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STONE FOR BREAD
AN EARLY SECOND-CENTURY BREAD-WEIGHT

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In *AJA* 95, 1991, 581f, Steven E. Sidebotham publishes a photograph of a stone object, found near the Roman granite-quarry at Umm Balad in the Eastern Desert of Egypt, which he describes as follows: ‘- a large worked granite stone weight shaped like a spheroid with a flattened top and bottom bearing on its top the incuse¹ letters “NE.” The stone has the following maximum dimensions: height = 19 cm; diameter = 25 cm; circumference = 91 cm. The overall dimensions of the letters “NE” are 4.8 cm in height and 8.4 cm in width. ... Slightly chipped at the top, the stone today weighs 28.9 kg. Taking into consideration the chipped proportions, the original weight of the stone was slightly over 29 kg; ...’ The author goes on to observe that the weight unit is 0.527 kg. He also makes the following remark: ‘It is possible that the stone represented a standardized weight for fungible items such as sacks of grain shipped to Umm Balad, which would have been weighed upon receipt by the garrison. This ... would have been unusual for most grain in antiquity was measured by volume rather than by weight.’ As we shall see, the author’s thought of sacks of grain is not far off the mark.

Through the excavation and the resulting texts from Mons Claudianus it is now known that 55 pairs of loaves of bread, baked from one artaba of grain, were the standard ration for a quarry-worker for one month, at the time of Trajan. Towards the middle of the 2nd century the ration seems to have been 50 pairs, still baked from 1 artaba of grain. Why loaves were always counted in pairs remains unexplained. The figure 55 has already occurred in the ostraca published by H. Cuvigny in *CE* 61, 1986, pp. 271-286 (texts n^o 6-16) and later finds at Mons Claudianus have provided literally hundreds of these small labels. It is now thought that they were labels that accompanied the baskets with the bread when it was sent to each worker individually, after the artaba of grain had been ground and baked by a wife, sister, mother or other female relative down in the valley.²

The modern rule of thumb is 1 litre of grain = 0.8 kg, and 1 kg of grain = 0.8 kg of flour, i.e. 1 litre of grain = ca 0.64 kg of flour. The loss of weight down to 80%, incurred when the grain is ground to flour, consists of bran that is sifted away.³ In antiquity the bran was almost certainly left in the flour, as in graham flour today. On the other hand, the grain/flour may have contained more moisture than today’s oven dried grain, so a certain amount of weight-loss must have been incurred in the baking.

The following piece of arithmetic now becomes irresistible:

38.78 litres of grain (= 1 artaba⁴) weighs 31.029 kg - 6% weight-loss in grinding/baking = 29.16 kg of bread, or ‘slightly over 29 kg.’ This is too close for a coincidence, but does not solve the problem that grain, as Sidebotham remarks, is normally measured, not weighed.

¹ From the photograph it looks to me like the letters are chiselled rather than incuse.

² The evidence for the provisioning of the workers at Mons Claudianus will be published and evaluated by Hélène Cuvigny in a forthcoming volume of the *Ostraca Claudiana*.

³ Information concerning the relation between capacity measure and weight of grain was kindly supplied to me by Mr. Michael Kanyo of Valsemøllen, Køge, Denmark.

⁴ Cf. D. Rathbone, *Economic Rationality* p. 465.

But perhaps there is a solution. The normal procedure was to give the workers their pay and ration of grain in the valley whence they themselves, or rather their chosen representative, the *κιβωριότης*, had to take care of having it transformed into bread and transported to the desert. The labels would then guarantee each worker that this was *his* bread, baked from *his* artaba, which had been seen to be complete by somebody he trusted. But the soldiers and the imperial employees did not have wives down in the valley and may have received their rations in the desert in the form of already baked bread, in order to save fuel where it was scarce. On this background it becomes understandable why anyone would want to ascertain that the fifty-five pairs of loaves they were given really did represent an artaba of grain, and weighing must have been the only way.

An unpublished ostrakon from Mons Claudianus⁵ may be understood in this light: It is a list of names of people (nearly all soldiers) who, over a period of four days, have received an artaba of grain each. The list is signed by Klaudios *familiaris* in charge of the scales (*ἐπάνω τοῦ ζυγοῦ*) who declares that the artabas are complete (*πλήρεις*).

I think that Klaudios, even if he writes ‘*ἀρτάβην σίτου*’, was weighing out loaves of bread and that he had a stone exactly like the one found at Umm Balad.

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⁵ Inv. 7035. The text is dated by its archaeological context to the latter half of the second century.