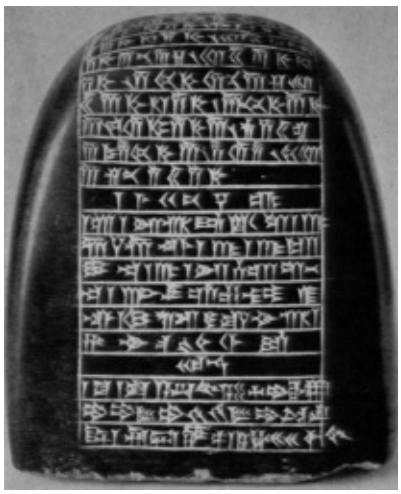
Babylonian and Roman Lengths, Volumes and Weights

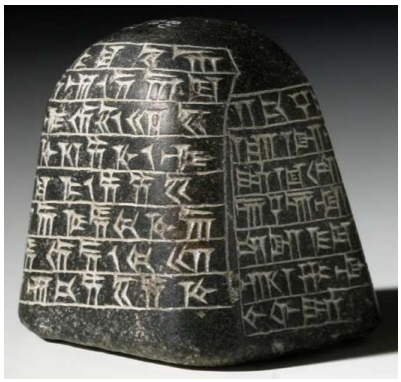
Jim Alison - May 2023

The meter contains 100 centimeters. By design, the length of the polar circumference contains four billion centimeters. The meter contains 60 Babylonian shusi. The polar circumference contains 2.4 billion shusi. The meter contains 54 ancient Egyptian digits and the Roman digit is the same length as the Egyptian digit. The polar circumference contains 2.16 billion Egyptian or Roman digits. The length of four Roman digits is equal to the length of three Roman inches. The polar circumference contains 1.62 billion Roman inches.

The Babylonian foot contains 20 shusi, or one-third of one meter. The Babylonian cubit contains 30 shusi, or one-half of one meter, and the double cubit contains 60 shusi, or one meter. The weight of the Babylonian mina is 500 grams. The weight of the Babylonian talent is 60 mina and the weight of the Babylonian shekel is 1/60th of one mina. The cuneiform inscription on British Museum exhibit number 91148 gives a weight of two mina during the reign of Shulgi, (c. 2000 B.C.) This weight is 1000 grams, or 500 grams per mina.



In *The Treasury of Persepolis* (1939), Erich Schmidt states "Another Darius inscription appears on stone weights, all found in rooms other than the treasure halls. The beautifully finished grayish green diorite weight PT3 283 was about 1 meter above the floor of Room 3 in the southern part of the Treasury. The Old Persian section of the trilingual legend reads: '120 karsha. I Darius, the great king, the king of kings, the king of lands, the king of this earth, the son of Hystapes, an Achaemenid.' The Old Persian symbol for 'hundred' has hitherto been unknown. The Babylonian version gives '20 minae' as the weight, corresponding to 120 karsha. The weight of the stone is 9.950 kilograms. If we make allowance for chips missing at the lower edge, a mina is almost exactly 500 grams, and a karsha is about 83.33 grams."



One of the smaller weights found by Schmidt in Persepolis, with inscriptions in both Persian and Babylonian, is exhibit number 91117 in the British Museum. The Persian inscription gives two karsha and the cuneiform inscription gives 1/3 mina. This weight is 166.29 grams, or 83.145 grams for the karsa, or 498.87 grams for the mina, without making allowance for missing chips.

In *Ancient Weights and Measures* (1926), Petrie reported a "fine hermatite weight of duck form, with the head and eyes carved, from Sparta, 20 darics of 128.6 grains." The grain weight given by Petrie is contained 15.4324 times in one gram. 128.6 grains, divided by 15.4324, equals 8.333 grams for one daric, or one tenth of a karsha of 83.33 grams, or 1/60 of a Babylonian mina of 500 grams.

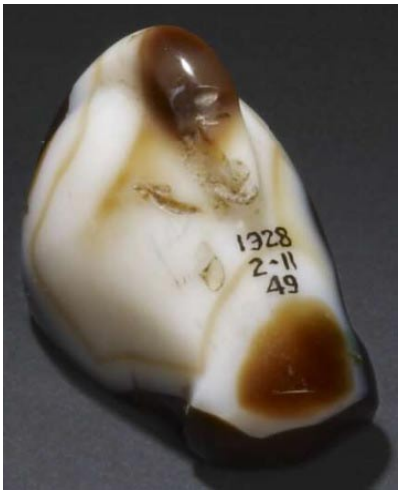


Exhibit number 128489 in the British Museum is a two shekel duck weight from the Late Babylonian period (circa 700 B.C.) This weight is 16.7 grams, or 8.35 grams per shekel.

In *The Oxford Handbook of Greek and Roman Coinage* (2016), William Metcalf states: "The weight of the daric, in comparison to the Croesus stater, increased from 8.06 g to 8.36 g, thereby restoring the ancient Mesopotamian weight standard."

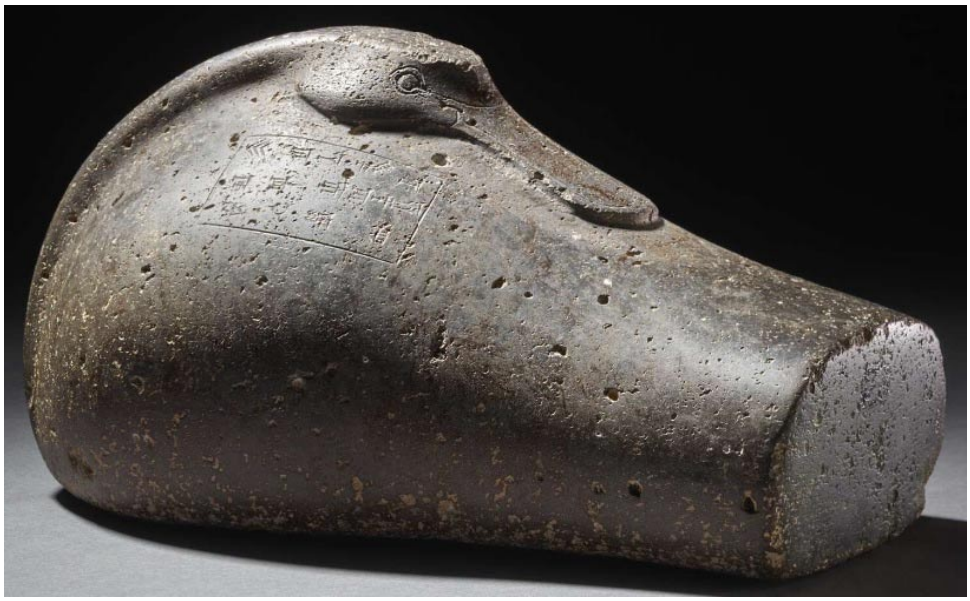
In *Bronze Age Weighing Systems of the Eastern Mediterranean* (2006), Alberit, Ascalone and Peyronel state "The earliest secure dating for Mesopotamian weights is Tepe Gawra VII: a variety of shapes already fit the standard unit of 8.3 g."

In *Mesopotamian Measures*, Livio Stecchini states: "Carl Lehmann-Haupt, as a young man, published the best essay of his career... His most important discovery was the reading of texts that clearly indicate that the qa (volume of a double mina of water) is a cube with an edge of six fingers. Hence, there can be no doubt that the cubic cubit contains 250 minai of water weight, or 125 qa."

In his essay, presented to The International Congress of Orientalists in1889, and published in 1891, Lehmann-Haupt states: "5000 years ago the Babylonians had a system in place very similar to our metric system. As the tenth of the meter forms the edge of a cube with a volume of one liter and a water weight of one kilogram, the tenth of the Babylonian double cubit forms the edge of a cube with a volume of one qa and a water weight of two mina." In *A Remarkable Collection of Babylonian Mathematical Texts* (2008), Joran Friberg states "There was, indeed, an Old Babylonian sìla (qa) equal to a cube with sides of 6 fingers (c. 10 cm), which was almost exactly equal to one liter."

In *Babylonian, Assyrian and Persian Measures* (1944), Angelo Segre states that in *Textes Mathematiques Babyloniens* (1938), "F. Thureau-Dangin correctly gives the fundamental relation one qa equals the cube of six fingers (shusi). This equivalence is based on 4669 (1-9) in the Yale Babylonian Collection and is verified in many cases." Segre also states "The Babylonian cubit was certainly very near to mm. 500."

British Museum exhibit number 91433 is a Babylonian duck weight of 15.06 kilograms with a cuneiform inscription reading 30 mina - true.



Segre gives this weight, of 15.06/30 = 502 grams for the mina, or 1004 grams for the double mina, giving 1004 milliliters for the water weight of the double mina that is contained in the qa, with the cube root of 1004 being 10.013 cm for the length of six shusi, or 50.066 cm for the length of the Babylonian cubit.

Six shusi cubed = 216 cubic shusi, in the base-six Babylonian system, is the equivalent of 10 cm cubed = 1000 cubic cm in the metric system. The 2.4 billion shusi in the polar circumference, or 600 million shusi for the quarter circumference from the equator to the pole, is the equivalent of one billion cm in the quarter circumference. The meter is a decimal expression of 100 cm, compared to the equivalent double cubit of 60 shusi.

The Roman foot was divided into 12 uncia (inches), and the Roman libre was divided into 12 uncia (ounces). In *A discourse of the Romane foot and denarius from whence, as from two principles, the measures and weights used by the ancients may be deduced* (1647), John Greaves cited Roman laws and inscriptions giving the volume of the amphora quadrantal as one cubic foot; the volume of the congius as one-eighth of the amphora; and the water weight of the congius as ten libre, or 120 uncia (ounces).

Given 12 uncia for the edge of the cubic amphora, the cubic congius, with one-eighth the volume of the amphora, has an edge of 6 uncia, or 216 cubic uncia. The water weight of 120 uncia, contained in the congius of 216 cubic uncia, gives a water weight for the cubic uncia of 120/216 or 5/9 of the uncia. Given 60 shekels in the Babylonian mina, and two mina of water weight in the cube of six shusi, or 216 cubic shusi, the ratio between the water weight of the cubic shusi and the weight of the shekel is also 120/216, or 5/9.

Greaves determined the length of the Roman foot from inscribed measuring rods, monuments, buildings, roads with inscribed waypoints, and given distances between known locations. Because of variations in the weights of coins and inscribed Roman weights, and because purity and temperature affect the density of water, Greaves rejected the idea of determining the Roman length standard based on the remains of Roman weights. Determining the weight standard based on the length standard is also a better method because the Roman weight standard is based on the length standard of the digit being contained 2.16 billion times in the polar circumference. Greaves concluded that the length of 60 Roman feet, or 720 Roman inches, was equal to 700 English inches. Twelve inches × 35/36 = 11.666 inches for the Roman foot; 11.666/16 = .7292 inches for the digit; and .7292 × 54 = 39.375 inches for the meter.

The Roman digit is 100/54 = 1.852... centimeters. The Roman foot is 12 uncia, or 16 digits, or 1.852 × 16 = 29.629... cm. The cubic Roman foot of 29.629^3 = 26012.29 ccm contains 80 libre of water weight, or 26012.29/80 = 325.15 ccm or 325.15 grams of water weight for the libre. The uncia is 1/12 of the libre, or 325.15/12 = 27.1 grams.

When the metric system was introduced, a copper cylinder that weighed exactly one kilogram and a rod that measured exactly one meter were sent to the United States, but the ship was captured by pirates. The one meter rod was lost, but the kilogram weight eventually arrived. The length of the meter may be determined as 10 times the edge of a cube containing the water weight of one kilogram, but the weight of the kilogram is based on four billion centimeters in the polar circumference, just as the weight of the Egyptian deben and the Roman libre are based on 2.16 billion digits in the polar circumference, and just as the weight of the Babylonian mina is based on 2.4 billion shusi in the polar circumference.