The conservation and valorization of the Horologion of Andronikos of Kyrrhos
**Brief history and description of the monument**

The Horologion of Andronikos, also known as the ‘Tower of the Winds’ or ‘Aerides’ (the blowing winds), built by the architect and astronomer Andronikos of Kyrrhos in Macedonia, is situated on the northern slope of the Acropolis, in close proximity to the eastern propylon of the Roman Agora. It was erected during the late Hellenistic period, possibly at the end of the 2nd century BC.

It is an octagonal building, 13.85 m. in total height, which incorporates a circular in plan space on the south side. The monument is made entirely of Pentelic marble with the exception of the foundations, which were built of poros; it has two propyla and rests on a three-stepped base (crepidoma).

The incised lines on the exterior of the eight sides of the edifice corresponded to an equal number of sundials that served the area, which had already acquired a commercial character even before the building of the nearby Roman Agora at the end of the 1st century BC. On the frieze that 'runs' the monument over the sundials, the personifications of the eight main winds are depicted, bearing their symbols: Boreas (N), Skiron (NW), Zephyros (W), Livas (SW), Notos (S), Euros (SE), Apiliotis (E), Kaikias (NE). The fully preserved roof of the building is comprised of twenty-four slabs and a circular ‘keystone’, on which a Corinthian capital rests and possibly served as the base of a bronze wind vane in the form of a Triton.
Inside the ‘horologion’ a hydraulic mechanism operated that, according to the existing interpretations, powered a water clock or a ‘planetarium’ device. The holes that were used for mounting the hydraulic mechanism, as well as cuttings that were intended for water supply conduits, but also for fixing the marble parapet which isolated the mechanism, are still clearly visible on the surface of the floor.

The mechanism functioned with water pressure, which came from the cylindrical space incorporated into the south side of the monument.

The interior of the building is marked in height by three architectural elements: two parallel Ionic cornices and a stylobate, on which eight decorative colonnettes stand supporting a two-banded epistyle. The traces of ancient wall painting, such as palmettes, lotus flowers and meander, which are still preserved in places are particularly significant; blue paint covered the ceiling.

The central section of the floor of the monument. (1992. DAI Athen, archive, Gehnen)
Throughout the byzantine period, but also after the capture of the city by the Ottomans, the monument served as a church, as evidenced by the fragments of frescoes with Christian subject matter (an angel and a saint on horseback), dated at the 13th–14th century, which decorates the northern and the northwestern side of the building’s interior, and also by a documentary source that dates back to the end of the 15th century. In the late period of the Ottoman occupation, the building was also used as a tekke of the Mevlevi order; the mihrab niche, carved into the wall on the southeastern side of the ‘horologion’, is directly associated with this use. Inside the monument, the incised graffiti of a Roman ship (2nd - 4th c. AD), as well as the graphite drawings of sailboats that date from later times are noteworthy.

During 1838 - 1839 the Archaeological Society at Athens unearthed the monument in its entirety, which was buried outside as well as inside up to the level of the first interior cornice. Then, in the mid-19th century, metal gnomons were mounted over the ancient incisions of the sundials, based on a study elaborated by the Greek expatriate officer of the French navy Leonidas Palaskas, whereas between 1915 and 1919 Anastasios Orlandos
carried out consolidation works on the monument’s roof from which he removed the ‘onion-shaped’ crown that had been constructed at the apex during the Ottoman occupation. It was replaced by the surviving lower part of the Corinthian capital that crowned the monument in antiquity. More recently, in 1976, the Greek Archaeological Service conducted consolidation and conservation work on the roof and the rest of the outer sides of the monument.

Later graffito with depiction of a sailboat

Inside the monument, NW side: Ionic cornice, late Byzantine fresco (13th -14th c.) with the figure of an angel. Possibly, an Epitaphios lament scene

The interior of the cylindrical space on the south side of the monument
Graphic representation, elevation.
J. Stuart - N. Revett, 1762

View of the monument from the north, before conservation work
The conservation and valorization of the monument

The need to tackle the problems of deterioration the Horologion of Andronikos suffered from as a whole, resulted in extensive conservation work on the surfaces of the monument inside as well as outside, but also in structural reinforcement. The aforementioned treatments were implemented between 2014 and 2015 in the context of the project of the National Strategic Reference Framework 2007 - 2013, ‘Conservation and Valorization of the Horologion of Andronikos of Kyrrhos, at the archaeological site of the Roman Agora of Athens’, initially by the Α’ Ephorate of Prehistoric and Classical Antiquities followed by the Ephorate of Antiquities of Athens, of the Ministry of Culture and Sports.

The monument during treatment

Work in process on the frieze and the roof of the monument
Conservation treatment: preserving the memories of a monument

All conservation treatments were conducted based on a study approved by the Directorate of Conservation of Ancient and Modern Monuments, and in conformity with the principles of the international standards applied to the discipline of conservation. The surfaces of the monument were characterized by a wide range of deterioration forms recorded, namely cracks, flaking, detached fragments, craquelure that resulted from the movement of marble blocks, heavy deposits of aerial pollutants, extensive biodeterioration, but also damage caused by man throughout the various uses of the building.

New studies and research methods of multispectral imaging, induced luminescence imaging at visible and infrared spectra and X-ray fluorescence, that were applied for the comprehensive investigation of the substrates of the mortars, the underlying paint layers and drawings of the decoration and inorganic materials analysis, brought forth new evidence for the ancient and byzantine painted decoration of the monument. Our knowledge regarding the history of the monument has been unexpectedly enriched following the revelation of two fragments of fresco on the interior of the wall surface, under the Ionic cornice and between the doors, bearing an angel and a saint on horseback and also after the revelation of a meander section that was part of the original painted decoration of the stone wall.

The figure of Boreas (NORTH) from the frieze, and graphic recording of the damages and its conservation treatment
The consolidation and cleaning of the surfaces, the filling of cracks and the bonding of fragments as well as the removal and replacement of unsuccessful past interventions were painstakingly undertaken. Inside the monument, all traces of paint and coatings, from the ancient decoration up to the Ottoman inscriptions, as well as the indiscernible graphite drawings of boats on the lower zone of the walls were conserved.

Severe flaking and cracking characterized the preservation state of the stone blocks of the roof inside the monument.

Detail of the pathology of the roof.

Byzantine fresco with the figure of an angel before and during its revelation.
On the relief of the frieze with the eight figures of the winds, which was severely damaged due to atmospheric pollution, the surviving pieces of information found on the ancient surface were preserved without proceeding to the filling of the damaged sculpted decoration and without removing the black encrustations, so as not to lose the authentic ancient surface.

The most laborious treatment was applied to the deteriorated Pentelic marble slabs of the roof. A total of twenty-seven conservators, marble craftsmen as well as an interdisciplinary working group were engaged in the conservation.
Finally, the marble slabs of the roof, whose inner surface was heavily damaged due to the ingress of rainwater, were meticulously conserved, whereas their joints were sealed so as to achieve the complete waterproofing of the monument.

On the shell, the symbol of Boreas, (NORTH) originally mended in the 1970s, a new treatment was undertaken, as the past intervention was no longer effective.

Extensive through cracks on the stone blocks of the sima with the lion-head spouts, before and after conservation.
Reinforcement of a crack with the aid of two titanium rods and bonding of a fragment

View of the northeastern propylon, before and after the cleaning of the organic deposits

Stone fragments that were dismantled and bonded again
Consolidation and restoration - turning the monument accessible to the public

Moreover, the work performed aimed at the static reinforcement of the monument, the weather protection and the accessibility. Therefore, geometrical documentation of the monument with modern methods was realized. A belt truss was attached around the monument, at the level where the roof marble slabs rest, so as to secure the structure against horizontal thrust. Certain slabs and masonry stones that featured cracks were structurally restored. Galvanic protection against corrosion was also applied on the two metal suspension rods which are placed in two of the roof slabs.
Simultaneously, instrumental monitoring of the critical cracks and the belt truss was applied. On the roof of the Horologion of Andronikos the clay tiles that were possibly fixed during the last decades of the Ottoman occupation were repaired and partially replaced, whereas the drainage of rainwater from the roof was improved with the application of lead sheets. A new ramp was installed at the entrance of the archaeological site and the surrounding space of the monument was paved, in order to facilitate the access of people with mobility impairment. Finally, inside the monument, a walkway was placed so as to render the monument accessible, yet without damaging the ancient marble floor, on which a unique mechanism of ‘timepiece’ or ‘planetarium’ was fixed, of a manufacturing philosophy comparable to that of the famous Antikythera mechanism.
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National Geographic, 1967

European Union
Regional Operational Programme «Attica 2007 - 2013»
Quality of life for everyone

The project is co-financed by Greece and the European Union

MINISTRY OF CULTURE AND SPORTS
EPHORATE OF ANTIQUITIES OF ATHENS