

# Can the Ica Stones be independently authenticated?

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Peru's enigmatic Ica Stones have been puzzling historians and scientists for many decades. Allegedly found in ancient tombs, the library of engraved rocks displayed at the private Cabrera Museum facility in the village of Ica, Peru, contains clear dinosaurian representations. Dinosaur drawings from pre-Colombian cultures are highly problematic for the prevailing theory that all dinosaurs became extinct before man evolved. However, these artifacts have been viewed with considerable skepticism since they were not found and documented by trained researchers. But other similar ceremonial burial stones were discovered and documented by international archaeologists and are housed in the collections of respected museums. This article explores ways to test Ica Stones to independently establish their antiquity or to confirm that they are merely modern productions created by enterprising local artisans.

The Ica and Nazca valleys in southern coastal Peru enjoyed a rich history as tribal Indian groups rose to prominence, like the prominent Nazcan culture which lasted from 100 BC to approximately AD 650 and the Ica culture which flourished from about AD 600 to almost AD 1200.<sup>1,2</sup> Tribal groups like the Nazcas, Icas, Wari, and especially the Paracas left behind numerous beautiful artifacts buried in their desert tombs. Along with rich fabrics, ancient tools, and detailed gold and ceramic works are engraved ceremonial stones from these peoples. The stones were first found in the tombs of the Ica Indians and so the generic name 'Ica Stones' was applied to them all. Antiquities from this region are typically dated by archaeologists using generalized 'Ceramic Periods' (table 1).

These stones are rounded andesite river rock, sourced locally in southern Peru, which have been worked by artisans in one of two ways. The primary methodology involved in manufacturing Ica Stones is blackening the surface of the stone. (Probably this black coating came from tar pits that are located south of the Ocucaje Desert.) Then grooves measuring about 1/16 of an inch deep were etched into the stone. The other methodology involves bas relief artwork (where the surface of the stone is lowered, leaving the artistic depictions raised above the surface of the stone).

The name 'Ica Stones' seems to have stuck because of the vast collection of these stones assembled in the village of Ica, Peru, by Javier Cabrera Darquea. Cabrera was a Professor of Medicine and head of his department at the University of Lima. He was also named Director of Culture for the Province of Ica. Cabrera became enamored with a collection of 600 engraved stone artifacts owned by the Solté brothers. Carlos and Pablo Solté operated a plantation in Ocucaje and allegedly obtained those stones by excavating tombs on their own property. After buying half of the Solté collection,

Cabrera augmented this archive by purchasing stones from locals who claimed to discover them during tomb excavations. Eventually over 11,000 such stones became part of the private Cabrera Museum collection.<sup>3</sup> The stones range in size from ones weighing a diminutive 100 grams to giant lithic art specimens weighing approximately 25 kg. The engraved pictures run the gamut from simple insects to elaborate fishing scenes and warriors fighting with what appear to be dinosaurian creatures. Even skeptics concede:

"And what do these etchings show? You guessed it: brontosaurus, triceratops, stegosaurus, and the whole dino collection of beasts!"<sup>4</sup>

## Categorizing the stones

The Ica Stones can be divided into three categories based on their provenance. There have been numerous stones discovered during documented tomb excavations involving qualified archaeologists. For example, in 1968 the Peruvian archaeologist Pezzia Assereto published a book on the archaeology of the province of Ica. As the representative of the National Archaeology Department of Peru, Assereto was in charge of excavations at the ancient Paracas and Ica

Table 1. Generalized ceramic periods in Peru

Period	Dates	Cultures
Late Horizon	AD 1476 – 1534	Inca
Late Intermediate	AD 1000 – 1476	Chimú, Chancay
Middle Horizon	AD 600 – 1000	Wari, Tiwanaku
Early Intermediate	AD 200 – 600	Moche, Nazca, Tiwanaku
Early Horizon	900 BC – AD 200	Chavin, Cupisnique, Paracas
Initial Period	1800/1500 – 900 BC	Early

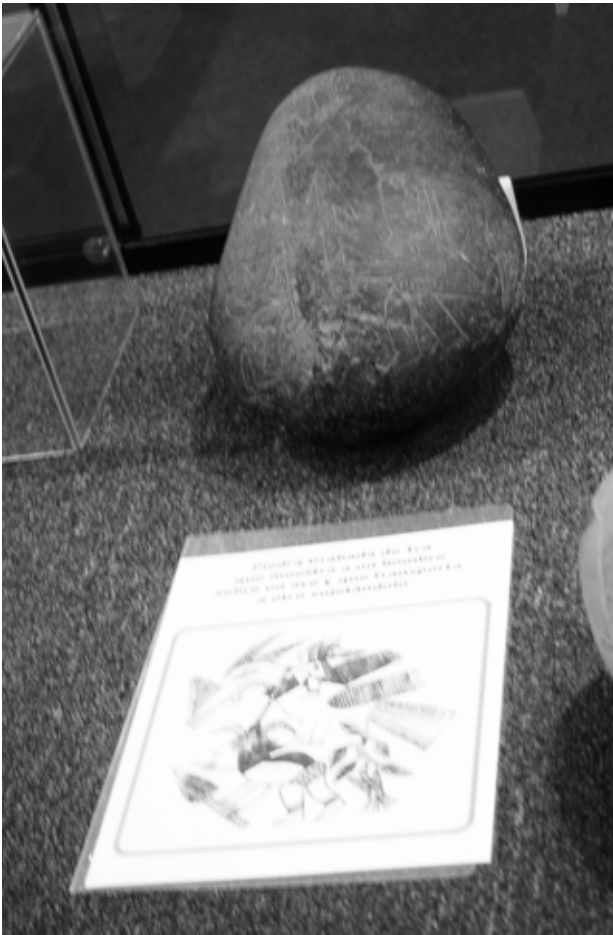


Figure 1. Ica Stones on display at the Museo Aeronáutico

cemeteries of Max Uhle and Toma Luz. He was initially suspicious of the private Ica Stone collections. However, after a considerable amount of work, he was able to find an engraved stone in situ at a tomb, which proved to his satisfaction “the authenticity of these artifacts”.<sup>5</sup> Later, in the San Evaristo cemetery in Toma Luz, Assereto found another blackened burial stone displaying a very realistic image of a fish. He dated the tomb to the Middle Horizon period (AD 600–1000).<sup>6</sup> He further recorded the discovery in an Ica tomb of a ceremonial stone with a flat surface on which was carved a realistic image of a llama.<sup>7</sup>

The various stones discovered by Assereto became part of the collection at Museo Regional de Ica. Other official museums involved with Ica Stone artifacts include Lima’s Museo Aeronáutico (figure 1), the Naval Museum, the Nazca Museum (Didactic

Museum Antonini), and the Palpa Museum of Peru. These museum pieces appear identical in manufacturing to the stones at the Cabrera Museum (as to the patina build-up, the bas-relief artistic style, and the depth of the etching). But their collections are not nearly as vast and don’t contain the controversial dinosaur depictions. We will call the Ica Stones in this category ‘museum stones’ (see table 2).

The Cabrera collection (figure 2) has long been viewed with skepticism because their artifacts were not found by archaeologists. Rather, they have come from impoverished, local Peruvians who know the landscape and are adept at finding desert tombs, digging down into them, and removing the valuables. These are the Huaqueros. They operate in a grey area of the law, digging without a permit, and selling finds to archaeologists, private collectors, and even world-class museums. The unspoken rule of the Huaqueros is that they never reveal where they find things. To be arrested as a grave robber could result in many long years in Peruvian prisons. One such tomb digger, Basilio Uschuya, especially fell under the suspicion of actually producing the stones to sell to Cabrera after artificially ‘aging them’.<sup>8</sup> While the implausibility of this accusation has been dealt with elsewhere,<sup>9</sup> the Cabrera collection must be classified as ‘stones of unknown provenance’ (a second category).

This brings us to the third category. Recently manufactured stones are available for sale to tourists. The fascination of New Agers, UFO advocates, and curious visitors ensures a ready market. After multiple visits, I (Swift) built up a friendship with Basilio Uschuya. On one such visit I offered to pay him to make me a dinosaur stone. It took a full day for him to carve a crude dinosaur onto a small stone using a hacksaw blade. The stone wasn’t much to look at (figure 3), but I was pleased that I had in my possession a ‘Basilio original’ which we could utilize later for comparison. Such recently produced artifacts we will call ‘souvenir stones’.



Figure 2. Woetzel at the Cabrera Museum in Ica, Peru



Figure 3. Basilio Uschuya souvenir stone

### Authentication

To the best of our knowledge no testing has been done on the Ica Stones by those who claim the stones were recently manufactured. And no rigorous critique of them has been published in the literature. Stones that have been found by museum-sponsored excavations or prominent archaeologists have, naturally, been accepted without authentication. But the Ica Stones of unknown provenance are another story. Seeking to establish credibility for his collection, Cabrera commissioned a number of tests on his artifacts. For example, in 1967 a few of his stones were submitted for examination to staff at a mining company in Lima. Geologist Eric Wolf documented his opinion that the patina and signs of wear demonstrated antiquity.<sup>10</sup> Wolf then submitted the stones to a laboratory in Bonn, Germany, for further testing. Cabrera later reported:

“On January 28, 1969 I received word from Eric Wolf that the results of the laboratory analysis conducted by a Professor Frenchen and his assistants at the University of Bonn were available. The stones were andesite and were covered by a patina or film of natural oxidation which also covered the etchings, permitting one to deduce that they are very old.”<sup>11</sup>

Some independent researchers have taken the initiative to analyze the Cabrera Ica Stones and concluded they are genuine antiquities. Ryan Drum is an American biologist from Iowa State University. While a NATO Scholar, he did postdoctoral studies on cell biology with an electron microscope at the Universities of Bonn, Germany, and Leeds, England. Drum has authored over 30 scientific papers in peer-reviewed journals, and has written the book *Electron*



Figure 4. Rio Grande Palpa Museum stone, held by Swift

*Microscopy of Diatom Cells*. In the 1970s he brought two Ica Stones to the US and performed a microscopic analysis of them. Drum wrote: “I have examined the rocks at 30 and 60 magnification in a stereo microscope, and found no obvious grinding or polishing marks ...”<sup>12</sup> When I (Woetzel) corresponded with him regarding patination, Drum clarified: “There was some desert varnish but not enough for me to estimate age.”<sup>13</sup>

Over the course of the last two decades I (Swift) have travelled numerous times to southern Peru, building up relationships with Cabrera, various museum officials, archaeologists and Huaqueros. On one trip Cabrera gave me a couple of his Ica Stones that had dinosaurs engraved upon them. I have personally visited the desert tomb sites on a number of occasions. Once while a group of us were walking over a grey desert hill that was a burial mound, we came upon some previously unknown tombs that had only recently collapsed and there, to my surprise, I discovered an engraved stone in situ, embedded in the side of the tomb. I filmed this with a camcorder. That particular stone was decorated with some non-descript geometric shapes.

In the spring of 2001, I (Swift) was notified by authorities from the Palpa Museum that they had discovered in situ an engraved stone displaying dinosaurs and other animals. It had recently been excavated from a Nazcan tomb complex that was dated between 400 and AD 700. This burial site is located at the far northern end of the Nazca Desert, just past the popular Nazcan Lines. The simplistic sauropod dinosaur on the stone is somewhat obscured by the extensive patina and not as detailed as most of the Cabrera Stones. There were about 30 eye witnesses to the stone’s discovery, including museum staff archaeologists. The tomb is located beside an irrigation ditch near Rio Grande Palpa, a river valley where it was exposed to an unusual amount of moisture. Because of



**Figure 5.** A photo of the head of the dinosaurian figure on the museum stone showing extensive patina buildup



**Figure 6.** A sketch of the dinosaurian figure carved onto the museum stone

that, there is an unmistakable patina, along with the typical film of oxidation.

Knowing my interest in Ica Stones containing dinosaurian representations, the Museum officials allowed me to examine and photograph this Nazcan burial stone (figures 4–6). Eventually, I was even able to secure permission to take their remarkable artifact to the United States for analysis. Moreover, the museum staff documented the details of this Ica Stone’s discovery for us in writing (see appendix 1<sup>14</sup>). Having possession of Ica Stones from each category (the souvenir stone from Ushuya, the Cabrera Stones of unknown provenance, and the museum stone of known provenance from the Palpa Museum staff), I explored whether there was a reliable way to discriminate between these categories, an independent test to authenticate the Ica Stones. If such a methodology could be established, this would be a powerful tool for evaluating the extensive Cabrera collection, including those stones of unknown provenance displaying unmistakable dinosaurian carvings. The most common way to validate purported antiquities

originating in a desert environment is to employ a lab that has experience in evaluating for authentic patina.

### Patina testing

All three stones (each containing dinosaurian engravings) were submitted to Mason Optical, Inc. in Hillsboro, OR, for initial analysis (table 2). The lab conducted an independent blind test on the three stones. The souvenir stone was clearly established as a recent production, with no authentic patina buildup in the angled incisions. Careful analysis by their specialized jumbo hospital stereoscopic microscope even detected blue metal flakes in an incision—undoubtedly traces of Basilio Ushuya’s hacksaw blade.

The analysis of the Cabrera stone of unknown provenance revealed a fine patina, embedded dirt, and natural oxidation, solid evidence of authenticity. The lab report stated: “These stones have been engraved with drawings. The incision of the drawings had a patina film over them. Therefore, they could not be of recent origin.” In addition to those age indicators, the museum stone displayed extensive salt peter buildup and even a lichen growth on one section of the stone. The report concluded: “Patination is a relative dating method and is not absolute. These stones could have been engraved 500 years ago, 2000 years ago or earlier, but definitely are not modern.”<sup>15</sup>

While this lab report was pretty definitive for the artifacts tested, there still remained a significant degree of uncertainty concerning how well this test would work for the many Cabrera collection artifacts. Most of the stones of unknown provenance, including those with obvious dinosaurian depictions, display very little patina (as Ryan Drum had observed). In very arid conditions (less than an inch of rainfall per year in the Ocucaje), it is not uncommon for genuine artifacts to have little or no patina, even after many centuries.<sup>16</sup> And, as the lab report itself concluded, “Patination is a relative dating method”.

### Metallurgical test hypothesis

A second lab analysis was undertaken, utilizing a completely different authentication methodology. The same three Ica Stones were submitted to a lab specializing in metallurgical analysis. Our hypothesis was that poor Peruvians would have utilized readily available modern tools like Ushuya had done if they were mass-producing Ica Stones for Cabrera. Ancient stone artifacts, on the other hand, would likely give evidence of a Bronze-Age production.

“Compositional analyses can identify the alloys made by the ancient people, help in the authentication of items with uncertain origin (i.e. not excavated from



Figure 7. Nazcan bronze tools from tombs



Figure 8. Cabrera stone with arrows marking areas where metals were recovered

well-controlled archaeological environments), bring information on the employed metallurgical procedures, and, in the case of very ancient artefacts, provide hints about the raw materials [sic] provenance.”<sup>17</sup>

Metallurgical analysis would not be influenced by any ‘artificial aging’ patina applied to fake stones either.

An analysis was commissioned utilizing Chemoptix Laboratory in West Linn, OR, and we submitted the same three stones for examination. The lab requested sample Nazcan tools for metallurgical comparison purposes. Fortunately, we were able to secure three implements of known provenance (figure 7). Here is a portion of the final lab report (see appendix 2<sup>18</sup> and table 2):

“The stone surfaces were examined in their

entirety using dissection microscopes equipped with episcopic/incident light illumination (MIC). Incision (carved) regions showing possible reacted metal were tape-lifted using carbon tape and analyzed via scanning electron imaging and back scattering (SEM/EDX).

“This stone [museum stone] showed weathering in its carved incisions on all examined surfaces. On a single planar surface, MIC analysis showed the rock-building minerals altering into secondary mineralization with similar habit but exhibiting expanded volumes related to alteration within the incisions . . . . No relict abrasions, metallic or otherwise, were observed in the incisions on this stone. No metallo-oxide/hydroxides derived from iron nor copper were observed.

“This basaltic stone [stone of unknown provenance] showed small areas of copper mineralization loosely adhering to the regions of carved incision. The stone incisions also showed abrasion from incision. Although the stone indicated general protection from weathering, copper residues were severely weathered. Nonetheless, a few intact metallic fragments were observed [figure 8]. SEM/EDX [Scanning electron microscopy with energy dispersive X-ray spectroscopy] analysis indicated both scuffing morphology and spectra for a silver-bronze [figure 9]. Weathered zones adjacent to these particles also showed spectra suggesting derivation from this metal; those further from the metal scuffs presented spectra less relatable to the scuffs and indicating a more complex mixture of matrix elements and possibly limited diffusion. Perhaps significantly, no arsenic was recovered from the metal scuffs nor the adjacent weathered regions.

“The ‘weathering’ on this stone [souvenir stone]

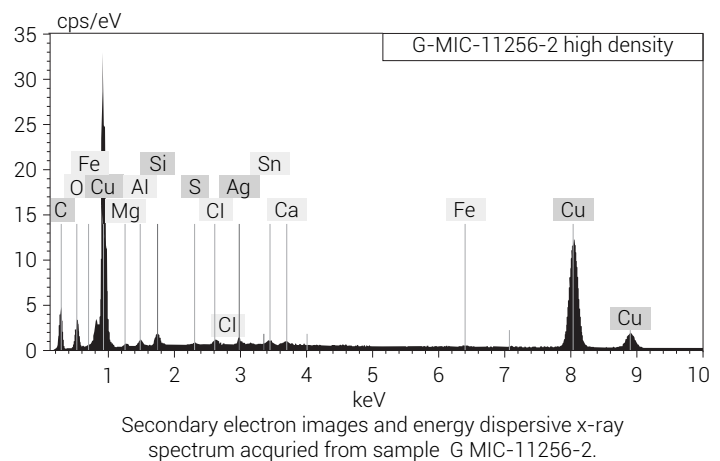


Figure 9. EDX spectrum from metal that was recovered from the Cabrera Stone, showing characteristic X-ray peaks that indicate a sample's elemental composition

**Table 2.** Summary of Ica Stones analyses

Category	Description	Provenance	Patina Testing	Metallurgical Testing
<b>Rio Grande Palpa Museum Stone</b>	17.8 cm long, 24.1 cm wide, and 10.8 cm high. Weighs 8.79 kg. Mohs hardness of 5.	Found in situ by secular museum archaeologists	Heavy patina, extensive salt pater buildup and even a lichen growth	No relict abrasions, or metallo-oxide/hydroxides derived from iron or copper seen
<b>Cabrera Stone of Unknown Provenance</b>	21.6 cm long, 20.3 cm wide, and 17.1 cm high. Weighs 14.63 kg. Mohs hardness of 5.	Allegedly found in Paracas tombs by Huaqueros	Fine patina, embedded dirt, and natural oxidation	Weathered copper metallic fragments were recovered from a silver-bronze.
<b>Souvenir Stone made by Basilio Uschuya</b>	20.3 cm long, 12.7 cm wide, and 5.7 cm high. Weighs 2.8 kg. Mohs hardness of 3.	Recently manufactured	no patina buildup and blue metal flakes seen under the microscope	Cursory exam showed a brushed on coating, but no metal recovered for analysis

peripheral to the incised figures was brushed on as a paint/coating. There were no conspicuous metal/metallo-oxides within the incisions upon cursory MIC evaluation.”<sup>19</sup>

### Discussion

It might seem odd that the museum stone of known provenance did not yield any metal remnants whatsoever for analysis. But we feel this fits with the extensive patina and lichen buildup from the more humid environment. The presence of moisture and the great antiquity of the artifact likely resulted in the complete corrosion of any residual metals. Any remaining corrosion remnants probably are embedded under the thick patina. This scenario is hardly unprecedented.

“Swedish researchers recently carried out a detailed statistical study that examined aspects of bronze corrosion and the burial environment for artifacts from the Bronze Age, the Viking period, and the early Middle Ages (Mattsson *et al.*, 1996) ... . Soil moisture was shown in the Swedish statistical work to be a significant influence on copper deterioration in burial environments. This corrosion is promoted in artifacts by deep burial (but still above the water table); by burial at low height above sea level for coastal material; by small pour size in the surrounding soil; and by burial in a barrow (burial mound).”<sup>20</sup>

The absence of arsenic and only trace amounts of tin detected in the stone of unknown provenance (from Cabrera) is a very positive indicator of antiquity. Early Bronze Age tools were simply made from ‘dirty copper’, typically annealed and beaten into shape. As metallurgy advanced, “Copper alloyed with small quantities of arsenic, lead, antimony and tin appeared during the Eneolithic,

indicating the first attempts of prehistoric metallurgists to improve the technical characteristics of native copper.”<sup>21</sup> Later Bronze Age workmanship consistently involved the addition of controlled amounts of arsenic and eventually tin to the smelted copper to increase the hardness of the final bronze product.

“The bronze alloys of copper-arsenic and copper-tin were a phenomenon of the late Middle Horizon and Early Late Intermediate Period (ca a.c. [sic] 900–1100) in the Central Andean culture. They were not the first copper-based alloys to be developed in the Andean region; the alloys of copper-silver and copper-gold long preceded them.”<sup>22</sup>

In ancient Peru, arsenical bronze was the most common in northern and central regions because of the rich arsenic bearing ores present there. The south and central Andes (including the Nazca region of southern Peru) were rich in the tin ore Cassiterite. By AD 1500 the Incas had disseminated the more advanced tin bronze throughout their South American empire.<sup>23</sup> Modern bronze is anywhere from 5% tin (a mild bronze) to 25% tin (in brittle bell metals) with about 12% being the most common.

The metallurgy of the bronze tools discovered in the Nazcan tombs was also analyzed by Chemoptix. None of them precisely matched the composition of the metal bits found on the stone of unknown provenance. One tool contained the silver but none contained the tin traces. Thus, they did not exactly match each other either. This result is consistent with the belief that these tools were produced during the Early Bronze Age, when impurities and uncontrolled alloys made for variations in bronze implement composition. Still today, profitably mining the extensive Peruvian copper ore deposits is difficult because of its varied impurities, especially arsenic.<sup>24</sup>

While the metallurgical authentication results for this stone of unknown provenance are quite impressive, an

important question remains. Could it be a modern stone production that was manufactured with Bronze Age tools? We think this to be extremely unlikely for a few reasons. Cabrera was not performing any of the analysis that we did as he bought stones (nor could he with the technology available at the time). Ancient bronze implements found in the tombs are rare and would most likely be sold quickly to a collector. If the Huaqeros were manufacturing Ica Stones en masse, it doesn't seem reasonable that they would have bothered to use ancient tools. Certainly Basilio Uschuya (who had supplied stones for Cabrera) did not do that when he produced the souvenir stone. Moreover, Early Bronze Age tools would have worn out long before the thousands of Cabrera Stones *could* have been manufactured.

We must also consider the possibility of contamination. The museum stone has been carefully handled by professional archaeologists. Heme iron from blood traces in the burial process could have been introduced before the archaeologists recovered the stone, but this wouldn't impact on the bronze profile analysis. We cannot be sure that the stone of unknown provenance was carefully handled and stored over the years. However, we feel it is very improbable that highly corroded bronze elements would have been introduced in such a way that they would adhere in the incisions.

## Conclusion

The next step in our research will be to utilize this same metallurgical analysis in attempting to authenticate Ica Stones of unknown provenance exhibiting dramatic, realistic depictions of obvious dinosaur species. It is hoped that lab tests continue to provide clear and consistent results as we proceed with the testing. Pre-Colombian burial stones have the potential to be powerful evidence that men and dinosaurs co-existed. While the Palpa Museum's in-situ discovery of an Ica Stone with extensive patina buildup that contains simplistic dinosaurian representations was a marvelously unique find; perhaps more significant is the development of a promising methodology to authenticate the numerous dinosaurian Ica Stones of unknown provenance.

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