

Early Metal Technology



There is more to metal technology than just straight smelting, melting, casting, hammering, filing and polishing. Maybe not a lot more, but enough to warrant a few modules:

1. [Gold \(Au\)](#)

Topics covered are: deposits, parting by cementation, purifying by cupellation, alloying, color, working and specialities.

2. [Silver \(Ag\) and Lead \(Pb\)](#)

Topics covered are: Making fun of Aristotle, silver production via cupellation of lead, lead production and uses.

3. [Tin \(Sn\) and Zinc \(Zn\)](#)

Topics covered are: tin mining and ore treatment, production. Why Zn is special.

4. [Mercury \(Hg\)](#)

Topics covered are: When, how and why?

The Seven Metals of Antiquity

Until the 14th century AD, (Western) humankind only distinguished seven metals, known as the "**seven metals of antiquity**": Gold, Silver, Copper, Iron, Tin, Lead and Mercury. Zinc, covered above, was unknowingly used as alloy element in copper (producing brass) but never obtained in its elemental state. Copper and iron will not be dealt with here since they are covered extensively in the backbone of the Hyperscript.

The distinction of seven metals does not mean that these metals were seen as what we now call *elements*. Up to about 1700, only the four "old" elements (earth, water, fire and air) plus **Aristotle's 5th element** ("aether") "existed"; metals were a mixture of earth and water. Mercury, for example, was seen as some modification of silver. Its Greek name was Hydrargyrum", meaning "watery silver".

In fact, one and the same word might have been used for different metals in some ancient culture. In ancient Greek *Copper* and probably all its alloys was called "**chalcos**" after the copper mines at Chalcis in Euboea. This word is still the root for many present-day words like "Chalcolithic age" (fancy for copper age), "Chalcopyrite" = copper pyrites or sulfides. But the same word was also used for *iron*, long before it eventually changed to "**sideros**". The word for steel was **caluy**, clearly related to chalcos. Later it changed to "**Chalybs**", however.

Our present-day words like *bronze* or *brass* for describing certain copper alloys have their roots in the middle age. No Roman, Greek, Assyrians and so on used words remotely similar.

We do not know what kind of "theories" people entertained for metals and their ores in the very early times because they neglected to write it down or to draw some cartoons. What we do know comes exclusively from later writings that survived. Metal technology, however, is far older than writing. Even after writing was established, the people who expressed themselves in writing would mostly not write extensively about lowly topics like how to make things. They liked to write about sex and violence; consider, e.g., the "Leda and the swan" story. Or worse, about philosophy if not religion.

However, one of the earliest pieces of writing, the **Gilgamesh epos** from roughly 2000 BC, when "*stripped of sex and violence*", to quote Jason Godesky, is about deforestation caused by the metal industry in Sumeria. "Gilgamesh and his companion go off to cut down a cedar forest, braving the wrath of the forest god Humbaba, who has been entrusted with forest conservation. It's interesting that Gilgamesh is cast as the hero, even though he has the typical logger mentality: cut it down, and never mind the consequences. The repercussions for Gilgamesh are severe: he loses his chance of immortality, for example. But the consequences for Sumeria were even worse. The loss of Gilgamesh's immortality may be a literary reflection of the realization that Sumeria could not be sustained" ¹.

Unfortunately, what made big waves back then, and for a long time after, is the BS that Aristotle exuded; a taste treat can [be found here](#). In his warped imagination, the rays of the sun penetrated the earth and somehow made the metal (ores) and the hot stuff inside that is sometimes coughed up by volcanoes. That view survived until about 1500 and then even spread (printing was invented) and got enlarged by the [alchemists](#). Prospecting was done with a divining rod if you believe written accounts. I bet that those early (probably illiterate) prospectors also kept their eyes open for the typical signs of a "[gossan](#)" and so on. In the words of Ron Morton, teaching "Economic Geology 4350" at the University of Minnesota Duluth: "The alchemists essentially took Aristotle's and Plato's ideas and modified them. One addition was the idea that not only the suns and stars rays led to mineral concentrations, but so did the rays of other planets and the moon. Thus different celestial bodies were responsible for different metals."

- *Gold* originated from the yellow rays of the *sun*,
- *quicksilver* was caused by the planet *mercury*,
- *iron* came from red *Mars*,
- *silver* from the light of the silvery *moon*,
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- *copper* from *Venus*,
- *tin* from *Jupiter*,
- *lead* finally from *Saturn*.

Since the sun's rays were responsible for gold deposits it was naturally concluded that where the sun's rays were most intense is where you would find the most gold. This idea was so widely held it ended up having political consequences. Spain signed a 1790 treaty with England giving up all claims to lands north of the Gulf of California. This included what would become Canada. Spain's willingness to cede these lands to the British was in large part due to the fact these were rainy/snowy, cold, dismal places and thus not much gold to be found there.

A smaller school of alchemists believed it was *only* the sun that was responsible for ore deposits. Like Aristotle they believed the sun's rays penetrated deep into the earth collecting moisture and vapors which condensed and hardened into "unripe" metals. These then filled veins and cavities in the earth's crust. Over time the "unripe" metals were changed or "matured" into the different mineable metals due to what they called "the alchemy of nature." This idea led to the belief that metals could be changed or transmuted and thus the long, futile effort began to change lead, tin, etc. into gold."

It is quite amazing what practitioners could achieve despite of the support by the "thinkers". Maybe sometimes it is an advantage if you can't read.

¹⁾ Jason Godesky: "Peak Wood", published by The Anthropik Network on 2005-10-25 Original article: <http://anthropik.com/2005/10/peak-wood/>