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Monetary Metals in Ancient Civilizations

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Abstract

Numismatics is one of the most complex fields of knowledge, intersecting with anthropology, history, and mathematics. It is a true reflection of human creativity and technological development throughout the ages, painting an accurate picture of human civilization's evolution. Currency is not merely an economic and monetary tool; it is an artistic and engineering document that matured over the ages, from the Chalcolithic period to the Metal Ages, from its primitive, raw form to sophisticated molds. This reflects the advancements and meteorological capabilities in working with ancient monetary metals such as gold and silver. In this context, the testimonies of prominent historians and travelers such as Herodotus, Pliny the Elder, Xenophon, and others stand out, confirming the importance of these rare coins, their origins, and their meteorological analysis as a bridge of monetary and cultural communication between East and West—a fact that contemporary scholars have sought to document. Its analysis is conducted according to precise scientific methods, and in the same manner as in this topic, entitled "Ancient Monetary Metals in Past Civilizations," we rely on both theoretical and applied aspects. This is supported by an archaeological coin collection and a metrological analysis, encompassing both historical and archaeological dimensions.

Keywords: Monetary metals, ancient civilizations, history and archaeology.

Introduction

Numismatists have defined currency as a unit of trade, a unit of weight, and a unit of deposit, thanks to the metallic material used in its manufacture, so that it serves all these purposes. (Babelon, J., 2006, p. 14) Metals have been used as a primitive monetary unit since the Stone Age, in their raw form and in different forms according to each civilization,

during the barter system. They were a profitable means of exchange in the lives of ancient peoples, with metals appearing in prehistory, in the Chalcolithic period (the Metal Age), without knowledge of their properties. (Rico, C., 2009, p. 30) In the Neolithic period and the dawn of history, humans understood the conditions for smelting and manufacturing them. Stone industries replaced metals in several fields and facilitated trade, especially in the Metal Ages, such as the Bronze Age. (Ardaillon, E., 1899, p. 78) At that time, they were used to manufacture various tools for daily life, such as weapons, agricultural implements, household utensils, and ornaments. Mines appeared, crafts diversified, and the road network expanded to develop trade. After the discovery of currency in Asia Minor, smaller monetary units became the most commonly used in trade between cities and then between Civilizations. What metals were used in coinage by ancient civilizations? What was the source of these metals? And what were the names of the most important mines in ancient civilizations?

Today, despite the tremendous development in mining and smelting technologies, some ancient metals are still used in modern industries. Gold and silver are still used in jewelry and electronics, and copper, tin, and nickel are used in various industries. (Maddin, R., 1998, p. 57) Chemists and physicists classified these ancient metals as monetary metals in the periodic table, specifically in Group 11, which includes gold, silver, and copper, along with other metals such as mercury and iron. This classification aims to understand the properties of each element in terms of density, atomic weight, melting point, and reactivity with other elements. (Craddock, P., 1995, pp. 201-205) Thus, the appropriate proportions of these metals are determined to obtain new, resistant, safe, and durable alloys. (Scott, 1991, pp. 12-15)

Perhaps The most important monetary metal used in the production of various types of coins is silver. Metrologists and numismatists have summarized the most important monetary metal sources in ancient civilizations as follows:

(Ag) Argentum (silver) and silver mines

Silver is considered one of the most important monetary metals used throughout ancient civilizations. Its exploitation began in the Mediterranean region in antiquity, and its deposits are numerous yet often overlooked. (Renfrew, 1986, p. 120) Homer mentions the Eliseans, who came from Libya, a land known for its silver. Silver is also found among the Hittites in Hittite, in the Halys region of central Anatolia. (Kraay, 1976, p. 9) Silver is not found in its natural form; it must be refined. Research has not yet revealed much about silver deposits. Among the most important mines are those in the Balkans and the Iberian Peninsula. The Iorio mine was a primary source for Athens, located 60 km southeast of the city.



Wikipedia.com Asia Minor, site of Iorio

According to the Xenophon, silver production is ancient, dating back to the second millennium BC. Vessels dating from 1350 to 1300 BC have been found. (Depeyrot, 2001, p. 45) Silver production relies on several stages, the most important of which is refining, where tin oxide is separated from the silver. This process is called coupling. The metal is heated to temperatures of 880°C and 960°C, a difficult process; to obtain 2 or 4 kilograms of silver, one ton of silver ore must be analyzed. (Craddock, 1995, OP CIT, pp. 201-203) According to Peisistratus, mining techniques were developed in Utica to facilitate industry. Around 483 BC, Philo of Myrna took an interest in the mines, building boats for the Phoenicians who sailed towards Persia. This occurred in the city of Athens, where the Greeks discovered that silver was found between the limestone and schist layers. (Scott, 1991, OP_CIT pp.14-15)

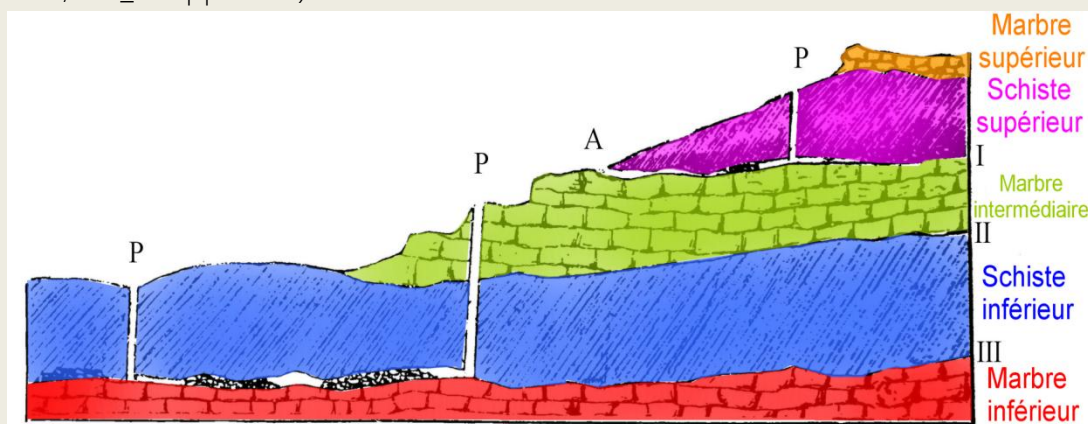


image representing mine shafts and the geology of the earth (WIKIPEDIA). COM The mine shafts, 60 centimeters long and 90 centimeters wide, resembled open wells and were opened for ventilation. The slaves working there, from the city of Utica, toiled with extreme hardship. This led, in the 12th century BC, to the slaves assassinating their guards, as was the case in the Iorio mine in 413 BC. The historian Pliny the Elder, in his famous work Natural History, described the scene of workers digging underground with great difficulty. He also mentioned the technique of breaking mountains by collecting water. They constructed huge canals (Corrugi) to bring water from thousands of kilometers away in the high mountains to reservoirs for storage, then released it all at once to break the rocks (RUINA MONTUM). They used water-lifting machines, employing Archimedes' screw technology, to drain the deep mines of groundwater.

"Cuniculis per magna spatia actis vigijatur and lucernas iisdemque mensura est vigiliarum multisque mensibus non cernitur dies Accidunt repentinae ruinae obruuntque operantes, ut iam minus temerarium videatur e profundo maris margaritas et purpuras petere."

In this text, Pliny the Elder explains the method, saying:

"Tunnels are dug for great distances under lamplight, and shifts are measured by the duration of their burning. Many months may pass without the workers seeing daylight.

Sudden collapses occur suddenly and bury the workers, so that extracting pearls and purple from the depths of the sea seems less dangerous than this work." (Pliny the Elder, v9) Here he describes the hardship of working i A picture depicting the hardships of the miners in the city of Lorio, where children also worked, as shown in the image above.



This image depicts the hardships faced by miners in the city of Lorio, including the labor of children. This is illustrated in the image above.

The relationship between mines and minerals and the religious aspect in ancient civilizations.

In ancient times, the gods of mines and minerals were primarily centered around the gods of blacksmithing, the masters of fire and volcanoes, who forged precious metals and iron.

In Rome: The god Vulcan, equivalent to the Greek god Hephaestus, was the god of fire, volcanoes, and metalworking. His blacksmithing workshops were often located beneath volcanic mountains. (Eliade, M., 1978, pp. 23-27)

In the Iberian Peninsula: The god Osca, associated with the city of Tarragos in Spain, was believed to be the protector of mines. The ancient name of the city was Huesca, which was famous for minting silver coins called Argentum Oscense.

In Egypt: The god Ptah was considered the god of creation and the patron of craftsmen, architecture, and metalworking. Lord of Memphis, who discovered the Shabaka Stone (Breasted, J.H., 1933, p. 44).

For the Twenty-fifth Dynasty, 610 BC, the inscription describes how Ptah created the universe through thought and word, heart and tongue. It is the first belief in history to speak of creation by word. (Adolf H., 1997, pp. 61-65).

The Near East/Canaanites: Kushar and Hesis were expert, skilled, and intelligent gods, craftsmen and blacksmiths who made the sacred weapons of the gods of the underworld. They were masters of buried riches (metals and ores) and gods of crafts and blacksmithing. The god Marduk is depicted as a crooked-limbed human, the god of metals, and as the dragon god Enka, the patron of wisdom and craftsmen (Black J., 1992, p. 78).

Africa (North Africa): The goddess Afrowa is considered the African mother goddess, possibly associated with the earth and its resources, in Libyan tribal mythology. She is linked to the Phoenician goddess Tanit, the goddess of fertility and protector of amulets, according to their beliefs (Ali Shaaban, S., 2004, p. 466).

Africa: Akan peoples (Ghana/Ivory Coast): For the Akan peoples, gold is a symbol of vitality and wealth, often crafted into sacred jewelry (Akindes, L.B., 1991, pp. 1-32).

Onyame: The supreme creator god, associated with the cosmic order, which includes the earth's resources. (Mbiti, J.S., 1970, pp. 78-80)

The Dactyls: Mythical deities, often depicted as dwarves, associated with primitive metalworking and jewelry making, and considered the Mother Earth. Many sources state that they were born in the mountains of Crete (Graves, R., 1995, p. 112) and possessed the ability to learn and possess industrial knowledge.



The Dwarfs Grecque & roman coins

Traditional ethnographic uses of the seven metals:

The "Seven Metals Stone" is made from a homogeneous mixture to combine planetary powers. It is believed to protect against envy or negative energies associated with folk crimes (such as black magic), especially in folk contexts where the number 7 is invoked for its sanctity.

The seven metals in ancient tradition (gold, silver, copper, iron, mercury, tin, and lead) are traditionally associated with the seven visible planets (Eliade, E., 1956, pp. 45-62) and the days of the week. Even today, some cultures still rely on this practice as amulets in their daily lives, such as the Germanic peoples (Fraser, J., 1970, p. 152), who believe these metals protect them from illness and ward off evil spirits. The associations are as follows:

Sun: Gold - Sunday

Moon: Silver - Monday

Mars: Iron - Tuesday

Mercury: Mercury - Wednesday

Jupiter: Tin - Thursday

Venus: Copper - Friday

Saturn: Lead - Saturday) (Abu Yahya, Z., 1981, p. 210). Furthermore, some believe that crafting a vessel from these seven metals heals illnesses and brings comfort and strength when the vessel clinks, according to Chinese and Japanese beliefs. The ancient legend of the clinking of pots is known as chovachi. Tibetan singing bowls (AlibabaGuid, 2024) are similar to the bowed bells, as are the chakras in Hinduism, where the belief in "centers of light and energy" in a spiritual and esoteric context has been adopted in modern Western mysticism. These chakras are vital energy centers in the human body according to Hindu and yogic traditions. There are seven basic chakras, depicted as vortices of light and energy (prana or chi) along the spine, influencing physical, emotional, and spiritual aspects of life.

Concordia

UNIVERSITY

DEPARTMENT OF CHEMISTRY

Report #U-475

May 30, 1996

GILBERT MONASTESE,
8861, 4 Esplanade,
Montréal, Québec,
H2N 1V3

Material: Copper Alloy Bowls

Results:

<u>Sample</u>	<u>Grand</u>	<u>Petit</u>
Copper	77.2%	77.5%
Tin	22.0%	21.7%
Lead	0.04%	0.03%
Zinc	0.01%	0.01%
Iron	0.14%	0.12%
Gold	< 0.01%	< 0.01%
Silver	0.03%	0.01%
Mercury	< 0.02%	< 0.02%

*Percentages of the Seven Metals Used in the Making of Chovachia Vessels and Bells
Concorde University, Chemical Analysis, Quebec, Montreal, Canada, No. 2, IV, 3.*



A talisman of the Germanic peoples for protection against disease (18th century), made from an alloy of the seven chemical metals: lead, tin, iron, gold, copper, mercury, and silver.

Returning to the historian Herodotus, in his discussion of silver, he mentions that the Athenian treasury's silver originated from the Iorio mine and that production did not

exceed twenty thousand kilograms. After the Salonian War, production increased to ten thousand kilograms. (Ardailon, E. 1897, p. 143)

According to Strabo, in 370 and 310 BC, the silver mines were neglected during the first century BC. During the second century, Athens minted eighty-five talons of silver coins, and the old currency was melted down (Conophagos, C. E. 1980, pp. 146-146).

The Pongy mine in Mount Pangaeon and the northern Balkan Peninsula:

The name Ponchi is found in the heritage of eastern Amphipolis on the plain of Strymon, meaning "mine." This mine was used in ancient times to produce gold, but in small quantities. Athens took an interest in its mines from the time of King Peisistratus, with the city of Amphipolis being founded in 437-436 BC. Its wealth was transferred to the Macedonians during the reign of Philip II in 357 BC (Hammond, N. p. 69; G. L. 1994), expanding to Hernistus, as we find in the sources Other silver mines included those on the island of Thrasos, the Parasios mine in Strymon, and the mines of the Damasion region north of Lake Ohrid in what is now southern Albania. Archaeological research has confirmed the existence of the highest (citadel)silver mine, known as Argyrokastro, where evidence of its presence was found near these mines in the royal tombs of Trebenište. (Archibald Z., 2013, p. 242)

Iberian Peninsula Mines

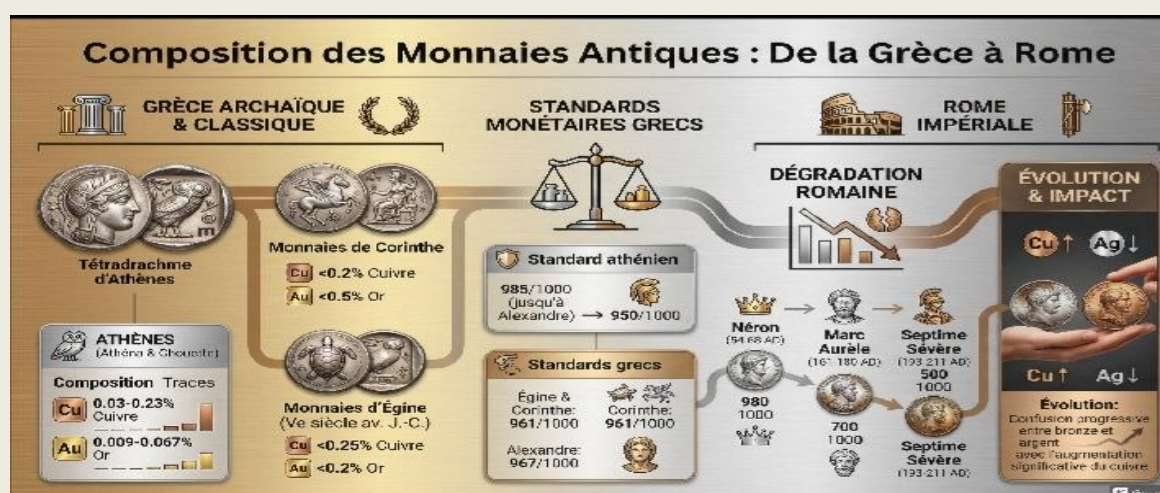
According to Aristotle, the Iberian Peninsula mines were famous for their silver. Theodore of Sicily explained that the word "Iberian" is of Greek origin and means "fire," and that the Phoenicians exploited the inhabitants' lack of awareness of the value of silver to purchase their needs at low prices. He stated that the importance of the Iberian Peninsula mines was similar to that of the Utica mines, but the working conditions were less difficult compared to the Iorio mines. He said, regarding the conditions of the workers there: "These wretched people remain day and night in the corridors digging underground, their bodies bent over, carrying hoes and hammers." (Babelon.J, 1944, p. 34)



Figure 1. – *Villes et peuples de l'Hispanie*

(Ag) Silver Currency

Silver was the most widely used metal in ancient civilizations, particularly among the Greeks and Romans. According to Pliny the Elder, the Romans required conquered peoples to pay silver, not gold, as compensation. Carthage was subjected to a tax after the war with Hannibal, estimated at 800,000 silver pounds and 16,000 pounds annually for fifty years. As a result of the Gallic War, large quantities of gold entered the market and were used for minting coins. However, the abundance of silver was sufficient to meet the needs of intercity trade, more so than the daily needs of the people. Silver is a precious metal, although a small amount of copper was added to the coinage. Copper was more prevalent in ancient civilizations, such as the first high-quality Greek coin (the tardrachma), which bore the image of the goddess Athena and the owl (Christian, R., 2009, p. 407). According to a study by C. Carry, it contained 0.03% to 0.23% copper and 0.009% to 0.067% gold. Corinthian silver coins contained less than 0.2% copper and less than 0.5% gold, while Aegina silver coins from the beginning of the 5th century BC contained less than 0.25% copper and less than 0.2% gold. As explained by numismatist Ernest Pablo, the Athenian coinage system, or its standard, was 985/1000 until the reign of Alexander the Great, estimated at 950/1000, then the Aegina and Corinthian system of 961/1000, and the Alexander coinage system of 967/1000 (Sanchez, Palencia; 2019; p. 215). The difference between the Roman system during the reign of Emperor Nero (980/1000), Marcus Aurelius (700/1000), and Septimius Severus (500/1000) and the rest of the mixture is copper, and over time it became difficult to distinguish between bronze and silver.

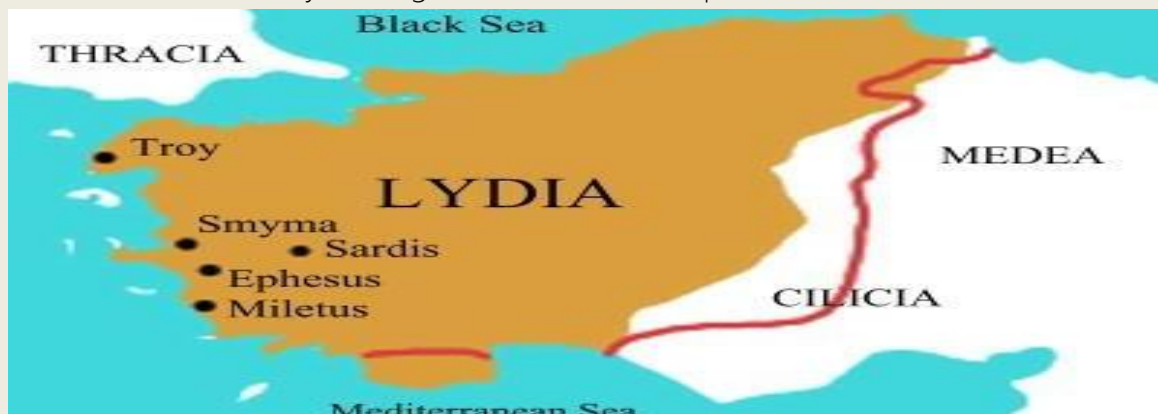


Silver Metrology Regarding the Professor's Action with the help of Artificial Intelligence
(Au + Ag) Electrum

Electrum is a natural alloy of gold and silver. Dating back to the 4th and 5th centuries BC, this "white gold" was known in Greek as "Krossos Lokos" in Sardis and was a symbol of prosperity. It was used in the construction of the palace of Menelaus and on the island of Rhodes in the Lindos region to create statues depicting the life of Princess Helen. The alloy was also used as a precious material in ancient civilizations (Blair, D., 2020, p. 56).

. Electrum mines.

Disseminated in Asia Minor, such as Sizzik, Phos, and Lydia, according to Strabo. It was found in Troy, within the borders of Abydos. Electrum was used in trade exchanges between cities. It was particularly used in Asia Minor, especially in Lydia, where the gold content of the currency was high (Babelon, E., 1897, p. 128).



Antiqueforever.com (Location of Lydia, Turkey)

In Sizzik, the gold content reached 65%, while in Lydia, it ranged from 36% to 50%. In the fragmentary currency of Lydia, it reached 52%. The earliest electrum coinage had a gold content of 95%, with an average of 27.5%. The gold content in electrum was not initially studied, as this aspect was only considered later to determine the alloy to be used in its production. Artificial electrum was studied by adding silver to gold. In Carthage, gold comprised 30% of the electrum coin. The 3rd-century electrum, which extended to the Bosphorus and Cimmeria, originated in the Loral region and contained 25% silver and 75% gold.

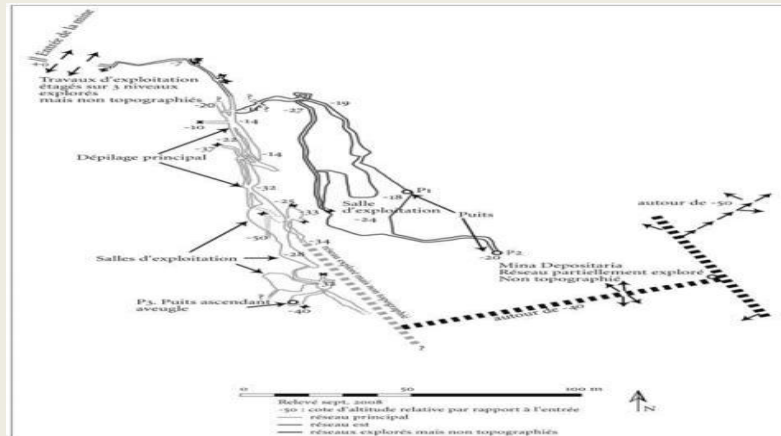
It was used in Carthage, Sicily, and Gaul by peoples such as the Pithori, Zaydagan, and Picton. (Van Wees, H., 2021, p. 184) These latter peoples used other materials in their electrum coins, such as copper, tin, or lithan.

Gold, mixed with copper, is found in the form of small pieces or nuggets called "pepits." Its high purity makes it easy to mine, and it is malleable. Gold is less commonly used than silver (Domirgue, C., 2008, p. 143) due to its rarity.

(Au) Aurum Gold Mines

European mines are distributed throughout the Balkans, Aegina, the island of Siphon, and in northern Thasos at Punja. The importance of gold mining was discovered by the Phoenicians. According to Theodore the Sicilian, "Cadmus" near Mount Punji, Philip II developed gold production so that a thousand talents could be extracted per year. According to Herodotus, the most important source of gold is found in northern Europe,

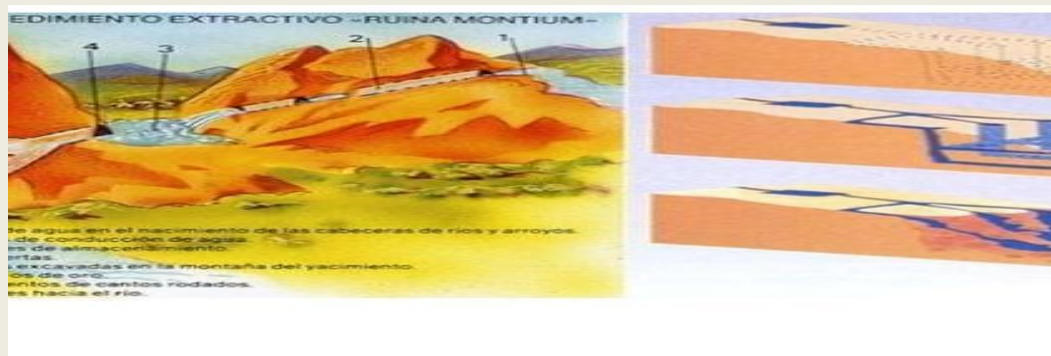
where we find gold caves such as the mines of Thrasus and the far north, where there is gold of the Sith and gold of the Arimas, in Gaul such as gold of Tarbely near Arcos, as well as in Great Britain, especially in the Iberian Peninsula in Andalusia, where its rivers are rich in gold (Müller, J.W., 1932, P.112)



*image of a mine in Cartagena, Iberian Peninsula, from the Roman period
Christiane Rico, Recherche sur les mines 2009.*

Medulla mine, an important mineral extraction site during the Roman period, located in northern Portugal, Spain.

Luis Sanchez Marcuccini ; Las Médullas, de l'or dans les montagnes de León.



Medulla mine, an important mineral extraction site during the Roman period, located in northern Portugal, Spain.

Luis Sanchez Marcuccini ; Las Médullas, de l'or dans les montagnes de León.



The famous Roman miner Las Médulas, a gold supplier to the empire, was located at the site of the Lucanea and Capo mines.

The Lucanea and Capo mines were perhaps the most important mines known in southern Italy during the Roman period.

The most significant historical event associated with these two mines was the Third Slave War (71-73 CE), a social conflict in which the Thracian slave Spartacus led the most famous slave revolt against the Roman Republic. (Brisson J. Paul, 1959, pp. 84-122) Spartacus escaped from a training school in Capo and formed a military force that defeated several Roman legions. In 70-80 CE, Spartacus escaped from Lentulus Batiatus's school in Capo using cooking utensils and fortified himself on Mount Vesuvius. The poor joined him, and he triumphed over Gaius Claudius. (SC, 2014, p. 208) (Aldo headed north towards Rome and then south. To escape, the Senate sent the military commander Marcus Gracius with a huge army who besieged Protium in southern Italy and was defeated at the River Selarius. As a warning, he crucified 6,000 surviving slaves along the Appian Way from Capua to Rome, and this painful incident became a symbol of freedom. His rebellion has been studied as one of the most prominent slave revolts in the history of ancient civilizations (Stauss. B, 2009 Various sources of the monetary treasure of Nice in Gaul.



*The image depicts the flight of the oppressed in Capua. Taken from the film *Spartacus*.*



The Lucan mine was the site of the Spartacus service facility. Fandom Apps.



Fig. 3. Provenance des monnaies trouvées dans un trésor à Nice (RRCH online).

The various monetary sources of the coin hoard from the city of Nice in Gaul. 6th and 1st centuries BC.

Cartography of Digging Coins (1950-2050) Thomas Faucher in HALL open science Digging Coins From the Greek World VI-1er s. av. j-c

Mines of the East

In Asia Minor, we find the mines of "Maisi" or "Mesi" in Cyzicus and Abydos, similar to the mines of Fiji.

They are frequently mentioned in the legends of King Midas, as well as in the city of Lydia of King Chrysos.

We also find the Chalcedonian peoples, known as the Swans, in the Caucasus. Legends mention that when a bull crosses a river, gold nuggets stick to its hide, and sheep's wool is taken from the river, dried, and burned to obtain gold. (Baqir al-Husseini, M., 1988, pp. 45-48), P.180)



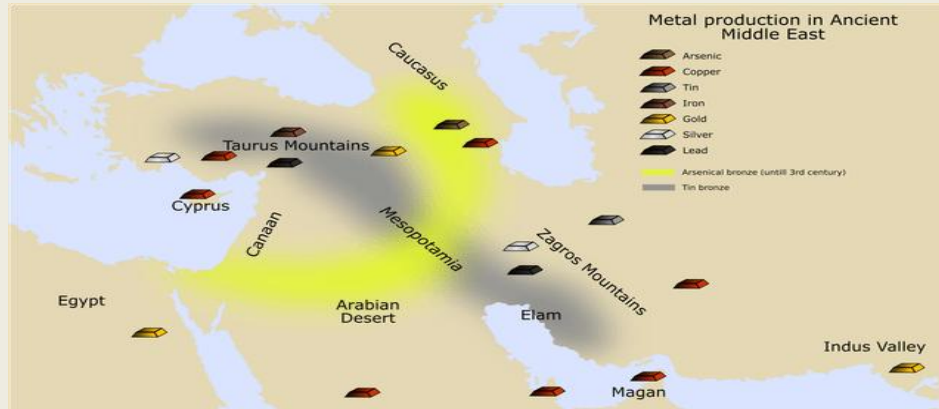
The teacher acts like artificial intelligence

India, the Arabian Peninsula, and Africa

India was another source of gold in its deserts, which were rich in it and transported by camel.

Alexander the Great sent a mining expert named Gargos, who spoke of the caves and mines of high-quality gold in this country.

The Arabian Peninsula was mentioned by Theodore of Siculus, acknowledging the quality and natural occurrence of gold from this region. The gold that had not undergone smelting was called "Aphorus" due to its high purity. (Al-Barghouthi, A.L., 2005, p. 145).



Wikipedia.com: Metallurgical Production in the Ancient Near East

Gold is found in Egypt, specifically in the city of Nubia, and was dedicated to the gods. It was used from the time of the Twelfth Dynasty and reached as far as Cyrene. Carthaginian gold, however, originated in West Africa, where they had a dedicated sea route (Rizqana, Ab, 1995, p. 112).



Depiction of a Nubian slave on a fragment of a relief. Ancient Egypt, 18th Dynasty, Amarna Period (1352–1336 BCE). • Werner Fuhrmann/Ory Mag Archives. (Elisa Castel)*Histoire & civilisation .com*

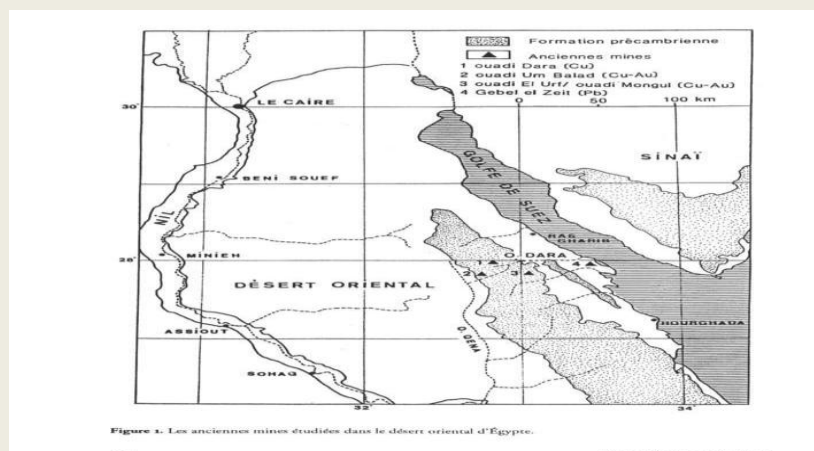


image depicting ancient Egyptian mines.

www.persee.fr/issue/arnil_1161-0492_1997_num_7_1

Gold Meteorology

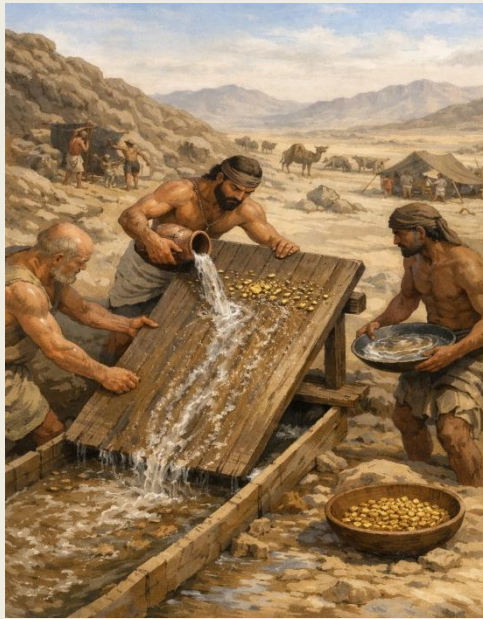
River gold, which occurs in the form of nuggets, "pepits," or flakes, requires simple refining (avignonage) because it is polished by current and friction. Gold extracted from mines, however, requires more precise techniques.



Alluvial gold uggets ;the teacher acts like Artificial Intelligence

Theodore of Siculus mentioned mines located in the far reaches of Egypt on the borders of the Arabian Peninsula and Ethiopia, where stone mixed with marble dust is transferred

onto a wide slab in a slightly inclined position, then it is turned over by pouring water on it, so that the water-soaked earthy part runs under the inclined slab, while the heavy gold remains on the slab. (Babelon, J.OP_CIT, P. 34)



Regarding the professor's behavior (artificial intelligence) in the purification and refining process

Theodore of Siculus mentions the process of leaching gold by placing it in a vessel with its impurities of clay, where it binds with lead, salt, tin, and barley bran. They seal the earthenware pots and arrange them in the oven, heating them for five days and five nights. When it cools, the gold is found to be completely pure.



The teacher is behaving like an AI

They also used mercury to leach it, by placing the solution in a pottery vessel with the gold, heating it intensely, then pouring it into a perforated leather bag, so that the mercury solution would pass through the perforations and the pure gold would remain, according to Blair the Elder (Blair. D, 2020, P. 56).



Regarding theTEACHER's behavior, (artificial intelligence) an image representing gold refining using mercury according toJean Babelons la monnaie dans l'antiquité

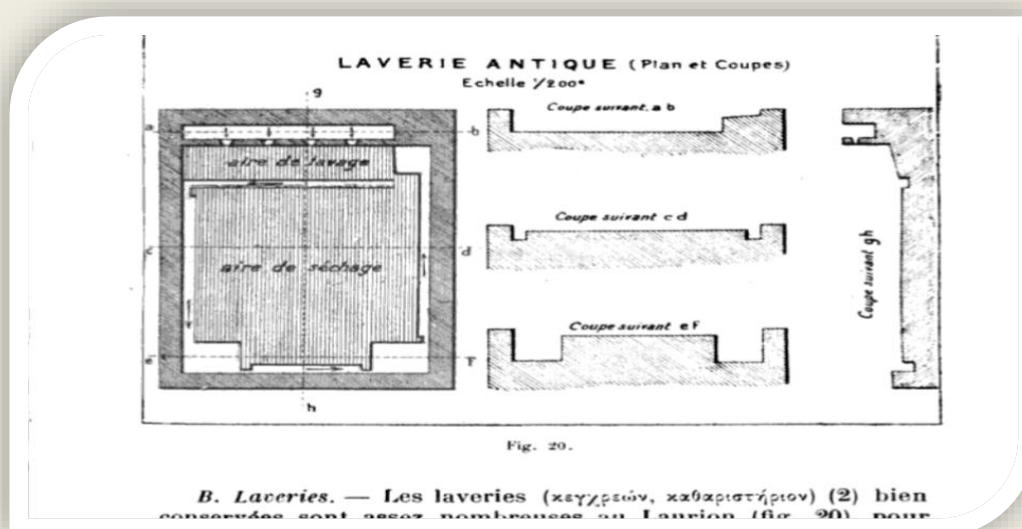


image depicting a washing and grinding workshop for minerals in Laurian
Les Mines du Laurion dans l'Antiquité Édouard Ardaillon

(Au) Gold Coins

Gold in ancient civilizations was of high purity because it was in the form of flakes or nuggets and was refined by burning, making it of the highest degree of purity for making gold coins. We used pure gold, using the carat as a unit, such as 18 carats (750 millimes), according to studies and analyses. King Darius's coins were struck with a unit of 23 carats (960 millimes), Emperor Augustus's coins (998 millimes), Vespasian's coins (991 millimes), and Constantine, who ruled in 336-337 BC, used a purity of 980 millimes (Rouzeau, B., 2021, pp. 112-115).



Regarding the student's behavior

(Cu – Cu + Sn) Copper and Bronze

Gold and copper were more widely used in the ancient world because they existed in their raw state and could be easily identified. The Romans called them Aescipio.

Copper Mines

Copper is found in Greece, particularly in Cyprus, specifically in Tamassos, an island so rich in copper that it lost its forests; Its wood was essential for the mining process, and it is found in Spain, Gaul, the Danube, Etruria, Campania, Sardinia, Germania, Egypt, the Arabian Peninsula, and all regions whose names begin with "Shalak" due to their copper-rich lands, such as "Shalcis" and "Shalci Duan." (Zeitschriften.D, 2019, pp. 34-38)

Bronze Coinage

Bronze is an alloy of copper and tin. It is harder than copper and was used continuously, especially in Roman coinage. The origin of the word bronze is "Ace brondesium" or "Ace de brondesi," after a city in southeastern Italy known for producing excellent bronze, especially for mirrors. Good bronze consists of 85% copper and 15% tin. Lead is rarely used in Greek coinage. In Roman coinage, bronze is mixed with 25% lead and 5–8% tin. (Robert J., Forbes, 1950, pp. 145-147)

(Cu + Zn + Sn) Orichalcum

The origin of the word "Orichalcum" is the Greek "Orichalkos," and it appeared in the 8th century BC.

Zinc (zincum) is the Latin name for tin (stannum).

Copper (Cuprum) is an alloy of copper, zinc, and tin, and it was used by King Mithridates in the 9th century BC, then adopted by Emperor Augustus at the end of the Roman Republic. It was distinguished by its bright color, strength, and use in ornaments and currency (Paul T. Craddock, 1995, pp. 233-236).

(Ag + Cu) Billon

Billon is a silver coin of low value mixed with a high percentage of copper. It is any coin whose face value is higher than its real value and is usually composed of at least 50% copper. It was called "fiduciary nummi" (aerosi nummi).

It spread during the 3rd century AD in Asia, Alexandria, and Antioch. And the decline is due to financial crises caused by wars and political conflicts.

(Cu + Zn) Lithium — Brass

Lithium, or brass, is an alloy of copper and zinc, golden in color, used in coinage and bronze production. Its Latin name is "stignum" or "stannum," and it is also known as "silver lead."

The Romans spoke of "plumbum album," and the Greeks called it "casterus." It was used in coins, utensils, and decorations, but it turns to powder when exposed to air, so it was rarely used for minting coins except in times of crisis (Mattingly Sydenham E, 1993, pp. 28-30).

(Pb) and lead metal

(Ni) Nickel

Niccolum and plumbum

Lead is a toxic, dark gray metal, easily melted and shaped, but unsuitable for minting coins due to its malleability. Nickel is silvery in color and resistant to corrosion, but it was sometimes used in ancient times for weights, writing on tablets, and making pipes.

Ferrum (Fe) Iron

Iron is a hard metal that oxidizes quickly. It is light gray in color, so it was rarely used for minting coins, only in times of crisis, as local ceremonial currency, and in commercial exchanges.

Iron mines are found in most countries, the most famous being the Cantaleres Caves in the Alps, where iron was found in considerable quantities (Andrew B., 1987, pp. 54-56).

(Sn) Tin

Tin is a lightweight, silvery metal that is easily molten. It is mixed with copper to make bronze. It was used in the Bronze Age for weapons, agricultural tools, and currency, and was widespread in Asia Minor, Britain, Spain, and Gaul (William H.B., 1992, pp. 22-24).

Conclusion

As we have seen, the development of currency in ancient civilizations was closely linked to the development of mining and metallurgy. Silver, gold, copper, and bronze formed the monetary basis of the major civilizations, while the mines of Asia Minor, Europe, and North Africa played a significant role. Africa played a crucial role in providing essential minerals. Ancient techniques such as washing, separating, and repeated smelting were pioneering and contributed to the formation of unified and sophisticated monetary systems. This is evidenced by the unit of currency used in ancient times, as revealed by treasure discoveries from each civilization, particularly the Greco-Roman currency, which reached its peak during the second century AD in eastern and western settlements, North Africa, and the Mediterranean region. Mines also facilitated the discovery of major trade routes for precious metals used by ancient civilizations, such as the Gold and Silk Roads, shedding light on ancient global trade and its key methods. The study of ancient currency and metals stands out as an important tool for understanding the economy, politics, and society of the ancient world, and remains a rich field for specialized academic research.

(see accompanying images)

Silver coins



L. Papius

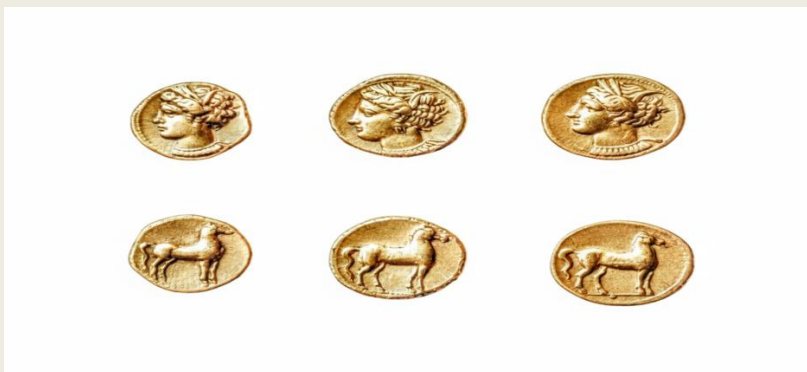


TRIDATES KING OF PARTHIA



Julia Domna

Gold electrum coins



CARTHAGE Auricalcum coins

,Bronz alloy



CALIGULA

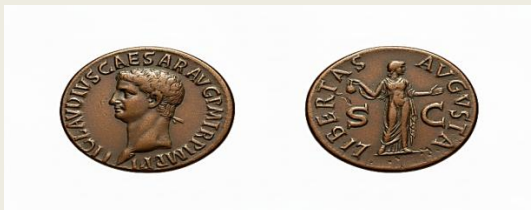


VESPATANUS

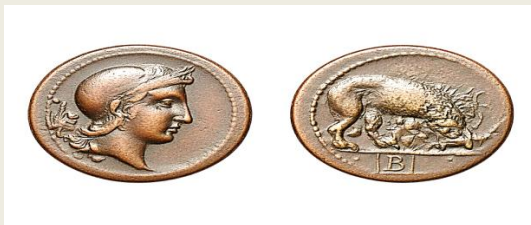
COPPER BRONZ COINS



Ti Claudius Nero



T. CLAUDIUS



(Morgantina) (Dilitron)

A BILLON COINS AN ALLOY OF SILVER AND COPPER



SEVIRINA

TIN COIN SENATUS POPULUQUE ROMANUS SPQR



Greek & Roman Coins

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