

# Lost Knowledge Today

## Part 2: Flame-proof bodies

Gustav Weiß

A second kind of ceramics found during excavations in northern Syria was used for the production of cooking pots and was extremely resistant to thermal shock. It is known as cooking pot ware and can be used for braziers in which a fire can be made, on the balcony or in the garden.

The reconstruction of this type of ceramics is also based on archaeometric measurements of the shards discovered. In this case, it is not only the chemical composition which is important; the interaction of the so-called matrix formed by the clay with the aggregates must also be considered. The thermal expansion of the matrix must be approximately equal to that of the calcite that is added to have a positive effect on the thermal shock resistance. But this can only be achieved if the crystals of calcite do decay through the loss of their carbon dioxide during firing, for which the ceramic must not remain in the kiln at above 700°C for an extended period in an oxidising firing. In reduction, the temperature can be higher. However, the firing temperature must be high enough so that the majority of the clay minerals can react with the other ingredients of the body so that a hard ceramic resistant to water can be achieved. Depending on the duration of the firing, this is the case between 500° and 600°C. This kind of cooking pot ware can be fired without constructing a kiln, in a bonfire firing or even when the thoroughly dried pot is well heated for the first time on the stove.

The average chemical analysis of this kind of ceramic corresponds to a blend of 100 parts by weight of red clay + 40 parts of calcite with a coarse sandy grain (corresponding to 71% clay and 29% calcite). In the reconstruction, the proportion of calcite can be adjusted according to plasticity; the samples tested showed



*Thin section of a ceramic sample fired in the laboratory to 700°C. The material has enormous resistance to thermal shock. It is made from clay deposits from the lower Habur River near Tall Sheikh Hamad. Coarse calcite "grog" in a matrix of marl containing quartz. If the body were fired to over 700°C, the calcite (CaCO<sub>3</sub>) would decay to form calcium oxide (CaO) and carbon dioxide (CO<sub>2</sub>). The resistance to thermal shock would be lost. The height of the picture corresponds to 1mm. Photo: G.Schneider.*

a considerable latitude from 20 – 54% CaO (1 CaO is contained in 1.8 CaO<sub>3</sub> = calcite). The mixture quoted of 71% powdered red clay plus 29% coarse calcite corresponds to a CaO content of 22.7% in the chemical analysis. The plasticity can be improved with the addition of bentonite.

Remarkably, there is a peasant potter in the Serbian village of Zlakusa near Uzice (200km south of Belgrade) who still produces ceramics of this type. It is said that this technique has been in use there for 300 years. Among the Indios too cooking pot ware of this type is still produced with the addition of coarse limestone.

***What kind of people were they in Mesopotamia in the 3rd millennium B.C? How did they live, what were their social norms and what did they believe?***

The clay shards examined which date back to early history, originating in northern Syria and neighbouring Turkey, are from the third millen-

None of them ever thought of weighing out the ingredients.

Flame-proof bodies are also available from pottery suppliers here in Germany that have been developed for such purposes:

Body no. 2 sg 0-5 from Witgert. This flame proof ceramic can only be fired to 800 - 850°C.

Creton bodies no. 592 and 599 from Goerg & Schneider with a low coefficient of thermal expansion. The lower the firing temperature, the lower the thermal expansion.

The body "Ceraflam 4010" from WBB Fuchs, which can be used for temperatures as high as 1300°C but should not be fired to above 1050°. It is recommended to light a fire in the finished piece with it standing on a bed of sand.

It is not possible to make a body flame proof simply by adding grog, particularly if the grog is fine. Coarse grog on the other hand prevents cracks spreading. This is a further beneficial effect of the coarse-grained calcite. Using coarse quartz as a "grog" on the other hand would have a detrimental effect because it expands every time it is heated to 500-600°C and contracts again on cooling, weakening the ceramic every time. An addition of 5% magnesite to a body has a different effect: magnesite only begins to form cordierite at above 1000°C, which has a very low thermal expansion and is used to make kiln shelves.

num B.C., the Early Dynastic period. This region, which is irrigated by the Euphrates and a network of tributaries, was culturally influenced by the

great cities to the south. Here in the north, the villages were threatened by nomads. The few towns had grown to importance through trade. The region was known for its outstanding pottery tradition. As early as the first half of the 5th millennium B.C., ceramics from Tell Halaf, which is situated in the central part of the region, dominated the Aeneolithic culture in the whole of Mesopotamia. But after 4500 and until 3600 B.C., the style of ceramic art came from the south, from Obed near Ur, the home of Abraham. From this point on, the potter's wheel spread everywhere.

A characteristic feature of cultural achievement in comparison to megalith grave and Bell-Beaker culture in western Europe at that time were the towering temples or ziggurats (including the Tower of Babel) in sacred districts, which corresponded structurally to the Egyptian pyramids and were given overall architectural form. Each temple was dedicated to a specific god. Parallel to these, the splendid palaces were also architectural masterpieces.

The third millennium B.C. is full of interesting insights into life at that time, which is illuminated by written sources besides the archaeological monuments. Not only that these millennia followed the Neolithic revolution with property, fraud, quarrels with neighbours and war, the potter's wheel and mass production and finally in the third millennium the advent of cuneiform script, they also followed an evolution in consciousness. Awareness of experiencing the individual ego in its confrontation with surrounding nature had grown. Dependence on natural events had made way for a desire to achieve greater independence, expressed as belief by intellectually coming to terms with the unknowable. In primitive, prehistoric groups, according to Walter Nippold ("Individuum und Gesellschaft", Braunschweig 1960), those who formed cultures had a clearly defined sense of individuality. The phenomenon of personality brought with it the need to express the inexplicable power, the cosmic and earthly laws of creation and destruction in human terms. The developing consciousness of human dependence on this inexplicable power that transcended the visible world, and subordinating oneself to it in all situations in life from birth to death, were at the heart of religions from the very beginning. In a social context, religion prescribed individual behaviour,



4 cm steatite tablet from the sacred mountain of Göbekli Tepe with a carved tree and snake.

which was punished or rewarded by a god who was now imagined as a person. Besides the major gods, there were also minor ones who were asked to intercede with those of higher standing.

Hand in hand with this anthropomorphization, humankind felt dependent on and orientated towards the deity with regard both to their origins and to their fate. This was initially true only for kings, later for further sections of society. This led on the one hand to a belief in a life after death and on the other to a deification of kings and other individuals.

In this process of religious evolution that dominated thought a thousand years before Abraham and one

thousand five hundred years before Moses, we find much that is familiar to us. Legends are preserved on cuneiform tablets, i.e. secular stories as well as myths referring to the hereafter that can be found again in the Bible.

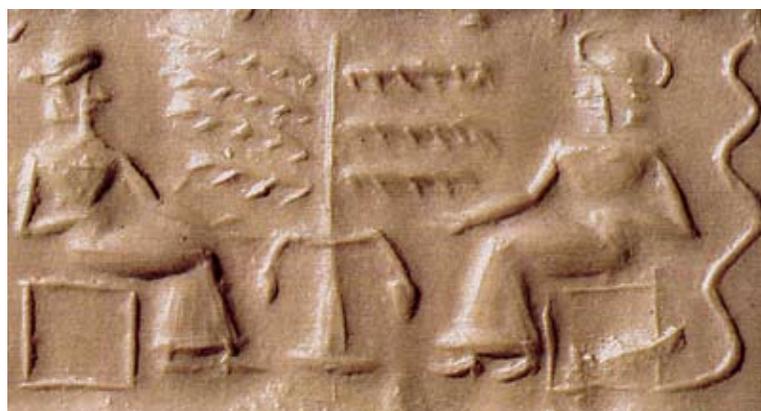
As early as 8500 B.C., human figures in clay had appeared in large numbers, which were perhaps related to the legend that human beings had been created from clay. And Venus figures carved from bones may have led to the legend that woman was created from Adam's rib. In the Sumerian language, "ti" means both rib and life. Trees and snakes may well have had a mythical significance too. They are carved on a steatite tablet found at the sacred mountain site of Göbekli Tepe, and a winged being resembling an angel is to be found on one of the roulettes invented in the 4th millennium. On another roulette, a man and a woman are shown beside a seven-branched tree of life. Behind the woman, a snake is coiled.

In the third millennium, the scribes wrote down the sagas of the gods and heroes which were recited by singers in the temples and at court, in the Early Dynastic period accompanied by the harp, the lyre or the



Impression of a 3500 year-old roulette depicting a winged being.

below - Impression of a 4000 year-old roulette depicting a hero and heroine; behind the woman, there is a snake (British Museum London).



wooden flute (Hermann Müller-Karpe: *Handbuch der Vorgeschichte*, vol. III. Munich: C.H.Beck 1974). A learned scribe at the court of King Solomon is said to have written down the cultural memory of humanity in 950 B.C.

Humanity, which was created to save the gods the labour of digging rivers and canals, had multiplied to such an extent that they disturbed the sleep of the highest deity, Enlil. He therefore wanted to visit a flood on them. The lower ranking deity Enki tipped off the hero of the story of the deluge, telling him to build a ship. After the flood, the gods agreed on the terms under which humanity would be allowed to survive, particularly that among humans, fertile as well as barren women should exist and also that there should be a demon to steal newborn babies from the mother's womb.

These cuneiform texts are from around 2900 B.C. They contain expressions of social ethics that were to reappear in the Law of Moses in c. 1225 B.C., when his society got out of hand and danced around the golden calf.

According to the law of Enlil, the sun god, who saw and supervised everything, it was considered a sin to repress the weak, not to release prisoners, to utter falsehoods, to persecute the righteous, to dishonourably approach the wife of another, to commit fornication or adultery, to study evil, or to be guilty of pride or fraud. For sinners, the punishment of god was expected, and for the righteous, a long and happy life. For the hereafter there was a belief in a final judgement.

Like in the story of Moses, the mother of Sargon, the king of Akkad, who ruled there in the 3rd millennium, placed him as an infant in a rush basket coated with pitch in the waters of the Euphrates. A water carrier found him, and after the king fell out of favour with Enlil, he himself became king. As a great conqueror who was "victorious in thirty-four campaigns", he was considered the ruler of the world.

Just as Jahwe instructed Moses to lead the People of Israel to the Promised Land, the kings of the city states were instructed by their gods to go to war. In c. 1290 B.C., king Lugalzagesi from the southern Mesopotamian city of Umma justified his raiding with instructions from the deity, Enlil, that all of the countries from the Persian Gulf along the Tigris and the Euphrates to the



*Cuneiform tablet from the late 2nd millennium B.C. with the Sumerian epic of king Gilgamesh of Uruk, who lived in the 3rd millennium B.C.*

Mediterranean should belong to him.

The most important work of Babylonian literature was the Gilgamesh epic, written in cuneiform on tablets of clay, a saga of king Gilgamesh, ruler of the city of Uruk, who lived in around 2600 B.C. and was worshipped as a god. In this epic, the following story is contained, which is characteristic of the ideas of the hereafter and the religious world in which the people of the third millennium B.C. lived:

The Sumerian goddess of Uruk, Innana (in Babylon, "Ishtar"), owned a tree from which she wanted to have a chair and a bed made. But the tree could not be felled for evil demons had taken possession of it. Gilgamesh came to the assistance of the goddess, drove away the demons, felled the tree and as a reward he was given a magic wand made from its roots, which however fell down, "into the earth, into the underworld". Gilgamesh's servant Enkidu offered to retrieve it for his lord. Gilgamesh gave him advice for his journey into the underworld. "You should not put on your clean garments: they (the dead) would recognise immediately that you are alien. You should not anoint yourself with fine oil from a

bowl: they would surround you at its scent. You should not hurl throwing sticks in the nether world: those struck down by the throwing sticks would surround you. You should not hold a cornel-wood stick in your hand: the spirits would feel insulted by you. You should not put sandals on your feet. You should not shout in the nether world. You should not kiss your beloved wife. You should not hit your wife even if you are annoyed with her ... The outcry aroused would detain you in the nether world." Enkidu ignored all this advice and was thus "detained in the nether world". As he could no longer leave the underworld, Gilgamesh grieved for him, and he turned to Enlil, the god of the land, Sin, the god of the moon, and Ea, the god of water, for help. The first two were silent. But Ea ordered a hole to be made in the earth, so that his servant could be brought up "with his breeze from the nether world". They hugged and kissed and sat down together. Enkidu told his friend of the order of the nether world, about which the living would weep. "My body, which your heart rejoiced to touch, worms infest it like an old garment; my body is disfigured by decay, it is full of dust." Then Enkidu told of all the deceased he knew and saw in the underworld, where one appeared like a companion of the gods, full of goodness, another, whose body had been thrown on the plain, was a spirit that "roamed the underworld".

Even when Gilgamesh was ruler of Uruk, the potters in this region, like everywhere else in the Middle East, knew how to make cooking pots from a calcareous clay with additions of coarsely ground limestone, which could even be placed unfired on a naked flame. This invention was lost in the following period, just like the extremely hard ceramic material that could not survive the emergence of the age of metal.

#### *Translator's note*

In the first part of this series, I regrettably translated Gustav Weiß' text to say that metallic ware was fired with straw and iron. This is of course nonsense. The correct version should read:

"As regards firing, it is believed that two-chamber kilns, which were known in Mesopotamia at an early stage, were used. It is possible that straw and oil were used as fuel, as is still traditionally the case in Iraq." My profound apologies to readers and author alike!

*David Erban*