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Copper, Tin, Bronze and the Bronze Age

Copper and tin are significant metals both in current use and in history. Alloying nine parts copper with one part tin makes bronze, an extremely useful metal. The discovery and use of bronze defined an important stage in the human story that we now call the Bronze Age.

Below, I'll briefly describe the geology of copper and tin deposits and then talk about the Bronze Age.

Copper Geology

Copper is sometimes found in nature as native copper but more often as a component of the sulfide mineral, chalcopyrite. Weathering of chalcopyrite can lead to the formation of minerals such as chalcocite, bornite, djurleite, malachite, azurite, chrysocolla, cuprite, tenorite, and brochantite.¹

Copper ores are found in a variety of geological environments. Chalcopyrite is usually found in volcanogenic environments, such as porphyry copper deposits. Weathering and/or diagenesis of the volcanogenic rock can lead to concentration of copper minerals in sedimentary and metamorphic rocks.²

Tin Geology

The primary ore of tin is the mineral cassiterite. Cassiterite is an oxide of tin and is considered to be part of the rutile group. Cassiterite is formed in very light coloured (highly felsic) granites and in pegmatitic veins. Erosion of these rocks leads to cassiterite accumulating in placer deposits. These placer deposits are a major source of tin.³

The Bronze Age

The use of bronze was preceded by the use of copper. People began using copper as early as the sixth millennium B.C. By 5,100 B.C. Copper mining was under way in what is now Bulgaria and Spain. Copper from these locations was traded throughout Europe.⁴

Around the same time that people in Europe were experimenting with copper, native copper was being mined in the Upper Peninsula of Michigan and traded throughout the Eastern woodland of North America.⁵

The idea of alloying copper with other metals probably occurred to many artisans in many places. The earliest bronze appears to have been made in what is now Serbia, during the 5th

millennium B.C. 6. Use of bronze spread to Egypt in 3,100 B.C., and China in 3,000 B.C. 6. By 2,100 B.C. its use had spread to Great Britain ⁴.



Figure 1 Bronze Casting, Credit: Hans Splinter

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During the Bronze Age, warrior elites monopolised the use of bronze for weapons and armour. These elites took over existing states and helped form new ones in the Middle East, Greece and East Asia. Warrior elites armed with bronze also dominated the chieftainships that existed outside the civilized states. Bronze became an important commodity in the trade networks. For example a flourishing trade network developed among the states of the Eastern Mediterranean, with all sorts of goods travelling from Egypt to the Levant, Anatolia and Mycenaean Greece ⁷. However, bronze was the key commodity.

The Bronze Age marked a great advance in the human story. It was also a violent time, they weren't making weapons and armour just for show. Bronze Age states and minor polities engaged in wars from as far west as the British Isles to the Far East of Shan Dynasty China.

The end of the Bronze age was also marked by violence. The famous siege of Troy, immortalized in Homer's epic poem, *The Iliad*, was only one of many violent incidents at the end of the Bronze Age. It is more than just a story of "those who live by the sword shall perish by the sword". The end of the Bronze Age around the year 1,200 B.C. appears to have been a systemic collapse caused by multiple social, political and ecological factors^{7,8}.

Systemic collapses usually begin with a ecological stress, such as bad weather. That leads to crop failures. The population that could be sustained in the good times is now too big to be fed by the resources available during lean years . Consequently, a series of bad harvests will lead to social and political stress. Political and economic relationships will be tested and many will fail. Long established networks of trade may collapse as the goods that were to be traded are no longer available and the trust that bound the system together evaporates. Ambitious warlords arise who motivate desperate people to join them in raiding supposedly richer neighbours. The onslaught of armed migrants leads to the collapse of now fragile political structures. After the dust settles, the fires burn out and the bodies buried, a new dark age arises and the survivors find new ways to live.

It's happened before, don't think it can't happen again.

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