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ORICALCUM THE METAL OF ATLANTIS

by

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No other work stimulated so much the imagination, nor gave origin to so many research studies as Plato's unfinished dialogues of Critias on Atlantis⁽¹⁾.

The island Plato named Atlantis, because its first king was called Atlas, has been described as an immense continent located on the West of the Strait of Gibraltar. Searched for in all the latitudes of our planet, it was even identified with America^{(2) (3)}.

In this article, we direct our attention towards the orichalcum (ὀρειχαλκος), an unknown metal mentioned in these dialogues together with gold and silver. According to Plato, orichalcum was a precious metal extracted from the mines of Atlantis and used by its craftsmen to cover the stone walls, sidewalks and columns of Poseidon's temple⁽⁴⁾.

Hesiod also referred to it, describing it as a shiny metal, a present from Hefaistos⁽⁵⁾. But neither Hesiod who mentioned it in "The Shield of Heracles" nor Aristotle who mentioned it in a passage of the "Second Analytics" and in the "Miriabilia" (pseudoaristotelic), knew either what type of metal it was or its composition. In his commernary on the "Analytics" Filipon identifies it as brass (a copper and zinc alloy, the color of the straw). At a later date this composition was also mentioned by other authors who wrote works on alchemy⁽⁶⁾.

Metallurgical Revelations by a XVI Century Historian from Peru

Felipe Huamán Poma de Ayala, a historian from Peru who lived during years 1535 to 1616, quoting autochthonous sources, narrated that, the people who lived in Peru went through five ages or eras, similarly to Hesiod's myth on the five ages necessary for the evolution of mankind. The men of the 3rd. age were called purun-runas and the women purun-warmi⁽⁷⁾ (Fig. 1). At that time, he says, they began weaving cotton clothes and dyeing them in different colors; they built houses with stone walls and straw roofs because construction with sun-dried bricks was unknown; they also started clearing up roads which were preserved until the time of the Spanish invasion.

Guamán Poma left some interesting information on the technical knowledge of the purun-runas, which can be found in his small catalogue of minerals⁽⁸⁾. When he refers to metals known in the 3rd. era, he says: they started looking for silver and gold, their (purun-runas) silver was called purun-collqui; and gold, purun-cori; and copper they named anta. Lead they called yana-tite; tin was called yurac-tite, and orpiment (As_2S_3) they called atocpa-corin. The latter, due to its color, they called fox's gold. In quichua language atoc means fox and pa is a syllable meaning ownership.

We note that, when referring to some of the minerals, the historian indian seems to be expressing himself in archaic greek!

The greeks name hematite (αἱματίτης, blood stone) and magnetite (Μαγνήτης λίθος, also called Ἡράκλεια λίθος, Heracles' stone), iron minerals⁽⁹⁾ Fe_2O_3 and Fe_3O_4 respectively, both mentioned by Theophrastus (c. 374 to 287 b.C) which, together with many other minerals kept the same suffix tite, which is equivalent to litos and means stone or mineral. Guamán

Poma de Ayala also calls lead yana-tite which means black mineral in quichua; and tin, which is a white metal, he calls yurac-tite which means white mineral in quichua ^(10a). According to Alonso Ramos Gavilán (1621), the commonly accepted meaning for the aymara voice titi is tin, lead or copper, therefore, we can say that in the region of Collao titi usually specified metals or minerals ^(10b). Lake Titikaka, also called Chucuito, located in this area, preserves the name of the Andean region rich in minerals, for titi-káka means a mountain of tin or lead.

The most important information contained in the catalogue is the mention of names given to the most coveted metals ⁽¹¹⁾. If we eliminate the prefix purun which only indicated the era, the combined names for gold and silver form the word cori-collque which would be very appropriate to denominate in quichua a precious alloy formed by those elements, inasmuch as a copper and gold alloy is called anta-cori ⁽¹²⁾. It is really possible to obtain this alloy in practice? Modern metallurgy proves that gold and silver are mutually soluble in all proportions, thus resulting in a more fusible and elastic alloy than pure gold.

Composition of Coricollque

According to Plato, orichalc had fire reflections ⁽¹³⁾. The only reddish combination of gold ⁽¹⁴⁾ and silver appears when we incorporate a small percentage of copper. (see Table I). It is sufficient to add 5% of copper into 75 parts of gold and 20 parts of silver to obtain a splendid pinkish color ⁽¹⁵⁾. Gold alloys with less than 12% copper are very malleable and easy to work with. Did the ancient peruvians know a precious alloy of this type? A metallic alloy of this type was recently discovered in a set of jaguars of Chavin style, amazingly shaped in thin sheets of precious metal and soldered with exquisite craftsmanship ⁽¹⁶⁾.

The jaguars were found in 1925 by a peasant in Chongoyape and classified as "Chavinoids" due to the style of their artcraft. It is too risky to venture a date of manufacture. Lechtman et al. believe they were made between the years 400 and 100 b.C. but they might be older.

Nevertheless, authors quoted have accepted this possibility, by admitting that peruvian metallurgic traditions have been kept from very early eras⁽¹⁷⁾.

We have no precise way to establish an exact date for the beginning of metallurgy in Peru, but Lothrop assures us that, in the region of Chavin, the same was developed very early in a magnificent style and with extraordinary manufacturing techniques⁽¹⁸⁾.

Various analyses were carried out of the metal used in the manufacture of the jaguars to ascertain their average value. These analyses showed they had the following composition: 9% copper, 76% gold and 15% silver. If we take into account the fact that, through heating in the air the surface can loose copper by oxidation, with the concomitant increase of precious metals, we must admit that the peruvian goldsmiths from the Chavin era knew how to work efficiently an alloy of precious metals "with fire reflections" which they most probably called coricollque.

CONCLUSIONS

According to Plato, in the short but fatal lapse of one day and one night, dreadful earthquakes and floods submerged Atlantis into the depths of the Ocean. "This is the reason why, even nowadays, that ocean is inaccessible and difficult to navigate due to the slime the submerged island left in its stead". Whit this explanation Plato⁽¹⁹⁾ tried to conceal the total ignorance that existed regarding the history and geography of one of the most civilized nations of the 5th. century

before our era. About the most distinguished achievements of men of the first three ancestries - as quoted by Hesiod - and those of the 4th lineage of heroes; only legends remain.

America is the only "island larger than Lybia and Asia put together", located in front of the Strait of Gibraltar. The information available to Plato, and which he transmitted with the best of intentions, was distorted. America did not sink, but a disaster of enormous proportions must have befallen the men of the third age. In Peru, the echo of this catastrophe was preserved through different traditions. According to Huamán Poma de Ayala⁽²⁰⁾, the purun-runas were annihilated by a (sic) pestilence - many people died - "they say that during six months the condors and vultures ate without being able to eat it all".

According to Plato, sheets of orichalc were used to coat the temple of Poseidon. In Peru, religious monuments were coated with sheets made of gold, but they were torn off by the Spanish invaders. Is it pure coincidence then that laminating was the most important and traditional peruvian metallurgy?

The myth of the island of Atlantis, qualified by Aristotle as pure fantasy, again acquires importance. What to believe? "Aurea mediocritas", advises us to follow the horatian thought: that is to say, we must not consider ourselves too wise to the point of judging it pure fantasy nor so naive as to go searching for it in the bottom of the Atlantic.

As regards the subject of Atlantis, a good hypothesis states that the chronicle is based on genuine traditions, but that it did not occur 9000 years before the era of Plato as stated by its author in the dialogues of Critias, but scarcely 900 years before his time. Decreasing time by a factor of 10⁽²¹⁾, the disappearance of Atlantis is contemporary to a violent volcanic eruption in the island of Thera, north of Crete. Through discoveries made during modern archeological excavations, it was proven that a cataclysm did occur in the sea of Crete, ap-

proximately in the year 1500 b.C., in conjunction with two eruptions in Thera. This cataclysm would be responsible for the collapse of a powerful thalassocracy, whose central government was located in Crete. K.T. Frost initially suggested this minoic hypothesis in 1909, while trying to explain the legend of Atlantis. This theory was recently followed-up by J.V. Luce in "The End of Atlantis"⁽²²⁾ proving quite satisfactorily the time factor but restricting the actual area to the boundaries of the Mediterranean Sea, which does not tally with the geographical location Plato mentions.

This catastrophe has left its mark in different parts of the Northern hemisphere. A notable variation in the climatic conditions, with sufficient decrease in temperature to freeze pine trees and hinder their growth was noticed in the growth rings of dead trees, in the region of White Mountain, California. This climatic variation must have occurred in 1626 b.C. and was related to the eruption in Thera⁽²³⁾. Similarly, in the perforated ice core of Camp Century in the north-east of Greenland, belonging to the period 1100 to 2700 b.C., it was found that the peak of the acid profile was from 1388 \pm 50 b.C. and the same is also considered a result of the eruption in Thera⁽²⁴⁾.

Summarizing, a cataclysmic phenomenon detected on a world scale involving a volcanic activity of extremely high intensity did occur, between the years 1400 and 1600 b.C. But, should we really only blame the volcano of Thera for this cataclysm?

Archeological studies carried out in the Peruvian Andes show this to be a rather simplistic claim. Stratigraphic excavations carried out in the cave of Huargo, located at 4,000 m.a.s.l. in the state of Huanuco (Peru), indicate that, during the last 12,000 years a strange volcanic incident occurred in that region of the Andes⁽²⁵⁾. The only two layers with volcanic ashes are dated as belonging to the second millennium b.C. The oldest of them and the one with the highest concentration of ash (10%), was dated by radiocarbon tests as belonging to approximately 1620 \pm 230 years before our era.

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The relationship between the quichua names used by ancient Peruvians for metals and alloys with greek nomenclature, can be attributed to the fact that, in ancient times, navigators from the Mediterranean region were in close contact with the people of America. Therefore, apart from the minoic hypothesis mentioned above, we must also consider the possibility of identifying "the island of Atlas" with America.

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TERZERA E DA DE IÑS PURVIRVIA



Fig. 1

The unique illustrated account of life in Inca times by Guamán Poma de Ayala, lost for 300 years, was discovered in Copenhagen in 1908. One of the drawings show the men and the Women of purun age.

Table I

According to Knab (Traité des alliages métalliques, Paris, Steinheil), the following interrelations exist between color and composition of different gold alloys:

	Gold	Silver	Copper	Iron
Yellow Gold	1000	-	-	-
Red Gold	750	-	250	-
Pale Red Gold	750	200	50	-
Green Gold	750	250	-	-
Blue Gold	750	-	-	250
White (english)Gold	750	150-190	100-60	-

Bibliography and Observations

- (1) Platon Oeuvres Complètes, T-V, Librairie Garnier, Paris.
- (2) Pedro Sarmiento de Gamboa (1572) "Historia de los Incas", Chapter 3, Emecé Ed. S.A., Bs. Aires (1943).
- (3) For a deeper study of this subject see:
Armando Vivante y J. Imbelloni "Libro de las Atlántidas" (1939) Humanior, Bs. Aires.
- (4) Plato, Critias, 116 d.
- (5) Hesiod, "The Shield", V.122
- (6) References on Aristotle, Filipon and Alchemists, in comments 430, Vol. VII, Plato's Dialogues, by Juan B. Bergua, Ed. Ibericas, Madrid (1960).
- (7) Felipe Guamán Poma de Ayala (Waman Puma) "El Primer Corónica y Buen Gobierno", folio 57, p. 46, Siglo Veintiuno, México, (1980).
- (8) Idem. folio 60, p. 49.
- (9) Dana Mineralogy VII Ed., Vol. I, p. 527 and p. 698, John Wiley & Sons, London, (1944).
- (10a) Jorge A. Lira "Diccionario Kkechuwa-Español", 2nd. Ed. p.339 and p.344, Editora Guadalupe Ltda., Bogotá (Colombia), (1982). Tití means heavy, with a lot of weight, metallic lead.
- (10b) Alonso Ramos "Historia de Copacabana" (Rafael Sans' version) Chap. 6, p. 7, La Paz, Bolivia, (1860).

- (11) The name collqui is preserved in the collquipocro toponymics, originating in a mineral site located in the district of Pampas, Department of Ancash. Collquipocro means silver pit in quichua. Different types of sulfurous silver minerals have been extracted from the mines located in Collquipocro, including native silver. A.Raimondi, "Ancash", p. 112, Lima (1873).
- (12) The ancient inhabitants of Peru knew a copper and gold alloy, called by the joint-word antacori. Walter Lehmann "The Art of Old Peru", p. 24, Ernest Benn, London, (1924)
- (13) Plato, Critias, 116 c.
- (14) Assyrians knew red and yellow gold. The red gold (Ṣariru ruššû) is described as a product from the Underworld or Aralli (the greeks called it Hades), the dust of its mountains. p. 59 "A Dictionary of Assyrian Chemistry and Geology" R. Campbell Thompson, Oxford, (1936).
- (15) L.Weil "L'Or", p. 43, Librairie J.B. Baillière, Paris (1896).
- (16) Heather Lechtman , Lee A. Parsons and William J. Young, "Siete Jaguares de Oro del Horizonte Temprano", Revista del Museo Nacional, Vol. XLI, Lima (1975).
- (17) Idem p. 282
- (18) Lothrop, Samuel K., "Gold Artifacts of Chavin Style" American Antiquity (1951); 16(3); 226-240.
- (19) Plato, Timaios, 25 c.d.

- (20) Felipe Guamán Poma de Ayala "El Primer Nueva Corónica y Buen Gobierno (*), folio 61.
- (21) It is possible to justify this as an error of transcription? The greeks followed a decimal system. As algarisms they used the twenty-four letters of their alphabet. In the ancient inscriptions, it was common to find the following: Δ (ten, from δέξα); Ϝ (fifty, from five times 10); Η (one hundred, from Ηεκατόν); Χ (one thousand, from χίλιοι); etc. To write down the numbers 9; 90; 900, etc., in a similar way to the one used by the romans, they used the following: ΙΙΙΙΙ = 9, ϜΔΔΔΔ = 90; ϜΗΗΗΗ = 900; ϜΧΧΧΧ = 9000, etc.
A. Bailly Dictionnaire Grec Français, p. 2195, Liv. Hachette (1950), Paris.
- (22) J.V. Luce, "The End of Atlantis", Thames and Hudson, London (1969).
- (23) Valmore C. La Marche Jr. & Katherine K. Hirschboeck "Frost Rings in trees records of major volcanic eruptions". Nature, Vol. 307 (121-126), 12 Jan. 1984.
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- (25) Augusto Cardich "Excavaciones en la Caverna de Huargo" Revista del Museo Nacional, Vol. XXXIX, p. 11-29 (1973) Lima.