

LA METROLOGÍA DE LOS CELTÍBEROS Y SU ROMANIZACIÓN

Celtiberian metrology and its romanization

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Fecha de aceptación de la versión definitiva: 26-10-2000

BIBLID [0514-7336 (2002) 55; 247-255]

RESUMEN: Hasta ahora, apenas ha sido investigada la metrología celtibérica, a excepción de pesos monetarios. A base de las medidas de adobes prerromanos, se propone un pie celtibérico de 24 cm. En cuanto a los pesos, podemos aceptar un módulo de 9 g para joyas de plata y algunas monedas de bronce; sin embargo, las pesas de telar no se conforman a ninguno sistema metrológico. Con el tiempo, se adoptaron medidas romanas de largura (como indican las dimensiones de ladrillos, tejas y monumentos arquitectónicos) y de peso.

Palabras clave: Metrología. Celtibérico. Romanización.

ABSTRACT: Celtiberian metrology has scarcely been investigated until now, with the exception of coin weights. On the basis of measurements of pre-Roman mud bricks, a Celtiberian foot of 24 cm is proposed. With regard to weights, we can accept a module of 9 g for silver jewelry and some bronze coins; however, loom weights do not conform to any metrological system. Over time, Roman measures of length (as indicated by the dimensions of bricks, tiles and architectural monuments) and weight were adopted.

Key words: Metrology. Celtiberian. Romanization.

One of the many achievements of Romanization was the adoption of a universal system of metrology to replace the bewildering variety of regional weights and measures. Unfortunately, very little attention has been devoted to the pre-Roman metrology of Celtiberia, or to its Romanization. This article is an attempt to do both.

The region chosen for this study consists of the part of the Spanish Meseta commonly considered "Celtiberian" (the territories of the Celtiberi, Arevaci and Pelendones), as well as the adjacent lands of the Vaccaei and Carpetani, which were strongly influenced by their Celtiberian neighbours. That this influence included metrology is suggested by the use of Celtiberian measures of length and weight among the Vaccaei and Carpetani, as will be argued below.

Measures of length

Literary sources provide no information on the metrology of the Celtiberians, though it is probable that, in common with other ancient peoples, they originally measured length with parts of their body, such as a finger, a palm, or a foot. To settle disputes over the correct length of such measurements, a fixed standard may have been adopted and copied in various towns, so that a Celtiberian foot would be the same throughout the Meseta.

Although the measurements of stone blocks used in Celtiberian fortifications show little consistency¹, the dimensions of pre-Roman mud

¹ See e.g. the numerous measurements for individual sites in Collado Villalba, 1990. His photographs reveal, moreover, that even in a given town wall there were many different sizes of stone.

SITE	DIMENSIONS (CM)			RATIO	REFERENCE
Madrid province	50	25	4.7	2: 1: $\frac{1}{4}$	Valiente Cánovas, 1987: 126
Ayllón SG	50	20	10	2: 1: $\frac{1}{2}$	Zamora Canellada, 1993: 36
Calatañazor SO	50	25	11	2: 1: $\frac{1}{2}$	Taracena Aguirre, 1926: 21
Garray SO	48	26	11	2: 1: $\frac{1}{2}$	Mélida <i>et al.</i> , 1924: 13
Garray SO	37	18	12	$1\frac{1}{2}$: $\frac{3}{4}$: $\frac{1}{2}$	Mélida <i>et al.</i> , 1924: 13
Ocenilla SO	30+	21-26	9-11	$1\frac{1}{4}$: 1: $\frac{1}{2}$	Taracena Aguirre, 1932: 47
Izana SO	30	27	10	$1\frac{1}{4}$: 1: $\frac{1}{2}$	Taracena Aguirre, 1927: 8
Alto Chacón TE	30	27	7	$1\frac{1}{4}$: 1: $\frac{1}{4}$	Atrián Jordán, 1976: 11
Daroca Z	30	15	10	$1\frac{1}{4}$: $\frac{2}{3}$: $\frac{1}{2}$	Aranda Marco, 1986: 312

TABLE 1. *Dimensions of celtiberian mud bricks.*

Abbreviations used in tables: CR = Ciudad Real, M = Madrid, SG = Segovia, SO = Soria, TE = Teruel, TO = Toledo, VA = Valladolid, Z = Zaragoza, ZA = Zamora.

bricks suggest not only the existence of standard lengths, but also the metrological system on which they were based. At several sites in Soria and Madrid provinces, as well as at Ayllón (Segovia), Alto Chacón (Teruel) and Daroca (Zaragoza), we find bricks whose length is either 48-50 or 30 cm, with a width ranging from 20 to 27, and a usual thickness of 10-12 cm, though some examples are only half this thick (Table 1). These measurements may reflect a foot of about 24 cm, or slightly longer, since adobe shrinks somewhat while drying (Asensio Esteban, 1995:35). This is smaller than the Roman foot (*pes*) of 29,6 cm, but well within the length range of the human foot. Assuming this module, the long bricks would measure 2 x 1 x 0,5 Celtiberian feet, the short ones 1,25 x 1,0 x 0,5 foot, with some having a thickness of 0,25 foot. Conversion to the Roman foot (*pes*) is evident in the mud bricks from El Poyo del Cid (Teruel), where occupation extends from pre-Roman times to the reign of Claudius. The mud bricks from this site are uniformly 90 x 50 x 30 cm (Burillo, 1979: 76); these figures correspond to a length of three Roman feet and a thickness of one.

Fired bricks of the Roman period are quite thin (usually 4-5 cm), measuring one-sixth of a Roman foot (4,9 cm), though a few examples are half this thick and seem to represent the *uncia* or one-twelfth foot (2,5 cm). The majority of bricks are between 26 and 32 cm long,

approximating the Roman foot (Table 2). An example 45 cm long may represent 1,5 Roman feet (44,4 cm); however, bricks of 47-51 cm could follow either the Roman or Celtiberian standard. The width of the bricks shows great variation, with only a few examples of one foot (27-30 cm). However, a series of square and circular bricks from the "San Martín" site at Segovia measure 15 cm x 7 cm, or 0,5 x 0,25 Roman feet. The architectural writer Vitruvius (*De architectura*, 2, 3, 3) records that the Romans used the "Lydian" brick module of 1,5 x 1 foot, which in Roman terms would be 44,4 x 29,6 cm. None of the Meseta examples is sufficiently close to these dimensions to prove conformity to the Vitruvian canon; and since the vast majority certainly do not conform, this module was evidently not prevalent in the Roman Meseta.

Roman roof tiles (*tegulae*) from the Meseta are mostly 48-51 cm long by 32-40 wide and about 3 cm thick (Table 3). These do not clearly correspond to either Roman or pre-Roman metrology. However, floor tiles from Madridanos (Zamora), stamped "C IVLI MAS" or "CIM" (C. Iulius Masculus?) measure 60 x 29 cm, or exactly 2 x 1 Roman feet (Sevillano, 1978: 159, 168). Vitruvius (7, 1, 7) recommends two-foot tiles (*tegulae bipedales*) as a levelling course for concrete floors.

Stone columns are sometimes 30, 45 or 60 cm in diameter, corresponding to one, 1,5 or

SITE	DIMENSIONS			REFERENCE
Villaverde Bajo M	51	35	3	Pérez de Baradas, 1931-1932: 109
Villabaruz VA	48	40	5	Mañanes, 1979: 31
Mocejón TO	47	30	4,5	Revuelta Tubino, 1958-1961: 175
Villaverde Bajo M	45	25	4,5	Pérez de Baradas, 1931-1932: 109
Santervas del Burgo SO	?	30	5	Ortego Frías, 1954-1955: 189
Muriel de Zapardiel VA	37	18	4	Mañanes, 1979: 81
El Pardo M	37	18	?	Anonymous, 1982: 259
Torrelobatón VA	34	24	5,5	Mañanes, 1983: 34
Alcubillas CR	32	22,5	?	Mélida, 1917: 392
Pozoantiguo ZA	32	19	3,5	Sevillano, 1978: 234
Mocejón TO	31,5	29	3,5	Revuelta Tubino, 1958-1961: 175
Esguevillas de Esgueva VA	30	30	6,5	Mañanes, 1983: 58
Perales del Río M	30	25	25 *	Anonymous, 1982: 255
San Pedro de Latarce VA	29,2	12	6,4	Palol and Wattenberg, 1974: 139
Melgar de Arriba VA	29	?	4,5	Mañanes, 1979: 22
Mocejón TO	29	17	3	Revuelta Tubino, 1958-1961: 175
Villaverde Bajo M	29	14,5	3,6 †	Pérez de Baradas, 1931-1932: 109
Villaverde Bajo M	28	17	4	Pérez de Baradas, 1931-1932: 109
Villagarcía VA	27	27	8	Mañanes, 1979: 34
Mocejón TO	27,5	15,5	4	Revuelta Tubino, 1958-1961: 17
Villabáñez VA	26	26	3	Mañanes, 1983: 74
Alcubillas CR	26	22-27	?	Mélida, 1917: 392
Santervas del Burgo SO	?	27	4,6	Ortego Frías, 1954-1955: 189
Santervas del Burgo SO	?	24-25	5,5-6	Ortego Frías, 1954-1955: 189
Padilla de Duero VA	26	23,5	7	Mañanes, 1983: 196
Bustillo de Chaves VA	25	25	5	Mañanes, 1979: 15
Madridanos ZA	24,5	11	3	Sevillano, 1978: 159
Mocejón TO	23	19	4,4	Revuelta Tubino, 1958-1961: 175
Santervas del Burgo SO	?	13	3,25	Ortego Frías, 1954-1955: 189
Toledo TO	22	22	6	Sáinz Pascual, 1996: 41
Alcubillas CR	19	10	5	Mélida, 1917: 392
Segovia SG	16	15	7	Zamora Canellada, 1996: 788
Segovia SG	15	15	7 ‡	Zamora Canellada, 1996: 788
Villagarcía VA	12	6	2,7 §	Mañanes, 1979: 36
Mocejón TO	10,7	7	2,3	Revuelta Tubino, 1958-1961: 175
Torrelobatón VA	8	5	2,4	Mañanes, 1983: 31
Tordehumos VA	7,5	4,5	2,8	Mañanes, 1979: 29

TABLE 2. *Dimensions of roman bricks.*

* *triangular*; † *semicircular*; ‡ *circular*; § *rhomboid*.

two Roman feet², though many irregular sizes are also found; 1,5 feet is the Roman cubit (*cubitum*) according to Vitruvius (3, 1, 2). House

walls 90 and 54 cm thick at Hontoria de Cerrato (Palencia) and 57 cm at Cabañas de Sagra (Toledo) presumably represent three and two

² 30 cm at La Serna (P), Villaverde de Medina (VA) and San Esteban de Gormaz (SO), 45 cm at *Sego-briga* and *Termes*, 60 cm at Luco (TE) and *Segovia*:

Cortes and Ríos, 1979: 56; Mangas, 1980: 215; Taracena Aguirre, 1941: 146; Argente Oliver, 1991: 127; Burillo *et al.*, 1991: 292; Losada Gómez and Donoso Guerrero, 1965: 9-10.

SITE	DIMENSIONS			REFERENCE
Villanueva de la Condesa VA	51	40	3,5	Mañanes, 1979: 40
Benafarces VA	51	?	2,5	Mañanes, 1983: 10
Fuentespreadas ZA	50,5	41	5	Caballero Zoreda, 1974: 17
Torrelobatón VA	50	38	3,5	Mañanes, 1983: 32
Villaverde Bajo M	48	32	5	Fuidio, 1934: lám. 34
Santervas del Burgo SO	?	?	3-3,25	Ortego Frías, 1954-1955: 189
Montealegre VA	40	37,5	3	Mañanes, 1983: 20
Mucientes VA	10	?	3	Mañanes, 1983: 22

TABLE 3. *Dimensions of roman tiles.*

Roman feet, respectively (Calleja González, 1977: 298; López de Ayala-Álvarez, 1959: 27).

Roman metrology can also be seen in monumental architecture. The north gate in the Augustan city wall at *Segobriga* measures 11,8 x 4,7 m, equivalent to 40 x 16 Roman feet (Almagro-Gorbea, 1990: 207), while the city wall at *Augustobriga* is 2,9-3,2 m, or 10 Roman feet, thick (Schulten, 1914: 127). The Roman bridges at Arcillo (Zamora), Luco de Jiloca (Teruel) and Medina de Ríoseco (Valladolid) are each 3 m, or 10 Roman feet, wide (Sevillano, 1970: 481; Almagro Basch, 1952: 179-180; Wattenberg, 1958: 37). A bridge at *Complutum* has a width of 6 m or 20 feet (Fernández-Galiano Ruiz, 1976: 37), while one at Pedraja de Portillo (Valladolid) measures 7,5 m or 25 feet, equivalent to 10 Roman *gradus* (Wattenberg, 1958: 37)³. The cisterns used as part of the aqueduct system at *Valeria* each measure 21,5 x 3,0 x 4,6 m, corresponding to 73 x 10 x 15 Roman feet (Osuna Ruiz *et al.*, 1978: 95).

The frequent occurrence of 10 and its multiples in these measurements may reflect the use of the Roman perch (*pertica*) of ten feet as a module in architectural planning⁴. This perch of 29,4 m was employed, for instance, in the design of the Roman forum at *Conimbriga* in Lusitania (Alarcão and Étienne, 1977: 88-89).

³ Measurements for Pedraja de Portillo ("Puente de Carramedina") and Medina de Ríoseco ("Puente Villagodia") are calculated from Wattenberg's scale plans on the page cited.

⁴ "Habet ... *pertica* passus duos, id est pedes decem": Isidore, *Etymologiae*, 15, 15, 2.

Moreover, wooden measuring-rods corresponding to the *pertica*, of which remains have been found in Austria (Dilke, 1971: 73), were probably in common use in surveying and laying out large buildings throughout the empire. A longer measurement, the mile (*mille passus*) is amply attested by the numerous Roman milestones from our region, as well as the distances in such documents as the Antonine Itinerary.

Measures of weight and volume

Discussions of ancient measures of weight usually rely on the evidence of coins. However, we know that weight standards often existed prior to their use in coinage (Domínguez Arranz, 1979: 241). Evidence for pre-monetary weight standards in our region can be found in the silver torques, bracelets and other objects which may have been used as currency before the introduction of coinage. Those from the hoard of Padilla de Duero (Valladolid) appear to employ two weight standards, one of about 45 g (actual weights 40, 44, 145 [= 48 x 3], 147 [= 49 x 3], 21 [= 42 ÷ 2]) and the other of about 54 g (actual weights 57, 107 [= 53,5 x 2], 159 [= 53 x 3]) (García-Bellido, 1999: 372). *Tortas*, pieces of silver ready for conversion into jewelry, found in the hoard at Driebes (Guadalajara) seem to be based on multiples of 9 g, with actual weights of 9, 18, 27, 36, 45, 82, and so on (García-Bellido, 1999: 378-379). Of course, the Padilla de Duero jewelry could also be based on this system, since 45 and 54 are multiples of 9. The same standard may sometimes to apply to materials

other than metal. An alabaster weight from the *municipium Elaisio* near Botorríta (Zaragoza) bears a weight of 35,51 which, as Beltrán Lloris (1989: 367-368) points out, does not fit with either the Iberian or the Roman weight system. However, it could well represent four units on the 9 g scale.

Consideration must also be given to the evidence of pre-Roman weights (*pondera*). García-Bellido (1999: 375-378) has already suggested that the discoid bronze examples from Cancho Roano (Zalamea de la Serena, Badajoz) are consistent with a weight standard of about 9 g, even though some of the weights (e.g. 30,86 g, 131,40 g) are not easily explained as multiples of 9. With these data may be compared the clay loom weights from *Numantia*, having a *terminus ante quem* of 133 B.C. The weights of 35 Celtiberian *pondera* from this site were published some years ago (Comisión Ejecutiva, 1912: 39-40), and additional examples have been tabulated more recently (Arlegui Sánchez and Balano Soriano, 1995: 149-151)⁵. Many are marked on the base with a symbol, but these appear to be manufacturers' signs rather than weight markings, because some pieces of identical mass and size bear different symbols, while the same symbols appear on pieces of different weight. Some of these weights seem to correspond to important multiples of 9 g: e.g. $40 \times 9 = 364$ (actual weights 356, 360, 368); $50 \times 9 = 455$ (actual weights 440, 457, 460); $100 \times 9 = 900$ (actual weight 870); $200 \times 9 = 1.800$ (actual weight 1.785); $300 \times 9 = 2.700$ (actual weights 2.670, 2.730).

These examples would seem to support the argument for a 9 g weight standard. However, the majority of weights do not correspond even roughly to any significant multiple of 9. Is it possible that the apparent multiples of 9 result from mere coincidence? To test this hypothesis, let us

see if the evidence would equally support a different module. For instance, if we posit a system based on multiples of 10 g (which was certainly *not* an ancient weight standard), then the Numantine weights of 259 g, 401 g, 503 g, 604 g, 967 g and 2.030 g could be seen as 25, 40, 50, 60, 100 and 200 times this fictitious unit. Alternatively, if we assumed a module of 44 g, the Numantine weights of 440, 870, 1.785, 2.640 and 4.340 g would appear to represent factors of 10, 20, 40, 60 and 100. Similarly with the bronze *pondera* from Cancho Roano, one could argue that weights of 9, 31, 70 and 102 g are based on a unit of 10 g, or that examples of 31, 63 and 170 g are multiples of 15,5 g.

Celtiberian towns in close contact with the east coast may have adopted the Iberian weight system, to facilitate commerce in metals. At any rate, the earliest bronze coins in our region, those of *Sekaiza* in the Jalón valley in the early second century BC, are on the weight standard of 10-11 g, used at *Kese* and other Iberian mints (Villaronga, 1979: 133). Subsequent issues of *Sekaiza* and *Bilbiliz*, later in the same century, have a weight of 14-15 g, which does not conform to any known standard (Villaronga, 1979: 179-180, 185). Another second-century mint, *Areikoratikos*, issued bronze coins of 26,5 g, followed by a second series of half this weight (García-Bellido, 1999: 383). These appear to be modelled on the Roman uncial *as* of 27 g. Other second-century mints use lighter modules, of which two were current: coins of *Arekoratas* and *Erkauika* have a weight of 10-11 g (perhaps following the example of *Sekaiza*), while those of *Kontebakom-Karbikom*, *Nertobis*, *Arekorata* and *Sekobirikes* weigh about 9 g (Villaronga, 1979: 184, 187, 200-201). This module of 9 g is peculiar to Celtiberia and has never been satisfactorily explained. However, since (as noted above) weight standards preceded coinage, the coins of 9 g may be following the same metrological system as the jewelry, though this is of silver rather than bronze. Assuming a silver-to-bronze value ratio of about 1:80, as suggested by the coinage (García-Bellido, 1999: 382-384), we may postulate that a nine-gram unit of silver would be equivalent to approximately 80 nine-gram units of bronze.

⁵ Many of the weights in the 1995 article seem to be reweighings of items in the 1912 publication (not surprisingly, since both sets of data came from *pondera* in the Museo Numantino de Soria). I have used the weights in the 1995 version, assuming them to be more accurate. Weights for both the Numantine and Cancho Roano *pondera* are rounded off to the nearest gram.

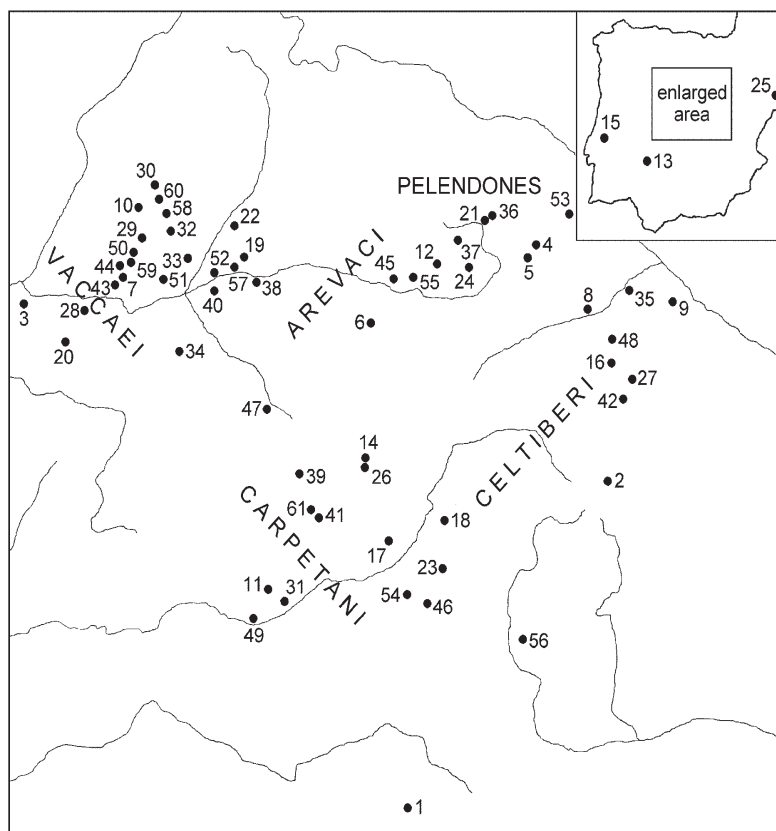


FIG. 1: Location of places mentioned in the text (in alphabetical order). 1, Alcubillas; 2, Alto Chacón; 3, Arcillo; 4, Arekorata; 5, Augustobriga; 6, Ayllón; 7, Benafarces; 8, Bilbiliz; 9, Botorríta; 10, Bustillo de Chaves; 11, Cabañas de la Sagra; 12, Calatañazor; 13, Cancho Roano; 14, Complutum; 15, Conimbri-ga; 16, Daroca; 17, Driebes; 18, Erkaui-ka; 19, Esguevillas de Esgueva; 20, Fuentespreadas; 21, Garray; 22, Hontoria de Cerrato; 23, Huete; 24, Izana; 25, Kese; 26, Kontebakom-Karbikom; 27, Luco de Jiloca; 28, Madridanos; 29, Medina de Río seco; 30, Melgar de Arri-ba; 31, Mocejón; 32, Montealegre; 33, Mucientes; 34, Muriel de Zapardiel; 35, Nertobis; 36, Numantia; 37, Ocenilla; 38, Padilla de Duero; 39, Pardo (El); 40, Pedraja de Portillo; 41, Perales del Río; 42, Poyo del Cid (El); 43, Pozoantiguo; 44, San Pedro de Latarce; 45, Santervas del Burgo; 46, Segobriga; 47, Segovia; 48, Sekaiza; 49, Toledo; 50, Tordehumos; 51, Torrelobatón; 52, Tudela de Duero; 53, Turiasu; 54, Uclés; 55, Uxama; 56, Vale-ria; 57, Villabáñez; 58, Villabaruz; 59, Villagarcía; 60, Villanueva de la Conde-sa; 61, Villaverde Bajo.

Silver coinage follows the Roman *denarius* standard, though with some reduction of weight over time. The *denarii* of *Arekoratas*, at 3,81 g, are believed to belong to the late second century, contemporary with coins of similar weight at *Bolskan* in the Ebro Valley, while those of *Turiasu* and *Sekobirikes*, at 3,56 g, apparently date mainly to the Sertorian war (Villaronga, 1987: 16, 21). It must be stressed that, while the dating of Celtiberian silver coin issues is facilitated and to some degree corroborated by the presence of datable Roman *denarii* in some of the hoards, the chronological sequence of the bronze issues has been reconstructed largely from their weights. Therefore, drawing conclusions about changes in metrology on the basis of this hypothetical (and still controversial) chronology involves a circular argument.

Weights of bronze or stone were useful for market transactions. A set of six bronze weights was found in a Roman cemetery near Uclés

(Cuenca), inscribed with their values; the largest was twelve ounces, or one Roman pound (Quintero, 1889: 76 and note). A further two weights come from Huete (Cuenca): one in marble, with a bronze handle, bears the Roman numeral L and weighs fifty Roman pounds (16.253 g); the other, in bronze and marked x, weighs ten pounds (3.254 g), both based on a pound of 325 g (*CIL* II, 4962,1-2). A spherical diorite weight from Tudela de Duero (Valladolid) weighs two pounds and is inscribed in silver, "II CCA"; the interpretation "Claudius Caesar Augustus" after the numeral is doubtful (Palol, 1963: 250-252). Two clay loom weights from Alcubillas (Ciudad Real) each weigh 325 g, or one Roman pound (Mélida, 1917: 392), while *pondera* from *Uxama*, no longer extant, were marked with Roman numerals which presumably indicated their weight (Loperráez, 1978: 300).

We have, as yet, no data for the Celtiberian system of measuring volume. Romanization of

measures of volume was assured by the use of Roman pottery. Vessels were made in standard sizes to hold a recognized unit of volume; for instance, wine and oil amphoras. Cooking recipes (as we know from the famous book attributed to Apicius) also prescribed measurements in Roman units, such as the pint (*sextarius*) and its divisions. While explicit evidence from the Meseta is lacking, it is highly likely that the *sextarius* and the *modius* (a dry measure used for grain) became standard measures of volume in this region.

Future investigators should make an effort to determine the capacity of amphoras and *dolia* excavated in the Meseta. An easy method of doing this is to fill them to the brim with small styrofoam chips, of the kind used in commercial packing. The chips from each vessel can then be carefully poured into a box graduated in centimetres. This simple procedure indicates the exact volume of each vessel in metric units, which can then be translated into their Roman equivalents (1 *sextarius* = 540 cm³; 1 *modius* = 8.754 cm³). The same technique, applied to pre-Roman pots, might reveal the Celtiberian volumetric system.

Conclusions

The available data now make it possible to draw preliminary conclusions about Celtiberian units of measurement and their Romanization. The dimensions of pre-Roman mud bricks from Meseta sites suggests a Celtiberian foot of about 24 cm (or perhaps slightly longer, in view of shrinkage from drying). Though mud bricks are the only surviving and recognizable evidence for such a unit, it is logical to assume that this Celtiberian foot would have been the basis for all measurements of length. That this metrological system was widespread is indicated by its use not only in the eastern Meseta (Soria, Teruel and Zaragoza provinces) but also among the Carpetani (Madrid province) and Vaccaei (Segovia province).

Though some early bronze coinages adopted the Iberian weight system of 10-11 g, the majority are based on a module of 9 g. This 9 g unit seems to have been used not only in Celtiberia proper, but also among the Vaccaei (Padilla de

Duero hoard) and probably among the Carpetani. There is no evidence that loom weights were based on this metallic standard: although some *pondera* seem to approximate multiples of 9 g, the large number that cannot be fitted into this system suggests that the apparent multiples are merely fortuitous.

Romanization is evident from the widespread use of the Roman foot (*pes*) of 29,6 cm in bricks, stone columns, and buildings. The evidence from large structures such as bridges, with dimensions in multiples of 10 Roman feet, suggests the use of the *pertica* in design and layout of these monuments. The Roman mile was used for measuring lengths by road. In terms of weight, the Roman *denarius* standard (rather than the Celtiberian unit of 9 g) was adopted for silver coinage as early as the second century B.C., presumably because it was used to pay Roman taxes and other obligations. The use of the Roman pound (*libra*) and ounce (*uncia*) in commercial transactions is attested by bronze and marble weights.

Although we currently lack data on units of volume, future investigators may be able to determine the Celtiberian module and document its Romanization, by measuring the internal capacity of ceramic vessels.

In view of the paucity of previous investigations into Celtiberian metrology (except in regard to the contentious problem of coin weights), the conclusions offered in this article are necessarily tentative. However, it is hoped that the data and discussion presented here will stimulate further debate, and lead to a refinement of our understanding of this neglected area of Celtiberian studies.

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