



View of the restored temple of Athena Nike from the E. Photo T. Souvlakis, 2010

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2010 – 2011, The progress of restoration on the Acropolis

Completion of the restoration of the Athena Nike temple was one of the most important events that marked the second half of 2010 on the Acropolis.

Intervention on the temple had started in 1998 with the removal of the frieze blocks of the temple and their transfer to the Museum and it was continued from 2001 on with the dismantling of the entire monument. The study for the intervention was carried out by D. Giraud. Head of the work was the civil engineer D. Michalopoulou, while the architect K. Mamalougas made all the necessary supplementary architectural studies. E. Lembidaki, archaeologist, was responsible for the documentation. Head of the work team was the experienced marble technician, L. Zacharopoulos.

The purpose of the intervention was to remove the oxidised iron reinforcements of the previous restoration from 314 architectural members of the temple and to restore the structural integrity of the fragmentary blocks. Yet after dismantling the temple it was found necessary to extend the intervention to the members of the poros shrine that was preserved in the basement below the marble temple.

In the course of research on the dismantled architectural members, new evidence emerged that led to the rearrangement of the cella wall blocks and the Ionic column capitals of the temple, after studies made by K. Mamalougas. This also provided the opportunity to identify and reset on the

monument scattered fragments, and even whole architectural members that had been used in the earlier interventions. Finally, D. Giraud made a supplementary study for the restoration of the pediment, the cornices and the sima of the temple, with considerable use of new marble.



View of the restored temple of Athena Nike from NE. Photo T. Souvlakis, 2010

After approval by the Central Archaeological Council (KAS), the study was applied to the temple. This increased the amount of physical work, thereby extending the time it took to complete it.

After completing the intervention on the ceilings of the Propylaea in December 2009 and the north side of the Parthenon in May 2010, the efforts of the Service were devoted to completing the restoration work on the temple of Athena Nike. From May 2010 to the end of July, with the collaboration of the personnel of all the Acropolis worksites, the copies of the frieze blocks were adjusted and set in their definitive positions and part of the east pediment, the cornices and sima of the temple were restored with fillings of new marble. Incorporated in the sima blocks made of new marble were ancient

fragments that had survived; five lion heads were carved anew. In August 2010, in a coordinated operation in which personnel from all the worksites collaborated, with the supervision of S. Oikonomopoulos, the monument was cleared of the scaffolding system by means of bridge-cranes. The west side of the Acropolis was presented to the public, with the Propylaea and the temple of Athena Nike entirely free of scaffolding.

With the restoration of the temple of Athena Nike the great programme of restoring the Acropolis monuments, which had begun in 2000 with funding from the 3rd Community Support Framework, was completed. In more recent years, however, new studies

have been carried out so as to begin interventions in areas of the monuments where structural problems are evident. The YSMA, with the necessary administrative capacity, responded to the request of the Region of Attica by submitting a complete proposal to include the new interventions on the monuments, with funding from the National Strategic Reference Framework (NSRF). The funding, which was approved by the programme “Attica 2007-2013” comes to 8,000,000 €. The decision to apply it was announced in December 2010, but preparation in the YSMA worksites was already under way some months earlier.

The new funding made it possible to take on more personnel for accomplishing the works included in the NSRF programme. Recruited, therefore, after a strict selective



*View of the Parthenon after beginning the works of restoring the west side.
Photo M. Ioannidou, 2011*

procedure, were five civil engineers, one architect, five archaeologists, one electrical engineer, one rural and surveying engineer, four conservators, ten marble sculptors, and seven work technicians. Included among those chosen are also a number of the old colleagues of YSMA, experienced engineers and marble sculptors whose terms of employment had expired in June 2009. Among the new personnel of the YSMA is the chemical engineer E.

Aggelakopoulou who was detached from the Directorate of Restoration Technical Research, so as to assume the position of head of the Surface Conservation Section of the YSMA, after the retirement of the chemical engineer E. Papakonstantinou.

The new work period includes an extensive programme on the Parthenon. Head of the work of restoring the Parthenon is the architect N. Toganidis. Among the

personnel of the project are the architects V. Eleftheriou, V. Manidaki, E. Lambri-nou, and A. Papandropoulos. E. Karakitsou, archaeologist, is in charge of documentation of the Parthenon restoration. The marble sculptors are headed by G. Aggelopoulos and D. Phoskolos. The scientific personnel of the programme was augmented after May 2011 with the addition of the architect K. Skaris, the civil engineers A. Vrouva, V. Palieraki, V. Delizisi, I. Konteas and the archaeologist E. Mimidou.

The most important work on the Parthenon is the intervention on the west side of the monument, which was restored by N. Balanos during the first period of anastelosis of the Parthenon (1898-1902). The purpose of the new intervention is to cope with the serious structural problems and deformations in that part of the monument that are due to the destructions of the past, to the previous anastelosis, and also to earthquakes that have struck the monument. Moreover its purpose is the restoration of the monuments appearance by including in the monument a number of architectural members made of new marble. The study for this intervention has been carried out by the architects V. Eleftheriou and V. Manidaki. Included in the programme for 2011-



*Suspension of a section of the base of the northwest Parthenon akroterion.
Photo V. Eleftheriou, 2011*



Dismantling the base of the southwest Parthenon akroterion. Photo V. Manidaki, 2011

2013 is intervention on the two corners of the west side, which includes, in accordance with the study, the dismantling of a total of 80 architectural members. To begin with, the dismantling will be carried out in the areas in which N. Balanos intervened in 1902. It will, however, be extended as far as the architrave blocks of the corner intercolumniation, the breaks in which were at that time repaired with large iron reinforcements that were placed on the façade of the monument. Programmed likewise is the structural restoration of the column capitals and one more architrave block. Planned also for this same phase is the dismantling from the two corners of the monument of a total of 6 metopes and their transport to the Acropolis Museum for their protection. Accurate copies of artificial stone will replace them on the monument. The addition of 6 new blocks in spaces that were left in the upper course of the two corners (cornices and tympanon blocks) are expected to strengthen the building structurally. Surface conservation will be carried out on all blocks to be disman-



Lowering the northwest corner cornice block of the Parthenon. Photo V. Eleftheriou, 2011

The subject of hoisting equipment to be used in the intervention was examined in detail, in order to facilitate the work with the least possible aesthetic interference, as the west side of the Parthenon provides

the main view of the temple, dominating as it does the landscape of the Acropolis. It is a view of the Parthenon that should not be obstructed by scaffolding for any great length of time. It was decided to transfer and install the Potain crane, which had been used in the work on the north side of the Parthenon, in the west side of the monument. The crane rests on a surface foundation of reinforced concrete on the rock itself in a suitable position north of the north façade of the Parthenon extending to the middle of the west area. When not in use the crane folds up, in order to lessen aesthetic interference with the monument. Construction of the foundation and the installing of the crane –with the help of the Derrick crane installed inside the monument– was carried out in the fall of 2010 by an outside group collaborating with the Service.

The tasks of dismantling began with the NW corner of the monument on May 20 and, by the June 29, 17 blocks had been lowered (the acroterion base, the pan-tile with antefix, 3 blocks of the raking sima,



Carving the flutes of the columns in the north colonnade. Photo V. Vlachou, 2011



Working on the flutes of the fifth from E column in the north colonnade. Photo M. Ioannidou, 2011



View of the south wall of the central building of the Propylaia, while resetting the blocks of the 19th course. Photo K. Karanasos, 2011

among them the corner block of the raking sima that is in one piece with the lion-head pseudo-spout, 5 lateral cornice blocks and the end block of the tympanon backing wall, 2 blocks of the tympanon backing wall, a tympanon orthostate and 3 lateral cornice blocks).

In order to find out the extent of shifting that might have occurred in the corner columns and in the 4th column of the west side while lessening the load in the process of dismantling, a monitoring system was installed with optical fibre sensors.

Together with the work on the west side, work is proceeding on restoring the orthostates of the north wall of the cella. The programme of 2011-2013 calls for the restoration of 15 ancient blocks of the exterior course. They are to be reset in their definitive positions after their structural restoration. Only one ancient block from the interior orthostate course has been identified. The others will be made of new marble for the positions where they are needed for supporting the overlying section of

the wall, to be restored in the succeeding programme.

Included also in the Parthenon works is completion of the carving of the flutes in the new marble supplements of six columns of the Parthenon north colonnade. This consists of the final working of the surfaces of the new marble drums and



Resetting a cornice block on the south wall of the Propylaia. Photo K. Karanasos, 2011

it requires high specialisation and skill on the part of the marble sculptors.

Finally, work is beginning on the restoration of the lintel of the cella west wall, which had been restored by N. Balanos. In this phase, the two interior beams, parts of which are preserved, will be restored and filled in with new marble.

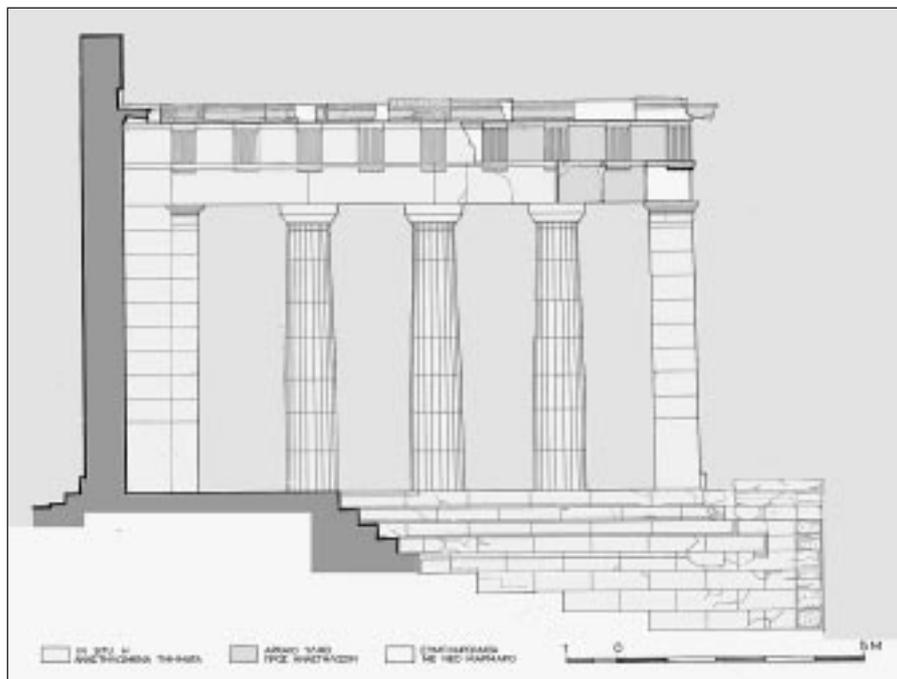
In the Propylaia, immediately after restoration of the ceilings of the central building was completed, the programmes for restoring the south wall of the central building and the south wing of the monument were prepared. Until his retirement in December 2010 the architect T. Tanoulas was the head of the Propylaia restoration project. In May 2011, added to the scientific personnel of the project, K. Karanasos, architect, and E. Petropoulou, archaeologist, were the experienced civil engineer V. Papavasileiou and the archaeologist K. Koutsadelis.

The programme to restore 19 blocks of the south wall of the central building, in accordance with the study by the architect K. Karanasos, began in March 2011. Previously, preference had been given to

the structural restoration of 16 ancient architectural members that were finally restored to the south wall. For the needs of the programme, two wall blocks and a crown block to replace the one exhibited in the British Museum, were made in new marble. The programme is expected to be finished at the end of September 2011.

The programme for the south wing of the Propylaia comprises the restoration of ancient material lying on the ground to its authentic position. This material had, during the 15th century, been incorporated in the tower built by the Florentines in the south wing. After the tower was taken down in 1875, the ancient material of which it consisted was studied by many researchers (Bohn, Dörpfeld, Wood and Dinsmoor). During the decades of the 1940's and 1950's (1946-1954 and 1957-1960), Anastasios Orlandos restored a column, two antae and their overlying architrave blocks to the south wing of the Propylaia.

The architectural study for the restoration of the south wing was made by T. Tanoulas. The study called for the



Proposal for the restoration of the south wing of the Propylaia: north side of the colonnade. Drawing T. Tanoulas, 2010

restoration in their authentic positions of 50 architectural members, the authentic material of which varies from 60 to 100%, while the total amount of ancient material to be restored would amount to 90%. One architectural member (a frieze block from the west façade) was to be made entirely of new marble. The

present writer and V. Papavasileiou studied in particular the static efficiency of the previous restoration, so as to determine if it needed to be dismantled. The technical study that was carried out showed that Orlandos' restoration was statically efficient, since the reinforcements that were used are made of stainless steel and bronze and there was no evidence of cracking or breaks. There are reservations, however, about the architrave blocks of the north and west sides, because the procedure of combining the fragments into an architectural member that was applied in the past is counter to the principle of preserving the original structural function of the architectural members and thus imposes their dismantling.

Special discussion centred on the great tile of the south niche between the central building and the south wing, a unique architectural member 4.50 m. in length and weighing 7.5 tons. The fragments of the member that were found enabled T. Tanoulas to make a complete graphic restoration. The Committee for Conserva-



Working on a filler in a geison block of the south wing of the Propylaia. Photo K. Karanasos, 2011

tion of the Acropolis Monuments (ESMA) reserved examination of both the reconstruction of the gigantic monolithic tile of the south niche and the possibility of roofing the south wing, in the context of future programmes.

The restoration of the south wing with architectural members that are reset in their original position will contribute to better preservation of the architectural members, to the architectural completeness of the monument and, thus, to its readability. It will, moreover, strengthen the response of that part of the monument to possible earthquake, since it restores the connection of the north colonnade of the wing with the northwest anta.

The study of the south wing was approved by both the ESMA and the Central Archaeological Council. Already under way is the structural restoration of architectural members that are to be reset on the monument (joining of fragments belonging to the same architectural member, joining of two supplements of new marble to ancient fragments, the making of six casts for new supplements, the pointing of new marble supplements). The bridge crane that will support the restoration will be constructed in October 2011, after removal of the bridge crane of the south wall.

In the area of the temple of Athena Nike, after completion of the restoration, works are proceeding with funds from the NSRF in order to remove the worksite installations, clear the area surrounding the temple, form an approach for visitors to a place from which to view the temple, and to improve the protection and function of the area beneath the temple with the archaic shrine. The metallic shed housing the machinery for cutting marble has already been dismantled and removed from the area of the temple of the Brauronian Artemis. Likewise dismantled, in order to be restored, are four crown blocks

of the bastion that had been composed of various fragments in the previous restoration. It had not been possible to remove them until now as they supported the scaffolding used in the intervention. After removal of clamps and cement mortar, one of the ancient fragments was attributed to the south crown, and supplements of new marble are being made to fill in these stones.

Surface conservation of the marble was continued during the past year with the

carried out likewise on the upper resting surface of 17 members of the north toichobate.

In the Propylaea, under the direction of the conservator K. Frantzikinaki, systematic conservation was carried out on the members of the south wall of the central building and the south wing, and also on the upper surface of 11 architectural blocks in situ, on which the blocks of the south wall are to rest. In addition, a drum of the first column from the north in the



Joining belonging fragments to a member of the north crown of the Athena Nike bastion. Photo D. Michalopoulou, 2011

chemical engineer E. Papakonstantinou in charge –until December 2010– then, from March 2011, headed by chemical engineer E. Aggelakopoulou.

On the Parthenon, with the conservator A. Panou in charge, rescue conservation was carried out on the west side of the monument. Specifically, intervention focused on the architectural members of the superstructure of the NW and SW corners, which are to be removed, and on the metopes and triglyphs of the west side which are to be dismantled from the monument. Systematic conservation was

west side of the monument is undergoing conservation. Conservation of the north section of the floor of the east stoa is to begin immediately, in accordance with the study by K. Frantzikinaki.

In the temple of Athena Nike, the north crown blocks and orthostates of the west wall underwent systematic surface conservation.

In the Erechtheion, the conservator G. Frantzi was in charge of systematic conservation of the interior side of the west wall of the cella. Cleaning of the

coffered ceiling of the south wing was continued by means of laser, while its appearance benefited from the removal of the old mortar that covered a large part of the ceiling. In process too is the special photography that is revealing the existence of ancient colour (Egyptian blue) on the four sides and the grounds of the 40 coffers.

The Surface Conservation Section also removed the sealing mortar of the preceding interventions from the poros triglyph (AE 21432) of the archaic Parthenon. It has completed documentation of the conservation performed and of the new evidence that has been discovered on the blocks of the west frieze of the Parthenon, after cleaning with laser.

Documentation of the Scattered Architectural Members, headed by the archaeologist E. Sioumpara, was continued during the past year with recording, photography and classification of 669 fragments of members out of a total of 1000 from the pile of the Arrephorion. In order to mend the fragments of the poros architectural members that had been identified during

the previous year, research was carried out to find a suitable mortar, in collaboration with the Surface Conservation Section and N. Maravelaki, Professor at the Technical University of Crete. Work on joining the fragments is to begin immediately in the old Acropolis Museum in a space made available by the 1st Ephorate of Prehistoric and Classical Antiquities. E. Salavoura archaeologist at the Documentation Office joined the technical office of the Scattered Architectural Members in June 2011.

During the past year, photogrammetric survey of the Acropolis monuments was continued by the rural and surveying engineer, D. Mavromati. Orthophotomosaics were produced of the groundplans of the north and south corners of the west side of the Parthenon, the groundplan of the west wall of the Parthenon cella, and the two views (east and west) of the lintel in the wall. Recently the project has been extended to include survey with a laser scanner by the new YSMA rural and surveying engineer, A. Valani. Likewise under way is preparation for public tender for the extensive photogrammetric surveying of the monuments, which has been



Cleaning of the coffered ceiling of the Caryatid porch with laser. Photo G. Frantzi, 2011

incorporated in the NSRF and includes photogrammetric surveys of areas of the Parthenon, the Propylaia and the temple of Athena Nike.

In the framework of documentation of the interventions, the Documentation Office, headed by the archaeologist E. Lembidaki, continued throughout the year to record the evidence from the restoration in the YSMA database. Activities were intensified during this last period by the recruitment of new archaeologists who were installed in the offices of the Parthenon, the Propylaia and the Section of Scattered Architectural Members. They are mentioned above. The services of two more colleagues, the archaeologists M. Katsianis and V. Vlachou have been added to the office of the central archive. Among the works of the past year are, in addition, the publication of a special issue on the works of restoration, the publication of the Acropolis Restoration News of the YSMA, containing the proceedings of the one-day seminar entitled “Modern technologies in the restoration of the Acropolis”. At the same time, the Documentation Office is preparing an informative leaflet on the Acropolis works and panels giving information about the works in the archaeological site.

Photographic documentation of the works is being carried out systematically by an YSMA photographer. S. Mavrommatis was the head of the Photographic Laboratory until his retirement in November 2010.



Surface conservation of the northwest column in the central building of the Propylaia. Photo K. Frantzikinaki, 2011



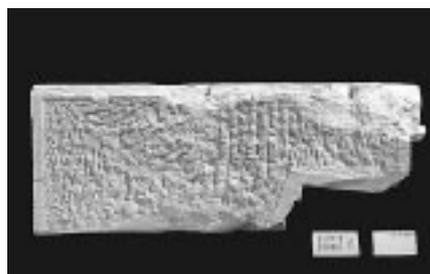
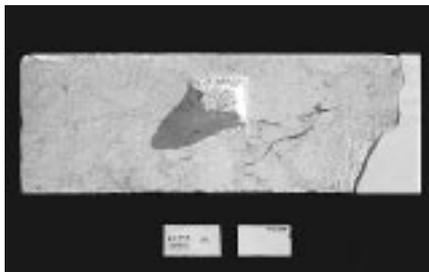
*Three-dimensional scanning of a column capital of the archaic Parthenon.
Photo E. Sioumpara, 2011*

Since then, systematic photography of the works is being done by T. Souvlakis.

Throughout the entire past year the contribution of the YSMA Electromechanical Support Team has been of great importance. The team is headed by the electrical mechanical engineer S. Oikonomopoulos, who provided the support necessary for the works, with the monitoring of the elec-

tro-mechanical installations of the YSMA. The team has recently been increased with the recruitment of the electrical and computer engineer D. Zois.

The Education and Information Department of the YSMA continued its activity, which is described in detail both in the chapter "News from the Acropolis" in the present issue, and in the chapter "New



*Special photography of architectural members of the Propylaea and the Parthenon.
Photo T. Souvlakis, 2011*

Activities and Publications of the Information and Education Department", co-authored by the head of the Department, C. Hadziaslani, architect-archaeologist and the archaeologists E. Kaimara and A. Leonti.

The contribution of the YSMA Accounting Office, headed by P. Katsimichas, was indeed substantial in the financial closing of the YSMA work that was funded by the 3rd Community Support Framework, and in logistical preparation and monitoring of the work of the YSMA with the NSRF. Equally important was the contribution of the ESMA Secretariat, with Ch. Papanikolaou in charge.

The past year saw the beginning of a new phase in the restoration of the Acropolis monuments. In this new phase the YSMA is proceeding with the restoration of the monuments, guided by the knowledge and experience gained in the previous interventions, and following the proven methodology that has assured the high quality of the work completed. The connection with research and the achievements of contemporary technology is continuous, thus assuring the development and improvement of the procedures of study, accomplishment and organisation in the works of restoration. Herein is the school of the contemporary Hellenic approach to restoring the monuments of classical antiquity, which is internationally recognised.

Maria Ioannidou
Civil Engineer
Director of the YSMA

The restoration programme of the temple of Athena Nike: brief evaluation

A. General

The work of restoration on the temple of Athena Nike was completed in September 2010. The total duration of the restoration project was 10 years and it is the third in the history of the temple. It was preceded by the work spanning the years 1835 - 1845, carried out by L. Ross, Ch. Hansen, E. Schaubert and K. Pittakis –the first anastolosis of a classical monument in the new Hellenic state– and by those during the period 1935-1940 by N. Balanos and A. Orlandos, which in addition to the temple, were extended to include the entire underlying bastion.

The monument, one of the most important of classical antiquity, had disappeared because it was dismantled by the Turks on the eve of Morosini's attack (1687). It was indeed saved by the restorations noted above, which gave it the form that was preserved up to our times. The methods employed, however, while acceptable then, with the passage of time have caused problems necessitating a new restoration.

The programme for restoring the temple anew began in October 2000, in accordance with the study made by the architect D. Giraud. During the course of the work problems arose that could not be resolved before dismantling the temple and studying its architectural members. Supplementary studies were therefore needed and these were carried out either by the same architect or by the supervising engineers of the work, signers of the present article. The problems of the monument were handled

within the framework of the principles applied by the YSMA to all the Acropolis monuments. Apart from the general problems common to all the monuments, however, special mention should be made of the difficulties of this specific programme. These can be summarised as follows:



View of the temple from the East. Photo. T. Souvlakis, 2011

- The monument was dismantled and then rebuilt in its entirety. Intervention on an entire classical temple creates additional difficulties as opposed to interventions that are limited to specific areas of a monument much of which still remains in situ.

- The restoration in the past of the architectural members of the monument to incorrect positions and in addition –during the first restoration– on a krepis that was deformed because of subsidence, led to re-

peated cutting of the architectural members, which altered their original measurements.

- The existence of an underground space beneath part of the temple overthrew the basic principle of founding the monument on compact foundations and required the invention and application of entirely original solutions. These works, moreover, extended the area of intervention –beyond the classical temple– to include also the poros shrine and part of the bastion itself.

- The location of the monument at the edge of the bastion, caused particular difficulty with the installation of the hoisting system and the bearing scaffolding.

B. The benefits of the restoration programme

The benefits of the restoration programme may be summarised as follows:

1. Repair - Structural independence of architectural members

As is well known, the new interventions on the Acropolis were imperative not only because of physical damage to the architectural members suffered with the passage of time. Equally significant was the human factor and the materials that were used in the preceding anastoloses. The temple of Athena Nike was no exception, since the extensive use of iron reinforcements, insufficiently anchored and protected from oxidation, caused numerous breaks and cracks in the marble of the architectural members. The replacement of iron with titanium, as on the other Acropolis monuments, is one of the most important benefits of the new



The subterranean space as it was found after dismantling the temple. Photo D. Giraud, 2002

restoration since, from the standpoint of materials used, it assures the right behaviour of the monument through time.

An equally important gain was the recovery of structural independence of the architectural members, one of the most basic structural principles of classical monuments. As became evident, especially after dismantling the monument, the members of the temple were in many cases fragmented and, in the previous anastelosis, they had been joined in a way that violated the basic principles of dry masonry and their structural independence.

In many cases, in order to compose an integral architectural member, instead of being joined together, the fragments had, each one separately, been set in place with the use of iron elements, while the empty spaces between the fragments, where invisible, had been filled in with cement. Cement had been used likewise in order to fill in parts of the architectural members around the cuttings for the clamps and dowels. The above problems multiplied the number of marble fillings needed and thus the number of joins in the invisible areas of the architectural members.

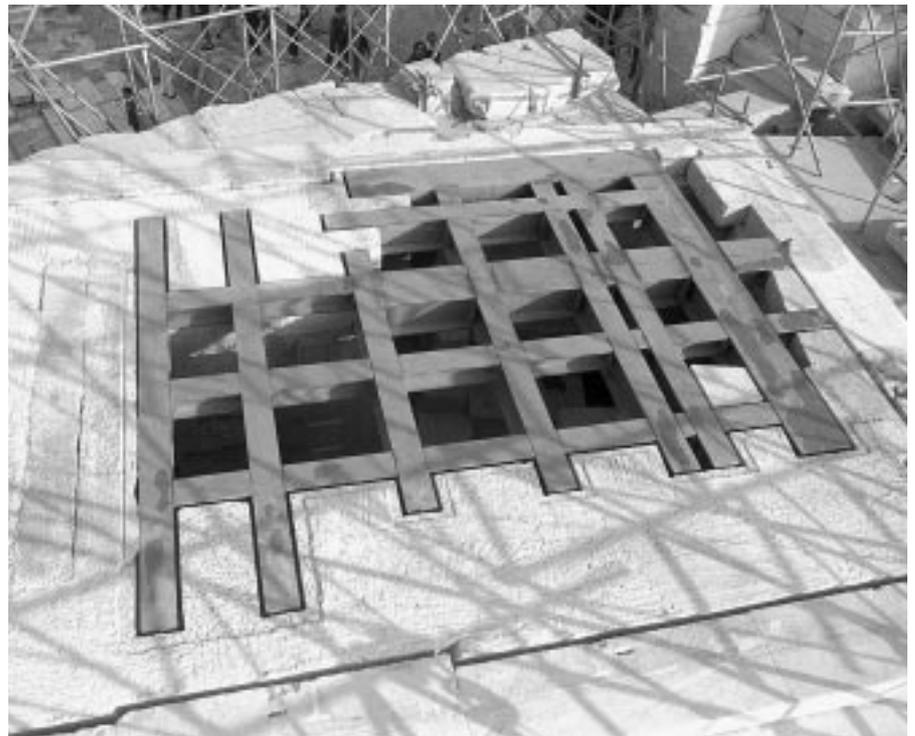
Wherever feasible, in the recent restoration of the monument, an effort was made to achieve the best adaptation of the new supplements to the fragmentary ancient members so that they would follow the break surfaces to the extent possible. This was done in order to lessen the impression of the strongly geometrical forms

created in the restoration of the temple in the previous anasteloses in which the ancient members were cut so that a supplement could be adapted to them.

Finally, the choice of marble for making the supplements depended on the interior structure (marble veins) of the ancient marble, given that the architectural members are subject to various different strains depending on the positions they occupy.

2. Redesigning and replacement of the bearing structure beneath part of the temple

Redesigning the bearing structure beneath the floor of the temple yielded significant advantages both for the classical temple and for the preserved part of the poros shrine in the underground space. The composite construction, made up of reinforced concrete and steel beams, that was used in the previous anastelosis of the temple with the aim of making the underground crypt available for study of the poros shrine and other archaeological remains, showed clear signs of damage with



The metal grid beneath the floor of the temple. Photo K. Mamalougas, 2004

cracks in the concrete from oxidation of the reinforcements in the slab and corrosion of the iron beams. The method by which it was supported in the underground space, moreover, by building a little wall of non-reinforced compact stone mortar, which abutted the blocks of the poros shrine, had caused damage to the poros with the appearance of salts. The replacement of the reinforced concrete slab with a metal grid of stainless steel and the redesigning of the method for supporting it, was a work of great scholarly interest, because of the special behavioural requirements of the new construction and the limitations imposed by the available space to the dimensions of its structural members. The special conditions prevailing in the underground space, moreover, made the work arduous. The benefits obtained were, however, particularly significant since resistance of the monument to time was assured and the floor of the temple was now correctly and fully restored at the right level.

3. Restoration and improvement of the conditions of preservation of the poros shrine

The restoration programme was extended



Dismantling the poros shrine. Photo K. Mamalougas, 2002

also to the preserved part of the poros shrine, which was dismantled in order to replace the iron clamps and dowels added in the previous anastelosis and to remove the salts from the stones. Furthermore, the redesigning both of the bearing slab of reinforced concrete and the method of supporting it with pillars of stainless steel,

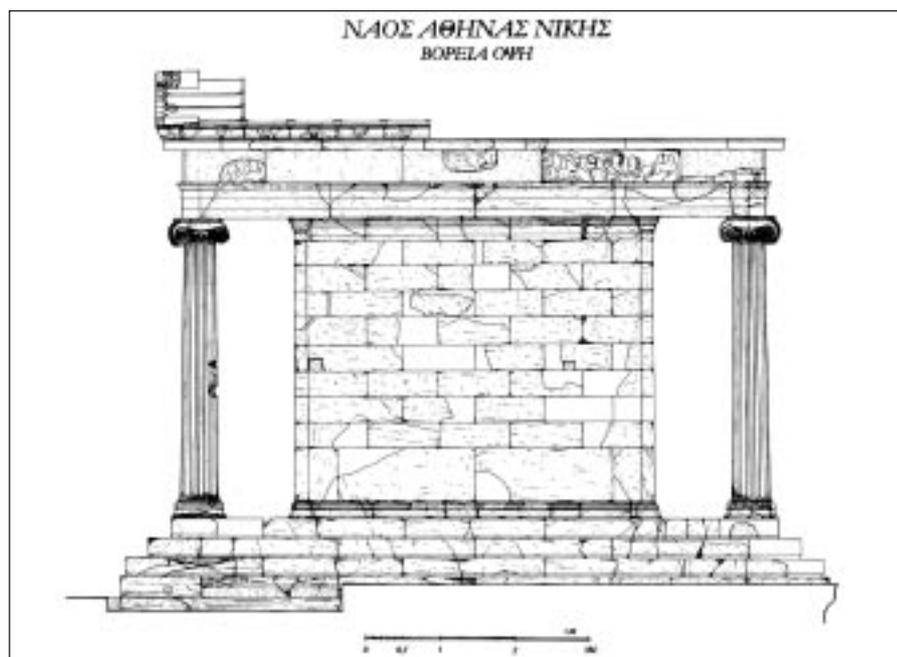
improved the conditions of preservation and accessibility of the poros monument. This was accomplished with the removal of the aggravating elements of the earlier construction such as the iron support within the shrine and the non-reinforced cement found abutting the poros members. Waterproofing of the area was likewise improved.

4. Rearrangement of the members

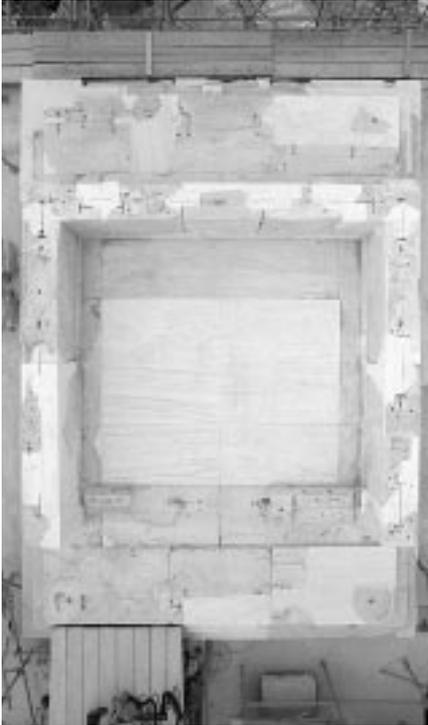
The new restoration programme provided the opportunity of correcting the positions of architectural members wrongly placed in the previous anastelosis. In some cases the evidence for the rearrangement was to be found on visible surfaces of the members and was known before the monument was dismantled. In other cases the evidence was found on their invisible surfaces in the course of studying the ancient construction marks. A total of 42 of the 327 architectural members that compose the entire temple were rearranged. Changes were made in the arrangement of the column shafts, the capitals, the pillars, the cella wall blocks, the ceiling coffers and the frieze blocks.

5. Correction of deviations from the original geometry of the monument

Apart from the possibility of improving individual parts of the temple, the new restoration enabled us to correct problems that had been caused by the earlier anasteloses and had to do with deviations from the original geometry of the monument. The most significant of these was the 4 cm. incline of the crepis and consequently of the entire monument toward the west. This resulted in various distortions such as the inclination of the west columns toward the west rather than toward the cella wall. Similar corrections, on a smaller scale, invisible to the casual observer but important for the architectural consistency of the monument, were carried out on various different parts of the building, as a result of the study and rearrangement of the members.



North facade of the monument after restoration. Drawing K. Mamalougas



Restoration of the monument during the phase of resetting the members of the cella. Photo K.Mamalougas, 2006

Here it should be noted that, unlike the other large monuments of the Acropolis, the precise original measurements of the temple of Athena Nike were not given facts but had to be found through research, since no part of the temple is preserved in situ. Furthermore, a great many of the architectural members had lost their original measurements through the procrustean trimming they received in the previous anasteloses, made in order to place them on a deformed krepis or to “fit them in” to an incorrect position.

6. Partial restoration of the cornice and pediment

An important benefit of the new restoration programme was the extension of the restoration to include part of the horizontal cornice, part of the pediment and part of the sima of the temple. A fuller picture of the architecture of the building has thus been obtained and a significant number of scattered ancient fragments has been included in the monument.

7. Inclusion of scattered material

The new restoration added a significant amount of ancient material to the building, in the form of both fragmentary and intact members. Part of this material was already known from the initial study. Other pieces were found either scattered on the rock or incorporated as ordinary inert material in the concrete filling inside the crepis of the temple.

8. Replacement of the frieze with copies

In accordance with the current practice of moving the sculptural decoration of the monuments to the Acropolis Museum, the authentic members of the frieze have been replaced by cast copies made according to special specifications.

As shown above, the advantages of the new restoration are especially significant both for the present form of the monument –one of the most important of classical antiquity– and for its future course through time.



Replacing the authentic frieze with cast copies: 1. Trial setting of the south frieze in the laboratory.

2. View of the west frieze on the monument. Photo D. Michalopoulou, 2011

Dionysia Michalopoulou

Civil Engineer

Head of the restoration project

Kostas Mamalougas

Architect

Athena Nike Restoration project



Fragmented architectural member of the crepis. Photo K.Mamalougas, 2003



Resetting the coffered slabs of the pranaos.
Photo K.Mamalougas, 2010

The following worked in the team for the restoration programme of the temple of Athena Nike: D. Michalopoulou (civil engineer, head of the project), K. Mamalougas (architect engineer), E. Lembidaki (archaeologist), L. Zacharopoulos (head of the work team), G. Paganis (2000-2007, head of the work team), A. Anagnostou (draftsman, operator of hoisting machinery, in charge of storeroom), G. Georgiou (2003-2009, draftsman), K. Tsirintoulakis (marble sculptor), V. Panopoulos (marble sculptor), A. Panoutsopoulos (2002-10, marble sculptor), A. Demetropoulos (2000-07, marble sculptor), M. Kovaïos (2002-09, marble sculptor), K. Daes (2003-09, marble sculptor), G. Vasileiou (2003-09, marble sculptor), M. Armaos (2003-09, marble sculptor), G. Hamilakis (2003-09, marble sculptor), I. Balabanis (2003-09, marble sculptor), P. Niaouris (2003-09, marble sculptor), M. Demetriou (2002-07, marble sculptor), A. Theodoridis (2003-08, marble sculptor) D. Vayianos (2002 to date pantograph operator), D. Gregoropoulos (2002 to date, pantograph operator), V. Takouli (2002 to

date, cast maker), Ph. Vlachogiannis (2002 to date, technician), D. Sideropoulos (2003 to date, technician), Th. Karabelas (2003 to date, technician), A. Damis (2003 to date, technician), E. Vlachogiannis (2003-08, technician).

Significant likewise was the contribution of the following: V. Savvatiadou (2000-03, draftsman), Th. Moutopoulos (2003, draftsman), A. Daphtis (2000-04, marble sculptor), K. Skylas (2000-03, marble sculptor), M. Voutsina (2003-05 marble sculptor), M. Alvertis (2007-09, marble sculptor), D. Zervas (2007-09, marble sculptor), V. Tsitsibakos (2010 to date, marble sculptor), Ch. Rodopoulos (2000-01, technician), K. Tsiphlas (2002-03, technician).

Finally, participating in the work for a short time were: G. Alexandridis, A. Athanasopoulos, K. Dallas, G. Desypris,



Lion head from the north sima.
Photo. K. Mamalougas, 2010

Th. Grekas, S. Kaphouros, A. Kladios, E. Konstantinopoulos, D. Kouvas, V. Manidaki, K. Megoulas, M. Mouzoura, I. Palamaris, L. Philippousis, G. Regos, G. Skalkotos, V. Skaris, M. Toupheleki, S. Tseperis, G. Vidalis, R. Vidalis, K. Xypolytidis and others.



West view of the monument, after restoration. Photo K.Mamalougas, 2010

Restoration of the superstructure of the south wall of the central building of the Propylaia

Completion of the project of restoring the superstructure of the central building of the Propylaia is a most important achievement in the field of archaeological restoration, not solely for the Greek region. With the removal of the iron reinforcements that had been incorporated in most of the architectural members in the previous restoration, the redetermination of the original positions of the ancient members, and the inclusion of others that were still on the ground, the restoration increased

can very well be taken as the link between the completed programme and that which is to follow and which is already under way. This is because the next intervention programme on the Propylaia calls for the setting of blocks adjacent to the architrave blocks, thus extending the restoration to the west of these.

This is the smaller scale programme of restoring the superstructure of the south wall of the central building; it was approved

in general, in fairly good condition. Specifically, the two faces, exterior and interior, apart from traces datable after classical times (typical is the rectangular opening that emerged with the removal of two entire wall blocks of the 9th and 11th courses and two half wall blocks of the 10th course during the first years of the Turkish occupation), show no signs of mechanical deformation. The minimal shift of the blocks is perhaps to be connected with the dislocation and severe shifting toward the exterior suffered by the south wall of the east porch of the building by the end of the 1990's. It is notable that the corresponding section of the opposite, north wall of the Propylaia shows more in the way of damage. Examples are the characteristic pyramidal sections of marble that are missing from the corners of the wall blocks and the visible surface erosion of the blocks, especially on the upper half of the east interior face of the wall. Conversely, preserved on the south wall are traces of the painted ornament on parts of the surface of the cyma reversa of the section with the crown blocks in situ.

The structural tissue of the central building of the Propylaia was disrupted only



View of the east portico of the Propylaia from the SE, after its recent restoration. Photo K.Karanasos, 2010

the comprehensibility of the monument but did not really change the image that had become anchored over the past years in our perception.

The harmonic inclusion of the necessary fillings, and, in certain circumstances, the inclusion of architectural members entirely of new marble, likewise contributed substantially to the promotion of the architecture of the building. Specifically, two more epistyle blocks of new marble were added to the south side of the central building, in order to make the form of the southwest corner of the entablature of the east portico more complete. Although an interpolation in the overall programme of the restoration of the ceilings of the Propylaia, this intervention in the south side of the monument

by the Central Archaeological Council of the Ministry of Culture in July 2008. The study for the restoration of the blocks set on the south wall of the Propylaia west hall was carried out by the undersigned between 2001 and 2007. It concerns the finding of the original positions of wall blocks and a cornice block that was found to belong to this part of the monument.

The results of this research were presented at the 5th International Meeting for the restoration of the Acropolis monuments in October 2002; in succeeding years new evidence was obtained that enabled us to reach to final conclusions.

The south wall of the central building that corresponds to the west hall is preserved,



Drilling a hole in the filling of a block from the south wall. Photo K. Karanasos, 2011

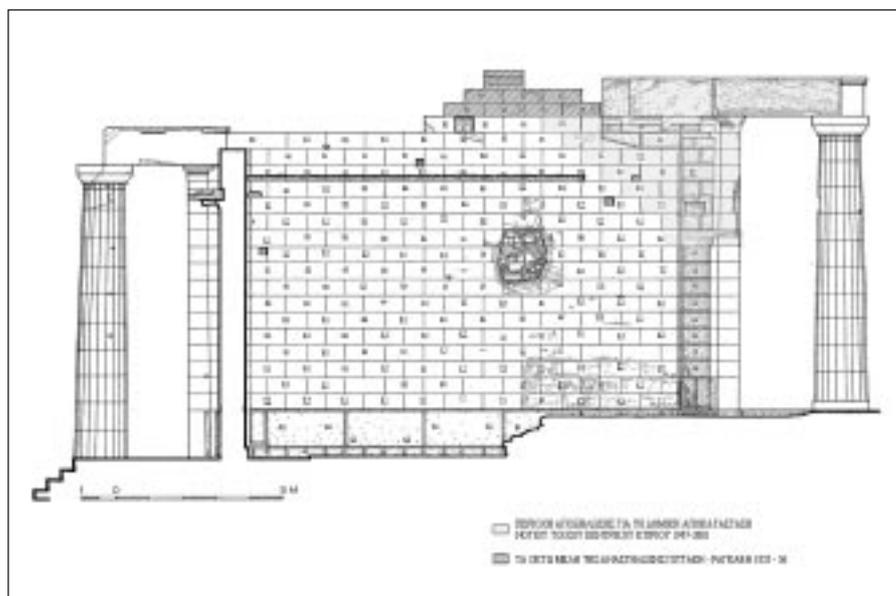
minimally in Mediaeval times. A large part of the superstructure of the west hall and the east portico was destroyed in 1640 when a lightning strike caused the explosion of gunpowder stored by the Turks in that part of the monument, beneath the coffered ceiling. The first representations by travellers illustrating the interior of the Propylaia at the beginning of the 19th century, show the south wall of the west hall up to the course of blocks where the section of blocks of the interior cornice is visible toward the interior of the building, that is to the 18th course. Shown in their places in that course are the first four blocks of the interior cornice from the east. Among the first interventions of the years 1835-1836 in the anastelosis of the Acropolis monuments, together with removal of mediaeval additions, was the restoration of the south wall with the resetting by Kyriakos Pittakis, curator of the Public Central Museum, of seven wall blocks of the 19th and 20th courses and one cornice block. They were set not in their original positions, but in the place of similar blocks, without horizontal and vertical clamps and dowels and without binding mortar. Specifically, in this intervention, the eight pieces were positioned as follows: in the 19th course, four of the blocks had been set in the positions of the first, second, third and fourth wall blocks from the east. The last block in the row had been placed upside down so that it was resting on its upper surface. Three blocks were set in the 20th course in the positions of the second, third and fourth blocks from the east. Finally, the cornice block was set in the position third from the east.

In the anastelosis intervention of Nikolaos Balanos on the Propylaia (1909-1917), this part of the south wall underwent no change. Thus the wall of the west hall remained in this form until the years of the recent interventions under the Committee for Conservation of the Acropolis Monuments. These architectural members were

dismantled in November 1997 in the framework of structural restoration of the south wall of the east portico (1997-2001). Lowering these blocks to the ground provided the opportunity to measure and study them meticulously, together with blocks lying on the ground in the area of the Propylaia that had similar morphological and technical features, first by the architect and head of the project of restoration of the Propylaia, T. Tanoulas, and the experienced draftsman P. Moutopoulou, and subsequently, from

tics belonging to the south wall, and was found to have been set incorrectly by Balanos.

The two side walls, north and south, of the central building of the Propylaia have each twenty courses of blocks above the orthostate, which is composed of Eleusinian stone. Each course, in the section that corresponds to the west hall, is made up of nine or ten blocks. Up to the 18th course the blocks are set as stretchers and they take up the full width of the wall, which



South wall of the central building of the Propylaia, from the south, on which the eight blocks of the anastelosis of K. Pittakis are outlined. Drawing T. Tanoulas

2001 on, by the writer. Included in the research were also blocks of the 18th course. It is worth noting as well that valuable information came from the parallel study of the cornice blocks and blocks of the corresponding courses of the north wall of the West Hall that were dismantled in September 2002, in the framework of the project of restoration of the superstructure of the central building. In sum, examined in the study were 20 blocks, 11 of which come from the collections of scattered members and have the features of blocks that belong to courses 18, 19 and 20, while after the blocks of the north wall were dismantled, yet another block of the 20th course was added. It has characteris-

is 0.88 m. The length and height of the stones varies around 1.178 m. and 0.49 m. respectively. On the blocks of the 18th course blocks of the interior cornice rest the wall epistyle blocks of the Ionic architrave of the west hall. The width of the blocks of the interior cornice on their upper resting surface is equal to 1.034 m. Behind the blocks of the Ionic architrave the wall is completed with two rows of blocks of the 19th course and 20th course that are less wide than the others, 0.69 m., and in each case lower, not exceeding 0.42 m. in height. The ceiling beams and the inter-beam slabs rest on the architrave, whereas on the outer side, the cornice is bedded on the wall blocks. The two side

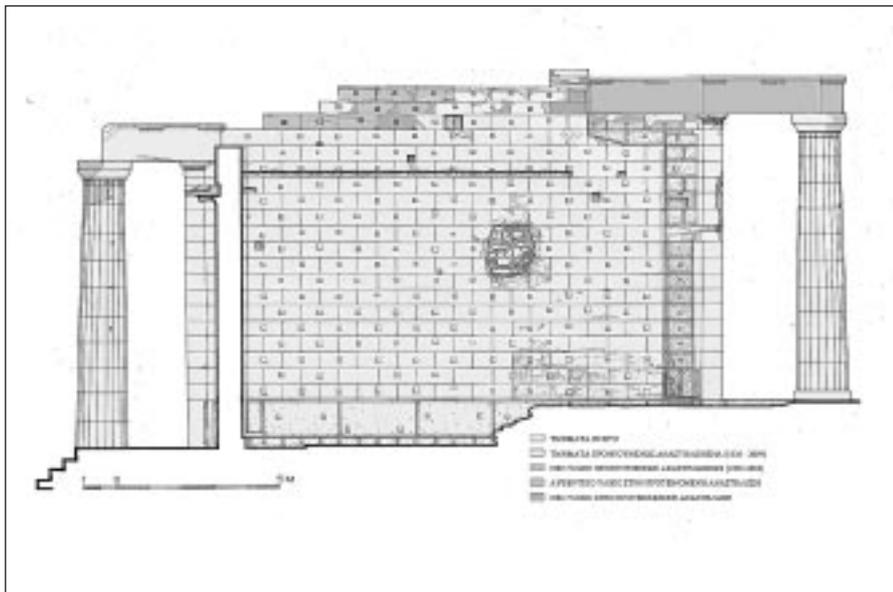
walls of the central building incline inwards, but the thickness of the walls remains constant so that their two surfaces (exterior and interior) are parallel.

In the course of the study, basic characteristics were identified and defined that provided criteria for investigating the original positions of the blocks. Taken into consideration were the locations and depth of the cuttings for the clamps and dowels, the positions of the pry-holes and of the cuttings for the auxiliary dowels made in

beginning at the west end, since the cuttings for the dowels are on the east thrust surface, that is on the right of the face of each block. This proved to be the most significant criterion of their distinction from the blocks of the corresponding courses of the north wall, which have the dowel cuttings at the left of the block face, since they were set in the same direction. The degree of natural erosion of the faces of the wall blocks was not a basic criterion for distinguishing them, as there was no clear difference in terms of damage be-

block with the upper and lower horizontal planes are, the upper dihedral corner obtuse, and the lower dihedral corner acute. The divergence from the vertical of this surface, which corresponds to the height of each block, is approximately four millimeters.

A total of four interior cornice blocks were examined. Of these, three were on the ground in the area south of the Propylaea while the fourth, in the British Museum, was measured in the summer of 2000 by the architect T. Tanoulas. We may note that this block had been carried off together with other architectural members of the Acropolis monuments by Lord Elgin between the years 1800 and 1803. On its upper bedding surface, the block of interior cornice in the British Museum has cuttings for lowering it with the help of a grab and, in addition, there are auxiliary dowel holes on the west surface of thrust for the support of the overlying blocks. This specific block was therefore the last in its row to be set, after the last of the blocks adjacent to it from the east and the west were dowelled, and it occupied the fifth position from the east. A block made of new marble will be set in its place. West of this block will be set the other three crown blocks that were examined.



*The south wall of the central building, south facade, after its restoration.
Drawing T. Tanoulas*

the course of setting the overlying blocks, as well as some particular features specific to each individual block. As has already been noted, the blocks of courses 19 and 20 are narrower than the others. The blocks of the 20th course in particular can be distinguished from the underlying ones because they display a finished sinkage of 0.065 m. in width along the upper edge of their outer face. Some of these have in addition horizontal cuttings joining them with the Ionic architrave blocks that rest on the walls. The inner face of both these two courses was roughly tooled, since it remained invisible behind the wall epistyle blocks. During the study it was found that both these courses had been set

tween the blocks of the north and south walls of those courses. In the course of the interior cornice, the four blocks in situ had been set beginning at the west end and the fifth from the east was the terminating block of the course (the last-laid intermediate block). In addition, it was found that only the southernmost of the two vertical dowels on the upper surfaces for connecting them with the blocks of the 19th course, in the end was actually used; so too in the underlying course, dowel cuttings were observed that had not been used. The exterior face of the blocks of all the courses has an incline so that the two dihedral corners formed by the meeting of the plane of the exterior face of the

For the arrangement of the blocks of the 19th course, a total of seven wall blocks were examined. The block that is first from the east was not found among them. By analogy with the corresponding block of the north wall, it was indubitably L-shaped since part of the east surface of thrust entered between the wall-supported architrave of the south wall of the east portico and because it was set last in the series. In its place will be set a similar block of new marble. Finally, examination of the remaining blocks of this course showed that only one met the criteria necessary for including it in the anastelosis proposed at present. It also emerged that among the blocks reset on the wall, in-

cluding those up to the seventh from the east, not a single one remained in the position it had occupied in the anastelosis of 1836.

A total of eight blocks were examined in connection with the arrangement of the blocks of the 20th course. Not one of these could be assigned to the first from east position. As verified from the corresponding block of the north wall, this too will have been L-shaped, just as the underlying block, and shorter than the adjacent blocks. In this case too, replacement by a similar block of new marble was proposed. Research also showed that the two blocks did not meet the criteria necessary for their inclusion in the south wall. We note that one of these (AAA 5219) was included in the restoration of the north wall in the place of a block wrongly set by Balanos, which was finally included in the restoration proposed at present and occupied the last, seventh from east, position. None of the three that had been restored in 1836, occupied the same place again.

Finally, the position of the only preserved cornice block of the south wall is at the east end, as is evident from its comparison with the corresponding cornice blocks of the north wall. It was found to have the same technical characteristics as the first from the east cornice block on the north wall, the only difference being that in length and in width it is larger. These characteristics are the L-shape face where the stone abuts the wall epistyle block of

the south side of the east portico, where its face shows to the right, i.e. on the east thrust surface; also the slight bulge measuring 0.355 m. x 0.75 m. in the east side of the upper resting surface, on which rests a block of the west pediment in the east portico.

Of the twenty blocks covered by the study, including the wrongly placed block of the north wall, sixteen were identified as belonging to the south wall. Eight of these are blocks that had not been previously restored. The condition in which they were found was in general good, so that they needed neither the joining of ancient frag-

setting three more blocks, which, as already noted, are to be made entirely of new marble, thus increasing the total number of blocks in the restoration to nineteen. These are the block of the interior cornice that replaces the block in the British Museum and the first blocks from the east in courses 20 and 19, necessary for the bedding of the cornice block.

We note that for the needs of the restoration, it was necessary to dismantle the last in situ block of the interior cornice toward the west (AI.N.Θ.P.8), next to which the four blocks of the intervention programme are set.



1. Dismantling the in situ block of the interior cornice of the south wall 2. Resetting the block of interior cornice made of new marble 3. Carving the final surface of the block of interior cornice made of new marble 4. Mending a new marble filling to one of the blocks of the 19th course.
Photo K. Karanasos, 2010- 2011

The reconstruction of the superstructure of the south wall of the central building of the Propylaea, while an independent project, can be considered as a continuation of the completed programme of restoring its ceilings, because it supplements in an intelligible way the structural tissue of the monument that was so thoroughly disturbed by the explosion of 1640. By utilizing preserved authentic material from the area of the building

and setting it in its initial position, the study makes the building more comprehensible and contributes to the aesthetic improvement of the image of the monument as a whole.

Konstantinos Karanasos
Dr Architect
Propylaea Restoration Project

The gradual revealing of colour on the ceiling of the Porch of the Maidens in the Erechtheion

One of the programmes of the YSMA Conservation Section that is in progress today is the conservation and cleaning of the coffered ceiling of the porch of the Maidens in the Erechtheion. The cleaning of pollutants, the deposits of soot and black incrustation, with the use of laser technology, included in the conservation programme, is being carried out in collaboration with the Institute of Electronic Structure and Lasers of the Foundation for Research and Technology Hellas (IESL-FORTH). For this purpose, the interior space of the porch, behind the copies of the Caryatids, was closed off by a panel of polycarbonate sheets. A raised floor was constructed, providing access to the ceiling in order to do the work.

The ceiling comprises four slabs 4 m. in length, all of which are held at their north end in the south wall while at the south end they are bedded on the architrave of the south side. The two outer ones (east and west) consist of single rows of coffers and at their east and west sides respectively they rest on the architraves of the east and west sides of the monument - threefold support (Study for the Restoration of the Erechtheion, Athens 1977). The two middle ones, each have three rows of coffers. The numbering of the eight rows of plaques, is from west to east from number 1 to number 8, and the coffers from north to south from the letter A to the letter E. Each row is made up of 5 coffers. All the slabs are decorated with coffers, which have horizontal bands al-

ternating in steps with cymatia (curved surfaces) to end in flat surfaces, the coffer lids. The total number of coffers in the entire ceiling is forty. On their lower surface, the coffers are enframed by an astragal in relief and, according to Stevens' study (G.P.Stevens and J.M. Paton: The Erechtheum, Cambridge Massachusetts, 1927), in the spaces between them traces of a painted pattern are visible, a narrow



General view of the coffered ceiling of the Caryatid porch. Photo G.Frantzi, 2011

band of colour (decorative band). There is a similar band around the coffers. The same study likewise reports a painted egg pattern on the cymatia of the coffers (Ionic cymatium) and a lack of decoration on the coffer grounds.

As for today's picture, it was found that, except for a very few cases reported below, neither on the interior surfaces of the coffers (cymatia, bands) nor on the lower surfaces around these, can a distinct painted decoration be observed. At the same time, the existence of coatings in combination with deposits of soot and black incrustation, has resulted in a picture that is

even more confused. The coatings cover a chromatic scale from white to beige and are probably evidence of later efforts to cover or protect the ancient painted decoration. During the course of cleaning with laser, it was found that the coatings cover a large part of the stepped surfaces of the coffers. Careful observation revealed that on 25 of the 40 coffers there are deposits on cymatia, bands and on areas between

or around the astragals. In a considerable number of bands this covering is practically homogeneous over the entire marble surface. Traces of painted decoration which was difficult to interpret were observed on cymatia of four coffers, while in five cases, below and between the coffers, we find traces of the band reported by Stevens. Distinguished in all cases on these coffers, on both bands and cymatia, is a similar layer of black colour be-

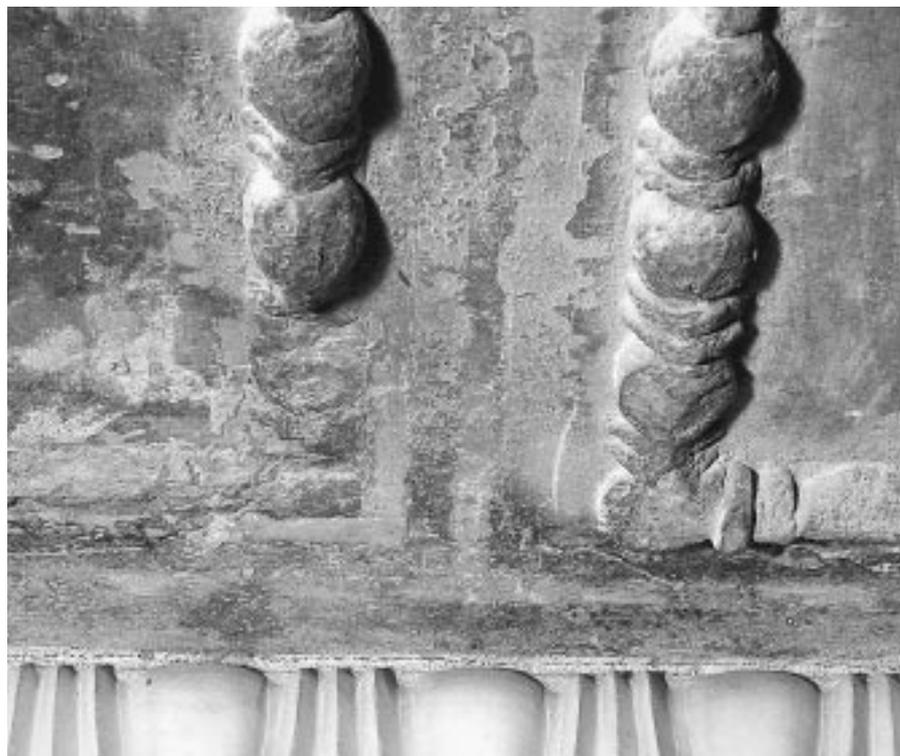
neath the beige, which is clearly distinguishable from the black incrustation.

Analytically:

Many of the astragals are missing from the lower surface of the **1st coffered slab** and those preserved show some change of form. Preserved beneath $\Phi 1\Gamma$ - $\Phi 1\Delta$ and $\Phi 1\Delta$ - $\Phi 1\text{E}$, on the lower surface of the coffers, are parts of the two decorative bands, mentioned above. Preserved in fairly good condition on the interior sides of the coffers in many places are layers of black colour that, because of its homogeneity and its extent (it covers nearly the entire area of the flat surfaces) gives the impres-

sion of a background. A specific example is provided by the bands on two coffered slabs ($\Phi 1\Gamma$ and $\Phi 1\Delta$). On the progressively curving cymatia of the north side –of the coffer $\Phi 1\Delta$ – traces of outlines have been found that dimly suggest the egg pattern and are the only case of painted decoration found on an Ionic cymatium. With very good lighting, one can also see bits of blue colour in the area of the suggested background. On this coffer, the beige coating is missing and trial cleaning with laser revealed scattered bits of blue colour. On the remaining 4 coffers of the 1st slab the beige coating is preserved (in some cases white) both on bands and on cymatia. In some cases, moreover, there are traces of brush-work on it, supporting the hypothesis that it is a coating that was applied at a later time.

In the **2nd coffered slab** the deterioration is limited to surface sulphation. The lower surface on coffers $\Phi 2\Gamma$, $\Phi 3E$ has cracks and sulphated parts of the surface of coffer $\Phi 2A$ are flaking off. Damage to the relief astragals here too is extensive. In addition, a thin skin is observable beneath the black incrustation, which has pulled loose in a number of places, while here and there it

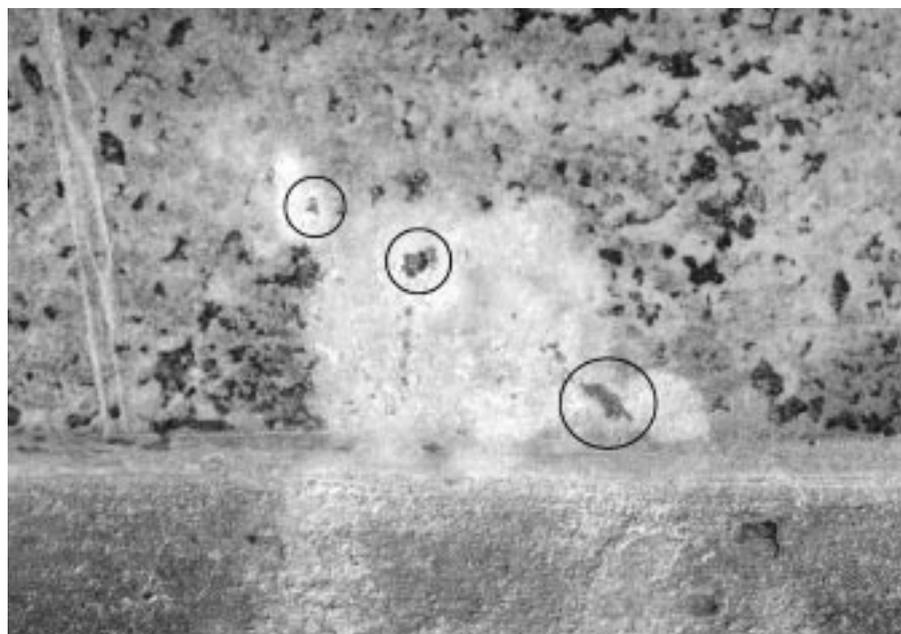


Traces of the two decorative bands on the lower surface between the coffers $\Phi 1\Gamma$ - $\Phi 1\Delta$. Photo S. Mavrommatis, 2008.

little bulges - swellings; it is entirely identical with the beige layer. Bits of blue colour were observed on a number of coffers around the relief astragals. Traces of a beige coating are visible on nearly all the coffers above the black layer, while bits of

blue colour can be discerned here too on some coffers, but only on the cymatia.

The **3rd coffered slab** is the one that was the most problematical because of its collapse during the Greek Revolution. As a result it broke into five large fragments and other smaller pieces, so that a large part of it has now been filled with new marble. The lower surface of the slab has likewise suffered great damage. Lost practically entirely is the decoration and, specifically, the astragals at the perimeter of the coffers. On this slab two coffers preserve remains of a beige coating, but it is limited because of the great wear and extensive interventions it has suffered. A significant element that has emerged on some coffers –after cleaning the surface by means of laser– is that the surface has an especially orange tint that distinguishes it from the natural colour of the marble. This, combined with the results of analytical methods that were used and are described below, perhaps verifies the existence of an orange-brown coloured layer



Detail of the first cymatium of the west view of the coffered slab $\Phi 1\Delta$ (coffer 1 West). The circles indicate the existence of blue colour. Photo T. Souvlakis, 2009



The Egyptian blue is mapped as a bright white using the VIL method. Photo G. Verri, 2009

(known as “epidermis”) that we find in other cases as well, on all the Acropolis monuments (calcium oxalate and calcium phosphate). In a few isolated cases after cleaning with laser bits of blue colour have also been revealed.

Preserved quite well on the lower surface of the **4th coffered slab**, is a large section of the astragals, mainly at the east end, while the west end, which is next to the greatly damaged third coffered slab, is missing its carved decoration and has considerable surface damage. Preserved on three coffers in excellent condition is the beige coating and the black layer beneath it. It is worth noting that the beige coating shows a homogeneity in texture and in thickness, and an orange tone compared to its appearance on the other slabs. The soot deposits, moreover, adhere to it with exceptional strength. In some cases after cleaning traces of blue colour emerge here too.

In accordance with all the above observations, blue colour has been found on a

considerable number of coffers, and it is now a question of determining if this is Egyptian blue or azurite. **Egyptian blue** ($\text{CaCuSi}_4\text{O}_{10}$) –possibly the first compound pigment in the world– is known as early as the 4th Egyptian dynasty (2600-2500 B.C.) and it is a mixture of lime powder, quartz sand, copper ore and natron. **Azurite** (basic copper carbonate $2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$) was known in antiquity and Pliny the Elder refers to it as “κασαός” or “caeruleum”. The use of azurite on stone gives it a colour that ranges from indigo to sky-blue (ultramarine) and from cobalt to turquoise.

With the approval of the ESMA for research on the coatings of the surfaces of the coffers, in the first phase the following non-destructive methods of analysis were chosen: Multispectral imaging cameras Musis of Forth–Photonics and of the Diagnostic Centre of Ormylia. Also by means of X-Ray Fluorescence Spectrometry (XRF) with which copper was detected in many places on the ceiling (indicating the

presence of azurite or Egyptian blue) and calcium (in combination with the copper an indication of Egyptian blue), also lead and iron, indicating other pigments as well.

Finally, the most revealing method with which Egyptian blue was detected and photographed in December 2009 was the VIL method (visible-induced luminescence imaging) developed by Dr. G. Verri, then post-doctoral research associate of the British Museum and now lecturer at UCL. This method is very simple in its application and it is valuable for detecting some of the polychrome concealed by the monuments. Its greatest advantage, however, is that it is a non-destructive method that does not require samples. The object being examined is illuminated by visible light in a dark environment. According to G. Verri the emission of the Egyptian blue can be recorded using visible sources of stimulation and a camera with some sensitivity to IR radiation at 800-1000nm of the electromagnetic spectrum. In the monochrome photographs VIL, the Egyptian blue shows up as a bright white, whereas all the other colours materials look grey. Indeed, with this method the result was impressive. It was revealed that on many coffers remains of Egyptian blue were preserved, in a considerable number of cases on the curved cymatia and, of primary importance, in some cases invisible to the naked eye. What proved to be the greatest discovery was the emergence in detail of the pattern of the decoration, which is an Ionic cymatium with palmettes (anthemia) in the corners and which are depicted on the three cymatia on all sides of each coffer. With this method, likewise, the presence of blue colour was perceived around the relief astragals on the lower surface of the coffers. Significant too is the fact that even the ground of the coffers, where it was previously noted that painted decoration was unlikely, scattered traces of Egyptian blue was found, making it likely that there was

a sky-blue background. Also on the 3rd slab, where no coatings were preserved, traces of Egyptian blue have been discovered on cymatia after cleaning with laser.

What is it that prevents detection of the patterns by the naked eye? The fact that most of the coffers have been covered by the beige coating is the reason why the blue colour is no longer visible on the coffers. Yet even in cases where the coffers have no such coating the decoration is still not clear macroscopically. For example, on coffer Φ1Δ where a clear and unified black layer is observable and above it bits of blue pigment, the revelation of the patterns on the Ionic cymatium with the application of the Verri method is indeed impressive. It is evident that the crystals of the Egyptian blue penetrated into the black layer and even into the marble and essentially are revealed by means of photography as a majestic blue background that today can be recognised only as a bright white in the digital photographs VIL. This was verified also by the analytical methods (second phase of analyses), that were carried out in the laboratory of archeometry - materials science of the



Visible in the west side of coffer Φ1Δ is the black layer on both the level and the curved surfaces. Photo G. Verri, 2009

NCSR Demokritos by I. Karatasios and the conservation group of the Erechtheion, staffed by G. Frantzi, A. Mardaki, and D. Garbis and the former head of the Surface Conservation Section, E. Papakonstantinou. With the X-Ray Diffraction analysis (XRD) the chemical formula of Egyptian blue was identified and with Scanning Electron Microscope

analyses (SEM/EDAX) it emerged that the crystals of Egyptian blue indeed were found in the fabric of the marble or in the black layer. As for the beige skin, it was found to be a layer of calcium composition. Worth noting is the existence of calcium oxalate and calcium phosphate, which certifies the existence of the orange-brown layer in a considerable number of cases and agrees with the earlier analyses. Observation with a polarizing microscope likewise verified the stratigraphy of the samples where, beneath the beige, the existence of a black layer had been ascertained –the composition of which to date remains unexplained.

Since then, the Erechtheion conservation group has acquired the corresponding camera and is already photographing the ceiling coffers over an extensive area.



The Egyptian blue is mapped as a bright white using the VIL method. Photo G. Verri, 2009

Giasemi Frantzi
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The replacement of sculptured architectural members on the monuments of the Acropolis. Casts, copies and authentic members

Cast copies have been used on the Acropolis monuments to replace the sculptured architectural members as early as 170 years ago in the first anasteloses. Ever since then the material of the copies and the method of producing them has continued to be a matter of concern, since they are connected with areas of the monuments of major importance for their image and meaning, designed to attract attention, such as metopes, friezes, pedimental sculpture, the Caryatids, lion-head spouts on the simas, and even the architectural members of composite form, such as the Ionic capitals.

Historical background

Casts were first employed in restoration on the Acropolis in the mid-19th century and their use was confined to copies of the Elgin marbles that were sent from the British Museum. Restored on the temple of Athena Nike together with the authentic frieze were the ceramic (?) dark coloured copies of four frieze blocks that had been removed by Elgin and, for the restoration of the porch of the Caryatids, a ceramic (?) copy from the British Museum was set in place of the third Caryatid. During this same period, the damaged 6th Caryatid was replaced by a new marble figure carved by the sculptor Andreoli, incorporating only the ancient fragment of its torso. The new Caryatid had been rendered with classicistic expression and details, and it remained to remind subsequent restorers of the difference between a free copy in marble and a faithful cast copy. In the second generation of anasteloses, the so-called period of Balanos, the focus of concern was on the

west frieze of the Parthenon, especially on how to replace the two northernmost blocks, which are in the British Museum. Initially it was decided to carve marble blocks leaving a “projection” for a future carving of the relief. The matter was then reconsidered and it was decided to make

the blocks with a “recess” for the future setting of plaster casts. In the third review of the problem, the Committee decided to replace the missing blocks with simple marble blocks, cut without the relief, but on the same level as those in situ. The repeated reviews show the perplexity and



The Erechtheion in 1844, drawing by Hansen. Visible in two pieces is the cast of the 3rd Caryatid that was sent by Lord Guilford



The 6th Caryatid as it was in 1904. Balanos Archive

innate difficulty of the question of restoring sculptured architectural members such as the frieze. The three alternative proposals summarize the three possibilities for replacing a sculptured member. They will return to centre stage in the restorations of later times.

In 1932 “cement” casts of the horses of the chariot of Apollo and of the statue of Dionysos were sent by the British Museum and set in place in the east pediment.

It was said then that they would be there temporarily, since the project elicited many objections at the time.

In the more recent period of the Acropolis restorations of 1976-1977, the group of Kekrops and his daughter, and also Kallirhoe in the west pediment were removed and replaced by copies made of polyester, sent by the British Museum.

In 1979 the Caryatids were removed when there was no longer any doubt about the increasing erosion of their surfaces and every alternative for retaining them in situ had been exhausted. Five years later, cast cement copies were set in place. The theoretical and technical speculation of that time on the subject of introducing copies played a part in working out the methodology and practices that have ultimately been established in the Acropolis restora-

tions. Together with the copies of the four authentic Caryatids, copies were made at that time in the same way, without any distinction to show the different history of their more recent date, of the 3rd Caryatid and the 6th –restored– Caryatid. Incorporated were very few authentic pieces, while the broken nose on the face of the Kore –the work of a vandal in 1905– was not restored.

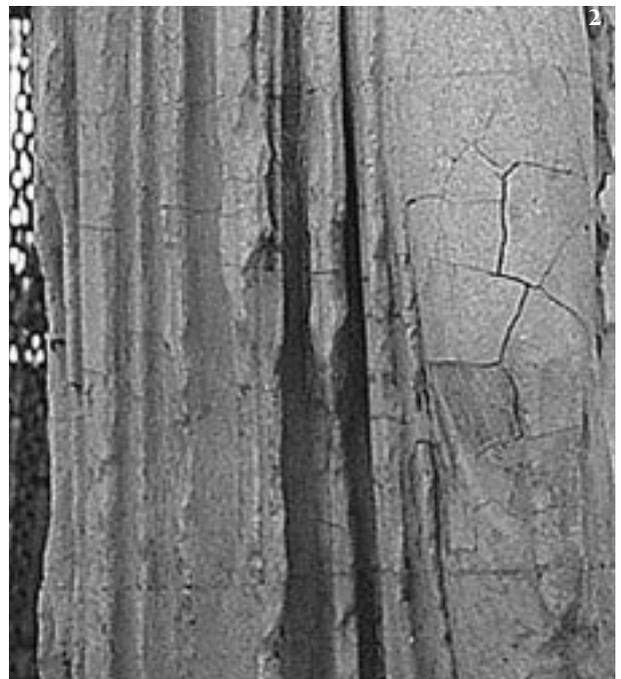
During the succeeding decades nearly all the sculptured architectural members were replaced with cast copies: in 1990, the east metopes of the Parthenon, the NE sima in one piece with the lion-head, after discussion and rejection of the alternate solution of making a marble copy, and the cement copies of the statues of the east pediment were renewed. In 2002-3 copies of the Parthenon west frieze were set in place and 2008 saw the setting of copies of the westernmost metopes of the north side of the Parthenon and the frieze of the temple of Athena Nike.

For the copies of the Parthenon west frieze particularly, P. Kouphopoulos, Architect-Engineer, and the Committee for Conservation of the Acropolis Monuments (ES-MA) devoted lengthy research to the question of materials. Discussed was the choice between making a full cast of the block in a cement mould or creating compound blocks with marble in the main mass and casting the relief façade. The relevant question was posed for the colleagues of the 3rd International Meeting in 1990, when the choice of marble copies was suggested by many delegates. In two instances reference was made to the newest technology of the time, electronical stereopantographs. Finally, after much back and forth reexamination of the subject, the solution of a complex form of marble with cement façade was chosen. This definitive decision and the deviation from the principle of retaining the original structure in the restorations, had a strong effect on the possibility of restoring the sculptured surfaces in the future. In the more recent pe-

riod of the restorations, during the past five years, exceptions to the general use of cast copies are seen in the marble copies of the Ionic column capitals of the Propylaia and the sima with the lion heads on the temple of Athena Nike. It was decided finally that the reconstruction of the Ionic column capitals of the Propylaia in marble was better aesthetically since this would “...emphasise the design by Mnesikles”. A

be replaced because of ageing.

The conventional –cement– copies of the sculptured members of the classical monuments, as is evident also from the international meetings on the Acropolis restorations, were never considered entirely successful from the aesthetic point of view. This is because they lack clarity and crystalline texture, qualities that are in-



1. The 3rd Caryatid during its removal in 1979
2. Detail showing damage to the surface after 66 years of exposure (1913-1979)
Photo A. Papanikolaou, 1979

similar intervention had been made likewise by Orlandos in the restoration of the corner column capital of the temple of Athena Nike, although on a smaller scale. Today, the only authentic sculpture still in situ on the Parthenon are the metopes of the west side of the monument. In the framework of restoring the west side of the Parthenon it is planned to replace the 6 metopes of the corners with copies, a move that has given rise to the present theoretical concern. At this very moment, no final solution to the problem of the copies has been found and it is still timely since it is clear that during the coming decades the older cast copies will have to

herent in our image of ancient works of art. Recorded likewise is the view supporting a technical solution, which would allow reexamination of the subject in the future and replacement of the copies with others made of more satisfactory materials.

Casts and copies, new prospects and objections

Today the question of copies is more timely than ever before, since the development of three-dimensional electronic scanning and CNC –computer numerical control machine tools– changes the technological situation and the possibilities of producing

copies. For the first time an automatic faithful copy carved in a material that is the same as that of the authentic member appears to be feasible, without the need for contact, most often insecure, with the original itself.

Furthermore, the creation of a digital model from a scanned ancient member makes it possible to fill in (in places, if not entirely) areas where the geometry is clear. In other words, it is possible to produce a digital restoration of its form, as in the case of the Ionic column capital from the Abaton of Epidauros, where the damaged ancient column capital was digitally scanned and reproduced with stereopantograph –CNC– in Aeginetan sandstone. Likewise, in the recent anastelosis of the temple of Athena Nike, the sima with the restored lion-heads was completed digitally in the areas where it was carved in one piece with the tile and then the entire architectural member was reproduced with stereopantograph –CNC– as a single marble unit.

Beyond their widespread commercial use today, these applications are used for the digital scanning of ancient sculptures and the production of copies in marble. Exam-

ples are the goddess Pomona, a 17th century statue in the round, 1.90 m. in height, from the gardens of the Het Loo palace in Holland, or the famous head of the Colossus of Constantine exhibited on the Capitoline hill in Rome; for a related exhibition, a copy was made in solid Carrara marble weighing 25 tons.

These technologies, moreover, are being widely applied in the works on the Acropolis in producing marble fillings for various architectural members, providing also the possibility of monitoring the accuracy of their measurements, and their precise agreement with the ancient surfaces.

The value of the copy lies in the possibility of consolidating the form, as preserved today, in an objective way. This is why marble copies made by hand were excluded in the past; for they were affected by the skill of the individual, the artistic nature and undoubted “interpretation” of the sculptor/copyist on the work. And let me to repeat here my view that the preference up to now for cast copies lies precisely in the fact that the authentic is reproduced automatically and is not easily affected by interpretations.

From another standpoint, to be sure, the creation of faithful copies undermines the value of the original, which, among other things, is defined by its uniqueness. Yet we should bear in mind that the creation and spread of copies is an unquestionable chapter in the History of Art.



Casts of the statues in the east pediment. Dionysos after the setting of his thighs
Photo P. Kouphopoulos, 1992

There is to be sure the matter of showing the difference between copy and original. In fact, always in question in the anastelosis is the degree to which the interventions should discriminate between the new and the authentic members or fillings. It is considered that the more faultless the fillings and more faithful the copies, the more difficult their distinction by non-specialists. Yet strong differentiations in the interventions degrades the image of the monuments. In this connection Professor Ch. Bouras rightly observes that the additions in new material “should not, be evident from a distance, but only from close...”. Successful and sufficient technology of copy-making is, in my opinion, that which provides the possibility of total accuracy, so that we can choose the degree of differentiation. In this sense, what is at stake in the production of copies is not the achievement



The cast of the Kecrops group being lifted into position. Photo D. Monokrousos, 1977



Cast copy from the Parthenon frieze (2) and a middle phase during its carving by means of a CNC stereopantograph (1)
Photo Venus Company, 2007

of differentiation but rather the attainment of similarity.

With the method of the computer numerical control machine tools the difference is



Detail showing the setting of two slabs of the west frieze. Photo V. Manidaki, 2010

easily monitored. A variety of evidence for making copies is easily available, such as the preservation, to the extent desired, of the “contour” lines of the mechanical movement of the cutting head. Furthermore, the geological structure and the damage will always be clearly different in the original and the copy.

The main question, in my opinion, posed in the choice of material for restoration is the insertion of differentiated material in the image and meaning of the monument. The method of making copies is a contemporary solution to that problem. In the Acropolis restoration marble has been used in most of the restored architectural members, whereas for the sculptured members, exceptionally, the copies are cast. This practice was in accordance with the principles of restoration, given the technology of the time. Yet it caused asymmetry in the composition, texture, resistance and aging between the members of the monument, since the life-span of a copy made of artificial stone is less than that of a marble one. Thus serious



Copies of the west frieze of the Parthenon being set in place.
Photo R. Christodoulou, 2003

aesthetic as well as practical questions, –the deterioration of the cast copies– oblige us continuously to review the supplements –technically, structurally and from the standpoint of material– in order to obtain the same life-span and compatible aging image throughout the entire monument, and therefore a more general aesthetic balance.

In accordance with the above, the key points for the choice of copies are, briefly, the following:

- The sculptured architectural members are of primary importance on a monumental masterpiece such as the Parthenon –with a significance even greater than that of the architectural members. To the extent possible, their restoration must enable them to retain the qualities and associations with the architectural work as a whole, which they had in their original form.

- A principle in the Acropolis restorations is to retain the form, the ancient structure and the material of the monument –marble.

- It must be possible to treat the additions and replacements of the architectural members in a unified way on the monument in respect to techniques, structure and material and, by extension, the durability to be expected.

- The technological possibilities for producing copies in each period must be taken into account.

The excellent reception of the Ionic column capitals of the Propylaia, which were made entirely from new marble and the scepticism about the image of cast copies as seen from nearby are two observations of concern.

The subject of the use of new technologies for producing marble copies was discussed by the Committee for Conservation of the Acropolis Monuments (ESMA) in February 2011 and it was decided to retain the existing theoretical principle and practice. The subject remains, however, as a question in the restoration of monuments that will indubitably occupy us in the future.

Acknowledgements

I should like to thank the members of the Committee for Conservation of the Acropolis Monuments (ESMA), in particular the President of the Committee Professor Emeritus Ch. Bouras, the Director of the YSMA, M. Ioannidou and Professor F. Mallouchou, for providing me with access to the ESMA-YSMA archive. I thank also Professor M. Korres, the civil engineer K. Zambas, D. Giraud –until recently director of DAAM– Martin Cooper, head of the Conservation Centre of the Liverpool Museum, the architect N. Toganidis, the architect G. Mavrommatidis, the civil engineer E.-E. Toumbakari, the President of the VENUS Company, E. Mazitzoglou, the sculptor D. Mastropoulos, all the colleagues of the YSMA, engineers, archaeologists, sculptors, marble sculptors and, especially, the cast team of the YSMA, for their instructive information and enlight-



Cast copy of the reconstructed marble capital of the 6th Caryatid
Photo V. Manidaki, 2010

ening viewpoints of theoretical and practical questions concerning the copies.

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**The present article is a summary of the work reported under the same title in the Conference "Methods of Anastelosis, materials and problems of application" of the Society for Research and Promotion of the Scientific Anastelosis of Monuments, held in Thessalonike on 20 November 2010.*



Marble filling in the sculptured decoration of the Porch of the Caryatids
Photo V. Manidaki, 2010

The restoration of the Parthenon's pronaos: aesthetical matter or theoretical dilemma?

Background to decisions governing the pronaos' restoration - theoretical concerns.

The restoration of the Parthenon's hexastyle pronaos has long proved a subject of major theoretical discussion, which has continued from the completion of Korres' restoration study in 1989, through its im-



View of inner side of pronaos columns, looking NE. Photo L. Lambrinou, 2009

plementation in 1998-2004, until today –more than 20 years later. This relatively far-reaching intervention had no precedent among previous modern works on the Parthenon, with regard to its extent, and it therefore elicited a variety of objections concerning the acceptance of such a drastic change to the long-familiar form of the monument –even if such a change were to be documented in detail. The case of the pronaos also illuminated a general problem in restoration practises: the need to harmonize the different theoretical perspectives of the various specialists involved in restoration concerning philosophical or practical aspects of interventions, including their aim and extent. The main concerns to arise at the time of the 1990 decision focused initially on the questions of total versus partial restoration of the pronaos and the acceptable quantity of new marble to be introduced. Ultimate-

ly, however, the greatest concern seemed to become the unresolved problem of which final form should be approved for the new in-fillings on the inner sides of the columns.

Disagreement in 1990 at the level of the governing Central Archaeological Council concerning the final form of the surfaces of new fillings to be installed in the pronaos' columns postponed the final decision to proceed with the restoration and led to the supplementary study of 1994 by C. Bouras. The new 1994 study proposed leaving the intended marble in-fillings of the column drums unfluted, with the result that the in-filled parts would appear as simple, partial cylinders. This proposed choice of form had as its precedent a successful similar choice, made by A. Orlandos during the reconstruction of the Hephaisteion's east-porch columns in the 1950s. One key advantage of Bouras' 1994 proposal to ESMA was its allowance for the possibility of future fluting the columns; that is, after the work was completed, it would be possible to reconsider the matter of the reconstructed columns' omitted flutes and to decide whether or not to proceed with fluting. This new 1994 solution, endorsed at the time as being fully reversible, postponed the problem of choosing the final treatment of the columns' surfaces until the following decade. Now that time has come, since implementation of the 1994 decision has enabled YSMA to reexamine the strengths and weaknesses of the pronaos restoration for the purpose of achieving a fuller, more satisfying response to theoretical concerns and aesthetic questions underlying present-day approaches to restoration.

Contemporary interventions as rescue works

Contemporary interventions on the monuments of the Acropolis are essentially rescue works, in the sense that they give preference to repairing or replacing Balanos' previous anasteloses. This focus has the advantage of providing an already established framework for determining the extent and form of interventions to be undertaken on sections of the Acropolis monuments that have earlier been re-

stored. In the case of the original anastelosis of the north colonnade in 1923-1931, Balanos fought hard to secure acceptance of the clearly new form that he was proposing for the monument and succeeded after a struggle of ten years. This form, inherited by present-day restorers, has long been considered aesthetically acceptable, thus making it difficult to reverse. This difficulty is aptly manifested in the scepticism that has greeted contemporary proposals, such as those for the pronaos, which call for changes to the familiar image of the monument. It is a scepticism that has evoked discussions concerning the preservation of historical continuity, while overlooking the fact that the present image of the Acropolis monuments is to a great extent the product of earlier, 19th



View of pronaos columns, looking N. Photo L. Lambrinou, 2009

and 20th century restorers, rather than of any previous historical process.

Changing the image

The idea that no drastic change should be made to the image of the ruin is a basic principle of modern restoration to the extent that this principle does not become a brake on efforts to improve the building with newly identified and preserved members. Rather than being limited to simple conservation of the ruins, the aim

of contemporary Acropolis interventions is to reincorporate newly identified members. The Acropolis monuments are approached as architectural creations, not simply as inherited, unchangeable exhibits. In this sense, the purpose of resetting newly identified members within the buildings is to give them their fullest and most recognisable form, whether or not this upsets their established image. Thus, the current efforts being made on the Acropolis are intended primarily to improve the monuments of the Acropolis aesthetically and pedagogically. It should be evident, nevertheless, that every intervention on an Acropolis monument leads to a new, non-historical, albeit reversible image of the monument. This a priori cost to the monument's existing image we consider to be balanced by the resulting gain in comprehensibility, as well as by the rescue of previously scattered ancient material through its incorporation into the monument. The term "rescue" is employed here because the architectural members scattered on the ground are fragmentary, not suitable for exhibition and not easily understood. Restored to their original positions on the monument, however, they regain their primary role and clearly contribute to the building's completeness.

Preservation of historical evidence

In every restoration undertaken on the Acropolis, the basic premise is that a monument's historical evidence will be safeguarded and preserved. Clearly every intervention, just as every process of excavation, carries a certain cost to the preservation of the monument. Traces left on the building by identifiable historical events are considered to be historical evidence. Ultimately, however, all traces visible on a building's architectural members, whether random or intentional, including the fractured areas themselves of any partly preserved members, can be considered historical evidence. When an intervention is based on the filling-in of fragmentary members, the preservation of all random traces on this architectural material cannot be set as a priority, since setting such a priority would be self-contradictory. On the contrary, the in-filling of incomplete architectural members is guided in such a way

as to preserve those traces left by the building's original construction or subsequent historical events. Telltale marks left from the blocks' original carving and the recognisable traces of later constructions (i.e. repairs, additions, conversions) on the building constitute important historical evi-



1. Pronaos column (4th from N) before restoration. Rectangular fence-cutting visible on upper, 4th drum.

Photo S. Mavrommatis, 1989

2. Detail of 4th column from N after restoration. Still visible are the traces for supports of ancient fences and Byzantine cuttings.

Photo L. Lambrinou, 2009

dence that is prioritised for preservation.

The inward-facing, fire-damaged surfaces of the pronaos' column drums fell away from the columns' upper areas, but are still largely preserved on the lower in situ parts of the columns. This evidence of the fire-damaged surfaces is a fortuitous result of a chance event in the history of the monument that indicates the way in which the building was destroyed. Nevertheless, the fire-damaged pronaos columns in particular were thought to represent a special case, since the thermal fracturing of their surfaces constituted one of the central pieces of evidence attesting to the damage caused by the ancient fire. The interior sides of the pronaos columns would have been especially interesting had they been preserved historically. Since the drum fragments that survived, and which have been incorporated into the monument, do

not exhibit fire-damaged surfaces on their western, inner sides, their completion with new marble scarcely affects any sections containing thermal fracturing.

On the other hand, sections of column

drums with traces of thermal fracture preserved on their north and south sides had to be treated differently. Here an attempt was made not to cover these traces with new marble additions. The result was a discontinuity in the forms of in-fillings and a somewhat unharmonious final aesthetic result. Ancient mortises cut in the sides of the columns, which served for the attachment of intercolumnar screens, have not been concealed by new in-fillings. Similarly left visible are the traces of coarse carving (with a pointed tool) on the middle columns where the Byzantine apse was once attached to them. Preserved also in these areas are the fluteless sections of the drums scarred by thermal fracturing.

Historical consistency

On the issue of historical consistency (or inconsistency) in the anastelosis of the pronaos the past and present acceptance of

interventions on the Acropolis' ancient monuments constitutes, by definition, acceptance of this paradox. Historical inconsistency is inherent to the very idea of preserving the ruins of ancient monuments; that is, in consolidating them at some particular, chosen moment or stage in their history for example, the stage of their ruination. This historical inconsistency becomes even more apparent when restoration works are carried further by expanding simple conservation measures into restoration of whole sections of the Acropolis monuments, in a desire to reverse their history. The form of the building that we recall by means of restoration represents a chosen remodeling of the building using some of its fortuitously preserved parts. This effort cannot be termed a "return" to a previous historical phase of the building, due, firstly, to the fortuity of the preserved and incorporated remains and, secondly, to the drastic effect that restoration has on the building itself by tending to negate its historical authenticity.

Despite these drawbacks, restoration is considered to be a fully acceptable procedure when principles based on special experience and international agreements are respected. Restoration is clearly an historical act, in the sense of being an irreversible change, which results in an historically new image of the building. This new image legitimises the intervention only when the intervention has adhered to the form of the original structure and has worked toward its benefit. The present-day appearance of the Parthenon, as well as that of the other Acropolis monuments, is to a great extent (completely in the case of the Athena Nike temple) an image already created by earlier restorers, which resulted from an historical decision made, in many respects, from the very beginning of the restoration efforts on the Acropolis in September 1834.

Which historical phase to restore?

The question of which historical phase of a building is most important to preserve and should be the subject of anastelosis is a particularly significant yet complex issue. The suggested approach in anastelosis nowadays is to accept as equally impor-

tant all historical phases of a building. In practice, however, such a broad approach proves difficult to follow, since it involves priorities that may differ totally, depending on the particular circumstances or requirements of the monument's various historical remains. In the case of the Parthenon, post-Classical alterations made to the building through the centuries were relatively limited. Moreover, the preserved evidence for these alterations is scarce—a situation to which archaeologists and restorers of the 19th century contributed significantly. This historical fact narrows the range of present-day alternatives, so



*View of pronaos columns, looking S.
Photo L. Lambrinou, 2009*

that any contemporary restoration of the building is ultimately constrained to the revitalization of the Classical temple.

In the case of the pronaos, the question, during the 1980s, of which historical phase to restore was posed differently. Here, the dilemma eventually led to the unusual decision in 1994 not to carve the flutes of the new marble in-fillings on the columns. The western flutes of the pronaos columns, as already noted, had survived for 8 centuries, whereas the columns themselves, although partly defaced by the ancient fire, had survived for an additional 14.5 centuries. Specifically, the dilemma amounted to whether the

original, shorter, classical phase with fluted columns should be restored or the phase with fluted columns that was historically longer—that is, the late Roman through 17th c. phase. For the pronaos, it had to be decided, therefore, whether the intervention would be guided by historical/archaeological or architectural/aesthetic priorities. In the event that the historically longer phase might be designated the most important to preserve, the major question would be how to present this phase in practical terms—that is, what should be the form of the in-fillings on the western, inner sides of the columns. As this option was discussed, various ideas were advanced, and some experiments were even conducted, about the best way to reproduce the fire-damaged appearance of the drums through artificial destruction of the surfaces of the new marble in-fillings, so that they would seem to have suffered thermal fracture. Such an approach, however, would have merely produced an artificially contrived imitation—reminiscent of a stage setting—which attempts to convey the chance result of an historical event.

According to the principles of the Venice Charter and other international agreements governing restoration, such scenographic approaches are discouraged, since the newly added, theatrically doctored material leads to a deceptive representation of the structure's form that may be chronologically confusing and which ultimately promotes an historical forgery. In other words, present-day restorers should not imitate the effects of the physical process of change on the members, nor artificially reproduce the history of the building, but instead reconstruct the building as an architectural work. An intervention should not present the fortunes of the building's members as a three-dimensional narrative. An intervention is optimal only when it fully corresponds with, or only deviates for justifiable reasons from, the authentic construction. In this sense, with respect to every new addition to the building, no other form is acceptable but the original—as long as restorers can reconstruct that original form faithfully.

In fact, this last-mentioned principle has been followed closely in the restoration programmes already completed on the Acropolis, and in those projects still on-going, with only two documented, probably unsuccessful exceptions (SW triglyph of the Parthenon). In all other cases, architectural members have been and continue to be restored with in-fillings of new marble that match the missing pieces' original measurements and form. The original carving of a missing piece's surface is also replicated. This general accordance, omnipresent from the building's general layout to the smallest ornamental detail, contributes in such a complex structure to the harmonious integration of new material into the ancient construction, for the purpose of enhancing the comprehensibility of the building. In-filling with new material is preceded by the assiduous study of the architectural canons and morphology of the ancient structure, so as to avoid reproduction of hypothetical partial forms. In the case of the pronaos columns, as the plan of the building is clear and significant features are preserved in situ, it is possible to recover the form of the east porch precisely as it was in the original construction. The preserved evidence was gathered, researched and described in Korres' 1989 study, so as to provide without doubt the



*Detail of 3rd column from N after restoration. Still visible are the traces for supports of ancient fences and Byzantine cuttings.
Photo L. Lambrinou, 2009*

exact form of the columns and the original provenances of their once scattered fragments.

The difficulties encountered and the eventual impasse that arose in addressing the question of which form of the Pronaos to preserve led to the 1994 proposal and thus to the making of partly worked drums a course of action that did not directly address the basic dilemma. Essentially, it was proposed to reproduce a phase of the constructional procedure slightly before the final step in the original process, which was the carving of the flutes. This 1994 proposal was certainly not intended to indicate a lack of knowledge or information concerning the columns' original form or the extent to which they had been carved, since it has long been understood that the columns of the pronaos, just as all other the columns of the Parthenon, had been completed during the original construction of the building. The possibility for later reconsideration and perhaps for eventual completion of the flutes in the new in-fillings was reserved, but postponed to some future point in time. Pursuant to this agreement, the 1994 proposal was finally accepted and ultimately carried out.

A new approach

With the arrival of the new millennium and the completion of the restoration of the pronaos, the obvious aesthetic asymmetry of the restored columns in the Parthenon's east porch has once again brought to the fore the question of the final form of the new, western in-fillings. The resulting proposal of 2004-2005 by the present author called for the carving of the flutes now to be undertaken using a mechanical cutter –a course of action intended to reduce the amount of time required for the operation. The specialised mechanical cutter to be employed had previously been used successfully for cutting the flutes of all the new in-fillings in the column drums of the Parthenon's north colonnade. The 2005 study concerning the time required for the carving of the pronaos flutes described the different lengths of time needed for cutting the flutes by hand or by machine and also

took into account the necessary time for dismantling and resetting the drums (3 years/6 months). As explained in the study, mechanical cutting of the flutes does not reach the ancient surface not only for reasons of security, but also because the profile of the ancient flutes constitutes a section of a pseudo-ellipse, which the circular disk of the mechanical cutter cannot reproduce. A few millimetres of marble are left uncut, therefore, with the final carving of the flutes executed by hand. The final finishing of the flutes by hand cannot be replaced by any mechanical process and continues to be a basic, preferable part of the anastelosis process.

The restoration of the Acropolis monuments, as products of the modern age, have made use of technology from the very beginning of the work, through all their stages, wherever feasible and necessary. The mechanical cutting of new members using laser technology replaces, in some cases, much of the hand work, which is thus reserved for the final rendering of the members' surfaces. In every case, the reasons behind the choice of mechanical over manual carving are not based on any weakness of traditional techniques, but on an attempt to expedite the works. From an economic and technical standpoint, traditional techniques cannot attain either the economy of manpower or, especially, time in such extensive works of anastelosis as those being undertaken on the Acropolis. The inclusion of these works in European funding programmes which come with clearly defined time frames, makes YSMA accountable for the time in which the interventions are completed.

In a positive step forward, approval for the full carving of the new marble additions in the columns of the pronaos –although only to be achieved by hand and in situ– was passed by KAS in late July, 2009.

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**Translation by J. R. Leonard*

New activities and publications of the Information and Education Department

The school year of 2010-2011 was very creative for our Department. Completed during this period were four new productions, which are described in the present article.

Acropolis and Restoration

Since architectural heritage is an inestimable cultural good that must be preserved and handed on to future generations, it is of major importance to approach it through education. With this in mind, in 2010 the Department of Information and Education of the Acropolis Restoration Service has created a new Teacher's Pack entitled "Acropolis and Restoration".

The pack is prepared for educators and for pupils, particularly of the Secondary level, who declare special interest in the works of restoration being carried out at present on the Acropolis, and are interested in the problems of the monuments and the reasons that have led to their restoration. It contains ten educational pamphlets that are divided into two groups:

In the first group of pamphlets, theoretical subjects are presented that are associated in a general way with the restoration of ancient monuments, particularly those of the Acropolis: the types of restorations, the problems of the monuments and the reasons for the intervention, the principles of the works of restoration on the Acropolis, the method of the interventions on the Acropolis monuments.

Presented analytically in the second group are the restoration programmes that are carried out on each individual monument under the titles: Parthenon, Propylaia, Erechtheion, Temple of Athena Nike, The Rock, the Walls and the Environment. A special pamphlet is dedicated to proposals for the educators. The contents of the Pack

as a whole offer an inter-thematic way of teaching and can provide a theme to be developed in many lessons of the school curriculum; moreover it can be incorporated in the teaching material of different grades. In particular, great possibilities exist for developing the theme in the framework of Environmental Education.

All the pamphlets of the Teacher's Pack are triptychs to facilitate their use in the classroom by smaller groups of pupils. On one face of the pamphlet the subject is de-



Teacher's Pack "Acropolis and Restoration"

veloped with the necessary informative text, while on the other side there is plentiful photographic material with views of the monument before and after restoration, accompanied by explanatory captions for easier comprehension of the subject.

The Teacher's Pack includes also the film "The Works on the Athenian Acropolis", (duration 60 minutes) comprising 5 thematic units: The Parthenon, the West side of the Parthenon, the Erechtheion, the Propylaia and the Temple of Athena Nike.

The film is a valuable audio-visual product for pupils studying the restoration works, since they can listen to the people who are carrying out the work talk about what they are doing; they can also see details of the work being done, which they would not be able to see otherwise.

With the opportunity of this publication, the Department is organising an open day programme on the Acropolis in the autumn of 2011, that will familiarise school children and the general public with the monuments of the Sacred Rock and with the restoration works.

www.acropolis-athena.gr

Another educational activity completed by the Department of Information and Education in 2010, is the on-line application "Athena, Goddess of the Acropolis" (www.acropolis-athena.gr). The application was created in collaboration with the Acropolis Museum, thanks to the generous funding from the Bodosaki Foundation, to which special thanks are due.

Athena, the goddess of wisdom, of culture and the arts was directly connected with the city to which she had given her name. Her presence as a name, as a tradition and as an artistic expression was predominant everywhere, especially in the most important sanctuary of the city, the Acropolis, where the goddess was worshipped in many different forms and capacities.

The purpose of the on-line application is to familiarise the user with the various natures of the divinity. By means of a virtual tour of the Acropolis Museum, the user, following a beam of light, looks for and observes the exhibits of the goddess Athena that have been chosen.

A number of these reflect the sacred cult

statues of the goddess that were once within the temples and of which today no trace remains, such as the clay statuette resembling the wooden statue of Athena

pediment, where only part of the statue has survived. Yet another category of statues that can be seen in the application comprises the various votives-dedications

named Meleso, as well as the famous Pen-sive Athena.

The application includes also a fragment of a Panathenaic amphora, the vase that was presented as a prize to victors in the Panathenaic games, on which there is a representation of the goddess Athena, fully armed as a goddess of war. For each of these exhibits the user can read a brief description, a relevant myth, information about the cult of Athena as well as the relevant ancient texts of Pausanias. In addition it is possible to see the exhibit from close-up and some of them all around, virtually restored.

Three months after the uploading of the on-line application www.acropolis-athena.gr, there have been 3,844 visits, a number that corresponds to 3,145 individual visitors. Six hundred of these visitors come from 49 foreign countries. It is interesting that a third (33%) of the visits are direct visits. The other sources of "traffic" are the reference websites (62%) and search engines (5%).

The photographs, the artistic design and the editing of the application were done by Professor K. Antoniadis and the application design and development by Y. Koutsoukos.

A Day in the Acropolis Museum with the Goddess Athena

The next educational activity of the Department combines the on-line search for the goddess Athena with an actual search for the goddess inside the Acropolis Museum. The programme has been organised by the Acropolis Museum and in its context a special Family Pack has been created. The Pack contains a series of games that help the child recognize the goddess Athena from her attributes and search for her in the Museum. The purpose of the Pack is to attract families and to facilitate their visit inside the Museum. As an introduction to the programme "A Day in the



On-line application "Athena, Goddess of the Acropolis"

Polias, the patron goddess of the city, that was kept inside the Erechtheion, as well as the marble statue of Athena Parthenos, a Roman copy of the chryselephantine masterpiece by Pheidias, that stood within the Parthenon.

Included likewise in the application are some of the most important architectural sculptures of the Acropolis with themes taken from the goddess's mythology, such as the impressive statue of Athena in the Gigantomachy where she is shown fighting with the Giant of earthquakes, Engelados, from the pediment of the "Archaio Naos" (the Old Temple), as well as the representations in relief of Athena from the Parthenon frieze and from the parapet of the Athena Nike temple. In this same category of architectural sculptures are the statues of Athena from the two pediments of the Parthenon. The birth of the goddess was shown in the east pediment, from which her statue has disappeared but the user can recreate her in his imagination with the help of a virtual reconstruction of the statue. So too, the struggle of Athena with Poseidon in the west

to the goddess that represent the goddess herself, such as the Athena that was carved by the famous sculptor Endoios, the little bronze Athena Promachos, goddess of battle, dedicated by a woman



Digital reconstruction of the chryselephantine statue of Athena Parthenos

Acropolis Museum with the Goddess Athena”, a bilingual 3-minute film was made by K. Arvanitakis, explaining the contents of the Family Pack as well as the on-line application (www.acropolis-athena.gr), which everybody can visit afterwards at home.

The family also receives a specially designed childrens’ plan of the Museum and stickers with the representations of the goddess Athena. In the quest for the goddess in the Museum, the children can use

home, the child can repeat and also continue his/her game with the goddess Athena on the internet.

Another activity the parents can enjoy with their children in the Museum, in the course of the programme, is based on the game “A day in the Acropolis Museum playing with the Symbols of the Goddess Athena”, which is accompanied by a series of magnets with the attributes of the goddess. First the children learn the goddess’s symbols, the spear, the shield, the helmet,

other cases, the figures are black but the face of the goddess is painted white, as was the practice so as to distinguish the female from the male figure. The children search for these representations of Athena in the gallery of archaic exhibits, in the east and west Museum cases and match the pairs of cards, exercising their memory and their observation skills!

For a period of around 3 months beginning on 16 April 2011, when the programme began to work, 1,004 families have participated. Of these, 821 families borrowed the Greek Pack and 67 families the English version. Up to 5 May, when the English Pack began to circulate, 160 childrens’ maps had been offered with stickers in the English language. The average time spent in the Museum by the visiting families was around two hours.

In the context of evaluating this activity, a questionnaire was drawn up, which the parents filled in when they returned the Pack. A total of 189 questionnaires were gathered, 42 from foreign families and the rest from Greek families.

Acropolis and Education

For the Information and Education Department, the school year 2010-2011 closed with the completion and publication of the book “Acropolis and Education”, which was made possible with the very generous funding of the Panayotis and Effie Michelis Foundation, to which special thanks are due. The book has 192 pages and it constitutes a guide for a teacher to carry out educational programmes about the Acropolis and the classical antiquity.

The book has two parts. Described in the first part are the activities of the Department as they were developed over the past 25 years, in an effort to make knowledge about the life and art of antiquity more compelling and comprehensible to school children and to educators. Described and analysed in particular are:



Family Pack. Photo Acropolis Museum Archive

as a basis the game “A Day in the Acropolis Museum Searching for the Goddess Athena”, which includes cards with information about the goddess, graphic or digital representations of her and suggested activities. Of help also may be the specially designed childrens’ labels that have been set next to the chosen exhibits. Each time the children recognise a representation of the goddess Athena, they place the corresponding sticker on the plan which they later take home.

The representations of Athena chosen for this searching game comprise some of the exhibits of the goddess that are included also in the on-line application (www.acropolis-athena.gr). Thus, on returning

the peplos, the owl, the olive tree and the aegis with the goddess's gorgoneion. They then place the symbol-magnets on a drawing-magnet of Athena. In this way each child makes his/her own individual composition.

The children finish their tour of the Museum playing a memory game entitled “A day in the Acropolis Museum Playing with the Images of the Goddess Athena”. The game includes nine pairs of cards showing Athena’s faces painted on clay vases. Some are painted in the black-figure technique, that is, a black figure on a red ground, and others in the red-figure technique, with a red figure on a black ground. Some are painted on a white ground, while in two

- The educational programmes that are organised for school groups.
- The seminars conducted for educators and pupils on classical greek art and architecture as well as on the restoration of classical monuments.
- The educational resources, printed and digital, that have been published by the Department about classical art and architecture, and the restoration works on the Acropolis.
- The special symposia for educators as well as exhibitions of educational material.

The chapters have been arranged so as to make it easy for the reader to find and use the programme or educational material that interests him.

The book includes also educational programmes that were carried out in the old Acropolis Museum and which can now be pursued in the new Museum. They have been supplemented with new photographs of the exhibits and their new display in the Museum. The educational activities presented in the first part of the book constitute the one side of the Museum-School collaboration.



Celebrating the Panathenaia at school

Presented in the second part of the book are a number of chosen projects that were carried out by educators and pupils of various schools in Greece, with which we have collaborated from 1991 to the present. These reports of the educators present the way in which they used and incorporated into their teaching the experiences and knowledge they gained from participating in the Department's educational activities. This is a very significant aggregate of rich in ideas teachers' projects that have already been applied by educators of all grades and all specialisations. In the course of studying these reports, it was decided that their publication would be easier for the reader to comprehend, if they were arranged by subject: in a first level on the basis of the place where the programmes took place (applications at School, at Special Schools, at Libraries, at other Monuments or Museums); in a second level on the basis of the teaching unit in which they were carried out (through the lessons in History, Applied Art, Language, Natural Sciences etc). Since most of the applications can be entered in many categories, their classification is not absolute and it was finally de-



Cover page of the book "Acropolis & Education"

termined according to the subject that was predominant in each project.

In each of these programmes the way in which the educator approached the Acropolis and its monuments is made clear, always depending on his specialty, his class and the specific aims he had set. Thus the educator who is interested can study many different programmes concerning the Acropolis and its epoch, that incorporates ideas, methods and applications created by colleagues with the same background, the same possibilities and the same goals.

Special thanks for her contribution to all the above, as well as for her assistance to all the activities of the Department are due to the archaeologist Sylia Paraschou.

Cornelia Hadziaslani

Architect-Archaeologist

Head of the Department

Eirini Kaimara

Archaeologist

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Archaeologist

Information and Education Department

News from the Acropolis

From July 2010 to date the YSMA has accomplished restoration works of utmost significance, while simultaneously furthering activity in education and in promoting the work of the Service for the professional community and for the general public.

Educational activities

In 2010, the YSMA Information and Education Department carried out various educational activities that were attended by 34,145 people, educators, pupils and the general public. Specifically, 152 educational programmes were held, in the New Acropolis Museum, for 3,047 pupils (9-13 years old) with the theme “The Sculpture of the Parthenon”. The Museum Kits of the Department were lent and used by 11,997 pupils from 240 schools (622 classes) of 18 counties throughout Greece. Moreover, 18,100 individuals played the on-line games of the Museum Kits (www.parthenonfrieze.gr/play-with-the-frieze).

The Department held seminars for 1,002 people, educators and students to whom educational material was given. Most of the seminars had as theme the “Educational Programmes about the Acropolis and the New Museum”.

Likewise during the past year, the Department participated in a one-day conference on the subject of “The Use of New Technology in the Context of Educational Museum Activities”, which was held on the 28th of June, 2010, by the Greek Section of ICOM (International Council of Museums). The subject of the talk given by the Department was: “www.parthenonfrieze.gr: an on-line application about the Parthenon Frieze”. Likewise, in the framework of the International Conference on the subject of “Open Access: Research - Education - Public Data Base” that was held on the 17th of December, 2010, in Athens by the National Documentation Centre/ National Hellenic Research Foundation, in collaboration with the organisation SPARC Europe (Scholarly Publishing and Academic Resources

Coalition) and the Union of European Research Libraries (LIBER), the Department participated with a talk on “The Ancient World in Modern Education - Open Educational Content about the Acropolis”.

In 2010 a new educational folder under the title “Acropolis and Restoration” was published. It contains ten educational pamphlets divided into two groups and the film “The Works on the Athenian Acropolis”.

In addition, in 2010 the on-line application on the subject “Athena, goddess of the Acropolis” (www.acropolis-athena.gr) was completed. The purpose of the appli-



From the presentation of the Acropolis works at the British Museum.

From above: D. Michalopoulou, N. Toganidis, L. Lambrinou

cation is to familiarise the user with the different aspects of the goddess Athena and with the Acropolis Museum. The application was created by the YSMA Department of Information and Education in collaboration with the Acropolis Museum thanks to the generous funding of the Bodosakis Foundation.

Special thanks are due to the archaeologist C. Paraschou for her help to all the educational activities of the Department.

Presentation of the Acropolis works in a study day at the British Museum

Completion of the three large restoration projects (north colonnade of the Parthenon, ceilings of the central building of the Propylaea and the temple of Athena Nike) provided the occasion for a full presentation of the work of the YSMA. On October 8, 2010, the British Museum organised a study day entitled “Restoring the Acropolis of Athens”, at which those in charge of the works were invited to speak. The General Secretary of the Ministry of Culture and Tourism, Dr L. Mendoni, greeted the conference in a message. The President of the ESMA, Professor Emeritus Ch. Bouras, presented the overall account of the work of restoration that had been carried out over the past 35 years under the scholarly direction of the ESMA. Mrs. M. Ioannidou, Director of the YSMA, spoke about the research and technology used in the restoration of the Acropolis monuments. The restoration of specific parts of the monuments was presented in detail by the heads of the Sections and the Technical Offices as follows: Mrs. E. Papakonstantinou, chemist-engineer, presented the works of surface conservation of the Acropolis monuments, Mrs. D. Michalopoulou, civil engineer, spoke on the restoration of the temple of Athena Nike, Dr Tasos Tanoulas, architect, presented the restoration project of the Propylaea and Mr. N. Toganidis, architect, reported on the Parthenon restoration project. Mrs. L. Lambinou, YSMA architect, spoke about the past and present interventions on the north side of the Parthenon. Finally, Associate Professor and member of

ESMA, Dr F. Mallouchou-Tufano, presented the restoration of the Erechtheion.

Publications - Digital activities

On the occasion of completing the large restoration projects, the YSMA circulated a publication with the title “The restoration of the monuments of the Athenian Acropolis” in both greek and english. Presented in the book, which was edited by the head of the Documentation Office, Dr E. Lembidaki, is the history of the interventions, the principles and methodology developed by the ESMA and the works of restoration completed on the monuments. The illustrations, selected from the rich YSMA Archive, and particularly the most recent ones, depicting the monuments after restoration, make the publication a valuable tool for informing the public. The booklet has been distributed to libraries and educational establishments in Greece and abroad.

Another important achievement of the Documentation Office during the past year is the updating of the Service's website. The new website (www.ysma.gr) has a



Publication entitled «The restoration of the monuments of the Athenian Acropolis».

Photo T. Souvlakis, 2010

modernised appearance, more attractive and easy for the visitor to the network, while assuring simultaneously independence during the process of updating the information it contains. Finally, the Documentation Office designed an original application of an electronically interactive tour in the archaeological site of the Acropolis through high-analysis photographs and panoramas (www.acropolis-virtualtour.ysma.gr). The visitor to the website can enjoy excellent photographs of the monuments, in morning

and evening lighting, and details of the monuments that are difficult to discern for those actually visiting the site. In the coming period, the application will be enriched by explanatory texts to be entered in the YSMA website.

Distinguished visitors to the Acropolis works

On the 30th of October 2010 the archaeological site of the Acropolis was visited by a team of reporters from the most important German media, on the initiative of the Hellenic Foundation for Culture of Berlin with the support of the Ministry of Culture and Tourism. The occasion of the visit was the completion of the restoration programme of the Acropolis monuments and the purpose was to promote the Hellenic cultural heritage to the European public. The journalists were given a tour of the Acropolis works by Professor Emeritus Ch. Bouras, President of the ESMA, and by Mrs. M. Ioannidou, Director of the YSMA, and thus had the opportunity to be informed about the restoration being carried out on the Acropolis. The visit was considered particularly successful and the reports that appeared in the German press shortly afterwards –at a particularly difficult conjuncture for Greece– showed a modern and effective service performing an extremely demanding work of restoration.

On March 24, 2011, Queen Sophia of Spain visited the archaeological site and unveiled the marble stele that was installed by the Beule Gate. The stele was constructed by the marble technicians of the Propylaea project and it copies the text of King Peter V of Aragon who, in the 14th century, called the Castle of Athens the “most valuable jewel in the world”. Queen Sophia was received by the General Secretary of the Ministry of Culture and Tourism, Dr L. Mendoni, the President of the ESMA, Prof. C. Bouras, the Director of YSMA, Mrs. M. Ioannidou and the Head of the 1st Ephorate of Prehistoric and Classical Antiquities, Dr S. Samartzidou.



Guided tour of the British Museum by Dr I. Jenkins for the research personnel of the YSMA. At the left is Professor Ch. Bouras, president of the ESMA.

Finally, on July 9, 2011, the Acropolis was visited by the Minister of Culture and Tourism, P. Geroulanos, accompanied by the General Secretary of the Ministry, Dr



Visit of H. M. Queen Sophia of Spain to the Acropolis. At the left M. Ioannidou, Director of the YSMA, and right L. Mendoni, General Secretary of the Ministry of Culture and Tourism. Photo T. Souvlakis, 2011

L. Mendoni. The occasion of the visit was the dismantling of the corner pedimental sima with the pseudo-spout lion-head from the northwest corner of the Parthenon, in the context of the programme for restoring the west side of the monument. The architectural member, with the impressive details of its construction that are preserved, elicited the wonder of all those present. Particularly positive were the comments on the coordination and skill with which it was dismantled.

Guided tours

As each year, this year too the scholarly and technical personnel of the YSMA guided visitors who had particular interest in the Acropolis restoration works. Here we report on two out of the many, mainly because of their symbolic content. On September 30, 2010 the YSMA Director, Mrs. M. Ioannidou, guided the members of the Association of the Friends of Acropolis around the restored monuments. This was, in fact, the second guided tour for the Friends in 2010, and the occasion was the completion of the

restoration project of the temple of Athena Nike. This extra tour was arranged in order to present the completed restoration programme of the YSMA to the members of the Association, who have for years followed and supported the Acropolis works. In addition, on February 18, 2011, the pupils of the Centre for the Education and Rehabilitation of the Blind were guided through the works of restoration by the present writer and by the marble technicians Mr. P. Georgopoulos and Mr. S. Aggelopoulos. The pupils, accompanied by their teachers, had the opportunity to touch the monuments and to understand the basic meanings of architecture and ancient construction that they had been previously taught in school. They were also informed generally about the works of restoration, the principles and methods applied, and about the changes made by the work in the appearance of the monuments. In their visit to the workshops, the



H.M. Queen Sophia of Spain with the work team at the Parthenon worksite. At the right is the General Secretary of the Ministry of Culture and Tourism, L. Mendoni. Photo T. Souvlakis, 2011

pupils responded with interest and enthusiasm to the presentation of the cutting tools and the techniques of marble working.

Lectures and publications about the Acropolis

During the past year, those responsible for the works played an active part in the

scholarly dialogue on the monuments and their restoration, with publications, lectures and reports at conferences. In addition to the conference at the British Museum described above, especially noteworthy is the lecture given by the President of the ESMA, Professor Emeritus Ch. Bouras, on the subject of “The diachronic values of the monuments of the Athenian Acropolis and the efforts to preserve it”. The lecture was given on May 16, 2011, at the University of Cyprus, in the context of a cycle of lectures by distinguished personalities in memory of D. Levendis.

On March 14, 2011, the Director of the YSMA, Mrs. M. Ioannidou spoke at an event entitled “Restoration on the Sacred Rock of the Acropolis” that was organised in Kalamata by the Bougas School and the Union of Educators of the School of Humanities and Cultural Studies of the

University of the Peloponnese. The subject of her talk was the work of restoration on the Acropolis. Participating in the same event was the head of the YSMA Electro-mechanical Team, Mr. S. Oikonomopoulos, mechanical and electrical engineer, who spoke about the special electro-mechanical equipment used for working, mending and moving architectural members on the

Acropolis rock. Mrs. Ioannidou went also to New York on a formal invitation by the Hellenic American Technical Society (HATS), where she gave two lectures about the restoration of the Acropolis monuments. The first was given on May 9, 2011, in the hall of the Church of the Holy Trinity and the second, on May 13, 2011, in the Center for Architecture of the American Institute of Architecture (AIA). The response of the public was warm, indicating once again the interest of the international community in the Acropolis works.

Mrs. V. Manidaki, architect, gave a report on “The replacement of sculptured architectural members on the Acropolis monuments. Casts, copies and authentic members” in the one-day workshop organised by the Research Society for the Promotion of Scientific Restoration of Monuments (ETEPAM) under the title “Techniques of anastelosis, materials and problems of application” (Thessalonike, 20 November 2010).

Significant also were the reports given by the Surface Conservation Section. G. Frantzi, K. Frantzikinaki, A. Panou, E. Papakonstantinou and A. Tsimereki presented a poster with the title “The Acropolis monuments: surface conservation projects and general conservation activities in the last few years” at the International conference “Conservation and the Eastern Mediterranean, Institute for Conservation and Artistic Works (IIC)” held in Constantinople, 20-24 September 2010. At the same conference, G. Frantzi, D. Garbis, E. Papakonstantinou and A. Karagouni presented a report entitled “Biodeterioration control at the Athens Acropolis monuments: strategy and complications”. The section took part likewise in the International Symposium

“Works of art and conservation science today” (Thessalonike, 26-28 November 2010) with a poster presented by G. Frantzi, E. Frangiadaki, N. Maridaki, Ch. Laskaridis and E. Papakonstantinou under the title “The foundation of the Arrephorion in Acropolis of Athens: decay and preservation state”. Finally, D. Garbis, S. Papida, E. Papakonstantinou and A. Karagouni gave a report on the subject of “Monitoring the biodeterioration on the Acropolis monuments: strategy and



Visit by the Minister of Culture and Tourism, P. Geroulanos, to the Parthenon. Photo T. Souvlakis, 2011

limitations” in the yearly one-day workshop of the Panhellenic Association of Conservators of Antiquities held at the Acropolis Museum on December 1, 2010.

Concerning the personnel

Last year saw the departure on retirement of some who had taken part in the work for the longest time. On November 30, 2010 the head of the restoration of the Propylaia, Dr T. Tanoulas retired. He has devoted 34 years of work to the Archaeological Service, 24 of them to the Propylaia, which he had also studied for his doctoral thesis. Having made a great many studies and overseen their application to the monument, T. Tanoulas has bound his name inseparably with the

Propylaia. Likewise, the head of the Surface Conservation Section, Mrs. E. Papakonstantinou, an especially active member of the scholarly personnel with a long career, completed her service with the YSMA on November 30, 2010. Despite their retirement, however, both remained close to the works, always available to share their knowledge and their experience with the newer members of the staff. Special mention should be made of the departure of the marble technician Mr. G.

Regos, who retired on August 31, 2010. Born and raised in the island of Tenos and with a wealth of experience in marble working, he took part in the Acropolis works for 20 years, for the last of which he was head of the Propylaia team. On November 1, 2010, the YSMA photographer, S. Mavromatis retired as well. His lens immortalised and displayed not only the monuments themselves, but the laborious process of their restoration.

The renewal of the YSMA personnel, finally, must be mentioned. This was achieved either by bringing in personnel from other services, or through new recruitments, with funding from the European Union. It is believed that an increased human element in combination with the experience and technical knowledge that has been gained in the course of the past years, will surely contribute to the successful completion of the works that have been programmed for the next three years.

Evi Petropoulou
Archaeologist
Documentation Office



*Preparations for dismantling a cornice block from the north entablature of the Parthenon.
Photo V. Eleftheriou, 2011*



*Dismantling the second from the west metope of the Parthenon north entablature.
Photo V. Eleftheriou, 2011*

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