Early Metal Technology

4. Mercury

Mercury or "Quicksilver" (German "Quecksilber") is liquid at room temperature; its melting point is -38,9 °C (-38 °F); it boils at 357 °C (675 °F). We cannot reasonably expect to find much by digging in ancient remains because changes are that it soaked into the soil and oxidized. Nevertheless, it is on of the "seven metals of antiquity" and thus was known in ancient times.
The question is: why? What could you do with a liquid metal before the invention of the thermometer, the barometer or the mercury diffusion pump? We shall see.

- Mercury, it seems, was found enclosed in tubes in Egyptian tombs that date from 1500 BC. I have yet to see a picture of that. The Mayas, about 1000 years later, also had 131 grams of it, contained in a chamber capped off by a circular stone in the middle of a ball court in Lamanai. What it was supposed to do I don't know.
  Otherwise there are written references and indirect observations. **Aristotle**, (384 BC - 322 BC), of course, remarked on it and actually coined the name "quicksilver" or liquid silver. I don't even know what else he had to offer but it was most certainly wrong, as always. Next, **Theophrastus** of Eresos (371 BC-286 BC), student of Aristotle and his successor as the head of the Lyceum in Athens, wrote around 315 BC the earliest surviving scientific book on minerals: "De Lapidibus" (On Stones). He states that quicksilver "... is made by pounding **cinnabar** with vinegar in a copper mortar with a copper pestle". That's interesting! We can make a metal without heat and smelting.
  Pedanius **Dioscorides**, (40 AD- 90 AD), a Greek physician, pharmacologist and botanist, in his 5-volume encyclopedia about herbal medicine called "De Materia Medica" (that was widely read for more than 1,500 years), writes about making quicksilver by heating cinnabar and condensing the vapor.
  Plinius (the elder, I guess, (23/24 AD - 79 AD)) knew the stuff but didn't call it "quicksilver" but Hydrargyrum, "water silver" - and that is responsible for "Hg" as the chemical symbol for mercury. The Romans also called it "argentum vivum", living silver. In late medieval alchemy all this so-or-so silver was represented by the symbol for the god Mercury and from that came the French name "mercure" that made it into English as "mercury", while the Germans stuck with "Quecksilber" and the chemists with Hg in short-hand. In Greek it's still hydrargyros.
  I skip what was going on in South America and in the far East - but those old Indians on both continents and the Chinese also knew a thing or two about mercury.

I'm not so sure about the vinegar, mortar and pestle approach for making mercury but the roasting bit works. You might do it in air or add some oxidizer like quicklime (CaO), whatever. Starting around 250 °C (480 °F) you oxidize the sulfur to SO_2 (it is a good idea not to stay downwind of the hearth) and volatilize the mercury, which is then condensed and collected. If necessary, your mercury can be purified by distillation, also easy to do 2000 years ago.

- But why would those ancient guys want to make mercury in the first place? I can think of several answers:

  1. It just happens when one fools around with cinnabar or mercury sulfide, HgS. Cinnabar (sometimes spelled cinnobar, and called "Zinnober" in German) has been known and used for a long time as a red color. "Zinnoberrot" still denotes a certain kind of red in German - it is incidentally exactly the color of the red names above; defined as "ff 00 00" in hex code.
  2. Making mercury is fun! It's nice, if unhealthy to play with it. And you can annoy Aristotle and his followers. Try as you might - quicksilver didn't quite fit into his "5 element philosophy".
  3. Mercury was supposed to be great for all kinds of medical applications. Today we might shudder at the idea of getting exposed to mercury - it is highly poisonous, in case you haven't heard - but mercury and mercury compounds were used against all kinds of illnesses (e.g. syphilis) until recently.
  4. You can actually use it for making amalgams, solutions of other metals in mercury. And that is useful if you are mining for noble metals.

  Let's look at these points a bit more closely.

Cinnabar Usage:

Cinnabar, or rather the **vermilion** made from it by grinding it into a powder, was a widely used and treasured pigment in the ancient world. The Latin word "vermiculum" originally denoted the ancient red dye obtained from "Kermes vermilio" vermin (an insect). The Romans called it "minium" for short and it was ancient Rome's most valued pigment and rather expensive.
The word "cinnabar" by the way, goes back to the Greek "kinnabari", which in turn comes from the Persian "zinjifrah" = **dragon's blood**.
Cinnabar is rather red, indeed:

Cinnabar crystals

Source: Wikipedia

- Cinnabar / vermilion was used for cosmetics. The stuff is rather poisonous and it is said that "it sometimes deformed the face". God knows what else was done with it but it was used in substantial quantities.

Aristotle Bashing and Alchemy

Sometimes during the Middle Ages people started wondering if the time-honored Aristotelian system of 5 classical elements was really universal. Substances like mercury just didn't fit, and the way out was to just take it as a new - the sixth - element. While they were at it they came up with two more "elements" for a grand total of 7. Earth, water, fire and air plus:

5. Hydrargum/Quicksilver, eventually called *Mercury*. It's also the passive female principle, possessing the ability to become changed.
6. Brimstone, later called *Sulphur*, the active male principle, possessing the ability to create change
7. *Salt*, the element of substance and physicality.

The three new elemens also stood for spirit, soul, and body. They could do things. For example, when the male principle gets together with the female principle - well, you can guess that one.

- Alchemists then considered mercury to be a kind of first matter from which all metals could be derived. That started the quest for **transmutation of metals**, in particular the making of gold from lead with the **philosopher's stone**. Those poor benighted fellers hadn't realized yet that philosopher's had never made anything real, tangible, or just useful.
  It was not before 1661 that Robert Boyle planted the first seeds of what would grow into the mighty tree of chemistry. More to that in the link.

Medicine

Like many poisonous things mercury and some of it compounds are powerful "medicine" for certain ailments. The Greeks used mercury in ointments, the Romans and Egyptians in cosmetics, and nobody worried much even so it was noticed that the slaves in the Roman mercury mines looked a bit unhealthy and didn't live long. Getting better now was far more important then possible bad long-term effects because people didn't live that long in the first place.
Medical uses continued up to our times.

- The first price for inventive mercury misuse goes to the Chinese. Their first emperor, God-like Qin Shi Huang (259 BC – 210 BC), the guy with the terracotta warrior army around his grave, was allegedly buried in a tomb that contained rivers of flowing mercury. This guy was going for immortality and drank an elixir that was supposed to give him just that. His "alchemists" had produced a mercury and powdered jade mixture that promptly caused liver failure, mercury poisoning and brain death. He was quite dead after drinking this potion, and apparently hasn't yet recovered.

Amalgamation

Amalgamation is the name for dissolving some metals in liquid mercury, just like salt in water. If you have silver or gold bearing rocks where you can't see the stuff because it is contained in minute invisible particle (that's the standard now), crush them and throw them in mercury. The mercury will dissolve the precious metals, what is formed is called an amalgam.
Heat it so the mercury evaporates and you have your silver or gold.

- It appears that extracting (precious) metals by amalgamation was used as early as 500 BC, possibly even earlier. It is still used today but we don't use slaves anymore (openly) and express at least some concern about the mess left behind.
- You may know the word "amalgam" from your dentist, who may have used some alloys of mercury with metals such as silver, copper, indium, tin and zinc to fill cavities in your teeth. It is inexpensive and relatively easy to use since after mixing ingredients together it stays soft for a short time so it can be packed to fill any irregular volume. After it hardened it is rather durable. Amalgam went out of style, however, because all kinds of bad long-term effects were associated with it.