

# The Acropolis in Ruins

*Undoing the damage of war, pollution, and time itself*

by MARIA BROUSKARI

*Frederick Edwin Church, The Parthenon, 1871*



Metropolitan Museum of Art, New York, New York, Bequest of Maria Dewitt Jessup

**F**OR CENTURIES, the summit of Mount Likavittós afforded a splendid view of the majestic ruins of the Parthenon and the other ancient temples on the Acropolis, which lies just over a mile away to the southwest, at the heart of the city of Athens. Today, the prospect on good days is still grand. On some days, however, the Acropolis is all but invisible from Likavittós, blotted out by destructive *nefos*, the Greek term for a brown cloud of sulfur dioxide and other noxious gases. Ravaged by pollution, war, and time itself, the monuments of the Acropolis are sadly eroded, stained, and crumbling.



But there are signs that help is at hand. The temple called the Erechtheum is covered with scaffolding. And the Parthenon, which once sheltered a towering gold and ivory statue of Athena, the city's patroness, will soon hold a huge crane, powerful enough to hoist and reposition twelve-ton blocks of marble. All this is part of the Greek government's effort to halt the deterioration of the Acropolis.

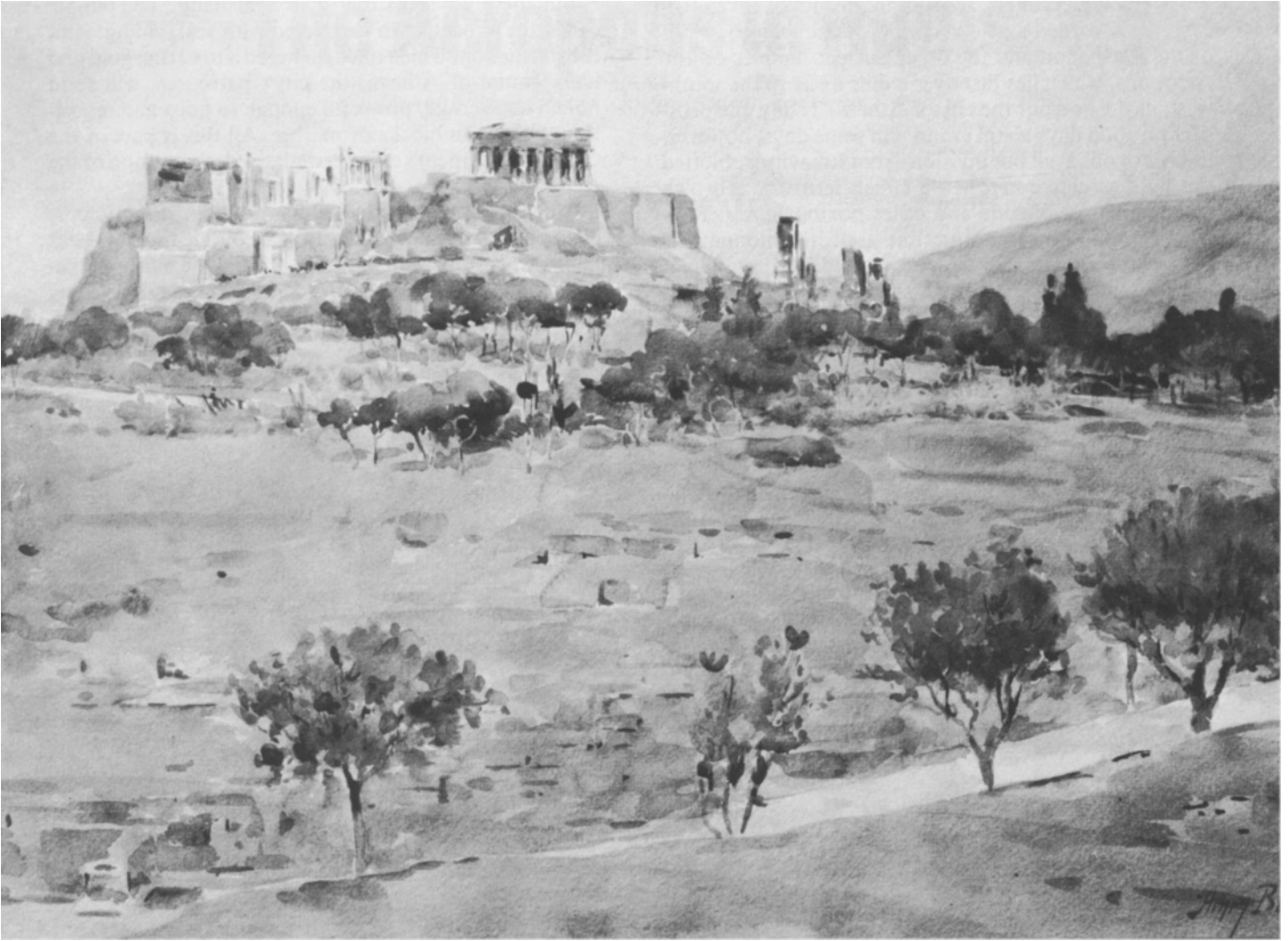
The flat-topped, rocky hill has a long history. People lived on the Acropolis as early as Neolithic times. About 1300 B.C., a stone wall was built around the hilltop settlement as a defense against invaders from the surrounding countryside. Other early structures were a palace and numerous primitive shrines. As the city grew, the seat of government moved from the top of the Acropolis to the area north of it, and at the summit the old shrines were replaced by temples to Athena and other deities. Thus, about the sixth century B.C., the Acropolis changed from citadel to sanctuary.

In 480 B.C., the flourishing city was captured by the Persians, who burned down nearly every building in it, including those on the Acropolis. Thirty years passed before the Greeks decided to rebuild the sanctuary. The project was directed by the great statesman Pericles, who placed in charge the sculptor Phidias. The first building to be constructed was the Parthenon. It was **larger than usual** for a Doric temple, with eight columns on the short sides and seventeen on the long ones, compared with the typical six and thirteen. Around the top of the outside wall of the main building and inside the outer colonnade ran a frieze depicting the yearly festival in honor of Athena. The sculptural decoration also included representations of the birth of Athena from the head of Zeus, the contest for dominion over Athens between Athena and Poseidon, and, above the outer colonnade, battles of the giants, the Amazons, and the centaurs. Most of the building was made of white marble from Mount Pentelicus, ten miles north of Athens.

When the Parthenon was nearly completed, work began on the Propylaea, the monumental gateway to the Acropolis. Designed by the architect Mnesicles, the building had a central, rectangular structure and two



*Marcel Lambert, Gargoyle from the Parthenon, 1877*



*Henry Bacon (1839–1912), General View of the Acropolis at Sunset*

wings, one of which once served as a picture gallery. Both severe Doric and more decorative Ionic columns were incorporated into the design, but because construction was interrupted by the start of the Peloponnesian War, against Sparta, in 432 B.C., some of the stone surfaces of the Propylaea were never polished.

The war did not put an end to all construction on the Acropolis, however. In 425 B.C., the Athenians erected the tiny temple of Athena Nike (Giver of Victory) on a projection of the rocky hill southwest of the Propylaea. Four delicate Ionic columns decorated each of the narrow sides of this temple, and a frieze depicted battle scenes from Athenian history and an assembly of the gods. During a lull in the fighting with Sparta, from 421 to 415 B.C., work began on the Erechtheum, a temple dedicated to Athena and Poseidon. The most elaborate (and elaborately decorated) of the Acropolis buildings, the temple had three porches, the most famous of which is that of the Caryatids—six columns in the form of graceful maidens with long, flowing hair and many-folded garments. When Athens was finally defeated by the Spartans, in 404 B.C., all work on the Acropolis stopped, but its buildings had been all but completed—in only forty years.

**T**HE SACRED BUILDINGS did not stand unscathed for long. In 334 B.C., the Macedonian king Alexander the Great displayed captured enemy shields on the Parthenon. Under the rule of the emperor Theodosius II, from A.D. 408 to 450, the Byzantines made off with sculptures from the Acropolis. Beginning in the sixth century, the early Christians, in their zeal to outlaw pagan worship, converted both the Erechtheum and the Parthenon into churches. And in the thirteenth century, the Franks adorned the Parthenon with a bell tower and wall paintings, traces of which can still be seen; topped the Propylaea with a ninety-foot tower; and notched the walls of the Acropolis like a battlement.

The Turks later turned the Parthenon into a mosque, replacing the bell tower with a minaret; the Erechtheum became a harem for the Turkish commander's wives; and the Propylaea was used to store gunpowder. In 1645, a bolt of lightning hit the powder, and the resulting explosion destroyed the upper part of the building. Some years later, under threat of attack by the Venetians, the Turks demolished the little temple of Athena Nike, used the stone to fortify the Propylaea, and stored their ammunition in the Parthenon. On September 26, 1687, German mercenaries manning Venetian artillery scored a bull's-

eye. The explosion and a fire that burned for two days left little of the Parthenon standing; the walls and twenty-eight columns of the middle section collapsed, taking much of the frieze with them. Francesco Morosini, the commander in chief, wanted to take home as a trophy the surviving sculptures of Athena's horses from the west pediment, but his engineers succeeded only in dropping them onto the rock below, where they shattered.

At the turn of the nineteenth century, Thomas Bruce, the seventh earl of Elgin and British ambassador to the Turkish sultan, sent home a great many marbles—including most of the remaining statues, friezes, and other carved sections called metopes—from the Parthenon, as well as a Caryatid from the Erechtheum. When the Greek War of Independence began, in 1821, a Turkish shell destroyed part of one Erechtheum wall, and the Porch of the Maidens collapsed. It was not until 1833 that the Greeks at last succeeded in ousting the Turks and Athens was freed.

**E**FFORTS TO REPAIR the damaged Acropolis began almost the day of liberation. One of the first acts of the new king, Otho, was to order the removal of all alterations and additions made to ancient monuments after the classical period. Scholars began identifying stone fragments that had escaped looting, and early restorers dreamed of returning the monuments to their ancient appearance. Work progressed on the main buildings of the Acropolis through the nineteenth and early twentieth centuries, and by 1933, the centennial of Greek independence, all the work contemplated by those first restorers had been accomplished.

It soon became clear that despite the good intentions of nineteenth-century restorers, their work had created a new danger. An earthquake in 1894 had prompted them to reinforce the buildings by putting in new internal steel supports to replace the iron ones the ancients had used to hold the stones together. However, the engineer of the project, Nicholas Balanos, failed to follow the example of the original builders, who had coated the iron clamps with lead to keep them from rusting. Eventually, the naked steel rusted and expanded, and by the late 1940s it had cracked the very marble it was supposed to reinforce. Water seeped into the cracks, froze, expanded, and made the cracks still wider. The result: columns and walls that had been reerected began, quite literally, to fall apart.

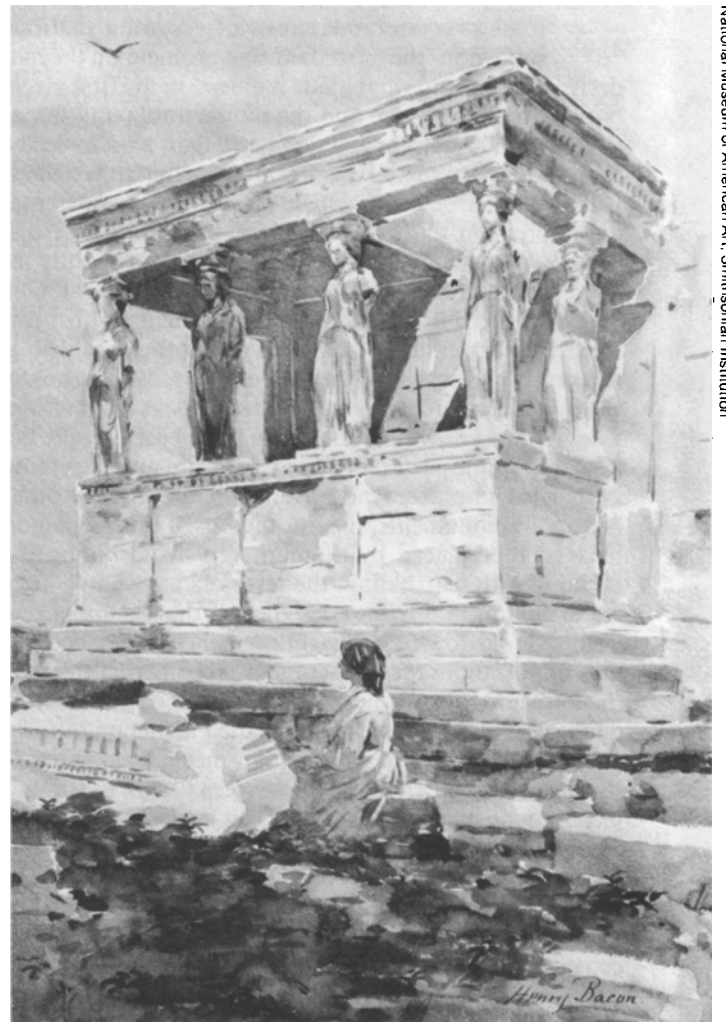
By this time, too, the effects of air pollution on the Acropolis monuments had become apparent. After the Second World War, the Attic basin underwent rapid urbanization and heavy industrialization. Today, roughly a third of the country's 9.7 million people live in Athens. More than three-fourths of the country's industry is there, and steel mills and fuel-processing plants surround the city. Of all the gases given off by cars and factories, sulfur dioxide is the worst. It combines with rainwater to form sulfuric acid; the acid, in turn, corrodes marble (calcium carbonate), turning it into gypsum (calcium sulfate), which is then washed away by rain.

So great was the damage caused by rusting iron and acid rain that the Acropolis authorities decided to redirect their efforts, shifting the emphasis from restoration to conservation and actual reconstruction. But the officials in charge of this effort could really offer no more than first

aid: replacing as many rusted iron clamps as possible with bronze, securing stone fragments in danger of falling, and putting back in place those fragments that had already crashed to the ground.

The real work of conservation began in 1975, when, at the behest of the then prime minister, Constantine Karamanlis, the minister of culture and sciences, Constantine Trypanis, set up a special committee of archaeologists, architects, engineers, and chemists to propose remedial measures. At times the committee has sought the advice of foreign experts, because the Acropolis is, in a sense, an international treasure. So far, the United Nations Educational, Scientific and Cultural Organization has contributed nearly four hundred thousand dollars, and the European Community, four hundred twenty-seven thousand. From 1975 through 1983, Greece itself spent more than 2.3 million dollars, and will probably spend at least another 5 million dollars until the work is finished, perhaps in a decade.

Among the first tasks of the Acropolis Committee was to find the best replacement for the old iron clamps. In September 1976, the group chose titanium, a metal that is strong, lightweight, and rustproof. The installation of the new reinforcers is a painstaking operation. Once the



National Museum of American Art, Smithsonian Institution

**Henry Bacon, The Erechtheum**

rusted iron is removed, workers insert a titanium rod in its place and secure the rod with cement. To date, this has been done only on the Erechtheum, which was in poorer condition than the rest of the Acropolis buildings and was therefore the first monument that the committee studied in detail. Craftsmen have replaced the crumbling Caryatids with cement copies and, in 1978, moved the originals into the Acropolis Museum, where they are safe from the ravages of weather and pollution. The workers have also been mending broken walls by replacing missing pieces with new ones carefully shaped from plaster molds. The new pieces are inscribed with their year of installation so that when the recently cut marble ages and blends with the ancient blocks, future restorers will nevertheless be able to tell the new from the old. The restoration of the Erechtheum is scheduled to be completed this year.

In the meantime, the Propylaea has required emergency measures to keep pieces from falling from its eastern architrave. The problem here was again the rusted iron clamps, and the remedy was again titanium rods, put in place between the autumns of 1981 and 1982. Also needing attention in the Propylaea are the Ionic colonnade and the ceiling over the eastern porch and central passageway. But these will not be restored without a detailed scientific study.

**T**HE SPECIAL CHALLENGES of restoring the Parthenon, the most daunting problem on the hill, derive in part from what made it unique in the first place: both its enormous size and the innumerable tiny deviations from straightness and symmetry that, paradoxically, make the structure look perfect. All the horizontal lines, for instance, are curved, which, art historians say, creates the impression that the building is breathing. The distance between columns varies, and they lean slightly inward and taper ever so slightly from base to capital. One problem, then, is to do nothing that might disturb this subtle, and calculated, asymmetry. Another problem is to correct the errors of earlier restorers, who in many cases incorrectly positioned fallen blocks of marble; workers must now find out where these blocks really belong, dismantle parts of the old work, and put everything in its rightful place. And meanwhile, as with the other Acropolis monuments, the iron clamps of the Parthenon have to be replaced by titanium. To avoid hiding the building with scaffolding, the restorers have had a huge crane built in France and designed so that its upper sections will fold down out of sight when they are not needed. One important use for the crane: to reconstruct the Parthenon's northeast corner, which was ruined by an earthquake in 1981. Other problems of the Parthenon restoration are philosophical rather than mechanical. For instance, should the frieze on the western part of the monument remain in place, protected, as it has been since 1976, by a shed, or should it be moved to the safety of the museum and replaced with a copy?

Besides working on the monuments themselves, the Acropolis Committee has begun to build gravel-and-cement paths along the routes that pilgrims are thought

to have taken to the temples in ancient times. The aim is to keep tourists from walking on vestiges of old inscriptions or other ex-votos, and to suggest what the sanctuary was like in antiquity.

Finally, the Acropolis project calls for strengthening the fortification wall and for shoring up the rock hillside itself. Although the bluish gray limestone that constitutes the core of the Acropolis is resistant to earthquakes, the slopes are less so, and boulders have occasionally come loose, menacing people below. Accordingly, in 1979, engineers and geologists began the tedious and dangerous task of securing the slopes, bit by bit. First, bushes and roots are cleared away, and the loose boulders are temporarily held against the rock core by a metal net pulled tight and fastened on either side. Next, a hole is drilled through each boulder and into the rock core, and a long unoxidized metal rod is threaded through the hole. Then the hole and any cracks in the boulder are filled with cement. So far, the northeast and southeast corners of the hill have been secured in this way, and work is expected to begin soon on the northern slope.

Even after the monuments have been restored, they will continue to be exposed to the destructive forces of pollution. That is why the Acropolis Committee has repeatedly pressed the Greek government to take measures to clean up the skies over Athens. In 1977, the government took the first step, which was to prohibit the burning of high-sulfur fuel in apartment houses around the Acropolis. It also banned jet flights over the area (a measure that reduces vibration as well as pollution), told automobile owners to install pollution-control devices, and urged industry to reduce smokestack emissions. Most recently, the Athenian government has begun building a new municipal gasworks twelve miles outside the city, which will permit closing the 150-year-old plant in the center of town. Polluting industries have been instructed to cut production, cars and buses have been banned from the hill, much traffic has been rerouted from the center of Athens to two highways encircling it, and the permitted sulfur content of fuel has been reduced. Fortunately, the population of Athens has stopped growing, and some people are even moving out. But work on the planned subway, which would reduce automobile traffic, has stopped for financial reasons.

In the long run, conservation of the marble depends on increasing its resistance to pollution. Scientists the world over are at work on this problem. One possibility is to find some chemical to apply to the marble that would either seal it off entirely or at least make it less reactive. Another project, under way at the Polytechnic School of Athens, is an attempt to turn the gypsum formed from corroded marble back into marble with the aid of heat, high pressure, and carbon dioxide.

Most scientists are well pleased with the work that has been done to save the Acropolis, though some of those who met in Athens last September to discuss plans for the future believe that more attention should be given to protection from earthquakes. But the Athenian engineer Costas Zambas, who has been working on the Acropolis project since 1977, observed: "We must respect the Parthenon's construction as it was made in the first place, even if by modern calculations this would make it vulnerable. Its resistance has been proved." ■

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