

#### PERSIAN WONDERS

A drainage channel encircles the Gate of All Nations, built in the mid-fifth century B.C. by King Xerxes in Persepolis, the ceremonial capital of the Persian Empire. Today, the site lies near the city of Shiraz in southern Iran.

KONRAD ZELAZOWSKI/ALAMY/ACI

TRIUMPH OF PERSIAN ENGINEERING

# XERXES CANAL

An ancient account of Persian king Xerxes carving a canal through a Greek peninsula was thought to be a tall tale, but exciting new studies suggest this engineering marvel really did exist.

ANTONIO PENADÉS





**LAND AND SEA**

Looking down from Mount Athos lies the site of the Xerxes Canal, which was constructed across the narrowest part of the Athos peninsula, which connects to the Greek mainland, located some 28 miles to the north.

NATALINO RUSSO/FOTOTECA 9X12

**H**istorians had long believed that the Xerxes canal was a myth, but they never stopped searching for it. For millenia the only evidence of this engineering feat was found primarily in one written source, leading many scholars to scoff at the existence of a canal built by so the mighty navy of Persia could pass through it in 480 B.C.

Recent archaeological finds on the Mount Athos peninsula in modern-day Greece suggest that this engineering marvel did indeed exist. Its creation is a vivid reminder today of ancient Persia's wealth, strength, and inventiveness that

Athens and other city-states faced when this mighty foe invaded their lands. The engineering prowess that built the grand city of Persepolis could also be utilized in the fight for control of the Mediterranean.

**Peril at Sea**

The story of the canal takes place during the Greco-Persian wars of the fifth century B.C. Many battles, such as those at Marathon and Salamis, have become famous "underdog stories," in which the Greeks challenge a much more powerful Persian foe—and win. The Canal of Xerxes reveals the power of their up adversaries.

The origins of the wars can be found at the dawn of the fifth century B.C., when the Ionian Greeks, who lived along the western coast of modern-day Turkey, revolted against their Persian overlords. In 494 B.C., Persian ruler Darius the Great crushed the Ionian-Greek rebels at the Battle of Lade and then destroyed the Ionian city of Miletus. Having brought the Ionians to heel, Darius sought revenge against their allies—the Athenians.

From this point on, Darius's fortunes changed abruptly: In 492 B.C., as a large part of the Persian fleet rounded the peninsula of Mount Athos, a fierce storm blasted in from the north. The

light and fast Persian warships were vulnerable in adverse conditions. Sitting high in the water, they quickly became unstable in high winds. The tempest dashed some 300 Persian ships against the cliffs of the peninsula and killed as many as 20,000 sailors.

Two years later in 490 B.C., Darius was humiliated by Athens on the shore at Marathon and retreated with his forces back to Asia. Distracted by a revolt in Egypt during his last years, Darius died without fulfilling his dream of ruling the Greek world. His son and successor, Xerxes began meticulous preparations to subdue Greece once and for all.

**FATHER AND SON**

A silver siglo coin from the late sixth century B.C. (opposite left) depicts Darius the Great with a quiver of bows. Darius was succeeded in 486 B.C. by his son Xerxes, depicted (below), on a Daric coin from the fifth century B.C.

DARIUS: ALAMY  
XERXES: ACI

**PERSIA  
AGAINST  
ATHENS**

**492 B.C.**  
Hundreds of Persian ships are wrecked and 20,000 men killed in a storm off the Athos Peninsula. The fleet are part of Darius I's mission to punish the Athenians for supporting an Ionian rebellion.



**490 B.C.**  
The Persians are defeated by the Athenians and their Plataean allies at Marathon. Distracted by problems elsewhere in his sprawling empire, Darius I suspends his campaign against Greece. He will die in 486 B.C.

**483 B.C.**  
Xerxes, Darius's successor, begins preparations for a new campaign against the Athenians. Work begins to cut a canal through the Athos Peninsula, off which his father's fleet wrecked in 492.



**480 B.C.**  
King Xerxes invades Greece. His foot soldiers and cavalry cross into Europe over two great pontoons spanning the Hellespont (Dardanelles Straits), while his navy uses the newly constructed canal.



## IMPERIAL MOTIVATIONS

# A MAN, A PLAN, A CANAL

The storm off Mount Athos that caused such devastation to the fleet of Xerxes's father, Darius I, in 492 B.C., was clearly a factor in Xerxes's creation of his canal. Nevertheless, undertaking the colossal financial and logistical burden of excavating the canal simply to avoid passing around the same cape, seems an unlikely motive for the project. The Athos peninsula could be rounded by sea in only a few days. With the benefit of experience and the cooperation of locals who knew how to read the weather, it would surely have been possible to avoid meeting another major storm. So why did Xerxes opt to build the canal? A superstitious fear of the sea may also have played a part. Then, of course, there was the element of

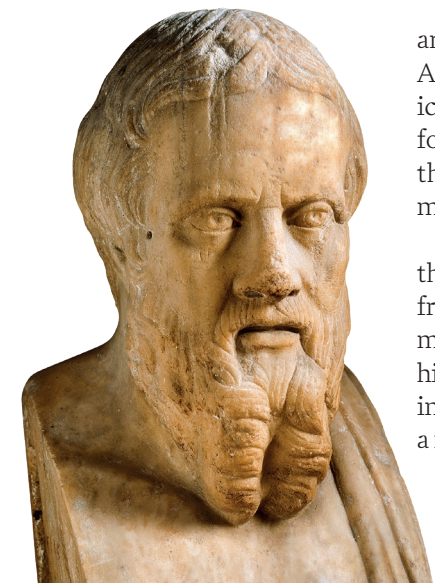
propaganda. Such an audacious feat of engineering would surely have sent a powerful message to the Greeks: the Persian invasion was unstoppable and surrender the only option. Herodotus offers his own, plausible theories as to the king's motivations: "As far as I can judge by conjecture, Xerxes gave the command for this digging out of pride, wishing to display his power and leave a memorial; with no trouble they could have drawn their ships across the peninsula, yet he ordered them to dig a canal from sea to sea." The canal, therefore, had an element of grandstanding. Xerxes, like other Persian sovereigns, bore the title "King of Kings." Like many who had come before, he seems to have shared the compulsion to leave his mark on the world.



## FATHER OF HISTORY

Herodotus (below) kept the memory alive of Xerxes Canal in his *Histories*. Marble bust, third-century A.D. Roman copy of fourth-century B.C. Greek work. Naples National Archaeological Museum

AKG/ALBUM



In spring 480 B.C., Xerxes launched a massive amphibious attack on Greece, a campaign that opened with spectacular displays of military engineering. Xerxes's first major logistical task in the new invasion was to ferry his vast army across the Dardanelles straits (also known as the Hellespont) that separate Asia from Europe. A pontoon bridge, constructed of boats tied together, was strung out across the turbulent stretch of water, nearly a mile wide.

Having reached the European side, Xerxes' armies marched overland along the northern Aegean coast, through the region known historically as Thrace. The Persian navy, meanwhile, followed the coast until meeting the barrier of the Mount Athos peninsula, just south of the modern-day Greek city of Thessaloniki.

The Athos peninsula is the easternmost of three finger-like promontories that stretch out from the Chalkidiki peninsula in what is now mainland Greece. At its tip rises the 6,670-foot-high Mount Athos, regarded as a holy mountain in Orthodox Christianity and today the site of a monastic community.

As in the time of Darius and Xerxes, the seas around the mountainous headland of the peninsula can often be hazardous. Motivated by the catastrophic storm that devastated his father's navy more than a decade before, Xerxes planned a way to avoid the treacherous waters. On arrival, the Persian navy found an even greater engineering project than the pontoon bridge that had enabled them to cross the Dardanelles: As part of his long preparations for the renewed invasion of Greece, gangs of laborers had hacked out a canal, over one mile long, from one side of the peninsula to the other. Through this channel, Persia's navy would eventually pass in their relentless, advance westward.

## Under the Lash

Virtually all the documentary evidence for the Canal of Xerxes is found in book seven of Herodotus's *Histories*. Writing approximately 50 years after the canal was built, the Greek historian records that "all sorts of men in the army were compelled by whippings to dig a canal," in operations that lasted three years. The canal

was sited at "Athos, a great and famous mountain, running out into the sea and inhabited by men. At the mountain's landward end, it is in the form of a peninsula, and there is an isthmus about twelve stadia wide; here is a place of level ground or little hills, from the sea by Acanthus to the sea opposite Torone."

The length of a stadium by Herodotus's calculations has long been debated, but many historians concur that 12 stadia is consistent with the 1.25 miles that make up the width of the peninsula at the site where the canal was believed to have been dug.

Such a project required massive labor, and Persia had access to it. According to Herodotus, it wasn't just their own men, "compelled by whipping," who took part in the excavation but people across the locality. As this part of Thrace was under Persian control, every man of military age was obliged to join the expedition against Greece, and some were pressed into digging the canal. Herodotus noted that in order to provide food for the workers, a market was set up nearby (close to the modern town of Nea

Roda) and "much ground grain frequently came to them from Asia." When Xerxes' army arrived, the regular contingents set up camps, while the monarch and his escort, including his elite corps, known as the "Ten Thousand Immortals," stayed in more comfortable accommodations.

After Xerxes arrived in Acanthus, the Persian nobleman Artachaies, who had co-directed the canal excavation, died. Artachaies was related to the king and belonged to the Achaemenid clan. Clearly an imposing figure, Herodotus described him as "the tallest man in Persia, ... and his voice was the loudest on earth."

Xerxes ordered a magnificent funeral in his honor, and the army built his burial mound right next to the canal he had built. Herodotus described how the army poured out libations for Artachaies while the Acanthians "sacrifice to him, calling upon his name." If this burial mound exists, it has not yet been discovered, but its presence would be key evidence in confirming the canal's site.

The canal's southern end is thought to have opened onto a small pebble beach overlook-

## ACROSS THE WATER

King Xerxes of Persia (seated, above) looks out over the Dardanelles Strait (Hellespont) prior to launching his invasion of the Greek city-states. 19th-century painting by Jean-Adrien Guignet

BRIDGEMAN/ACI



AEGEAN SEA

Mount Athos  
6,670 ft

#### STORMY WEATHER

In Book Six of his *Histories*, Herodotus recalls how Persian king Darius I's fleet was wrecked in 492 B.C., when it tried to round the Athos Peninsula. A storm destroyed hundreds of the ships and more than 20,000 men were killed. "Since the coasts of Athos abound in wild beasts, some men were carried off by beasts and so perished; others were dashed against the rocks; those who could not swim perished because of that, and still others by the cold."

Cape Kastanias

Cape Chalkias

Vatopedíou Bay

Cape Áyioi Theódhoroí

## THE PERSIAN SHORTCUT

FAINT TRACES OF THE XERXES CANAL are still discernible today across the farmland at the narrowest part of the peninsula. The canal once ran between the modern-day town of Nea Roda and Tripiti. Investigations carried out between 1991 and 2001 revealed that at its widest point the surface-level width of the canal was almost 100 feet, tapering to at least 50 feet at the level of the canal bed. The canal bed would have been around 10 feet below sea level: deep enough for the triremes but not for heavy cargo ships. The Xerxes Canal is remarkable but not unique in the ancient world. Darius I, Xerxes's father, had re-excavated an ancient pharaonic canal in Egypt that linked the Red Sea with the Nile delta. That canal had a maximum width of almost 150 feet at surface level and was over 16 feet deep.

MAP: NG MAPS  
ILLUSTRATION: SANTI PÉREZ

Scale varies in this perspective. Sailing distance around the Athos Peninsula from Neá Róda to Trypiti is 75 miles. Xerxes Canal was 1.25 miles long.

Kassándra Peninsula

Kassándras Gulf

Sithonías Peninsula

Vourvourou

Níkiti

Ágios Nikólaos

Agíou Orous Gulf

Ammoulianí I.

XERXES  
CANAL

Trypiti

Neá Róda

Ierissós

Ierissou Gulf

Cape Arápis

Cape Elefthera





## CONSTRUCTION TACTICS

# PHOENICIAN FLAIR

Herodotus recorded in his *Histories* the Persians' methods for assigning work when building the canal between 483 and 480 B.C. They would have have differnt groups of people draw lots to excavate different sections; often these groups were peoples who had been subsumed into the Persian Empire. The Phoenicians, the skilled maritime people from what is now Lebanon, stood out for their engineering prowess. Laborers in other groups attempted to dig straight down, causing, as Herodotus wrote, "the steep sides of the canal to cave in, doubling their labor; since they made the span the same breadth at its mouth and at the bottom, this was bound to happen." The Phoenicians, however, knew they had to dig

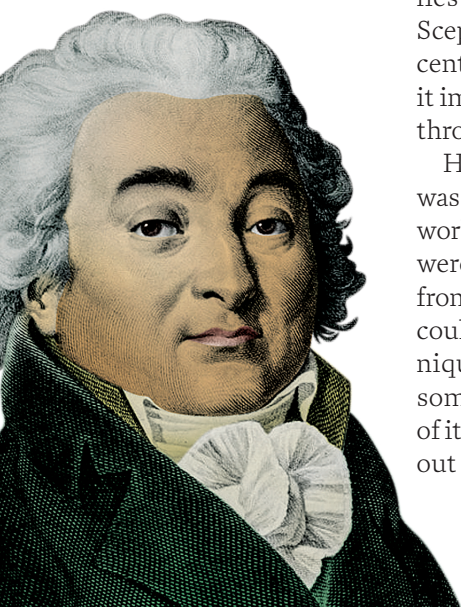
the channel much wider than necessary at the top, "and so showed the same skill in this as in all else they do; taking in hand the portion that fell to them, they dug by making the topmost span of the canal as wide again as the canal was to be, and narrowed it as they worked lower, until at the bottom their work was of the same span as that of the others." The investigation carried out by archaeologists between 1991 and 2001 has confirmed that some sections were indeed dug on the slant while others were made straight up and down. Structural differences across sections of the channel corroborate Herodotus's description of different groups following their own techniques, and offer fascinating insights into the multicultural nature of the work.



## FRENCH INVESTIGATION

The French diplomat and traveler Count Choiseul-Gouffier (below) explored the northern Aegean and argued for the existence of the Xerxes Canal in 1809.

ALAMY/VACI



ing the inner bay, near a village called Tripiti. Here the terrain is uneven, which would have complicated the excavation work. While the workers dug through layers of relatively soft sediment in other sections of the canal, at this southern end the ground is harder to penetrate. It is difficult to imagine how the workers managed to dig down as much as 80 feet to reach sea level at this point of the channel where it lies between two hills. When Demetrius of Scepsis, a Greek scholar writing in the second century B.C., examined this section, he judged it impossible that the Persians had channeled through the rocky terrain.

Herodotus recounts that the digging work was assigned to different working groups, who worked solidly for three years. As the Persians were able to count on almost unlimited labor from across the region and beyond, the project could go ahead with only rudimentary techniques: "when the channel had been dug to some depth, some men stood at the bottom of it and dug, others took the dirt as it was dug out and delivered it to yet others that stood

higher on stages, and they again to others as they received it, until they came to those that were highest; these carried it out and threw it away." Some of the excavated rock was used to build breakwaters at either end of the channel, to prevent waves eroding it and to stop the channel silting up.

Some time later, Xerxes departed and led his ground troops west towards the city of Terme (present-day Thessaloniki). He ordered his admirals to advance Persia's ships through the canal and then direct them to Terme to rejoin Xerxes and the ground forces there, which means it is unlikely that Xerxes actually witnessed the fleet sailing through the engineering marvel that bears his name.

## Legend or Landmark

Since few detailed descriptions of Xerxes Canal (except Herodotus) have survived to the modern age, the idea prevailed that his claim was an exaggeration or an outright invention. The mystery of the canal's existence lingered for millennia. In the 19th century,

interest blossomed in ascertaining whether traces of Xerxes's canal could be found. Marie-Gabriel-Florent-Auguste de Choiseul-Gouffier (1752-1817) was a French count who served as French ambassador to the Ottoman Empire. Passionate about ancient Greek history, he traveled the Aegean Sea aboard a frigate and in 1809 published the second volume of his chronicle *Picturesque Journey through Greece*, in which he argues that a canal really had once existed, cutting right through the Mount Athos peninsula. He even came up with a plan showing the measurements and sections in accordance with Herodotus's account. The romantic tone of his travelogue, however, and the absence of any rigorous scientific method led to his claims being dismissed.

In 1847, the Royal Geographical Society of London, published some topographical studies carried out by the sailor and geologist Thomas Spratt. These scientific findings did seem to corroborate the existence of the canal as described by Herodotus. What had seen a typically tall tale was now gaining plausibility, but it

would not be until the end of the 20th century that actual proof of the canal would begin to come to light.

From 1991 to 2001, a multidisciplinary team of British and Greek geophysicists, topographers, and archaeologists worked extensively on the site. It was a major collaboration involving the National Observatory of Athens, the British School of Athens, and the universities of Leeds and Glasgow in the U.K., and Patras and Thessaloniki in Greece. Benedikt Isserlin, from the University of Leeds, and later Richard Jones, from the University of Glasgow, directed the decade-long project.

On the Isthmus of Corinth, the spit of land that links the Peloponnese peninsula of southern Greece to the mainland, evidence had been uncovered of boats supported on wooden cylinders or wheeled platforms being dragged by slaves or animals along a stone causeway (*diolkos*) from one coast to the other. Isserlin wanted to check first whether such a causeway existed on the Athos Peninsula and could explain how Xerxes's fleet had made the crossing.

## COMING OUT THE OTHER SIDE

In 480 B.C., Persian sailors exiting the canal on the peninsula, would have gazed upon Mount Athos (above) from this perspective, before their boats resumed their westward journey.

JAN WŁODARCZYK/FOTOTECA 9X12



## BRIDGING THE GAP

# CROSSING THE HELLESPONT

Persian engineering prowess is evident in the fortifications at Babylon and Ecbatana as well as their bridges across major rivers. The pontoon bridges across which Xerxes's army crossed the Dardanelles Straits in 480 B.C. were the fruit of the empire's long experience in infrastructure projects. Herodotus recounts how almost 700 ships were lined up in parallel rows to span the strait, which is slightly more than one mile across. These boats (triremes from the Persian fleet and civilian craft from nearby towns) were tied to each other with ropes made of flax, papyrus, and Phoenician linen, which were then pulled taut by windlasses positioned on the shore. When the boats were all in place across

the strait, wooden walkways were laid across their decks, lined with a thick layer of packed earth to prevent slipping. Finally, palisades were erected along the sides of each pontoon to stop the horses taking fright when they saw the sea. The pontoon was as much a statement of Persian power as a piece of military infrastructure. The straits had a profound regional symbolism to the Greeks. According to Greek mythology, it is here that the twin siblings, Phrixus and Helle, are saved from their murderous stepmother by a magic golden ram who ferries them across the strong currents of the strait. Helle, however, falls off the ram's back and drowns, which is why the straits in antiquity were known as the Hellespont—Sea of Helle.



## FATAL CROSSING

Phrixus tries to save his twin sister Helle from drowning in the Dardanelles Straits, (also known as the Hellespont in her honor). These waters were bridged by Persian pontoons in 480 B.C. Painting, first century A.D., Pompeii.

BRIDGEMAN



When no evidence of such a causeway came to light, the team went ahead with geophysical tests to see if they could locate a canal.

Exciting initial results showed that there had indeed been some kind of ancient excavation in the middle of the peninsula, about 50 feet above sea level and some 65 feet deep. Taking into account that the sea level of the Mediterranean has risen more than three feet in the last 2,500 years, the team calculated that the depth of the seawater in the channel would then have been about 10 feet. They drilled nine boreholes, which allowed them to analyze the different layers of the subsoil. In the upper layers (about 30 feet down), they found several ancient layers of silt. Then came a vital clue below that: a dense bed of reddish solidified sand extending for just over a mile. Here were the canal's foundations: a wide, solid base.

For a decade, researchers on the site used methods typical of oil

and mining prospecting, including seismic tests and refraction and reflection techniques. With heavy hammers they struck metal pieces embedded in the ground. They then used geophones to record the strength and direction of the impulses generated. They were able to calculate how deep the layers of subsoil were by measuring the time taken for the volumetric waves to pass through them. They then linked subterranean points that showed similar acoustic transmission. They also performed electrical discharge and geo-radar (GPR) tests, to get a clearer picture of how the canal was structured.

Radiocarbon dating of the organic elements and high-resolution images taken from the Landsat satellite were definitive. Using their findings, the researchers were able to create a three-dimensional digital representation of the canal. The Greek-British joint project proved not only that some kind of channel had existed there but also settled the contentious issue of whether it could have run all the way from one coast to the other.

At first, the team had shared the doubts of generations of skeptics who believed that the channel could not have cut across the southern part of the peninsula due to the rockiness of the ground. But the discovery of the channel bed, the measurements made through seismic waves, and the stratigraphic analysis of the subsoil told a different story. Isserlin and Jones's team also confirmed that the channel had been constructed with sloping sides and measurements aligned with those of Herodotus's description: "from sea to sea, wide enough to float two triremes rowed abreast." Since the bottom of the channel turned out to be up to 65 feet wide, given the outward sloping walls, the navigable space at the surface level would indeed have reached the width necessary for two triremes to row abreast.

Having proved its existence, the question remains as to why the Xerxes canal disappeared both physically, and—apart from Herodotus's account—from the memory of the Greeks. No marine remains, such as shells, have shown up in the sediments on the canal bed, suggesting

that the channel was filled with sea water for a very short period of time. The size of the canal was not amendable to larger trading vessels, so it appears it was only used for smaller military ships. There is, however, a plausible theory as to why this infrastructure disappeared relatively quickly: In 479 B.C., the Persian forces were defeated at the Battle of Plataea, and the inhabitants of the Athos Peninsula were freed from the Persian yoke. It makes sense that they would allow an enemy-built canal to silt up naturally, or even fill it in themselves, thereby obliterating the landmark that symbolized their oppression. ■

CLASSICAL HISTORIAN **ANTONIO PENADÉS** HAS WRITTEN WIDELY ON CLASSICAL AND ANCIENT GREECE, INCLUDING BOOKS ON SPARTA AND MOUNT ATHOS.

## Learn more

*Persians: The Age of Great Kings*  
Lloyd Llewellyn-Jones, Basic Books, 2022.

*The Histories*  
Herodotus Editor, John M. Marincola. Penguin Classics, 2003.

## HISTORY LOGGED

Phoenician sailors create the walkway of the Persian pontoon across the Hellespont in a 1915 illustration from the popular history book, Hutchinson's *History of the Nations*. (above)

KEN WELSH/BRIDGEMAN/ACI





#### GATHERING OF THE NATIONS

The Apadana (Audience Hall) at the Persian capital, Persepolis, was begun by Darius the Great, and completed by his son, Xerxes. Here, once a year, the nations of the Persian Empire gathered to present tribute to the Persian ruler, and receive presents in turn. The reliefs shown form the central part of the frieze on the east stairs, depicting eight soldiers flanked by two figures of a bull being attacked by a lion.

PRISMA BY DUKAS PRESSEAGENTUR GMBH/ALAMY