Publisher
ACROPOLIS RESTORATION SERVICE

Editing and Production
E. LEBIDAKI

Photographs
YSMA Archives

Artistic Layout
O. SIMAIOFORIDOU

Translation
M. CASKEY

2nd Edition (updated with the restotation programme of 2011-2013)

Polygnotou 10, 105 55 Athens
www.ysma.gr, e-mail: ysma@culture.gr

THE RESTORATION OF THE MONUMENTS OF THE ATHENIAN ACROPOLIS

TEXTS
M. IOANNIDOU - E. LEBIDAKI

MINISTRY OF CULTURE AND TOURISM - ACROPOLIS RESTORATION SERVICE

1. View of the Acropolis from the Pnyx after completion of the restoration programme of 2001-2010 (2011).

During the decade of 2001-2010 an extensive restoration programme was carried out on the Acropolis. The interventions began as rescue work in 1975, the purpose being to halt the rapid damage caused both by the oxidation of the iron reinforcements of the earlier restorations and by the atmospheric degradation of the surface of the marble. This work developed gradually into interventions for the purpose of displaying the monuments and the archaeological site itself. Systematic research on the preserved architectural material showed that it was possible to incorporate in the monuments ancient fragments or members that had in the past been set into incorrect positions. It likewise proved possible to incorporate fragments that had lain scattered on the ground but the original position of which was now recognised. Responding to the general desire of today for greater comprehensibility, enjoyment and participation in cultural heritage, the inclusion of these scattered members in the monuments contributed to the clarity of their meaning and to their educational influence. Today, the works of restoration of the Acropolis are recognised as an example for interventions on ancient monuments of classical antiquity in Greece and abroad. The interdisciplinary approach to the problems, the transparency in all phases of the works, the scholarly research, the systematic documentation, the high quality of the works and the technologically original applications are the main characteristics of the interventions, and to these characteristics the works owe their special distinction. Thanks to these unique characteristics the restoration of the Acropolis monuments has indeed received international recognition and it is generally agreed that modern Greece is in the vanguard internationally in the restoration of ancient monuments.

After the completion of the great restoration programme of the years 2001-2010, the interventions have been extended also to other areas of the monuments that showed similar problems. In the new phase of the works, analysis of the earlier interventions and the experience gained during their course, provide the trustworthy guide for our future direction. With the same enthusiasm, with unlessened interest and care for the monuments, and with a visible horizon, moreover, of completion, we are proceeding to carry out the works that assure the continuation of the material existence of the Acropolis monuments and at the same time contribute to the display and diffusion of their intangible essence –of their spiritual wealth and inherent values– as an inestimable treasury for the generations to come.

July 2011

Maria Ioannidou
Civil Engineer
Director of the YSMA

Introduction

The inestimable artistic and historical value of the monuments of the Athenian Acropolis, that uniquely brilliant group of buildings created by the Greeks when they reached the height of their civilisation during the 5th century B.C., is recognised by all the civilised world. These masterpieces of world-wide architectural heritage were erected by the Athenian state as an expression of devotion to Athena, the patron goddess of the city, thirty years after the burning and razing of the city's sanctuary during the Persian wars. At a unique conjuncture of favourable circumstances, Perikles, a charismatic Athenian politician, assumed the ambitious planning of its reconstruction.

The four incomparably beautiful buildings that were constructed at that time on the Acropolis rock, the Parthenon, the Propylaia, the Erechtheion and the temple of Athena Nike, expressed the artistic resolution and respect of a city that had acquired not only the leadership of Greece but the cultural supremacy of all antiquity. Built entirely of white marble, with their inspired designing, these buildings became objects of great admiration even in antiquity and deeply influenced the architectural monuments to follow.

Witnesses of a culture that has deeply influenced that of today, the buildings make a visit to the Acropolis a pilgrimage to whatever beauty and perfection the world of antiquity has bequeathed us, despite the dramas, destructions and irreparable damage of time that they have endured over twenty-five centuries. This is why they must be preserved as historical evidence and handed down to coming generations in the best possible condition. So too, their artistic values must be displayed with their architectural form and function.

The Sacred Rock of the Acropolis of Athens, a natural beacon of Athenian topography, through all its constant changes (place of habitation, sanctuary, fortress, etc.), directly connected with its crucial role in the historical course of Athens, is a point of reference for Greek history and a symbol of modern Hellenism. Until the 4th century A.D. it still functioned as a sanctuary. With the domination of Christianity, churches occupied the interiors of the buildings (Parthenon, Erechtheion and Propylaia), welcoming the new religion. Its monuments underwent important changes and destruction during the period of the Latin (1205-1458) and Turkish dominations (1458-1833). With the freeing of Greece from the Turkish domination and the establishment of the Greek state (1833), the Sacred Rock of the Acropolis was promoted as the national monument par excellence and anastelosis of its monuments became a national goal of supreme importance.

After the initial interventions for cleaning, the purpose of which was to remove the remains of late antiquity and mediaeval times so as to display the monuments of the classical period, limited excavations and anasteloses of the monuments were initiated on the Acropolis rock. These were carried out experimentally but with unsurpassable enthusiasm. The period from the end of the 19th century to the Second World War was characterised by sweeping excavations on the Sacred Rock (1885-1890) and the accomplishment of an ambitious programme directed by the civil engineer Nikolaos Balanos. This included anastelosis interventions on the monuments on a grand scale, the purpose of which was, in so far as possible, to restore the form they had in classical times. These interventions covered a period of some 40 years and they gave the monuments the form in which they are known worldwide today (Parthenon 1898-1902 and 1923-1930, Erechtheion 1902-1909, Propylaia 1909-1917, temple of Athena Nike 1935-1940). It is an intervention that might be considered successful since it preserved their image as ruins, using to a great extent ancient material, with only a few additions of new marble. Yet from the technical standpoint, Balanos' anasteloses were catastrophic. Using the technology of his time, in an unpermissible way (ordinary iron used for joining fragments of architectural members or for increasing their resistance), and using scattered ancient fragments as ordinary building material, caused great damage to the monuments. After the Second World War, with the detection of significant structural problems caused by earlier anasteloses, an overall intervention on the monuments of the Athenian Acropolis based on a clear theoretical basis and high scholarly criteria was proposed as an emergency.

The establishment of the Committee for the Conservation of the Acropolis Monuments (ESMA) in 1975 inaugurated a new epoch in the approach to restoring the Acropolis monuments. The predominant perception was that the complex matter of restoring the monuments required the collaboration of scholars from many fields, archaeologists, architects, civil engineers and chemical engineers. Thus, to the fullest extent, the desire for an interdisciplinary approach was applied to the restoration of the monuments as formulated in the «Charter of Venice», the internationally accepted theoretical framework that governs interventions on ancient and historical architectural monuments.

This committee of interdisciplinary specialists, first of its kind in Greece, undertook at that time to study the serious structural problems and the problems of surface erosion of the monuments. It continued with the direction of interventions on the monuments of a rescue nature, the first concern being to remove from the monuments the rusted iron reinforcements of the earlier interventions and to deal with the damage to the surfaces by atmospheric pollution. As the works progressed they developed into more extensive anasteloses and restoration. Additional goals were to reset on the monuments ancient fragments that had lain scattered on the rock and were now recognised, and also –during the reconstruction of the monuments– to correct the errors of the previous interventions in resetting the architectural members. The acquisition in this way of part of the structural authenticity and authenticity of form of the monuments, was directed toward demonstrating their intrinsic architectural, aesthetic and environmental values, while making them more comprehensible to visitors.

By 2000 the rocks of the east and south slopes of the Acropolis had been consolidated (1980-1993) and the restoration of the Erechtheion completed (1979-1987), as well as the restoration of the east side of the Parthenon, the restoration of the 5th from the east column of the south colonnade of the same monument which was ready to fall, the restoration of part of the entablature of the east portico of the Propylaia and part of the south wall of the central building of the same monument. In addition, in 1993 the blocks of the west frieze of the Parthenon and, in 1998, the frieze blocks of the temple of Athena Nike were removed to the Acropolis Museum in order to be protected.

The year 2000, with the establishment of the

2. The Erechtheion after its restoration. View from the southeast.

3

4

Acropolis Restoration Service (YSMA) of the Ministry of Culture, saw the beginning of a new phase of anastelosis interventions on the Acropolis. The extensive programme of anastelosis that began then with funding from the European Union and the Greek State and was completed in 2010, included interventions simultaneously on the Parthenon (pronaos, opisthonaos, north side), the Propylaia (ceilings of the central building, north wall and east portico), and the restoration of the temple of Athena Nike. The programme included also conservation of the surfaces of the above buildings including the Erechtheion, consolidation and cleaning of the west frieze of the Parthenon, recording and classifying the scattered members, as well as works of consolidation and conservation of the circuit walls of the Acropolis.

The programme of interventions that began in 2011 includes interventions carried out simultaneously on the Parthenon (west side, west and north walls of the cella), the Proplaia (south wall of the central building, south hall) and the temenos of the temple of Athena Nike (subterranean crypt and the north crown of the classical bastion). Included also is surface conservation of the above mentioned monuments and of the Erechtheion, recording and classification of the scattered members, and continuation of research on static efficiency and seismic behaviour of the fortification walls on the Acropolis rock.

3. The Parthenon after the restoration of the east side. View from the east.

4. Intervention on the 5th from the east column of the south colonnade of the Parthenon.

5. View of the Acropolis from Lykabettos after completion of the restoration programme of 2001-2010 (2011).

The interventions on the Acropolis were imbued with the spirit of the «Charter of Venice», and with the additional principles established from 1975 on for the monuments of ancient greek architecture. These originated in the system of construction of the monuments of the classical period: the principle of reversibility in the interventions, that is, the possibility of returning the monument to the condition it was in before the intervention, respect for the original material, respect for the ancient structural system, retention of the structural autonomy of the architectural members and their original structural function. We must add: restriction of the interventions to the absolutely necessary, full transparency and scholastic documentation during the works and finally, presentation of the works in every way to the scholarly world and to the general public.

The main characteristic of the works carried out on the Acropolis is the continuous research that accompanies them from the very beginning through all phases of the works and the special studies made prior to each intervention. The most advanced technology is applied to the initial studies for the interventions, the organisation of the worksites, the performing of the works and to their systematic documentation. Traditional techniques and materials are utilised together with contemporary methods and materials that are compatible with those of the original monuments.

In the Acropolis anasteloses, those parts of the monuments that had been restored in the past –and sometimes sections that had not been restored before but evidenced the same damage and fragmentation– are dismantled, work that is facilitated by the articulated structural system of classical monuments. The dismantled members are restored on the ground. The rusted metal elements and the cement mortar of the previous interventions are removed. The fragments of the ancient members are re-joined. Used for this are rods of titanium and inorganic mortar. Reinforcements of titanium replace the rusted ancient or modern metal reinforcements between the architectural members. Where considered necessary, missing parts of the members are filled in with new Pentelic marble in order to restore their original form and structural autonomy. The new fillings are cut with the use of a point or with an electric pantograph so that they agree precisely with the broken surfaces of the ancient member being filled in. The join is then made using titanium rods. The outer surfaces of the fillings and of the members made of new marble are finished by hand so as to produce precisely the ancient form and decorative aspect of each member. In the anastelosis the goal is to restore the architectural members according to their original measurements, and to assure the function of the structural web in agreement with the building principles applied in antiquity. After being restored, the members are reset in the positions they had in antiquity or in similar positions. They are joined with titanium sheets that are made into clamps and dowels, and are anchored in the ancient sockets and cuttings with inorganic mortar corresponding to the ancient system of joining. In this process a perfect fit is sought, an inviolable canon, that insures the high quality of the contemporary intervention.

Together with the works of structural restoration, conservation is carried out on the marble surfaces of the monuments that show damage from the action of atmospheric pollution, from biological and physio-chemical agents and from human activity. These works comprise the consolidation of desintegrating surfaces, the joining of fragments, the filling of cracks and spaces with injected mortar, the removal of soot deposits and black crust, the application of an artificial patina to new marble fillings. The methods and materials employed are based on international bibliography, the experience of

6

7

8

6. Dismantling a fractured architrave block of the north side of the Parthenon.

7. Removal of iron reinforcement from Propylaia beams.

8. Setting an architrave block of the north side of the Parthenon.

9

10

11

the worksite and the original research carried out in the past, they are reversible and their behaviour over time has been tested. Finally, in order to avoid further damage, the architectural sculptures are taken to the Acropolis Museum and replaced on the monument by accurate copies in artificial stone.

12. Setting a double-T clamp of titanium for joining two architrave blocks in the north side of the Parthenon.

9. Fitting a new marble filling to a column capital of the north colonnade of the Parthenon.

10. Final cutting of the flutes on a fillng in a drum from the north colonnade of the Parthenon.

11. Carving the guttae on a cornice filling of new marble for the north side of the Parthenon.

13a-b. Column capital of the east porch of the Erechtheion. Condition of the surface before and after conservation.

The Erechtheion, the monument-depository of the most ancient Athenian traditions, built between 421 and 406 B.C., is an Ionic prostyle building. Its unusual plan, unique for a Greek temple, was imposed by the attempt to house many different cultic areas: the oikos of the cult xoanon of Athena Polias, honoured in the Panathenaic festival, in the east section; the shrine of the venerable hero-founders of Athens and chthonian divinities –the most important being Poseidon– in the tripartite west section. In the west part of its south side stands the famous porch of the Caryatids (Porch of the Maidens), so-named from the korai-supports that hold up the roof. The entrance to the west section from the north comprises a propylon with a brilliant coffered ceiling and magnificent doorway. During the 1st century B.C. the building was extensively repaired and there were a number of small alterations. In Early Christian times it was converted into a church, during the Frankish domination the bishop's palace, and under the Turkish domination a dwelling. Elgin carried off the north column of the east porch and one of the Caryatids. The monument suffered serious damage during the Greek War of Independence. The large-scale anasteloses of 1837-1846 and 1902-1909 gave it its present form.

The restoration of the Erechtheion was the first intervention to be carried out on the Acropolis under the scholarly supervision of the Committee for the Conservation of the Acropolis Monuments between 1979 and 1987, with the purpose of eliminating the errors of the earlier interventions. The parts of the building that had been restored earlier, as well as other parts with serious structural problems, were dismantled, the architectural members restored on the ground and reset on the monument. The Caryatids were taken to the Acropolis Museum for protection and replaced on the monument by precise copies in artificial stone. Dismantled after this were most of the north, the south and west walls and the ceilings of the north and south porches; their members were structurally restored, using titanium reinforcements. After systematic research, blocks of the north and south walls that had been set in the wrong places in the previous anastelosis were returned to their correct positions. As a result, the side walls of the monument regained much of their authentic structure and their authentic constructional inclination. Blocks of new marble were used to fill in the north and south walls. To improve the static resistance of the entire building, and to regain its form, the northeast corner was also restored. The first column from the north in the east porch, which had been taken by Elgin together with one of the original Caryatids, at present in the British Museum, was replaced by a cast copy made of artificial stone. In addition to correcting the failures of the previous interventions, the restoration of the Erechtheion increased its static efficiency and improved its comprehensibility.

14

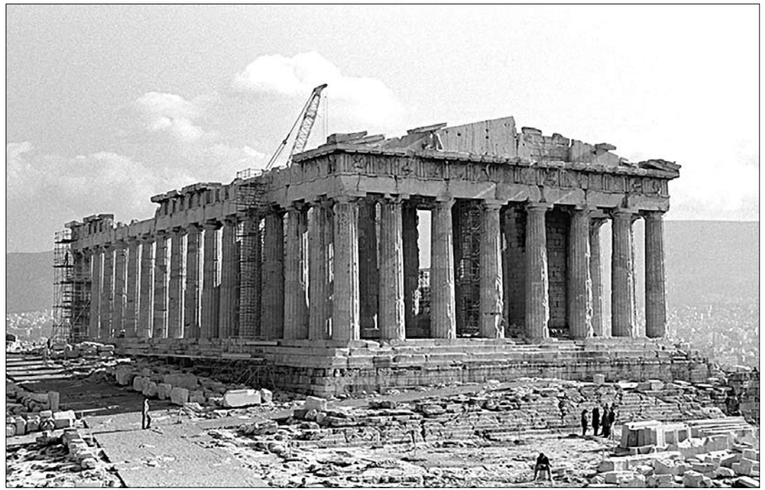
15

16

14. The Erechtheion. The north porch after its anastelosis. View from the northwest.

15. The Erechtheion after its anastelosis. View from the southwest.

16. The Erechtheion. The east porch after its anastelosis. View from the east.



17

18

The restoration of the Parthenon

The Parthenon, the most brilliant temple dedicated by the Athenians to the patron and martial goddess of the city Athena (447-432 B.C.), attributed to the architects Iktinos and Kallikrates and to the sculptor Pheidias, is the outstanding achievement of ancient Greek architecture and sculpture and one of the most perfect achievements of the human spirit. It is a peripteral temple of Doric style, with an amphiprostyle cella divided into two interior spaces and with many Ionic features, the most important of which is the Ionic frieze.

The building, which had remained complete for centuries, suffered serious damage from fire in late Roman times and was repaired during the 4th century A.D. Shortly afterwards, the temple was altered in order to function as a church, and then again, in 1460, with the taking of Athens by the Turks, it was transformed into a mosque. The greatest catastrophe in the history of the temple occurred in 1687, when it was bombed during the siege of the Acropolis by the Venetians. The explosion of the gunpowder that had been stored within the monument by the Turks, caused extensive parts of the building to collapse and turned it into a ruin. At the beginning of the 19th century, Lord Elgin began a systematic removal of the sculpture of the temple.

The first efforts to restore the monument by removing the built additions and remains of mediaeval and more recent times, began with the founding of the independent Greek state in 1833, when the Parthenon became the national symbol. The anasteloses of Balanos during the years 1896-1902 and 1923-1933, which gave the monument its present form, constitute an important milestone in its modern history. Yet because of the use of iron reinforcements for restoring the strength of cracked architectural members without sufficient protection, their oxydisation caused structural problems so serious that it was decided to make a new intervention on the monument during the decade of the 1980's. This new anastelosis intervention on the Parthenon, divided into 12 sub-programmes, began in 1983. In character it was mainly rescue-work and the focus was on areas that had been restored in the earlier interventions.

The restoration programme for the **east side** (1984-1991), originally involved the removal of the epistyle blocks, the entablature and the pediment at the two corners. This was extended to include the middle area so as to replace all the metopes with replicas and to repair the upper section of the seventh column. In this way the strict geometric form of the front of the Parthenon, which had been disturbed by the explosion in 1687 and some large earthquakes, has been restored.

On the **south side**, the 5th column from the east

17. The Parthenon before the restoration of the north side. View from the northwest (1990).

18. The Parthenon after completion of the restoration of the north side. View from the northwest (2010).

19. Parthenon. Resetting the column drums of the pronaos.

20. Parthenon. View of the east porch with restoration completed. View from the southeast.

19

20

21

of the south colonnade, wich was ready to fall, was restored (1993) by dismantling the entablature and moving the entire column shaft from the second drum upwards so as to complete the lowest drum and reinstate stability. The intervention was carried out using an improvised mechanism for grappling and transporting.

Between 2001 and 2010, three new programmes were carried out on the Parthenon: the restoration of the pronaos and opithonaos completed in 2004 and the restoration of the north side completed in 2010.

The restoration of the **pronao**s was less a rescue work than an attempt to restore the form of the east porch of the classical Parthenon, based on the evidence found in thorough research and the identification of a significant number of scattered fragments of ancient members. The inner six-column colonnade of the east end had been seriously damaged in a fire of the 3rd century A.D., the original surfaces of the columns on their west side had been totally destroyed, while Morosini's bombardment had thrown down nearly all the columns of the porch. Before beginning the programme, members of the colonnade that had either been restored by Balanos or showed signs of structural problems were dismantled in order to restore them. Research on the ancient blocks scattered in the wider area led to the assembling of additional architectural members (column drums, column capitals and architrave blocks). After their restoration, these were incorporated in the monument together with the members that were dismantled. The restoration of the six columns of the

22

21. Working on the upper resting surface of a new filling in a drum of the Parthenon pronaos.

22. Working on a filling for a column capital of the Parthenon pronaos.

23. Joining architrave fragments of the Parthenon opisthonaos.

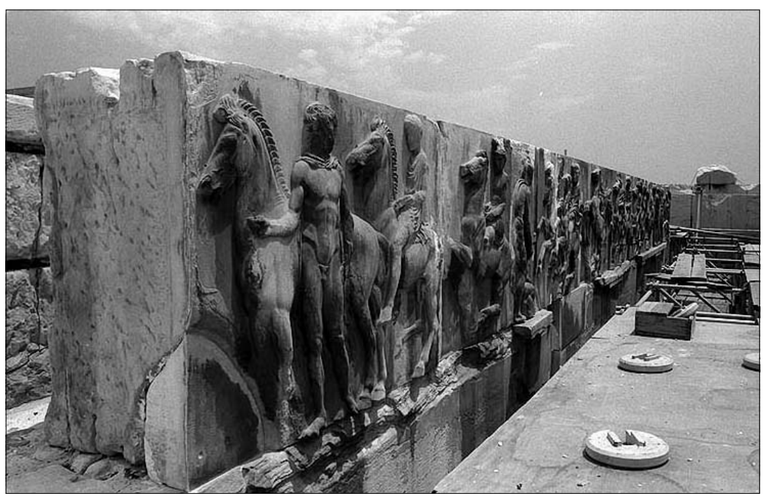
24. Parthenon. Opisthonaos. Joining fragments to a column capital.

25. Parthenon. Opisthonaos. View of the west frieze during its dismantling.

26. Parthenon. Opithonaos. Setting the copy of the west frieze on the monument.

23

24



25

26

27

28

pronaos, filling in the drums with new marble included the full anastelosis of the three first columns from the south and partial anastelosis of the other three. Included in the monument apart from the drums were the ancient architrave blocks of the first two intercolumniations from the north. In place of the ancient wooden sockets (empolia) and centring pins (poloi), titanium elements of equal resistance have been set.

The work of restoring the **opithonaos** involved the restoration of the west six-columned porch of the Parthenon cella, where the entire west side of the frieze was preserved. Although this area had not suffered extensive destruction, serious structural damage and wear were apparent. The Balanos interventions (1895-1902) had involved extensive replacements and filling in of the architectural members and the anastelosis of the northwest corner of the entablature. In the first phase of the work on restoring the opisthonaos (1992-1993), the preserved section of the frieze was removed to the Acropolis Museum in order to protect it. To avoid dismantling columns that had not been disturbed since antiquity, they were consolidated with special injections. The second phase of the programme (2001-2004) included the dismantling and structural restoration of the preserved members of the entablature of the west porch, two column capitals and two top drums. Four column capitals were also consolidated with special injections in situ. So as to assure a possible future replacement of parts of the copies of the frieze, without having to dismantle the underlying courses, the place of the frieze blocks that had been

27. Parthenon. Opisthonaos. View from the northwest after completion of its restoration.

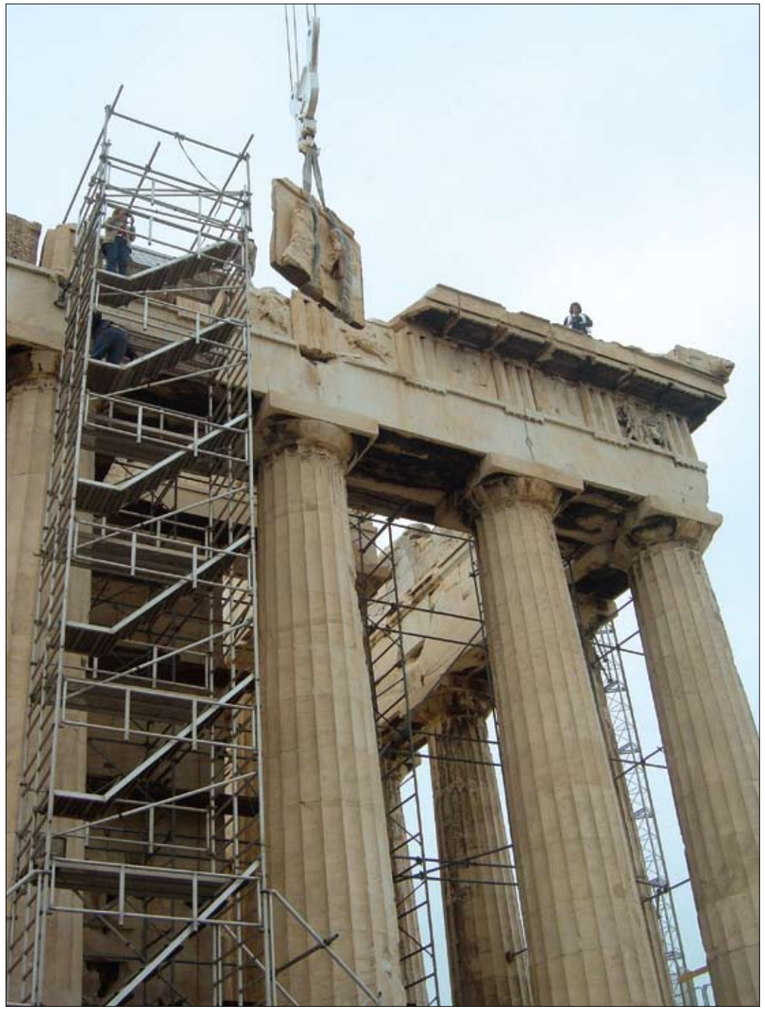
28. Parthenon. Opisthonaos. View of the copies of the west frieze from the west after placing them on the monument.

29. Parthenon. The north side before restoration. View from the northeast.

30. Parthenon. The north side after restoration. View from the northeast.

29

30



31

removed from the monument was taken by copies of the façade, with the sculptured decoration in artificial stone, which was anchored to marble blocks that took the place of the back part of what were originally single blocks.

The very serious intervention on the **north side** of the Parthenon, where the explosion of 1687 had caused eight columns with the corresponding overlying entablature in the middle part of the colonnade to collapse, had been carried out during the years 1922-1931 under Balanos, with a full anastelosis of the colonnade and a partial anastelosis of the entablature. The serious structural problems of this anastelosis (iron reinforcing, cement fillings) made a new intervention compulsory.

The purpose of the programme for restoring the north side –the most extensive ever undertaken on the monument– was to remove the rusted iron reinforcements that had been used for joining the members, to restore structurally the broken marble members and to remove wrongly placed architectural members, finding their authentic positions. During the period 2001-2003, eight middle columns of the north side (from the 4th to the 11th from the east) were entirely dismantled together with the corresponding areas of the overlying entablature. In 2007 it was considered necessary to extend the intervention to the west section of the entablature of the north side, so as to remove to the Acropolis Museum six authentic metopes in order to be protected. The metopes were replaced on the monument with copies in artificial stone.

The concrete fillings from the earlier intervention in the dismantled members were replaced by fill-

32

33

34

35

31. Parthenon. Lowering an ancient metope from the west corner of the north side of the monument (2007).

32. Measuring a drum of the Parthenon north colonnade.

33. Identification of two scattered fragments from a column drum of the Parthenon north colonnade.

34. Mending an architrave block of the north side of the Parthenon.

35. Parthenon. Resetting of an ancient column capital of the north colonnade.

36

37

38

ings in new marble, all the ancient fragments that were identified were re-set on the monument, the existing clamps and dowels were replaced with titanium. Finally, the earlier incorrectly set and restored architectural members were placed in their authentic positions, which were found through study of the members that were dismantled. For reasons of formal and structural completeness, it was proposed to include a few members of new marble. The flutes on the new marble fillings and drums were carved with a special cutter before being set on the monument. The final working of the surfaces of the flutes of the fillings is accomplished on the monument by hand after the drums have been set in place. In this new anastelosis the attempt was made to adapt the members to each other, a characteristic of the unsurpassed quality of workmanship of the monument. This result was ensured through detailed calculations and many trial settings and minor shifts with the help of two cranes that are installed in the cella and outside the north side of the monument.

Completion of the intervention has given the monument not only static resistance, but also increased comprehensibility and aesthetic wholeness. Indeed the north side of the Parthenon, together with the west, provides one of the most complete views of the temple, both for the visitor to the Sacred Rock and to those who see it from most places in the city.

The work of restoration of the **west side** of the Parthenon that began in 2011, is intended to deal with the serious structural problems and deformations of this part of the monument that are due to catastrophes of the past, to the previous restora-

39

36. Parthenon. Resetting an architrave block of the north side. View from the north.

37. Parthenon. Column of the north colonnade after restoration.

38. The Parthenon after completing the restoration of the north side. View from the north.

39. Parthenon. Interior view of the north side with restoration completed. View from the southwest.

40

41

42

tion and to earthquakes that have struck the monument. The purpose also is recovery of the form of the west view of the monument with the inclusion of a number of architectural members of new marble. The work includes the dismantling of the two corners of the entablature of the west side, the structural restoration of their architectural members, and their resetting with the addition of six more blocks of new marble (cornice and tympanon blocks of the pediment); likewise the removal and transportation to the Acropolis Museum of six metopes from the two corners of the monument for their protection and their replacement with faithful copies. The intervention focuses on the Balanos restoration of 1902 and will be extended to blocks of the architrave at the corner intercolumniations. These blocks will be structurally reinforced with interior rods of titanium in place of the large iron reinforcements that were set at that time in the façade of the monument. Planned for the same time is the in situ structural restoration of the column capitals and one more block of the architrave.

The programme of interventions on the Parthenon includes in addition the restoration of the lintel of the **west wall** of the cella, restoration of the lowest course of the **north wall** (orthostate course), with the resetting in their original position of fifteen blocks of the exterior course, and the filling in of the interior course with blocks of new marble. Final dressing of the flutes on new supplements to the six restored columns of the north colonnade is likewise to be completed.

43

40. Parthenon. Restoration works at the two corners of the entablature of the west side.

41. Parthenon. Taking down the pedimental sima of the northwest corner with the lion-head pseudo-spout. View from the northeast.

42. Parthenon. Dismantling a block of the typanon from the west pediment. View from the south.

43. General view of the Acropolis (2009).

The Propylaia, famous already in antiquity for its brilliant coffered ceilings and the unique design of the monumental entrance to the sanctuary of Athena, was a work of the architect Mnesikles (437-432 B.C.). It consists of a central building with two six-columned Doric porticos east and west and two Ionic colonnades in the interior, framed at the north and south by two wings with porches in the Doric order. The outbreak of the Peloponnesian War meant that the final work on the surfaces of the monument was never completed. The destruction of most of the superstructure of the central building during the years 1640-1830, after the explosion of gunpowder that was stored in the monument by the Turks, has led to a gradual loss of authentic building material, so that until now no more than one fifth of it had been recognised.

44

The highly significant intervention on the Propylaia under Balanos (1909-1917) involved the anastelosis of sections of the superstructure in the east portico and the west hall. Although the intervention made the building more comprehensible with the use of ancient material that was on the ground, ultimately it was catastrophic because of the extensive use of iron reinforcements for joining the ancient fragments and because the broken surfaces of the ancient members were trimmed. In many cases the members were restored to locations that were not the authentic ones. This fact led to the new anastelosis intervention on the superstructure of the central building.

During the periods 1990-1993 and 2002-2003, the members of the east portico and west hall of the monument restored by Balanos were dismantled. These interventions provided the opportunity for a systematic research of the material that came from dismantling the restored sections of the ceilings together with the ceiling fragments that lay scattered on the ground (fragments of coffered slabs and beams) and had not been used in the previous restoration. This meant that fragments could be combined and, with small additions of new marble, restored into architectural members (beams, coffered slabs and inter-beam slabs) that could be reset in the ceilings, in their original locations or in similar positions. The marble ceilings of the east portico and west hall were thus reconstructed over a surface that is almost double than that of the previous anastelosis.

Among the members of new marble that have been set on the monument, pride of place is held

44. Propylaia. The east stoa before the Balanos anastelosis. View from the east.

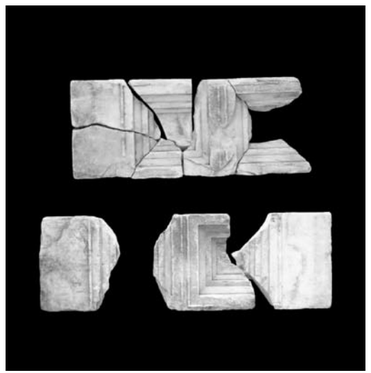
45. Propylaia. The east stoa after the Balanos anastelosis. View from the east.

46. Propylaia. The east stoa after its restoration. View from the east.

45

46

47a



47b

48

49

47a-b. Identification of fragments of the coffered slabs in the Propylaia worksite.

48. Propylaia. Dismantling the coffered slabs in the west hall.

49. Fragments of the coffered slabs identified during research in the Propylaia worksite.

by the two Ionic capitals that have been restored in the west hall, one on each side of the central passageway. The column capital of the Balanos anastelosis was made up of four ancient fragments that did not belong together and it was decided therefore not to use them in the present intervention. Fragments of the capital will be displayed in a future exhibition in the Acropolis Museum. The new capitals, exact copies of the ancient originals, were carved by hand. Interventions of special significance included also the structural restoration of beam fragments belonging to the ceilings. The beams are counted among the largest of the architectural members of the Acropolis monuments for which a special computer methodology was developed. So too, the lintel in the doorway wall of the monument, one of the two stones of which was restored in situ with a special injection.

50. Dismantling the column capital of the Balanos anastelosis in the Propylaia laboratory.

51. Carving the Ionic capitals from new marble in the Propylaia laboratory.

52

53

54

With the completion of the work in November 2009, the entrance to the archaeological site through the Propylaia gives visitors, coming through the central passageway, the unique opportunity of experiencing the roofed space of one of the most remarkable monuments of classical antiquity, a point of reference in the architecture of all periods for its unique design and the brilliance of the ceilings.

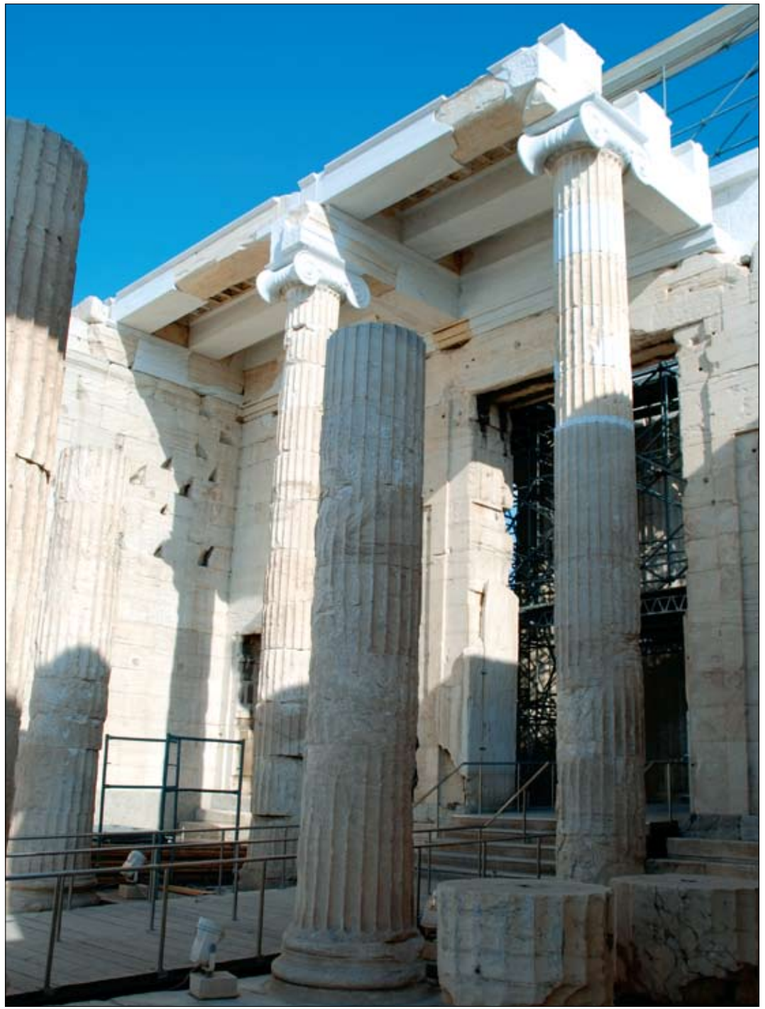
The programme of interventions that began in 2011 includes the restoration of the superstructure of the south wall of the central building and the restoration of the south hall of the monument with ancient architectural members, the original positions of which have been recognised.

52. Mending joining fragments of a beam from the Propylaia east portico on the special joining table.

53. Propylaia. Resetting a beam in the east stoa.

54. Propylaia. Resetting a frieze block in the east stoa. View from the east.

55. Propylaia. The west hall from the southwest after its restoration.



55

56. Propylaia. The ceiling of the west hall after anastelosis. Visible are the two copies of the Ionic column capitals. View from the northwest.

57. Propylaia. The restored ceilings of the west hall and the east portico from the south.

58. Propylaia. The ceiling of the east portico after anastelosis. View from the south.

59. The Propylaia after completion of the intervention in 2009. View from the Parthenon.

The temple of Athena Nike, designed by the architect Kallikrates, was built between the years 427 and 424 B.C., southwest of the Propylaia, on the bastion that fortified the entrance through the Propylaia. Ionic in style, amphiprostyle, with unique features of design and rich sculptural decoration, it replaced an earlier, poros shrine of the goddess, which was discovered in 1936 beneath the marble temple and is today preserved with the Mycenaean bastion on which it was founded, in a subterranean crypt that was created expressly for that purpose inside the classical bastion.

The history of the monument is marked by the demolition of most of its superstructure in 1686, before Morosini's bombardment, in order to use its members for building a defensive fortification at the entrance to the Acropolis.

The classical temple and the bastion on which it is founded, in the form preserved today, is the result of a series of anasteloses. The first anastelosis of the monument was also the first intervention for restoration of the monuments on the Sacred Rock. It was carried out between 1835 and 1845, just after the discovery of its members in the removal of the recent fortification by L. Ross, E. Schaubert, Ch. Hansen and K. Pittakis, and it involved that part of the building that had been demolished during the 17th century. The second anastelosis of 1935-40 by N. Balanos and A. Orlandos included the entire temple and most of the bastion. The serious damage and structural problems of the monument, after the earlier interventions, necessitated its third restoration with complete dismantling of its members.

The work began in October 2000. The new programme included both the marble temple and repair of the poros shrine. The wall blocks of the cella were dismantled, then the krepis of the monument, followed by restoration, the removal of fillings that did not belong to the monument, systematic documentation, study and structural restoration of the members. This last proved to be a particularly difficult task because of the fragmentation, scaling and damage to the members caused by the violent demolition in the 17th century and by the methods employed in the previous anasteloses. Research on the dismantled members yielded new evidence for the arrangement of the wall blocks of the cella, the column shafts (with the help of building traces going back to phases in

60. The temple of Athena Nike after its restoration. View from the northeast.

61. The temple of Athena Nike after the Balanos-Orlandos anastelosis. View from the east.

the use of the monument during mediaeval times and the Turkish domination), the Ionic column capitals, the coffered ceiling blocks (according to the construction of the wooden infrastructure of the roof), the frieze blocks, cornice blocks and pediment of the temple. It likewise provided an opportunity to identify and reset on the monument scattered fragments and complete members that had not been used in the older interventions.

The programme included also the replacement of the system of iron beams that supported the northeast corner of the temple and the slab of reinforced concrete beneath the cella of the temple, both from the Balanos intervention, with a specially designed grid of stainless steel. The works of resetting began in 2004. With the crepis of the monument again in place, the wall blocks were

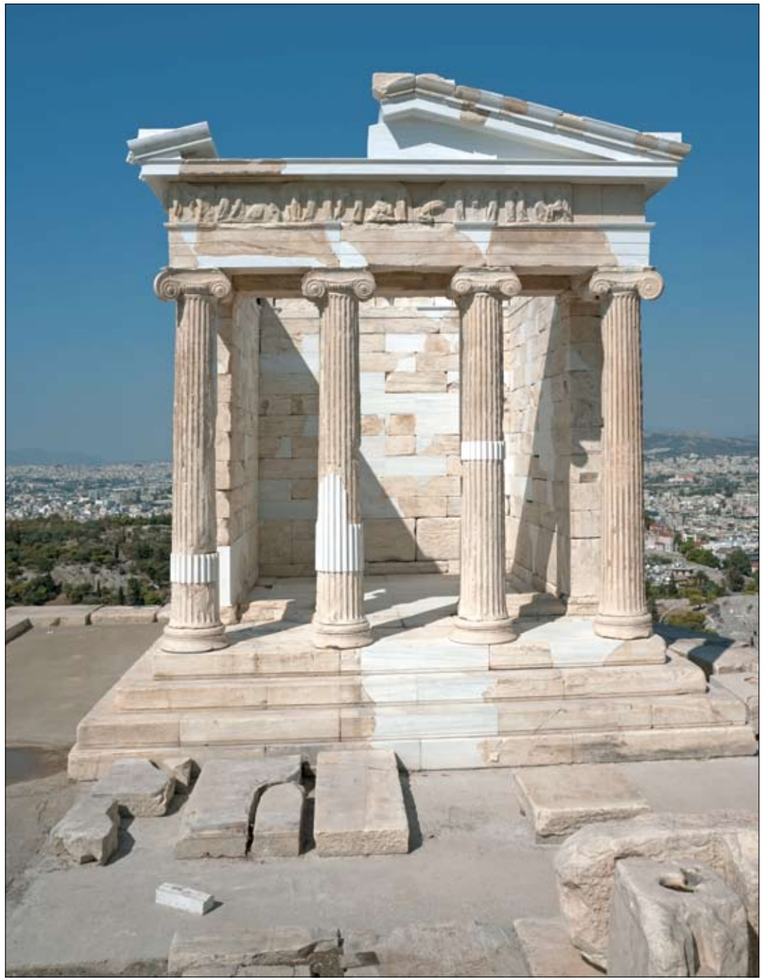
62

reset in their authentic places, correcting the earlier misplacements. This was followed by the resetting of the columns of the temple and the two antae of the cella.

Restoration of the monument was completed in the summer of 2010 with the restoration of the architrave blocks, the coffered slabs and the cast artificial stone copies of the Ionic frieze that replaced the originals on the monument. Restored also was the horizontal cornice, the sima and part of the east pediment with members made of new marble, wich included important authentic fragments. Among the fillings in new marble on the sima are the lion head water spouts in relief, all carved by hand and precisely faithful to the ancient decoration.

The new anastelosis of the temple of Athena Nike

62. The poros shrine of Athena Nike in the basement area of the marble temple after its restoration.



63. The temple of Athena Nike after its restoration. View from the east.

64. The temple of Athena Nike after the Balanos-Orlandos anastelosis. View from the northeast.

with the recovery of the horizontality of the crepis together with the restoring of the members to their authentic positions has recovered the monument's architectural essence and geometry. The restoration of part of the east pediment, with the incorporation of a significant number of original fragments that had not been used in the previous anasteloses, has helped to make the architecture of the monument more easily understood, because of the important formal and aesthetical improvement that the intervention has brought to the east side of the monument.

The programme initiated in 2011 in the temenos of Athena Nike includes improving the functionality of the subterranean crypt within the classical bastion, the restoration of four blocks of the north crown of the bastion and the arrangement of the area surrounding the temple. Organisation of the approach to the temple for visitors will complete the programme.

65. Members of the temple of Athena Nike in the worksite of the monument after being dismantled.

66. Restoring the architrave blocks of the temple of Athena Nike in the worksite.

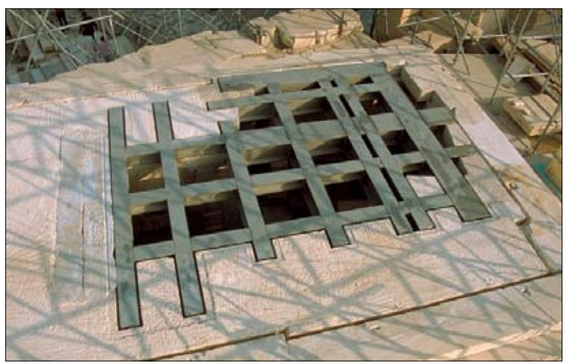
67. An Ionic column capital from the temple of Athena Nike after being dismantled.

68. Temple of Athena Nike. The metal grid on which the temple has been placed.

65

66

67



68

69

69. The temple of Athena Nike after its restoration. View from the northwest.

70. Temple of Athena Nike. Resetting a coffered slab.

71. The classical bastion after the dismantling of the temple of Athena Nike. View from the north.

72. Temple of Athena Nike. Resetting the north anta of the doorway wall of the cella. View from the southwest.

73. The temple of Athena Nike during restoration. View from the northeast.

70

71

72

73

74

75

76

74. *Temple of Athena Nike. Resetting a column capital in the pronaos.*

75. *Restoring blocks of the pedimental sima from the temple of Athena Nike.*

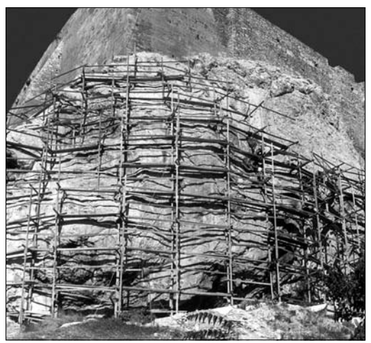
76. *Temple of Athena Nike. Resetting the pedimental sima. View from the southeast.*

77. *The temple of Athena Nike after its restoration. View from the southeast.*

77

78a

78b



79

Among the works carried out on the Acropolis were also the following :

• **Recording the scattered ancient architectural members** on the Acropolis. The purpose of the programme is to recognise fragments of architectural members that come from large stone piles on the Sacred Rock and to attribute them to the monuments from which they came; many of these fragments can be used in the context of the anastelosis programme. The works were completed in 2007 with the recording of 20,600 architectural members. Identified with these were fragments of sculpture and inscriptions, which have been deposited in the Acropolis Museum. The programme is continuing with the recording, cataloguing, plotting and drawing of scattered poros architectural members.

• The **circuit walls** of the Acropolis are a monument of great importance. Their continuous repair from antiquity has contributed to their preservation. The programme for **consolidation and repair** of the structural damage of the Acropolis circuit walls comprises the analytical documentation and systematic monitoring of structural damage, cracks and deformation of the walls using both mechanical means and advanced methods of electronic recording in order to research its static efficiency. Studies are made and interventions of a rescue nature are undertaken. Completed in 2007 in the context of this work, was the back-filling of the foundations of the Arrephorion, northwest of the Erechtheion and adjacent to the north fortification wall of the Acropolis, in order to protect its fragile poros foundations. In 2008, fragmented surface rocks in the southeast area of the rocky slope of the Acropolis were consolidated. The programme included also documentation of the seismic behaviour of the geological formation of the Acropolis with the installation of a network of accelerographs.

• Works of **surface conservation** were carried out on all the monuments of the Acropolis, on areas where anastelosis is under way and on other areas of the monuments as well, wherever the surfaces have serious problems of erosion. Among the most important works on the Parthenon was the conservation and cleaning of the sculptured surface of the west frieze, the purpose of which was to repair the damage it had suffered during its long history on the monument. The intervention began with the structural restoration of the blocks. The cleaning of the blocks from the soot deposits and black crust that had covered them was a most sensitive and delicate operation, since in the process the historical layers of the surface of the sculpture had to be preserved and retained, as they hold valuable information about the original workmanship and polychrome. The cleaning method chosen as the most permissible was the laser in an entirely original application, using simultaneously two wave lengths, ultrared and ultraviolet. It was developed after research in collaboration of the YSMA with the Institute of Electronic Structure and Laser of the Foundation for Research and Technology (FORTH). The works were carried out during the period 2002-2004 with excellent results. With this system, soot deposits and carbon and all types of black crust were safely removed without affecting the underlying layer of marble and coloured layers preserved on the sur-

80

81a

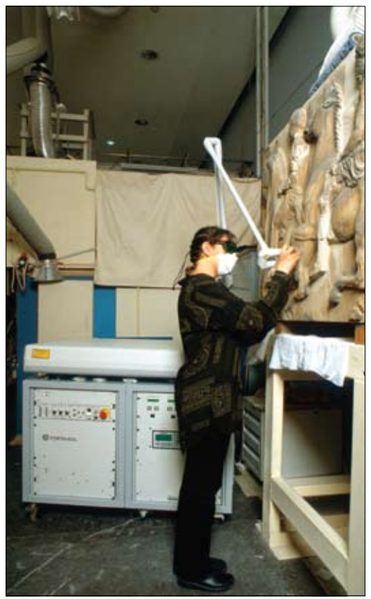
81b

78a-b. Scattered architectural members before and after they were recorded, photographed and grouped, in stone piles north of the old Acropolis Museum.

79. Consolidation works of the bedrock under the southeast corner of the Acropolis circuit walls.

80. Conservation work on the surface of a cornice block of the Propylaia.

81a-b. Conservation work on the surface of the south wall of the Erechtheion. Condition of the surface before and after the interventions.



82

face. In addition, significant information emerged about the art of carving, about ancient stone cutting tools; traces of ancient colour were found as well. This same method was applied also to the cleaning of the ceiling of the porch of the Caryatids in the Erechtheion. In the course of cleaning, traces of painted decoration and ancient colour were revealed.

• In the framework of **electromechanical support** of the anastelosis programmes of the Acropolis, a great many provisions were designed that accelerated the works of structural restoration. Many of these are original, for example the wagon for mending members, the special machine for cutting members of great length, the special vertical cutter for forming the flutes of column drums, the special suspension cramps for lifting architectural members safely, splints, the specially designed pointing tools (pontadoroi) and the special pantograph for the Parthenon work. Likewise notable, in 2004 a lift was installed on the north side of the Sacred Rock to provide people of special needs with access to the Acropolis.

83

84

82. Cleaning the west frieze of the Parthenon.

83. Metal cramp designed especially for resetting the cornice blocks of the Parthenon north side.

84. Mechanical cutter for carving the flutes in new marble fillings of the Pathenon column drums.

• In the context of **documentation of the interventions** on the Acropolis monuments, all phases of the works of anastelosis and conservation are documented analytically with the recording of the works in day-books, accompanied by systematic graphic, photographic and cinematographic documentation. Likewise, in the context of developing geographical information systems for documentation and graphic plotting of the Acropolis monuments, an application that is the largest analogue internationally, single geodetic networks have been established, the relief of the Acropolis rock has been mapped with full topographical and photogrammetric plotting of the fortification walls and the plan of the Acropolis, as well as three-dimensional scanning of the Walls for their full length. For processing and direct use of the documentation, especially for the Acropolis works, a single digital data base has been developed and the material produced each day at the worksites is thus processed. The capacity of the data base to present architectural members or broader sections of the monuments with all their documentation and the interventions that have been carried out on them, makes this a strong tool of support for the works, in the service of the personnel and for the scholarly world at large. Among the activities of the documentation office is also the yearly publication of «The Acropolis Restoration News» (both in Greek and in English).

• In the section of **information and education**, educational programmes are organised on the subject of the Acropolis and its monuments for school children and educators. In addition museum kits are lent or given to institutions in Greece and abroad, seminars are held for educators and students, special symposia for educators; educational material is distributed and specialised books and educational pamphlets are also published.

• To inform the scholarly world and the general public about the monuments of the Acropolis and the anasteloses being carried out, there are symposia, one-day conferences, lectures, exhibitions, documentary films, a variety of scholarly publications and informative booklets in addition to a website.

With strict and transparent procedures in performing the work and in the management of the funds, the Acropolis Restoration Service is carrying out a large work of high quality, which has already won international recognition. In the success of this great undertaking, advice of the Committee for Conservation of the Acropolis Monuments is invaluable. They developed the principles and methodology of the interventions, using the knowledge and experience of previous years, that made it possible to confront problems of theory and principle, scholarly research and technological applications, and choice of materials and procedures. They are the guiding force of the great and difficult work that has been accomplished.

85

86

85. Orthophotomosaic of the ground surface of the Acropolis rock.

86. View of the Parthenon and the Erechtheion from the Propylaia after completion of the restoration programme of 2001-2010 (2010).