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Frédéric Mège. The Concrete Floors of Megara Hyblaea. A Sicilian Perspective.. Mortiers et hydraulique en Méditerranée antique, 2019. halshs-02294045

HAL Id: halshs-02294045
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Submitted on 24 Sep 2019

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The Concrete Floors of Megara Hyblaea. A Sicilian Perspective.

Frédéric MÈGE
Aix Marseille Univ, CNRS, CCJ,
Aix-en-Provence, France

Abstract – Concrete floors were not widespread in Megara Hyblaia. They were constructed in the usual technique involving broken terracotta as an aggregate, mixed with sand and lime (*opus signinum* or, rather, broken terracotta concretes). Limestone powder could also be used as an aggregate (limestone mortars). Some of the broken terracotta concretes were decorated with rather simple patterns of inserted tesserae. The different types of concrete floors are mainly found in the Hellenistic baths and in some houses' rooms, generally interpreted as bathrooms or reception rooms. It seems that these floors appeared in Megara Hyblaea and in eastern Sicily in the second half of the 3rd cent. BC. Thus, it is possible to envision that their introduction in this area could be attributed to a Roman influence.

Résumé – Les sols bétonnés étaient peu répandus à Mégara Hyblaea. Ils étaient construits selon la technique habituelle comportant des morceaux de terre cuite (tuileau) comme agrégat, mélangés avec du sable et de la chaux (*opus signinum* ou, plutôt, bétons de tuileau). De la poudre de calcaire a aussi été utilisée comme agrégat (mortiers de calcaire). Une partie de ces bétons de tuileau était décorée avec des motifs assez simples en tesselles. Les différents types de sols bétonnés se trouvent principalement dans les bains hellénistiques et dans certaines pièces de maison, généralement interprétées comme des salles de bain ou des salles de réception. Il semble que ces sols soient apparus à Mégara Hyblaea et en Sicile orientale dans la deuxième moitié du IIIe s. av. J.-C. Il est donc envisageable d'attribuer leur introduction dans cette région à une influence romaine.

Introduction: the site

Megara Hyblaea is located on the eastern coast of Sicily, 20 km north of Syracuse. It was founded in 750 or 728 BC by Greeks coming mainly from the city of Chalcis, in Euboea. The archaic period of Megara came to an end in 483 BC when Gelo of Syracuse emptied the town and deported its inhabitants (Herodotus *Hist*. 7,156). Recent researches show that the site, after this event, stayed unoccupied for no more than one generation.[1] By the end of the 5th or the beginning of the 4th century BC, new town limits were established and delineated by the construction of a new city wall.[2] This so-called "Second Megara Hyblaea" was thus almost six times smaller than the archaic city and was organized around the ancient agora (Fig. 1). In 211 BC, Megara was conquered by the Roman legions of Marcellus during the war between Rome and Syracuse (Livy *Ab urbe condita* 24,35,2). The city wall was destroyed but the town was clearly not abandoned: new houses were built over the former fortification and the town of Megara was inhabited probably until the 1st century BC.

The remains which are taken into consideration in this article are all located within the limits of Hellenistic Megara Hyblaea and have all been unearthed during the excavations on and around the agora.[3] I will start by giving some definitions and by describing the structure of the concrete floors. Then, I will show some examples in their architectural context, followed by some data about the chronological context. Finally, I would like to raise some questions about the appearance of these floors in Megara and in Sicily as well.

Terminology and typology[4]

There were two types of concrete floors in Megara. The difference between them comes from the kind of aggregate used to form the mixture, while the other components were the same in both cases: lime and sand. To avoid inaccuracies and confusion, I therefore use specific terms to name these two types of floors, strictly based on the composition of the mixture.[5]

1 Whereas the main hypothesis for decades was a reoccupation of Megara only by the time of Timoleon (around 340 BC): Vallet, Villard 1958. These new hypotheses and results are presented in Tréziny 2018.

2 This wall is referred to as *premier rempart hellénistique* (First Hellenistic Wall R1) in Tréziny 2018 (see note 17).

3 Excavations by G. Vallet and Fr. Villard of the French School at Rome between the 40's and the 90's, the results of which are mainly published in Vallet, Villard 1964 and Vallet, Villard, Auberson 1976.

4 This part of the article has greatly benefited from the other presentations and the discussions during the workshop. Nevertheless, for now, the floor types of Megara Hyblaea can only be described at a very schematic level: I look forward to the opportunity to conduct much more accurate studies of these floors in the future.

5 See glossary in this volume. In particular, I prefer avoiding the use of more common terms like opus signinum or cocciopesto to denote the broken terracotta concretes.

Fig. 1 – Megara Hyblaea. View of city limits (map background: Geoportale)

The first type is named "broken terracotta concrete" for the aggregate was made of little pieces of terracotta, big enough to be seen by the naked eye.[6] There were 35 examples of broken terracotta concretes. The second type draws its name from its very fine aggregate, almost a powder, made of crushed limestone. As a consequence, I have named these floors "limestone mortars". There were only 5 floors of this type (see Table 1).

For most of the broken terracotta concretes, the upper layer (that is to say, the visible part) was plain and not decorated. Some of these upper layers had inlaid tesserae forming geometric patterns, most of the time parallel lines or irregular designs (Fig. 2); these tesserae were in most cases white and rarely colored. As far as it can be assessed, the broken terracotta concretes were all constructed in the same manner, with three layers, one atop the other.[7] On the bottom was a rough layer of rubble and earth; then there was plain concrete made of lime and gravel (thickness: about 8-10 cm); finally came the broken terracotta concrete (thickness: about 1 cm).

The surface of every limestone mortar floor of Megara is plain, with a grayish color typical of a local limestone (Fig. 2); nevertheless, it is highly probable that the upper layer of these mortars was painted (see below). These floors were constructed in the same manner as the broken terracotta concretes: first, a coarse layer; then, a more or less tough concrete; finally, the limestone mortar.

6 The nature of these pieces of terracotta is not known: they might come from tiles, bricks or pottery as well.

7 These layers happen to be the same ones as those described by Vitruvius (De Architectura 7, 1, 1-3), so that the same terms could be appropriately used: the bottom layer is the statumen, the middle one is called the rudus and the last one (which is, properly speaking, the broken terracotta concrete) is the nucleus.

Fig. 2 – Megara Hyblaea. Cement floors: broken terracotta concretes (four top pictures); limestone mortars (four bottom pictures)

Table 1: Table of cement floors in Megara Hyblaia, with reference to Fig.6 (numbering made according to works published to date)

Type	Location	Comment
Broken terracotta concretes	5 floors Immediately to the west of House 13,22	Building unknown, built over the Hellenistic Wall R2 Main part took off during excavations See Vallet, Villard, Auberson 1983: 16
	1 floor House 13,22; room b	Late building. See Vallet, Villard, Auberson 1983: 14, fig.13; 15-16
	1 floor House 13,22; room c	See Vallet, Villard, Auberson 1983: 14, fig.13; 15-16
	1 floor House 13,22; rooms h and i (*Gnaius Modius' baths*)	Same floor for rooms h and i See Vallet, Villard, Auberson 1983: 14, fig.13; 15-16; Mège 2013: fig.6, 207; 211
	1 floor House 13,22; corridor between room h and g (*Gnaius Modius' baths*)	See Vallet, Villard, Auberson 1983: 14, fig.13; 15-16
	1 floor House 13,22; room g (*Gnaius Modius' baths*)	See Vallet, Villard, Auberson 1983: 14, fig.13; 15-16
	1 floor South-west of House 13,22	Building unknown, located in the intramural ring road of Hellenistic Wall R2
	1 floor House 23,24; south-eastern room	See Vallet, Villard, Auberson 1983: 19, fig.17; 18
	1 floor South of House 23,24	See Vallet, Villard, Auberson 1983: 19, fig.17
	1 floor House 22,23; room e	See Vallet, Villard, Auberson 1983: 75, fig.53; 74-76
	1 floor House 30,12; southern part of room e	Roman building. See Vallet, Villard, Auberson 1983: 87, fig.59; 86-88
	1 floor Hellenistic Baths; room b	See Vallet, Villard, Auberson 1983: 51, fig.37; 49-60
	1 floor Hellenistic Baths; room c	See Vallet, Villard, Auberson 1983: 51, fig.37; 49-60
	1 floor Hellenistic Baths; room e	See Vallet, Villard, Auberson 1983: 51, fig.37; 49-60
	1 floor Hellenistic Baths; room f	See Vallet, Villard, Auberson 1983: 51, fig.37; 49-60
	1 floor Hellenistic Baths; room d	See Vallet, Villard, Auberson 1983: 51, fig.37; 49-60
	1 floor Hellenistic Baths; room i	See Vallet, Villard, Auberson 1983: 51, fig.37; 49-60
	1 floor Hellenistic Baths; room g	See Vallet, Villard, Auberson 1983: 51, fig.37; 49-60
	1 floor Hellenistic Baths; room h	See Vallet, Villard, Auberson 1983: 51, fig.37; 49-60
	1 floor Hellenistic Baths; rooms l and m	See Vallet, Villard, Auberson 1983: 51, fig.37; 49-60
	1 floor Hellenistic Baths; room k	See Vallet, Villard, Auberson 1983: 51, fig.37; 49-60
	1 floor House 30,11; south-western room	Floor indicated but missing. See Vallet, Villard, Auberson 1983: 82-83, fig.57; 81
	1 floor House 39,3; south-eastern room	See Vallet, Villard, Auberson 1983: 82-83, fig.57; 84

Type	Location	Comment
Broken terracotta concretes	1 floor House "chantier A"; sector 6	See Villard 1951, fig.3; 18-20
	1 floor House "chantier A"; sectors 16 and 17	See Villard 1951, fig.3; 18-20; 22
	1 floor House "chantier A"; sector 4	See Villard 1951, fig.3; 18-20; Mège 2013: 205, fig.2; 203-206
	1 floor Sanctuary 41,6; room 7	See Vallet, Villard, Auberson 1983: 37, fig.30; 35-39; Mège 2013: 206, fig.3; 206-210
	1 floor House XV B; room B18	Last phase of House XV B See Haug, Steuernagel 2014: Plan 6; 46-49; 61; Mège 2013: 207, fig.4; 210
	2 floors South of House XV B	Partially took off by excavations and vandalism
	1 floor North of Hellenistic Palestra	
Limestone mortars	1 floor House 22,23; room g	See Vallet, Villard, Auberson 1983: 75, fig.53; 74-76
	1 floor House 40,15; south-western room	See Vallet, Villard, Auberson 1983: 82-83, fig.57
	1 floor House XV B; room B15	See Haug, Steuernagel 2014: Plan 6; 43-44
	1 floor House XV B; room B17	See Haug, Steuernagel 2014: Plan 6; 43-44
	1 floor South-east of House XV B	

To close this description, it is relevant to make a short excursus about the wall plasters, because concrete floors were most of the time associated with them. We could determine[8] that the wall plasters are of the same types as the floors: one type was made of broken, sometimes crushed, terracotta, while the other one contained limestone powder. Floors and wall plasters of the same type came generally together. In addition, one can observe that the surfaces of some of the limestone plasters still bear scant traces of red ochre painting.

Concrete floors in context

The Hellenistic Baths

Almost all the floors of this building[9] were broken terracotta concretes, most of them having patterns of white tesserae with a different design for each room. In the examples depicted in Fig. 3, two sets of rooms, each room with a different, random arrangement of tesserae, were divided with a mat.[10] The tholos of the Baths was a round room decorated with a random arrangement of tesserae, where several terracotta bathtubs were placed all around against the wall (Fig. 3).

House 13,22[11]

House 13,22 in its first phase was located along the intramural ring road of the Hellenistic wall, before it stretched over the wall after the destruction of the latter (Fig. 6). A room located

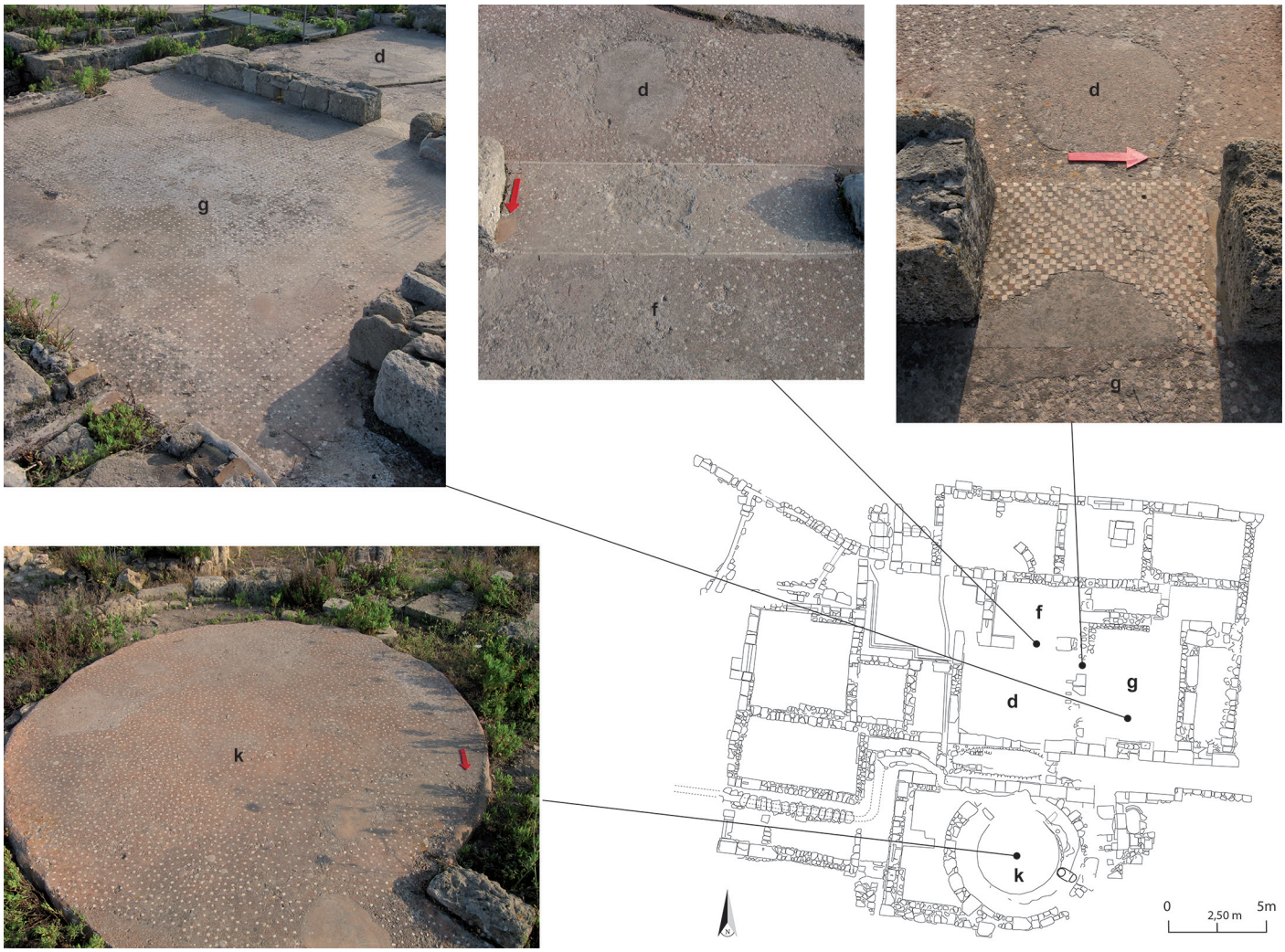
8 With the help of Anne-Marie d'Ovidio (see chapter in this volume), whom I warmly thank for this.

9 Originally published in Vallet, Villard, Auberson 1983: 49-60, this building will be further analyzed in Tréziny 2018.

10 The first set is room d and room g (according to the plan in Vallet, Villard, Auberson 1983: 51, Fig. 37. The dividing mat consisted of white, green and red tesserae closely set one against another (Fig. 3). It has played a peculiar role in the archaeological research on tessellation for it has sometimes been identified as the first example of *opus tesselatum* in the Western Mediterranean (Dunbabin 1994: 32). The dating of the baths in the second half of the 3rd century BC (see below and note 21) might invalidate this hypothesis. The second set is room d and room f, with a dividing mat made of small fragments of colored stones and lined with white tesserae (Fig. 3).

11 The house's name is the one used in Vallet, Villard, Auberson 1983: 15-16. Due to new analysis and thoughts, the designation of some Hellenistic structures (including House 13,22) is different in Tréziny 2018 and related works on Hellenistic Megara (see note 14 below).

Fig. 3 – Megara Hyblaea. Hellenistic Baths: room g with mat and room d in the background; mat between room d and room f; mat between room d and room g; tholos k



in the northern side of the house[12] was obviously one of the most important and was, at least partly, certainly intended for the reception of guests (Fig. 4). Indeed, the floor is a broken terracotta concrete whose pattern of tesserae is the most elaborate of all that are known so far in Megara: a central design, surrounded by a frame of blue and white tesserae; a doormat with a diamond-shaped design; parallel lines all around. Part of the house in its subsequent phases was occupied by a bath suite known as the "Gnaius Modius Baths". It was so called after its owner, whose name is inscribed in black tesserae placed in front of the entrance (Fig. 4). The bath suite consisted originally of two main rooms,[13] each one with a broken terracotta concrete floor. The first room was a vestibule/changing room with stone benches along the wall; it gave access through a narrow corridor to the second room, the bathing room. Its floor was decorated with lines of white tesserae and its walls were plastered with a broken terracotta mortar; in the southwest corner was a built-in bathtub, also covered with a broken terracotta concrete.

House XV B

House XV B has a long architectural history and is one of the biggest houses excavated in Megara.[14] In addition, it is the only one with a peristyle court. Two rooms[15] on the western

12 Room c, according to the numbering in Vallet, Villard, Auberson 1983: 14, Fig. 13.

13 Room h/i and room g.

14 Formerly named House 49,19 in Vallet, Villard, Auberson 1983: 45-47, this house has since been extensively published under the name House XV B in Haug, Steuernagel 2014. This name will be used as well in Tréziny 2018.

15 Room B15 and room B17, according to the numbering in Haug, Steuernagel 2014: Plan 6.

Fig. 4 – Megara Hyblaea. House 13,22: room i of the Gnaius Modius Baths, with detail of the inscription; room c, with schematic drawing of the tesserae design; room g of the Gnaius Modius Baths

side of this court stand out from the other ones because of their location, shape and limestone mortar floors (Fig. 5). The larger one was clearly an important room, used for dinners and receptions. The small room was a later addition and was built inside another room; it possibly had the same function as the big one, that is to say, to receive guests but in a more intimate context.

On the eastern side of the court, many changes occurred during the late phases of the house. One of these was the creation of a L-shaped room[16] with a broken terracotta concrete floor, curved and sloped toward a drain in the street wall (Fig. 5). This space can most probably be interpreted as a bathroom or latrines.

Chronology and origins of the concrete floors

An important point about the archaeology of Megara Hyblaea should be stressed before talking about the chronology of the concrete floors. In the area here considered (called *Le Quartier de l'Agora* by the excavators), the archaeological documentation in our possession is very scanty: as a consequence, we must generally lean on clues and indirect proofs to build hypotheses on the structures' dating. Nevertheless, I have several reasons to think that concrete floors were not used in Megara before the mid-3rd century BC. As a matter of fact, the construction of the Hellenistic Baths belongs to the second half of the 3rd century BC and House 13,22 was not built before the end of the 3rd century BC.[17]

16 Room B18.

17 The chronology of the Hellenistic Walls is very helpful here. There were two main phases: the First Hellenistic Wall R1 remained in use

Fig. 5 – Megara Hyblaea. House XV B: room B15; room B17; room B18

The architectural history and the building sequence of House XV B point to the same time span (Haug, Steuernagel 2014: 61-64), and so do the other constructions with concrete floors (Fig. 6). No certainties can be asserted here but only strong assumptions.

My research on Megara Hyblaea and other sites of Sicily during the Hellenistic period has led me to think about the origins of the concrete floors and particularly of the broken terracotta concretes. It is generally assumed that the technique of hydraulic mortar was invented and put into use in the Near East around the 10th century BC, although its origins are somewhat much more ancient.[18] This technique was used in Greece from the mid-5th cent. BCE onwards in public buildings[19] and slightly later in domestic contexts (at Olynthus, see Robinson, Mylonas 1946: 289). The appearance of concrete floors in the west is attributed to the Carthaginians, who might, moreover, be the inventors of the technique of the broken terracotta concrete.[20] Actually, most of the examples in Carthage do not date to earlier than the 3rd century BC (Dunbabin 1994: 32-36), although some plain broken terracotta

from *ca*. the end of the 5th to the beginning of the 3rd century BC; the Second Hellenistic Wall R2 was obviously built by Hiero II somewhere around the mid-3rd century BC (this topic will be developed in Tréziny 2018). Hence, the Hellenistic Baths are dated after the mid-3rd century BC because of their sewer which goes out of the town through a dedicated passage built in R2. Moreover, all the constructions aligned on the intramural ring road of R2 must be contemporaneous to it (like the predecessors of House 13,22). Conversely, houses located over and against the city wall (including House 13,22) could only have been built after its destruction in 211 BC (Fig. 6). The dating of House 13,22 in the Roman period of Megara was already suggested in Vallet, Villard, Auberson 1983: 15-16.

18 According in particular to some investigations in Anatolia, a basic technique involving a pozzolanic reaction was used from the Neolithic (Hauptmann, Yalcin 2001). In the Late Bronze Age, in Cyprus, a intentional and more sophisticated use of pozzolanic materials has been documented (Theodoridou, Ioannou, Philokyprou 2013). See also Vassal 2006: 34.

19 In Olympia, at the Greek Baths (Mallwitz 1972: 270); also Ginouvès 1962: 43. At the Dipylon/Kerameikos Baths (Greco 2014: 1315-1316).

20 This hypothesis is reminded for instance in Dunbabin 1994: 32 and in Vassal 2006: 39.

Fig. 6 – Megara Hyblaea. Plan of the site with particular structures. Pink lines: "hieronian" walls (3rd cent. BC). Green lines: roman walls (2nd-1st cent. BC). Orange surfaces: broken terracotta concretes. Gray surfaces: limestone mortars

concretes can be dated to the second half of the 4th century BC (*ibid*. 38). These data are fully confirmed at Kerkouane, abandoned around the mid 3rd century BC, where most of the archaeological remains are not older[21] than the beginning of the 4th century BC (Morel 1969: 515-516).

The oldest examples known so far in Sicily are consistent with these dates. The first concrete floors, painted in red or gray, were to be found in Monte Lato in the second quarter of the 5th century BC (Isler 1997: 20). The broken terracotta concretes appeared there during the 3rd century BC, first plain floors then, slightly later, floors with inlaid tesserae (*ibid*.: 23-25). In Selinous, the presence of broken terracotta concretes (with or without tesserae) has been linked to the Punic period of the city (ca. 340 - 250 BC), whereas the only reliable stratigraphical data indicate the first half of the 3rd century BC (Helas 2011: 64-69). As it appears, all these early cases of concrete floors are located in western Sicily. At Morgantina, in central Sicily, soundings in several broken terracotta concretes found in houses have shown that they were not older than the beginning of 3rd century BC, at most (Tsakirgis 1990: 441). In eastern Sicily, evidence in domestic contexts date to a later period, as at Megara. At Camarina, the only examples of broken terracotta concretes are in the 2nd century BC *Casa dell'Altare* (Pelagatti 1962: 259), and in Syracuse this type of floor has only been found in houses dating between the 3rd and the 1st centuries BC[22]. In the central and eastern part of Sicily, the same can be said about the floors brought to light in public baths. Indeed, the three bathing complexes of Megara, Morgantina and Syracuse are so very similar in plans, organisation and dates that they have been recently presented as part of an evergetism program enacted by Hiero II (Lucore 2013). Thus, their construction should be dated between ca. 275 and 215 BC and, as a consequence, their broken terracotta concretes also. Nevertheless, the baths of Syracuse and Megara present clear signs of rebuilding, so that their visible floors could be somewhat more recent than the buildings themselves[23].

To sum-up, below are the dates of the appearance of concrete floors by region.

North Africa:
Carthage: first half of 4th century BC (broken terracotta concretes); during the 3rd century BC (broken terracotta concretes with tesserae).
Kerkouane: first half of 3rd century BC.

Western Sicily:
Monte Lato: second quarter of 5th century BC (concrete floors); early 3rd century BC (broken terracotta concretes).
Selinous: between the mid-4th and the mid-3rd century BC.

Central Sicily:
Morgantina: beginning of 3rd century BC (broken terracotta concretes).

Eastern Sicily:
Camarina, Syracuse, Megara: second half of 3rd century BC (broken terracotta concretes).

Conclusions

These geographical and chronological data have led me to raise two hypotheses.

First, it appears clear to me that the origin of the technique of the broken terracotta concretes should not be looked for in a restricted area, or even in a city, but rather in a greater region, that is to say the whole Punic area in south-western Mediterranean. In other words, the development of this invention is probably due to Punic peoples living both in western Sicily and in North Africa.

The second proposition I would like to put forward may be more original and would certainly need further investigations to be accurately assessed.[24] Looking outside Sicily, in southern Italy, we know that the broken terracotta floors appeared from the early 3rd cent. BCE, perhaps slightly earlier.[25] Nonetheless, their greatest period of diffusion occurred in the 2nd century BCE (Vassal 2006: 43; Dunbabin 1994: 31, n.15) with many documented examples at Pompeii (see in particular Coarelli, Pesando 2005: 104, 150 and 221). Looking further afield, the situation is quite the same in Sardinia and Spain, where all the BTC floors should be linked to the Roman domination that

21 However, deep soundings have uncovered concretes belonging to 6th century BC constructions, but without further details on their nature; besides, a piece of a mosaic pavement has been found in 5th century BC backfills (Morel 1969: 499-500, Fig. 28). For the latter, the context of the finding raises suspicions on the dating (Dunbabin 1994: 36).

22 In Orsi 1915: 191. Also, *casa* 2: TPQ in the 3rd century (Gentili 1951: 281-282, Fig. 17); *casa* 6: 1st century (*ibid*.: 292-293, Fig. 26). Houses *ellenistico-romane e tardo romane* of the Via Timoleonte (Gentili 1956: 99-103).

23 It has recently been noticed that there were three phases for the *tholos*' floors in the Megara baths, the broken terracotta concrete with tesserae being the last one (Tréziny 2013). In Syracuse, the great *tholos* of the baths in Contrada Zappalà had the only attested broken terracotta concrete in the building; according to the excavator, the *tholos* seems to be a later addition to the bathing complex (Cultrera 1938: 300; also Lucore 2013: 155).

24 That is to say, the physico-chemical analysis of concrete floors. This a project I am willing to push forward in the very near future.

25 For instance in the domus 5 at Fregellae (end of 4th cent. BC, see Coarelli 1995: 19). In a hypogeum tomb at Naples (first half of 3rd cent. BC, see Baldassarre 1997: 523-530). In an andron at Civita di Tricarico in Lucania (3rd cent. BC, see De Cazanove: 901-941).

started in both regions during the last quarter of the 3rd cent. BCE (Tang 2015: 35-37). In Marseilles, some examples of BTC pertain to the same time span.[26] Therefore, whereas the BTC/BTM can be confidently seen as a technical phenomenon of the western Mediterranean (Dunbabin 1994: 30), all available data point to the crucial role played by Sicily in the development of the technique. In eastern Sicily, as we have seen, the appearance of this type of floors belongs to the same time span, in a time when this region was either under Rome's rule or dominated by Hiero II. Now, it happens that Hiero maintained for most of his reign a close and strong relationship with Rome. Hence, in this part of Sicily, rather than logically attributing the diffusion of broken terracotta concretes to the Punic influence, we could well think that it was the Romans who introduced and promoted the use of this technique. In that case, such a circumstance would be quite ironic when we think of Cato the Elder blaming his countrymen for their new (and, for him, scandalous) taste for broken terracotta concretes: the *pauimenta poenica*, invented by Carthage, Rome's greatest enemy of that time.

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26 Although they could be somewhat earlier: see in this volume the contribution of A.-M. d'Ovidio et P. Bromblet.