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SCIENCE

# The Secrets of Croesus' Gold; Archaeologists Learn How Ancient King Made His Money, Literally

By JOHN NOBLE WILFORD AUG. 15, 2009



In the ruins of Sardis, capital of the Lydians of yore, archaeologists are striving to separate fact from legend, seeking glimpses of what it meant in antiquity to be "rich as Croesus." But they are also finding much more: monumental remains of the passage of time and fortune for a major city under subsequent Persian, Greek, Roman and Byzantine rule.

Here, on the slopes of a broad river valley about 50 miles inland from the Aegean Sea, in what is now western Turkey but was then known as Asia Minor, King Croesus reigned in the sixth century B.C. over the flourishing empire of Lydia. The Lydians were dreaded warriors on horse and chariot, controlling the middle ground between the Greeks to the west and marauding nomads and surging empires, notably the Persians, in the east. They were enterprising in commerce, and their streams seemed to run with gold.

"Sardis rich in gold," Aeschylus wrote. Greek literature for generations held up Croesus as a symbol of enormous wealth but one whose gold could not assure him happiness or ultimate success. His golden reputation, if little else of Lydia, survives to this day, and has drawn archaeologists of the Harvard-Cornell Sardis Expedition to this storied site each summer for the last 42 years.

Although the archaeologists have not found hoards of gold or splendid palaces, the stuff of dreams, expedition leaders now think they have established that the gold of Lydia is no legend. It was definitely in ancient Sardis in the time of Croesus, they have determined, that the first coins of pure gold and pure silver were struck, an important step leading to a monetary economy as it is practiced today.

After a comprehensive analysis of gold-refining furnaces, hearths and other artifacts at the site, Dr. Andrew Ramage, a Cornell archaeologist and associate director of the expedition, concluded, "We can confirm the hypothesis that the Lydians under Croesus initiated the bimetallic system of coinage, and even propose that the Sardis refining installations made this introduction possible."

The scientific examination of the gold refinery, the expedition's most significant discovery to date, is described and interpreted in "King Croesus's Gold: Excavations at Sardis and the History of Gold Refining," written by Dr. Ramage and Dr. Paul T. Craddock, a specialist in metallurgy at the British Museum in London, and published in May by Harvard University Press.

Scholars have generally supposed that the Lydians were the first to invent coins of gold and of silver, but have argued over when it happened -- perhaps it occurred after Croesus, under Persian rule of Sardis -- and over how the Lydians were able to render raw gold into a pure state.

Others in the Middle East had begun to use measured amounts of precious metals as payment or expressions of wealth at least 2,000 years before Croesus. At some point in the seventh century B.C., Dr. Ramage noted, the Lydians got the idea of creating and marking small lumps of electrum, a natural alloy of gold and silver, at consistent weights. They may have done this as a convenient means of paying their mercenary soldiers. The drawback of such coins, however, was that the amount of the more prized gold in them often varied. One could never be sure of the coin's true value.

## The Technology

### Near Perfection From Raw Metal

Like almost all raw gold, the metal the people of Sardis panned for in the Pactolus and other nearby rivers came mixed with silver and traces of copper. The new evidence, Dr. Ramage and Dr. Craddock said, shows how the Lydians placed the raw material in small bowl-shaped hearths in the ground and, fanning hot coals with bellows, heated it in combination with lead to remove the trace metals. Then the remaining material, mixed with common salt, was subjected to prolonged heating in earthenware vessels until the gold was completely separated from the silver.

As much as he would have liked to have found something like the royal treasury, Dr. Ramage wrote, "This offers more of a challenge than admiring the superb finish or awesome weight of the worked products, because one can now wonder at the imagination required to bring the unlikely-looking raw material to a usable form, and at the skill required to produce gold of an almost perfect fineness."

The dating of materials found at the gold refinery and other circumstantial evidence, Dr. Ramage and Dr. Craddock said, put the most likely time of this technological advance during the reign of Croesus, between 561 and his defeat at the hands of Cyrus the Great of Persia in 547.

Since the first excavations of the gold refinery, beginning in 1968, several generations of archaeologists and their students have also labored under the baking summer sun trying to learn more about Lydian Sardis. This summer, expedition leaders said they had made great strides at last in tracing the defensive walls that enclosed the city center at the time of Croesus. Near one part of the wall, they found a kind of time capsule: rooms of a Lydian house, including a kitchen with cooking and dinnerware as they were the day Cyrus seized the city.

"The most exciting work now is finding and exploring the city wall of the Lydian period," Dr. Ramage said. "Now we know there was a wall for the lower city, not just the acropolis. And now we have an assemblage of everyday wares that should help us understand what it was like in the time of Croesus."

## The Frustrations

### Ruins Below Ruins, Delay After Delay

But the expedition has experienced its share of frustration and disappointment, common tests of an archaeologist's necessary capacity for patience.

One enduring frustration is that most of the Lydian city ruins lie under what archaeologists call an "overburden." Lydian Sardis is buried deep under silt, landslide debris and the stones of Roman and Byzantine construction closer to the surface. Excavators are always encountering something non-Lydian, causing delays and diversions from their original objective.

The Greek Temple of Artemis, uncovered by a Princeton University expedition in the early 20th century, was buried up to the capitals of its stately Ionic columns. Digging for Lydia had to wait. With other discoveries, like buried remains of a Greek stadium and theater, archaeologists chose to forgo excavations and press on with the Lydian quest.

For centuries, most of the ruins visible at Sardis have been of Roman origin, notably the magnificent baths and gymnasium near the main highway through the current village of Sart. Studying these ruins proved to be a time-consuming diversion, but this did lead to finding in the vicinity a second century A.D. synagogue, the largest known in the world at that time. A discovery like that could not be ignored.

Dr. Crawford H. Greenewalt Jr., an archaeologist at the University of California at Berkeley and the expedition's field director, shook his head in exasperation over the unfulfilled expectations.

"Why are we not finding any sumptuary art?" he asked, and by his tone, the lack of lavish art from palaces was clearly a question that has troubled archaeologists for years. "We are not digging in the center of Sardis, but on the periphery, because everything in the center is all deeply buried, with Roman and Byzantine ruins closer to the top. We are not digging graves, which often yield rich goods. But they've all been robbed long ago, especially the royal burial mounds across the valley."

## The Discoveries

### Glimmers of Booty Of Ravenous Looters

Some Lydian gold has come to light. The Princeton expedition found a vase full of gold coins. Looters seized gold and silver jewelry and bronze objects from tombs near the Turkish city of Usak. The so-called Lydian Hoard showed up on the international market and much of it was legitimately acquired through gifts by the Metropolitan Museum in Manhattan. In 1993, the museum agreed to give the material back to the Turkish government.

Perhaps the triumphant Persians, as well as succeeding conquerors, were responsible for the scarcity of gold and other possessions of Croesus. A story by the Greek historian Herodotus, writing in the fifth century B.C., suggests the possibility.

Croesus, watching Persian soldiers sack the city, is supposed to have asked Cyrus, "What is it that all those men of yours are so intent upon doing?"

"They are plundering your city and carrying off your treasures," Cyrus replied.

"Not my city or my treasures," Croesus corrected him. "Nothing there any longer belongs to me. It is you they are robbing."

But the Persians presumably left the city's royal palace standing, it was still in use in Roman times. By all Greek accounts, the palace was truly sumptuous, and everything about it left the Greeks with conflicting views of Croesus and the Lydians. (What the Lydians thought of the Greeks will probably never be known, for only 115 Lydian texts have survived and they are mostly formulaic gravestone inscriptions.)

The Greeks were envious of the Lydians' wealth and power and admiring of their stand against Eastern hordes and their generous gifts to Greek temples in Delphi and Ephesus. "The loving kindness of Croesus fadeth not away," wrote the poet Pindar.

But the Greeks also assumed an air of moral superiority. Their stories implied that the self-indulgent Lydians -- the men, it was said, wore earrings and fancy tunics -- had grown soft and brought their downfall on themselves. Had not the Greeks of more moderate means and modest tastes eventually beaten back the advancing Persians?

This attitude is best expressed in another story by Herodotus, later retold by Plutarch. It is about a visit the philosopher Solon is supposed to have made to Croesus; never mind that Solon, having died just before Croesus ascended the throne, probably never made the trip.

After Solon toured the royal treasury and palace, Croesus asked, "Who is the happiest man you have ever seen?" Thinking himself the happiest man in the world, he was furious when Solon named a lowly Athenian who had a loving family and had died bravely in battle for his country.

"The question you asked me I will not answer until I know you have died happily," Solon explained. "Look to the end, no matter what it is you are considering. Often enough, God gives a man a glimpse of happiness, and then utterly ruins him."

Soon afterward, Croesus lost his son and heir in an accident, and then lost everything to the Persians. When he was about to be burned to death, Croesus cried out three times, "O Solon!" When Cyrus inquired what man or god he invoked, Croesus told him the entire story, and his life was spared.

But the palace of Croesus, why have archaeologists failed so far to turn up such a potentially rich find?

"You're touching a sensitive nerve," Dr. Greenewalt said. "Wherever the palace is, it does not stand out in the topography. Other places, we see a mound and know where to look. It may be under central Sardis, which is so deeply buried and also built over by the modern village. If we knew where it was, we would certainly go for it, but we just don't know."

Despite the disappointments, the expedition has scored enough tantalizing discoveries to keep coming back year after year. One find, the rooms of a Lydian house, were being investigated this summer. The house, lying underneath Roman ruins, probably collapsed in the destruction of the city by the Persians. Among the broken pottery, glass and loom weights, a human skeleton lay on the packed dirt floor. In the kitchen were carbonized garlic and chick peas, evidence that fire swept vanquished Sardis.

One afternoon, Tumay Asema, a graduate student at Bilkent University in Ankara, took a trowel and sliced some dirt away from an iron object. At first, he thought he had found an iron knife. With a little more digging, it looked more like a sword. A couple of days later, the object proved to be neither knife nor sword, but some piece of household hardware that Mr. Asema was at a loss to identify. Even the simplest artifacts do not yield readily to probing archaeologists.

Standing with his back to an olive grove, Dr. Nicholas Cahill, an archaeologist at the University of Wisconsin at Madison, supervised local workers digging at the Lydian city wall. They have uncovered skeletons of a middle-aged man and a young man who was probably a soldier, his iron helmet near him.

Archaeologists have learned to distinguish the Lydian city walls from later ones, Dr. Cahill pointed out. The Lydians built with unfired mud brick laid on top of stone foundations without mortar, in contrast to Roman mortar-and-stone and fired-brick construction. But Lydian walls were substantial: about 60 feet thick at the base and at least 20 feet high, the western wall appears to have run down a ridge from the top of the acropolis to the lower city.

At the eastern wall, about half a mile away, Christopher Roosevelt, a Cornell graduate student and a great-grandson of President Franklin Delano Roosevelt, pointed to stacks of Lydian mud brick there, which time had left barely distinguishable from ordinary earth.

"It's one of those things," he said. "If you know what you're looking for, mud brick, you begin to find it."

Although only segments of the Lydian wall have been uncovered, Dr. Greenewalt said, "We have enough to establish the circuit of the wall well enough."

## The Drop of Gold

### A Sparkling Sample Of Croesus' Glory

Back at the excavation house, a compound of offices, workshops, storage depots, a dining room and living quarters under the shade of tall pines, young conservators worked at cleaning and piecing together the stones of a menorah from the synagogue. They were also making broken pottery whole. Archaeologists have been struck by the strong Greek influence on Lydian ceramics and other artifacts. This may not be surprising since Lydian kings had extensive trade with Greek cities like Ephesus and Smyrna (modern Izmir) not far away and sometimes held political sway there.

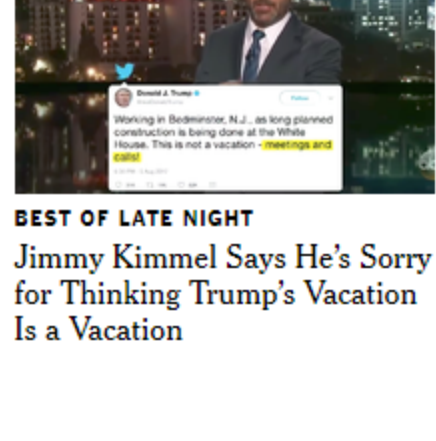
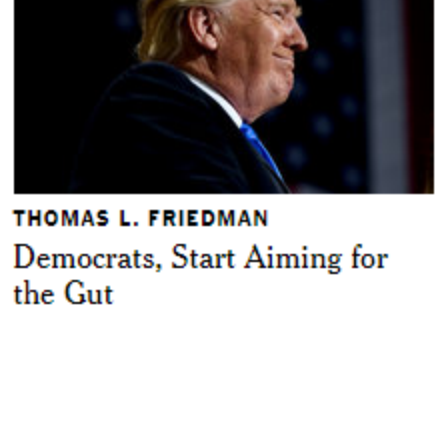
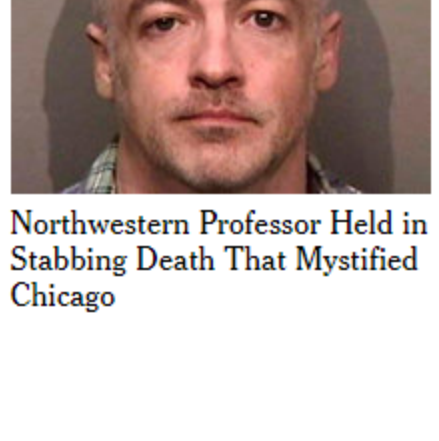
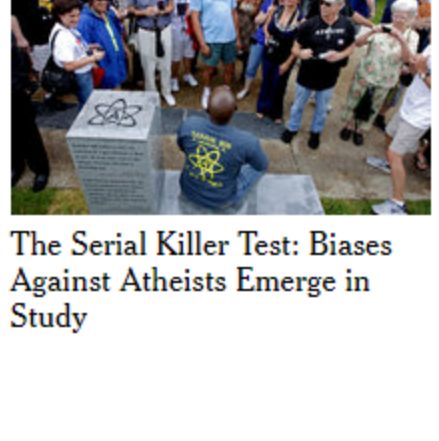
"The Greekness of Lydian culture is something archaeology has confirmed and clarified," Dr. Greenewalt said.

One morning, Dr. Greenewalt held a show-and-tell at a table in the compound's courtyard. Out of a box he pulled a glassified brick from a refinery furnace, a lump of lead oxide slag and then a pot used in the process of separating gold from silver. Lastly, he invited inspection of a piece of gray slag with a magnifying glass. Flecks of mica sparkled. Then a couple of the tiniest drops of yellow caught the light.

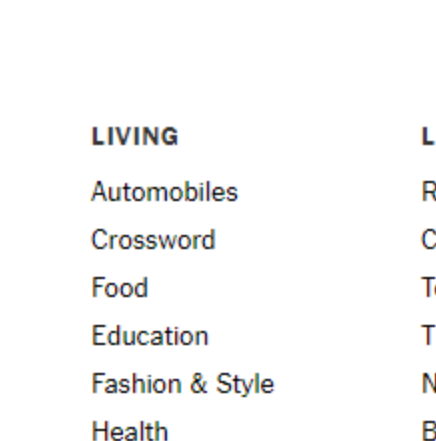
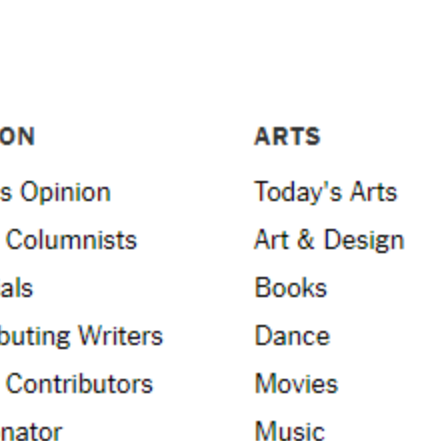
Gold?

"Yes," Dr. Greenewalt said. "You have now seen Croesus' gold."

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