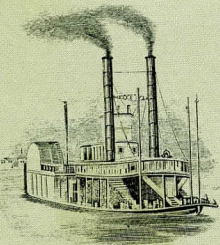
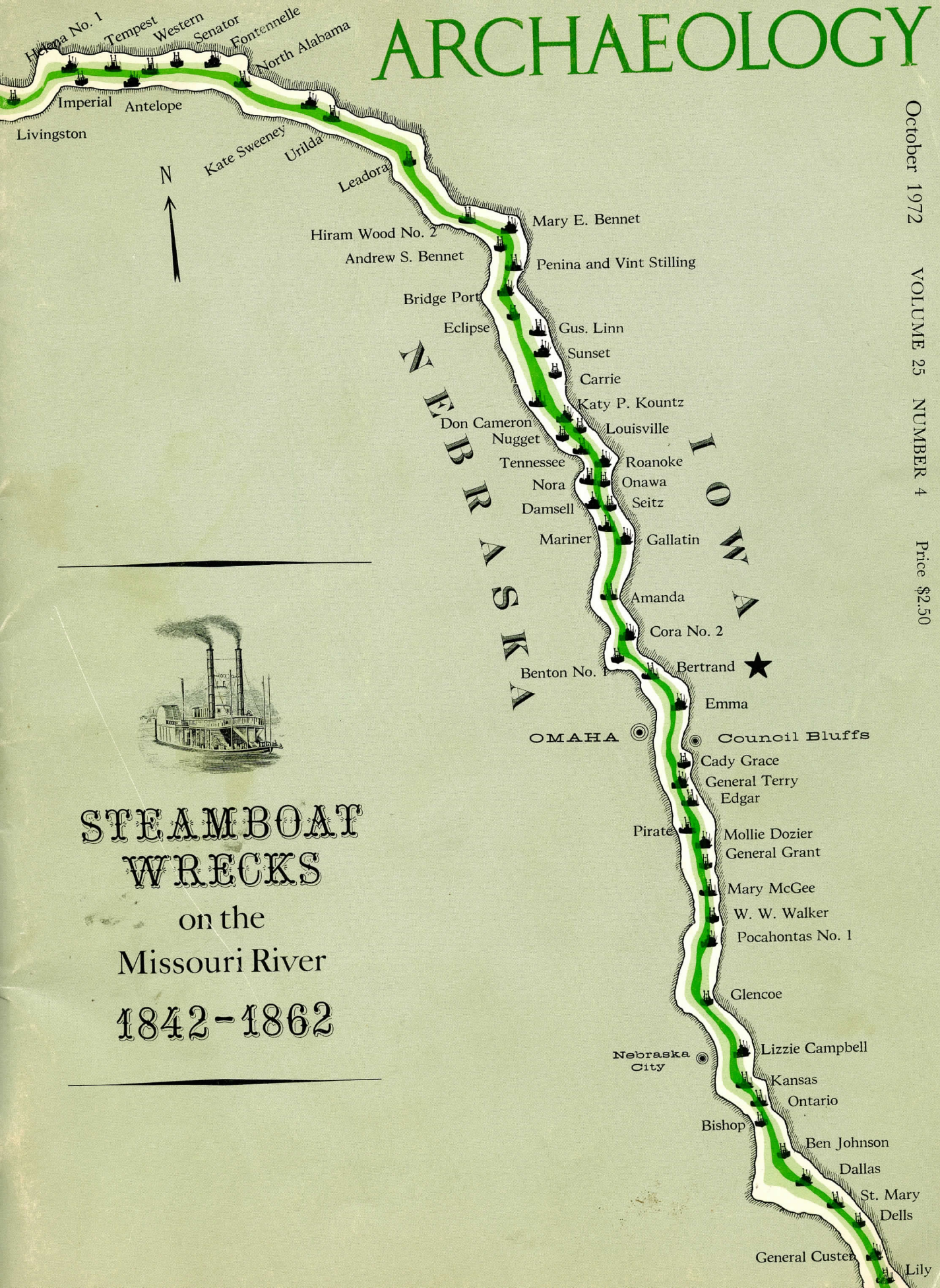


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STEAMBOAT WRECKS on the Missouri River 1842-1862

AN ANCIENT GOLD WORKER'S TOOL KIT

THE EARLIEST METAL TECHNOLOGY IN PERU

By JOEL W. GROSSMAN

From Pizarro's first contact with the Incas in 1527, the ancient Peruvians have been well known to the Western world for their fine craftsmanship in metal, especially in gold. Nevertheless, the origins of Andean metal technology have been obscure. Until this year, the earliest recorded metal artifacts in Peru—and for that matter in all of South and Mesoamerica—were some gold ornaments in the Chavin style from the north coast of Peru, dating to about 800 years B.C. From about the same time or a few centuries later, hammered copper tools have been discovered on the south coast of Peru. But despite the fact that pottery-producing peoples lived on the coast of Peru as early as the first half of the second millennium B.C., no metal earlier than the Chavin gold had been found with their remains.

The well-executed, hammered and embossed Chavin pieces do not appear to represent an incipient technology. If not, what were its antecedents? A partial answer has recently come from the hitherto little known south-central highlands of Peru. Excavations during a twelve month period at the site of Waywaka in the Province of Andahuaylas, southeast of Lima and north of Cuzco, revealed an early pottery style, and with it the earliest metal and metal working tools yet found in Peru. These excavations were supported by a Fulbright-Hays Fellowship and a National Science Foundation Dissertation Grant (GS-3085).



Waywaka is a large habitation site about the size of a football field located atop a long hill or shoulder directly above the modern city of Andahuaylas. The site is at an elevation of 10,500 feet and rises some 500 feet above the city. The excavations revealed a sequence of six distinct ceramic complexes spanning over thirty centuries of Andean culture history; it is the earliest of these, called Muyu Moqo, which concerns us here. Clear stratigraphy in the lower levels permitted the subdivision of the Muyu Moqo complex into three time units, or phases, designated A, B, and C-D.

The great antiquity of this pottery style became apparent when it was compared to the earliest known styles from the southern and central coastal areas of Peru. Neckless jars or *ollas* of the Muyu Moqo B phase are almost indistinguishable from those of the Hacha style which has been



The site of Waywaka (Ap2-2) located above the modern city of Andahuaylas in the south-central highlands of Peru. The area of ancient occupation is bounded by the road running around the crest of the hill. Excavations revealed a sequence of superimposed refuse levels spanning over three thousand years.

dated to about 1900 B.C. on the south coast. The Muyu Moqo ollas, small open bowls and bottle spouts, also show close similarities to the earliest forms recently excavated in the Ancon and Rimac valleys on the central coast.



These stylistic parallels indicate that the Muyu Moqo material probably also belongs in the early part of the second millennium B.C. The first of a series of radiocarbon determinations presently being processed confirms this. A sample of charcoal from 34 unworked stones resting on sterile sub-soil and associated with Muyu Moqo A sherds yielded an age of $3,440 \pm 100$ radiocarbon years B.P. or 1490 ± 100 B.C. (UCLA— 1808A). When cor-

rected for the change in radiocarbon production in the atmosphere since that time, according to the Bristlecone Pine scale, a date at least 250 years earlier is indicated for the beginning of Muyu Moqo A occupation at Waywaka. Because of the minimal stylistic differences between the A and B phases of the Muyu Moqo style, the second phase probably post-dates the first by no more than a century or two.



Lapis lazuli beads and hammered gold flakes from Burial 4.



Gold foil and beads recovered from the lower refuse of Level VIII in association with Muyu Moqo A sherds dating to 1490 ± 100 radiocarbon years B.C.

The first evidence of gold working in this early period came in the form of nine small flakes of finely hammered gold foil found in one of fifteen human burials located in the lowest Muyu Moqo A levels. The occupant of this grave, recorded as Burial 4, was a lightly built adult male who died between the age of 25 and 35. He was buried on his right side in a tightly flexed position. His knees were drawn up against his chest and his arms were drawn behind his back, which indicates that his hands may have been tied at the time of interment. The loose flakes and seven small lapis lazuli beads were found in his hands. One bead was found in his mouth; this bead was slightly larger than the rest and had a piece of folded foil inserted through its perforation. All perishable goods have long since decayed, and the only other objects buried with him were four field stones placed on top of his chest and stomach.

The nine bits of foil were uniformly small, none larger than 5 millimeters across. The smaller beads were cylindrical, averaging 5 millimeters in width and 2.8 millimeters in thickness. The larger lapis lazuli bead was 9 millimeters wide and 6.8 millimeters thick. The piece of foil through its perforation measured at least 41 millimeters in length. All of the foil was so thin that I was unable to measure its thickness with the equipment at hand. Its extreme thinness contrasts with the later Chavin gold work, which is generally made out of a thicker plate that could be bent and embossed.

Because all of the flakes recovered were like those found in Burial 4, it is possible that all served a single purpose. However, the thin foil might have had several different uses; it could have served as sheathing on more solid objects or as decoration sewn on clothing. What is clear at present is that it was used as a burial offering. The Muyu Moqo peoples still may have made thicker forms of metal as yet undiscovered.

Burial 4 may be the earliest occurrence of what appears to have been a long tradition in some parts of the Andean area. Describing traditional Peruvian burial practices in 1653, Father Bernabé Cobo wrote in his *Historia del Nuevo Mondo*, "It was their custom to place silver and gold in the mouth, in the hands, and on their chest, or in other places" (my translation). That the remains and their distribution in Burial 4 might represent a pattern in Muyu Moqo society and not just an aberrant case is also supported by a ceremonial burial of a white-tailed deer, *Odocoileus virginianus*, found in Burial 1 in the upper levels of the

refuse in Muyu Moqo C-D contexts. (The identification of Burial 1 as well as the other faunal material from Waywaka was done by Todd R. Olsen of the Department of Paleontology University of California, Berkeley.) The animal was found doubled up on its back in a small shallow pit; its legs were missing, its cranium placed to the side, and a chunk of turquoise or chrysocolla was found in its lower mandible.

Because none of the human burials contained any ceramics at all, and because the refuse level immediately above the rim of the Burial 4 pit contained mixed ceramics, it was not entirely clear from the context if this burial and the gold foil were buried during the phase A or B period of Muyu Moqo occupation. Only if gold foil was found in direct association with the Muyu Moqo A style sherds could a strong case be made for metal working in the highlands as early as the initial occupation of the site.

In an effort to solve this problem, I opened a final excavation unit. This time, instead of using the standard quarter inch screen, through which any bit of foil or beads as small as those found in the burial would easily pass unnoticed, I sifted all the lower Muyu Moqo refuse through a sixteenth inch mesh window screening. Although time consuming, this procedure yielded results. In the seventh level, from 90 to 103 centimeters below surface, a level containing mostly phase A sherds and some phase B sherds, I found twenty-five small flakes of foil and nineteen beads of various sorts. The case was stronger, but not proven. However, in the next level, Level VIII, from 103 to 127 centimeters, among a group of stones and clear of any intrusive burial pits, I found sixteen more gold flakes as well as fourteen additional lapis lazuli beads associated with only Muyu Moqo A pottery. Thus, while the total sample of gold foil amounted to less than half a gram, it was sufficient proof that hammered gold was known to these early pottery-producing peoples in the south-central highlands of Peru, possibly as early as the sixteenth or seventeenth century B.C.

The discovery of this ancient gold foil only raised an additional question, however: were the earliest Muyu Moqo peoples importing or actually making foil found in the refuse and burials? At first, the small amounts seemed to indicate that it might have been brought in from elsewhere. However, in the last week of the excavations, as the lowest level of the final pit was being cleared,

I found what appears to be a complete gold worker's tool kit. Resting on sterile bedrock, in the lowest Muyu Moqo A refuse level, were two stone bowls, one inverted over the other. These were roughly formed and made of a porous soft white volcanic tuff, known locally as "cheqo." When I removed the top bowl, I found inside three small cylindrical hammers and a larger, almost mushroom-shaped, evenly-worked anvil. While at first I thought that these implements might have served to grind pigments, their more probable function as metal working tools became apparent after I washed the soil from within the bowls through a fine mesh screen and found an additional flake of gold foil. Because of their softness, the bowls probably served only as containers for these gold working tools.

The functional distinction between the anvil and the three hammers is indicated by contrast in size as well as in shape. The anvil outweighs even the largest of the hammers by more than a factor of three. It was made from a fine grained greenish porphyry with large phenocrysts. It had been so carefully smoothed and finished that I could

see, with the naked eye, no nicks or scratches from its manufacture. The anvil had a broad, slightly curved platform and a thinner, almost parallel sided shaft which ended in a rounded butt.

The larger of the hammers had only one clear circular working face and was slightly conical with straight sides and a rounded end, while the two smaller hammers were double headed and cylindrical in shape. Both had slightly concave sides, which would have afforded the goldsmith a firm grip despite their small size. All three contrasted with the anvil in that their striking surfaces were flat, while in the latter the platform was slightly curved.

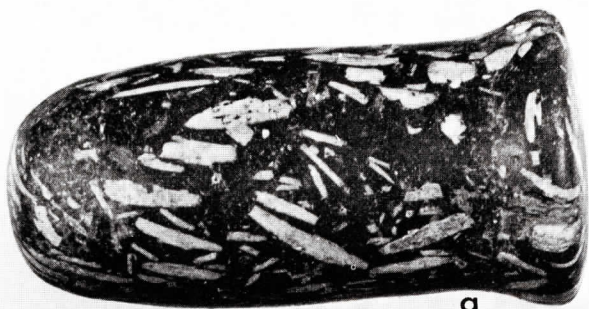
Finally, each of the hammers was cut from a different hard material. The larger of the three was cut from granular basalt, the second from fine grained greyish sandstone, and the third from whitish metamorphic garnet-quartz hornfels. Although not strikingly different in size, their differences in weight suggest that they may have been used in sequence as the foil became progressively thinner. In attempting to reconstruct how they may have been used, I found that the most feasible arrangement was to hold the anvil between my knees, leaving both hands free to manipulate the metal and hammers.



The two soft stone bowls containing gold working tools as they were found resting on sterile sub-soil in the lowest Muyu Moqo A refuse.



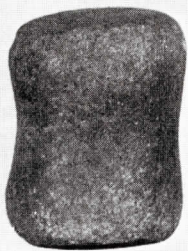
The kit in situ with its cover removed to show gold working tools inside.



a



b



c



d



Reconstruction of how the hammers and anvil may have been used. The drawing is by Father Albert Stankard of the Saint James Society.

Anvil and three hammers. a) Anvil: length, 10.1 cm., weight, 359.5 gms; b) Hammer: length, 5.8 cm., weight, 102 gms.; c) Hammer: length, 4.0 cm., weight 65.5 gm.; d) Hammer: length, 4.5 cm., weight, 58.5 gm.

While these are not the only known ancient metal working tools from Peru, they are clearly the earliest and the only ones yet found in association with datable cultural material. Two other groups came to the attention of archaeologists only after they had been unearthed by looters from the commercial market (*huaqueros*). There was no information as to where they were found or how old they may have been. They do, nevertheless, provide a basis for comparison. While the Muyu Moqo pieces are all cylindrical, both of the groups contain a larger assortment of tools, some square or rectangular, as well as other stones which probably served for embossing and engraving.

Because all of the gold was deposited—as were the ceramics—in the Laboratory of Archaeology at the National University of Cuzco, Peru, I could not submit any for chemical analysis. It is possible, however, that the Muyu Moqo smiths knew the process of annealing, and did not simply hammer native gold; Dr. Clair C. Patterson of the California Institute of Technology recently pointed out to me that the 10% silver impurity found in most native gold would make annealing virtually necessary in the production of such thin foil.

In summary, then, the presence of the foil in

the Muyu Moqo A contexts at Waywaka tells us that these pottery-producing people possessed gold foil as early as 1500 radiocarbon years B.C. The discovery on the same site of the gold-working tools allows us to say that it was the local inhabitants who made the foil. The earliest operations in South American metal technology so far reported thus took place in the south-central highlands nearly a thousand years before Chavin style gold objects were being made in northern Peru. It is always possible, of course, that further exploration will reveal still earlier evidence of the use of metals in this region.

FOR FURTHER READING: Junius B. Bird, "Treasures from the Land of Gold," *Arts in Virginia* 8 (1968) 20-23; Samuel K. Lothrop, *Inca Treasure as Depicted by Spanish Historians* (Los Angeles 1938); "Metal Working Tools from the Central Coast of Peru," *American Antiquity* 16 (1950) 160-164.

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