no. NF 101755). We are thankful to the Greek Ministry of Cultural Heritage and to the direction of the National Archaeological Museum of Athens for having authorized the scanning of the sculptures. A particular acknowledgement is due to Dr. Despina Ignatiadou, Head of the Department of Sculpture for her precious help.

REFERENCES

- BENCZE Á. 2015, *An experiment in stylistic analysis by comparison of virtual 3D models: the Palagi Head in Bologna and Vincenzo Gemito's 'Efebo'*, «Marmora», 11, 81-90.
- CAVVADIAS P. 1893, *Fouilles d'Épidaure*, Athènes,
- DINSMOOR W. B. 1975, *The architecture of ancient Greece: an account of its historic development*, New York.
- ΓΙΑΛΟΥΡΗΣ Ν. Φ. 1967, *Τα ακρωτήρια του ναού της Αρτέμιδος*, «Αρχαιολογικόν Δελτίον» 22, Α', 23-37.
- GOULAKI-VOUTIRA A. 1992, s.v. Nike, in *LIMC* [= *Lexicon Iconographicum Mythologiae Classicae*], Zürich-München, vi, 850-883.
- KALTSAS N. 2002, *Sculpture in the National Archaeological Museum*, Athens.
- PATAY-HORVÁTH A. 2016, *Master-hand Attributions of Classical Greek Sculptors by 3D-Analysis in Olympia – Some Preliminary Remarks*, in *CAA 2015: Proceedings of the 43rd Annual Conference on Computer Applications and Quantitative Methods In Archaeology*, ed. by S. Campana, R. Scopigno, G. Carpentiero, M. Cirillo, Oxford, vol. 1, 329-336.
- STUDNICZKA F. 1898, *Die Siegesgöttin. Entwurf der Geschichte einer antiken "Idealgestalt"*, Leipzig.
- THÖNE C. 1999, *Ikonographische Studien zu Nike im 5. Jahrhundert v. Chr. Untersuchungen zur Wirkungsweise und Wesensart*, Heidelberg.

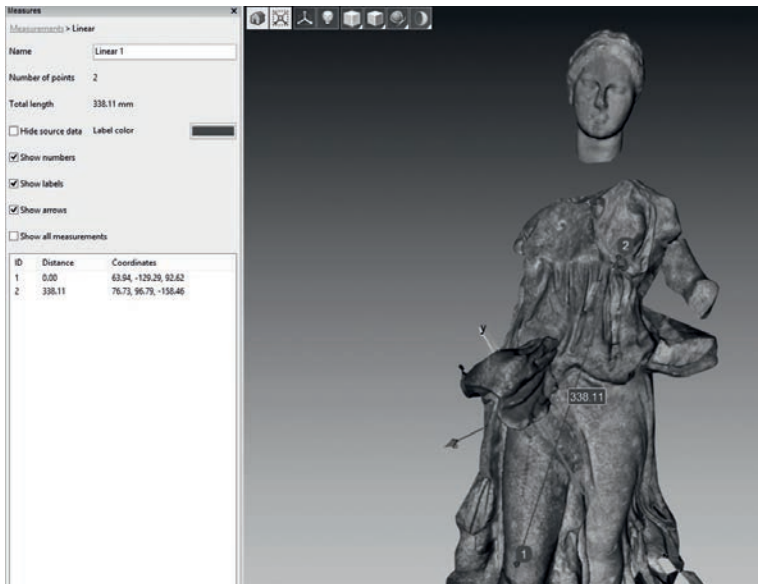
APPENDIX

1. MEASUREMENTS

1.1. Height

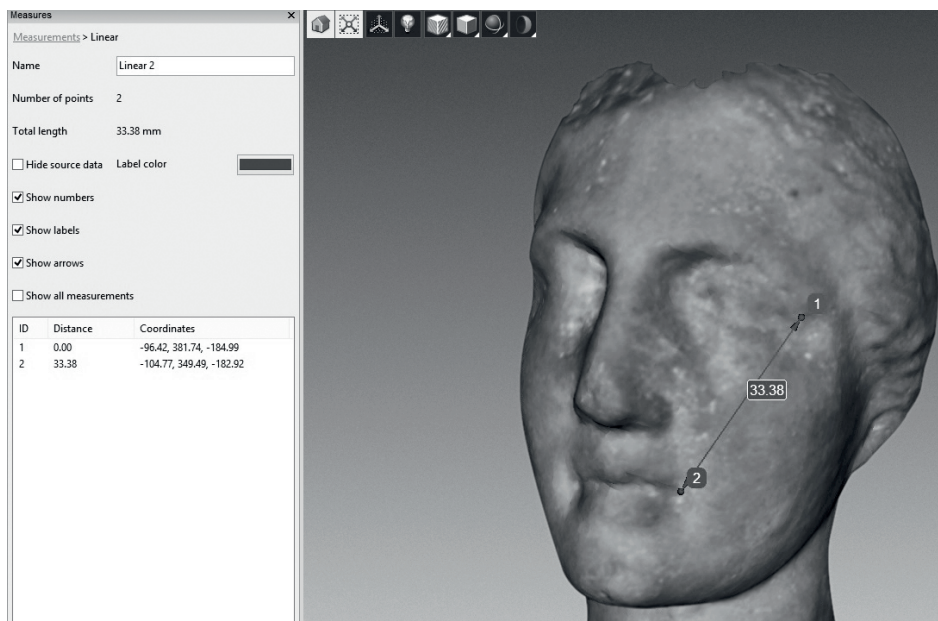


Athens, Nat. Mus., inv. 159: 32.7 cm.

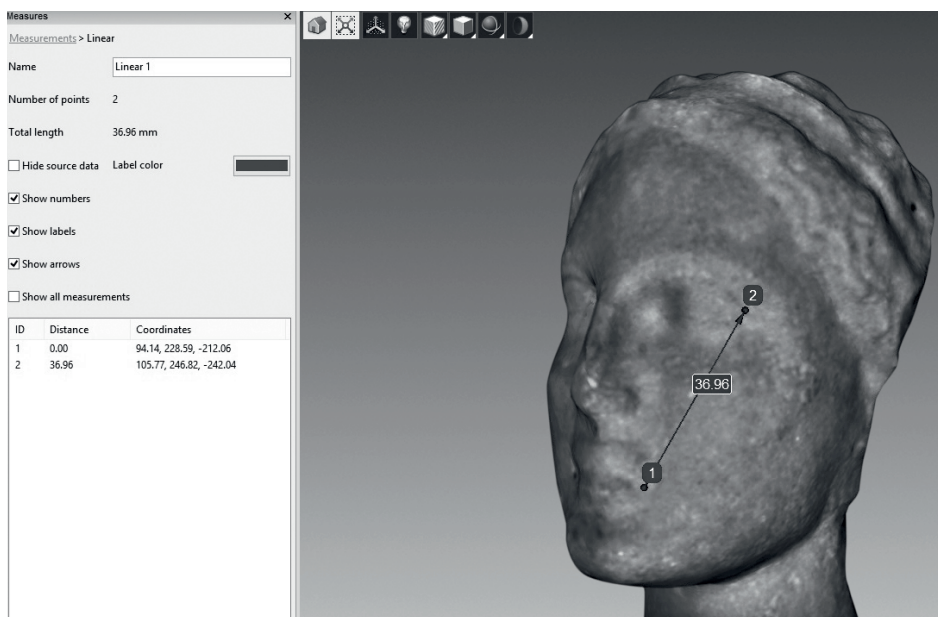


Athens, Nat. Mus., inv. 161: 33.8 cm.

1.2. Height of face

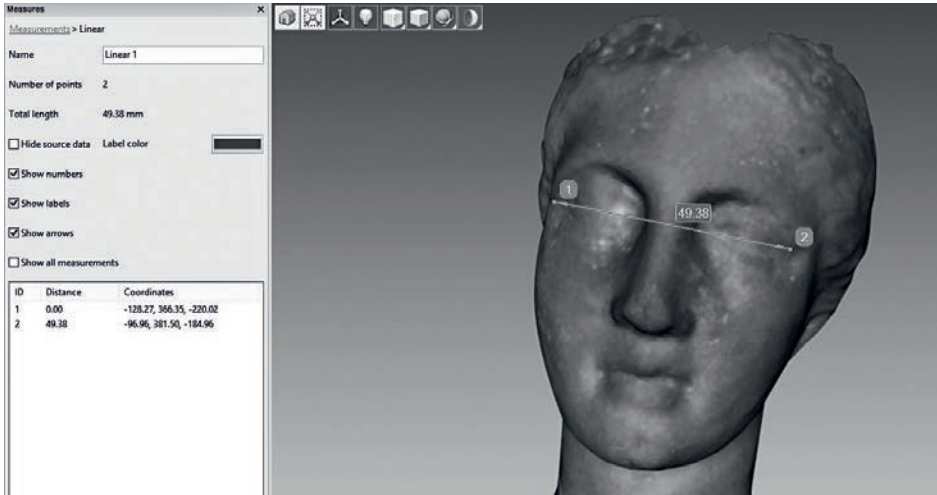


Athens, Nat. Mus., inv. 159: 3.38 cm.

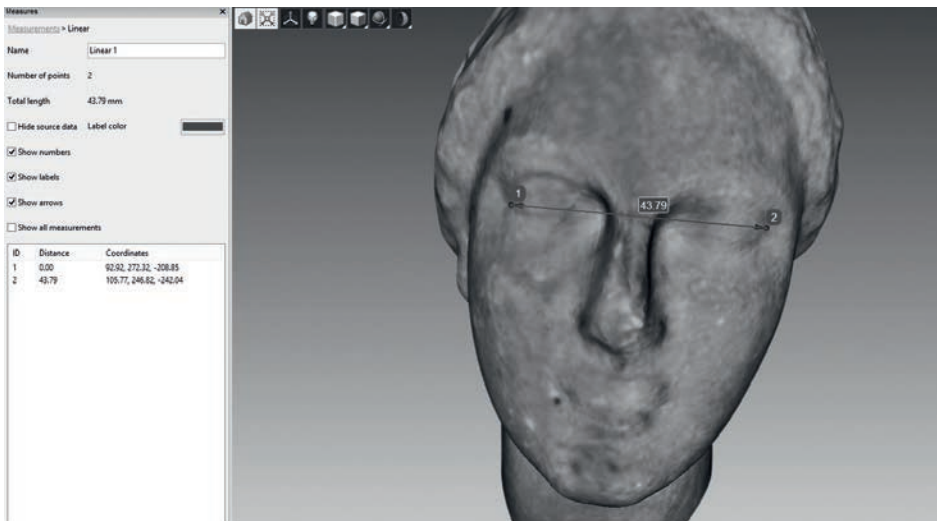


Athens, Nat. Mus., inv. 161: 3.69 cm.

1.3. Distance of the eyes

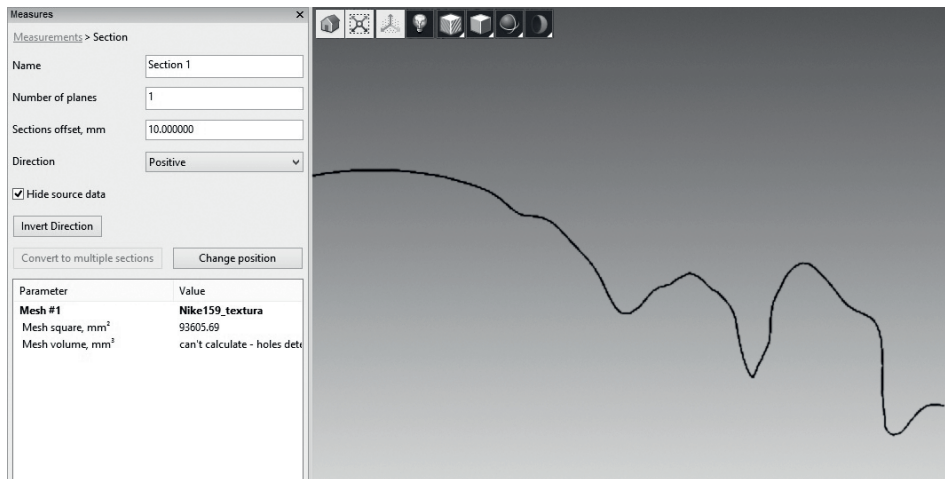


Athens, Nat. Mus., inv. 159: 4.93 cm.

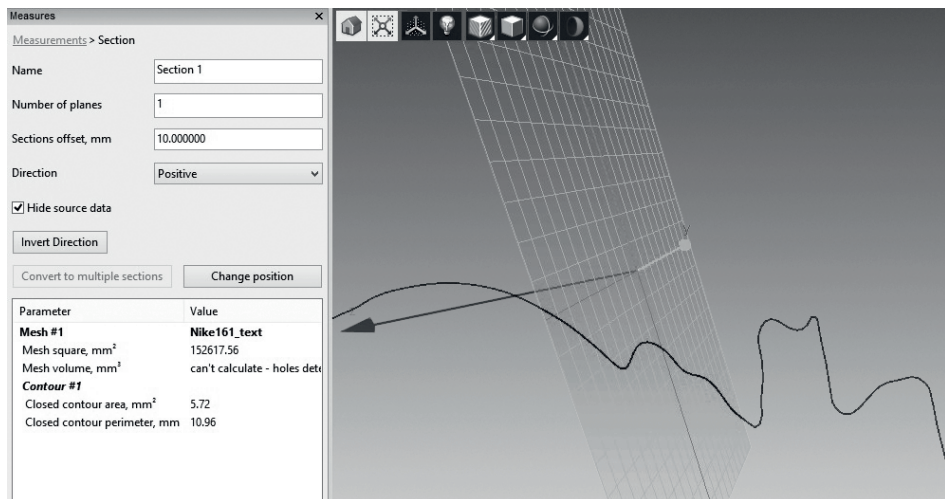


Athens, Nat. Mus., inv. 161: 4.37 cm.

2. DRAPERY FOLD SECTIONS

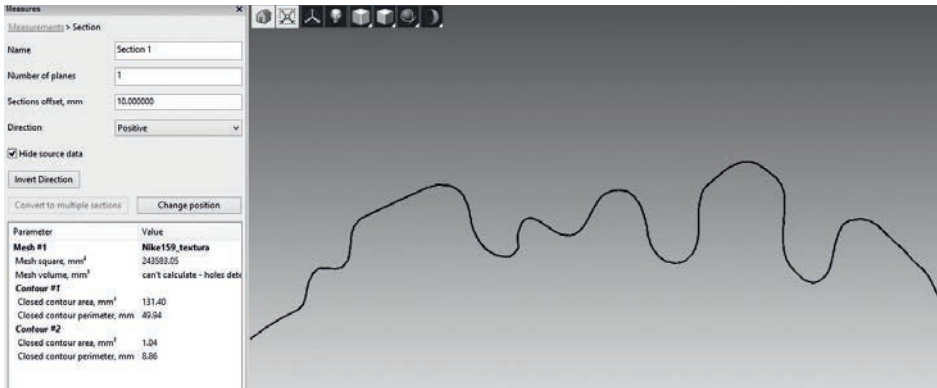
2. 1. *Floating drapery on the left side, folds directly above left knee*

Athens, Nat. Mus., inv. 159.

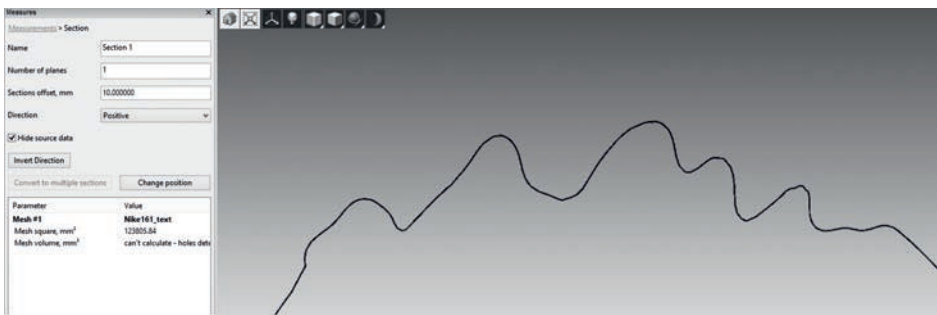


Athens, Nat. Mus., inv. 161.

2. 2. Folds of the belt zone



Athens, Nat. Mus., inv. 159.



Athens, Nat. Mus., inv. 161.

COMPOSTO IN CARATTERE SERRA DANTE DALLA
FABRIZIO SERRA EDITORE, PISA · ROMA.
STAMPATO E RILEGATO NELLA
TIPOGRAFIA DI AGNANO, AGNANO PISANO (PISA).

★

Maggio 2017

(CZ 2 · FG 21)



Tutte le riviste Online e le pubblicazioni delle nostre case editrici
(riviste, collane, varia, ecc.) possono essere ricercate bibliograficamente e richieste
(sottoscrizioni di abbonamenti, ordini di volumi, ecc.) presso il sito Internet:

www.libraweb.net

Per ricevere, tramite E-mail, periodicamente, la nostra newsletter/alert con l'elenco
delle novità e delle opere in preparazione, Vi invitiamo a sottoscriverla presso il nostro sito
Internet o a trasmettere i Vostri dati (Nominativo e indirizzo E-mail) all'indirizzo:

newsletter@libraweb.net

★

Computerized search operations allow bibliographical retrieval of the Publishers' works
(Online journals, journals subscriptions, orders for individual issues, series, books, etc.)
through the Internet website:

www.libraweb.net

If you wish to receive, by E-mail, our newsletter/alert with periodic information
on the list of new and forthcoming publications, you are kindly invited to subscribe it at our
web-site or to send your details (Name and E-mail address) to the following address:

newsletter@libraweb.net

Rivista annuale · *A yearly Journal*

*

Indirizzo redazione scientifica · *Scientific Committee Address*
LORENZO LAZZARINI · L.A.M.A. (Dip. di Storia dell'Architettura),
Università I.U.A.V., San Polo 2468, I 30125 Venezia, tel. + 39 041 2571413, -459,
fax +39 041 2571434, lorenzo@iuav.it

*

Amministrazione e abbonamenti · *Administration & Subscriptions*

FABRIZIO SERRA EDITORE®, Pisa · Roma

Casella postale n. 1, Succursale n. 8, I 56123 Pisa,
tel. +39 050 542332, fax +39 050 574888, fse@libraweb.net

Uffici di Pisa: Via Santa Bibbiana 28, I 56127 Pisa, fse@libraweb.net

Uffici di Roma: Via Carlo Emanuele I 48, I 00185 Roma,
tel. +39 06 70493456, fax +39 06 70476605, fse.roma@libraweb.net

I prezzi ufficiali di abbonamento cartaceo e Online sono consultabili
presso il sito Internet della casa editrice www.libraweb.net.

*Print and Online official rates are available
at Publisher's website www.libraweb.net.*

I pagamenti possono essere effettuati tramite versamento su c.c.p. n. 17154550
o tramite carta di credito (*American Express, Visa, Eurocard, Mastercard*).

*

Autorizzazione del Tribunale di Pisa n. 11 del 15 · 04 · 2005
Direttore responsabile: FABRIZIO SERRA

A norma del codice civile italiano, è vietata la riproduzione, totale o parziale (compresi estratti, ecc.), di questa pubblicazione in qualsiasi forma e versione (comprese bozze, ecc.), originale o derivata, e con qualsiasi mezzo a stampa o internet (compresi siti web personali e istituzionali, academia.edu, ecc.), elettronico, digitale, meccanico, per mezzo di fotocopie, pdf, microfilm, film, scanner o altro, senza il permesso scritto della casa editrice.

Under Italian civil law this publication cannot be reproduced, wholly or in part (included offprints, etc.), in any form (included proofs, etc.), original or derived, or by any means: print, internet (included personal and institutional web sites, academia.edu, etc.), electronic, digital, mechanical, including photocopy, pdf, microfilm, film, scanner or any other medium, without permission in writing from the publisher.

Proprietà riservata · All rights reserved

© Copyright 2017 by *Fabrizio Serra editore*®, Pisa · Roma.

Fabrizio Serra editore incorporates the Imprints *Accademia editoriale*,
Edizioni dell'Ateneo, *Fabrizio Serra editore*, *Giardini editori e stampatori in Pisa*,
Gruppo editoriale internazionale and *Istituti editoriali e poligrafici internazionali*.

Stampato in Italia · Printed in Italy

www.libraweb.net

ISSN 1824-6214

ISSN ELETTRONICO 1826-8072

SOMMARIO

SAGGI

- PATRIZIO PENSABENE, *Egyptian stones from the Eastern Desert and Aswan: the role of Alexandria in their trade* 11
- GIUSEPPE SCARDOZZI, *Marmi, alabastri e brecce policrome della Frigia sudoccidentale: cave, utilizzi, diffusione e aspetti archeometrici dei materiali lapidei di pregio dei territori di Hierapolis, Laodicea e Tripolis* 65
- ÁGNES BENCZE, PÉTER GYURIS, *Type, scheme and execution: three basic concepts for the definition of a personal style. An experiment helped by virtual 3D-model analysis* 121

NOTE E DISCUSSIONI

- ALI KHALIL BADAWI, *The ancient sources of building stones for the city of Tyre/Sur (Lebanon)* 141
- CATERINA PREVIATO, *La cava di Perd'e Sali (Villa San Pietro, Sardegna meridionale): nuovi dati* 159

RECENSIONI

- Patrizio Pensabene, Eleonora Gasparini (eds.), *ASMOSIA X, Interdisciplinary Studies on Ancient Stones* (Lazzarini) 177
- CATERINA PREVIATO, *Nora. Le cave di pietra della città antica* (Lazzarini, Van Molle) 178
- VILMA RUPPIENE, *Natursteinverkleidungen in den Bauten der Colonia Ulpia Traiana* (Lazzarini) 181