Public bath systems of
Late Hellenistic period
in Macedonia

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ABSTRACT

This dissertation was written as part of the MA in the Classical Archaeology and Ancient History of Macedonia aiming to focus on the development of hydraulic and bathing technology in Macedonia during the late Hellenistic period, an era of material and cultural wealth for Macedonia.

Although we dispose a large amount of information from written sources from the origins down to the 5th cen. BC, archaeological evidence is scarce and indirect concerning mainly in depictions on vases of bathing scenes. But excavations revealed the first bathing facilities of the 4th cen. BC: an important part of the bathing culture has been held by the Greek gymnasia, where the presence of baths was necessary for the cleansing of young athletes. Given the prestige of such institutions among the Greeks, it is not casual that the first excavated evidence comes from that environment. Only with the pass of time, when a more sophisticated way of life prevailed, baths were developed as independent units excavated all over the Hellenistic world.

It is the period of the Macedonian supremacy in the Greek mainland translated not only in military campus but also in cultural field. Macedonia is situated in the Greek avant-garde of technological experimentation and achievements, that’s why an extensive corpus of the hydraulic works can be found all around the kingdom. What is important to the aims of this dissertation has to do with recent finding of establishments quite different from Greek similar cases. It is pretty obvious that Macedonian engineers tried to find solutions in technical problems such as the heating of the water and the air. This aspect of the bathing technology has an extra interest, because it may give answers to the problem of the origin of the “ὑπόκαυστον” or hypocaust heating system, considered in general till today a Roman invention. For this reason Roman bathing systems are extensively examined and compared to the Greek ones, so that some preliminary conclusions can be extracted.
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INTRODUCTION

The presence of baths is archaeologically attested in Greece since the Prehistoric times. In the palace complexes of Cnossos and Tiryns a care for the water supply have been taken and specific areas were dedicated to bathing for the inhabitants in there\(^1\). Furthermore, the Homeric poems describe baths scenes concerning the leading heroes of their narration\(^2\). But it must be stressed that the above evidence concerns in private space and life inside the palaces and among aristocracy members. Although the attestation of bathing constructions and habits for such an early era is very important, we’ve lack data concerning public life. A palace is somehow a public building, of course, but the access in it is controlled – if not restricted – so that everyone couldn’t saunter freely. More than that, what is crucial to the present subject, is the presence almost exclusively of public constructions, that is baths, accessible by all citizens without restrictions.

Unfortunately, after prehistoric times we don’t possess any relative evidence down to 6th cen. BC\(^3\). Athenaeus provides the information that in the city of Sybaris in South Italy existed public baths using hot water before its destruction occurred in 510 BC\(^4\), but nothing remains today in order to confirm this fact. So there is another indirect way to trace the presence of baths in Archaic Greece: the depiction of bathing scenes in vases dated during the second half of the 6th cen. BC.

A late 6th cen. BC red-figure vase in the Berlin Antiken Museum presents a bath scene of four women in a small building (pl. 1a), maybe designed for this purpose. A tiled, gabled roof is carried by three Doric columns. Under their capitals are attached the faucets, so it seems that the water circulates through conduits incorporated to the column shafts. The water is spraying from lion and boar-headed spouts upon the women, who are standing in a pool\(^5\). Another bath edifice is representing in a late 6th cen. BC black-figure hydria from Athens, now in Leiden (pl.

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2. Od., 8, 233; 10, 165.
3. In Archaic Smyrna, destroyed about 600 BC, a bathroom with a tube has been found in a house of the 7th cen. BC. Nevertheless, the interpretation of the find is a dubious one and, in any case, we are talking about a private context. See R. Ginouvès, Balaneutiké, recherché sur le bain dans l’antiquité grecque (Paris 1962), p. 162.
4. Athenaeus, Deipnosophistai, XII, 518
1b). Two parietal walls delimit a building and in between them a row of columns supports a pediment. On the back wall panther-headed spouts (placed above shoulder level) spray the water on two men. On the outside, on its side of this building, a pair of men under a tree, where their cloths are hanging down, apply oil on their bodies; this action identify obviously the men as athletes. A somehow different bath scene has been depicted in a red-figure kylix of later dating (ca 430 BC) in British Museum (pl. 2), given the fact that there is no representation of a bath construction. A part of this scene is organized around an elevated, round basin, where three young men are standing; beside this first scene, another one takes place between two other athletes: the first one is holding a hydria and washing his comrade, who is standing on an elevated base, probably the mouth of a pit or of a cistern.

For the purposes of this essay, gymnasia are very important, because bath wings were attached to them for the cleaning of the athletes after their training. The vases’ description offers a great help, because it confirms the prevalent till today idea concerning these building during the Archaic era and afterwards. Initially, they were organized in open parks, bathing was made probably using cold water in fountains and basins, as the vase representations suggest and the gymnasia might have been walled-in according the examples of the Athenian gymnasia of the Academy (pl. 3), the Lykeion and the Cynosarges, but progressively they begun to take a standard form, when their educational functions and their civic role were increased. By the second half of the 4th cen. BC a typical form comprised a building with a peristyle and rooms all around a courtyard bearing a colonnade (usually this is the palaestra) and a large area in the open for sports exercise and running tracks. The first gymnasion with a colonnaded palaestra in all four sides is that of Delphi (334 BC, pl.

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6 Rijksmuseum Van Oudheden, PC63
7 F. Yegül, ibid., p. 18
8 E83
10 The word, actually, gymnasion (γυμνάσιον) uses as its base the epithet gymnos (γυμνός), meaning “naked”, because young athletes were naked during their physical exercise. According to Liddell-Scott vocabulary of the Greek language [H. G. Liddell-R. Scott, Μέγα Λεξικόν της ελληνικής γλώσσης, I (trasl. Στ. Μόσχος, Αθήνα 1970?), p. 545] the word “γυμνάζω” means “I am training someone, who is naked, in physical exercise” and “γυμνάσιον” is translated as “the public place, where physical training is exercised”.
11 It seems that this choice had be made for practical reasons: on one hand Archaic cities wasn’t large enough, on the other the training on gymnasia served originally military maneuvers [I. Nielsen, Thermae et balnea: I Text (Aarhus 1990), p. 9]
12 Ibid., p. 6
Apart the gymnasia, public baths, called balaneia (βαλανεία)\textsuperscript{14}, existed in Greek cities before the 5th cen. BC, if we recall the information of Athenaeus concerning Sybaris. The difference is that this category of baths is not for a restricted use by athletes, but addresses in all people either for secular usage in the cities or for ritual practices in the sanctuaries. The earlier excavated balaneion, dated in the middle of the 5th cen. BC, is that of Olympia (pl. 5) – its placement in the site of the Olympic games and in the vicinity of the gymnasium cannot be accidental – and probably the three phases of another one in the Dipylon area of Athens during the 5th cen. BC\textsuperscript{15}.

Balaneia didn’t gain an immediate acceptance during Classical period down to late 4th cen. BC and in some sources they are condemned as immoral\textsuperscript{16}. A possible explanation is the major prestige that still received the gymnasium as a civic institution; that’s why baleneia were originally owned by private citizens, who gave their name to the establishment. Despite their infamy, gradually down to Hellenistic times the situation changed, when balaneia were spread out all over the Mediterranean Hellenized world and bathing (especially the hot one) became a very popular social activity, so someone could visit a public bath several times a day. A possible reason of this change is the degradation of the gymnasium and the lost of its traditional role as a “training school” for young citizens, where they could exercise their bodies and minds: the prevalence of a more intellectual character during the Hellenistic times and also the growth of individualism and the love of personal comfort in a bourgeois way of living could easily interpret the major acceptance and development of balaneia\textsuperscript{17}.

\textsuperscript{13} F. Yegül, ibid., p. 9; W. Müller-Wiener, ibid., p.179-180
\textsuperscript{14} The noun “βαλανεία” comes from the verb “βαλανεύω” of uncertain etymology. About this subject see R. Ginouvès, ibid., p. 183, n. 4.
\textsuperscript{15} Ibid., p. 184; F. Yegül, ibid., p. 24. A slight difference between the two is the dating of the find in the 5th (Ginouvès) or in the 4th cen. BC (Yegül).
\textsuperscript{16} I. Nielsen, ibid., p. 7, n. 14
\textsuperscript{17} Ibid., p. 7; F. Yegül, ibid., p. 23-24
PART I

A DESCRIPTION OF THE EXCAVATED BATHING CONSTRUCTIONS IN HELLENISTIC MACEDONIA

1. Public baths
1.1. Pella (pl. 6)

Literary sources mention that a public bath was functional in Pella. Despite the later dating of the writer, Athenaeus (about the end of 2nd-beginning of 3rd cen.), he cites an earlier poet, Macho, who had lived about the first half of the 3rd cen. BC. The information given is a first-hand one, because the poet himself had visited Pella, and especially its balaneion, although he didn’t provide us its exact location. Consequently, we are not authorized to identify that of Macho’s with the one excavated preliminary in 1997 and finally ten years later, in 2007. Nevertheless, proving the existence of a public bath during the same period is an extremely interesting find per se, as it will be exposed in the following paragraphs.

1.1.1. Architectural structure of the building

The major public bath of Pella is situated in the area of the new entrance to the archaeological site from the South and occupies the NE part of the block in a surface of 563,50 m\(^2\). The form of the building is almost square with an internal open atrium-like area (length 14 m) and entrances on the North, East and South sides. On the North and East rectangular spaces, around the open area, of different phases were excavated bearing the signs of reshaping; on the contrary, the mass destruction on the West and South sides can lead only to the presumption that an equal arrangement

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18 Athenaeus, VIII, 348 e-f
19 Μ. Λιλιμάκη-Ακαμάτη, «Δωτρικές εγκαταστάσεις στην Πέλλα» in Σ. Πινγιάτογλου – Θ. Στεφανίδου-Τίβεριον (eds), Νάματα, τιμητικός τόμος για τον καθηγητή Δημήτριο Παντερμαλή (Θεσσαλονίκη 2011), p. 395
should have taken place there too\(^{20}\). On the West part of the open area, a swimming pool (7.50 X 4 X 0.60 m, pl. 7.1, 8a) was revealed, to its NW the lower part of a kiln or a furnace (pl. 7.2, 8b) and to its South a rectangular space (pl. 7.3, 9a), maybe related to it, and a cistern (internal dimensions: 1.10 X 1.20 X 0.97 m, pl. 7.4, 9b), partly carved in the bedrock and partly built on it upper part, and in (physical) connection to the previous rectangular space. Two pipes had a relation to the swimming pool: the first one (pl. 7.5, 9a) prevented the overload in it removing the unnecessary water, passed underneath the pavement of the Southern rectangular space and led to the outside of the building, to its South. The second (pl. 7.6) was bringing water from the outside crossing the road to the East of the building from the North to the South and then traversing the NE part of the open area probably till some point to the East, where a small part of a wall was excavated, maybe a well cleaning\(^{21}\).

On the North side of the building, a rotunda space (internal diam. ca 4.95 m, pl. 7.7, 10) was excavated with pebble pavement and individual tubs in a circular disposition, bearing signs of later destruction, a repaired pavement with tile pieces and subsequent alterations. There were found intact three tubs, part of a forth and one more completely destroyed\(^{22}\). In front of each of them a stone vase was placed. This construction destroyed partially the row of the North rooms\(^{23}\); immediately to its South – and to the East of the swimming pool – another rectangular space (pl. 7.8, 11) having its entrance to the NE corner and with, once more, 18 individual clay tubs fixed on the internal face of the walls\(^{24}\). In all sides four tubs are still preserved (except the Eastern one having three). In the NW and SA angles, the most difficult ones in order to maintain the canonical disposition, the tubs were placed in a diagonal orientation. All these constructions were based on a pebble pavement (3 X 3 m). On the middle of the South wall a hole was the entering point of a rectangular pipe


\(^{21}\) Μ. Λιλιμπάκη-Ακαμάτη, «Συγκρότημα εργαστηρίων και λουτρών στην Πέλλα» in ΑΕΜΘ 11 (1997), p. 200; Μ. Λιλιμπάκη-Ακαμάτη – Ν. Ακαμάτης, ibid. It is evident enough that the watering of the complex was guarantee by a combination of the supply from an external aqueduct and wells in situ [Α. Γ. Καϊώρα, Συστήματα ύδρευσης και αποχέτευσης κατά την ελληνιστική και ρωμαϊκή περίοδο στη Μακεδονία II (Θεσσαλονίκη 2008), p. 264].

\(^{22}\) The length of each tub measures 0.80-0.90 m, the width 0.45-0.50 m and the high is preserved for ca 0.25 m.

\(^{23}\) Μ. Λιλιμπάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 100 (n. 6), 103; Μ. Λιλιμπάκη-Ακαμάτη, ibid., p. 198; Μ. Λιλιμπάκη-Ακαμάτη, «Δημόσιο Λουτρό Πέλλας. Εργασίες συντήρησης και νέα ανασκαφικά στοιχεία» in ΑΕΜΘ 27 (2013) (under publication)

\(^{24}\) The length of the individual tubs is 1-1.13 m and the width 0.41-0.57 m. In front of 11 of these a marble (or simply stone) vase had be placed.
between the second and the third bath-tub (its width 0,15-0,20 m) for the evacuation of the water from the interior Southwards. Adjoining the West wall of the room a second one was formed as a bench in order to lay down personal objects during bathing.

In between the above circular and the rectangular bathtubs, a subterranean complex was found, a kiln (pl. 7.2, 8b) with an antechamber to its West and an air duct (pl. 7.9, 12) Eastwards: because of this construction the rotunda changed its form and use. This find had been placed underneath the pavement of a large space between the rotunda and the swimming pool and it was orientated from East to the West. Because of the underfloor nature of the kiln, a staircase led down to it and to its antechamber to the West, from where the supply of the fire was possible through an arched opening in the middle of the Western wall of kiln; both the antechamber and the kiln itself (2,20 E-W X 1,00 N-S) were paved. From the Eastern part of the kiln a covered air duct (length 10,70 m, width 0,40-0,60 m), cut directly onto the bedrock, led outside the building, where a chimney was probably constructed. Above the underfloor kiln there was found a largely destroyed bathtub, from which only the pebble pavement is conserved (2,80 X 1,35 m).

1.1.2. The phases of the bath complex

In this building three phases were distinguished. The first is dated on the last quart of the 4th cen. BC (pl. 13a) according the pottery (pieces, decorated after the West Slope style, were not found, pl. 23a) and coins of Philip II and Alexander III. During this phase an open space occupied the center of the building, because there

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25 Μ. Λιλιμάκη-Ακαμάτη, «Συγκρότημα εργαστηρίων και λουτρών στην Πέλλα», ibid., p. 199
26 Μ. Λιλιμάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 103
27 Ibid., p. 103-104
28 Μ. Λιλιμάκη-Ακαμάτη, ibid., p. 198
29 A different, radical dating is though proposed after the study of the pottery finds in two pits alongside the South wall of the bath complex and 0,70 m to it Northwards. The material can be dated around 410-400 BC. Given the fact that the pits were sealed off by the floor of the first phase, it is possible that the building was constructed soon after that period, in the beginning of 4th cen. BC. A support to this estimation can offer the pottery, collected under the foundation of the South wall and the refuse stones during the construction, because both can be dated to the last quarter of the 5th or the beginning of the 4th cen. BC. Maybe these pits were foundation deposits, known as ritual pyres, created after the rituals connected to the building of the bath. Vessels used for drinking and libations and refused animal bones probably have to do with the religious practices on these occasions. Their shallow form, the positioning of one next to the other and the simultaneous construction of the two and the South wall confirm their interpretation (N. Akamatis–C. Aamont, “Two late Fifth century BC pits from the public bath of Pella” in Antike Kunst 58 (2015), p. 25, 32-33).
was then a close connection between baths and open spaces, so it maybe existed some kind of communication between the complex and the open area to the South. Nevertheless, openings on the external walls are not visible, except the North one, where part of a threshold was found in situ (pl. 13b). Around the internal open space rows of rooms were disposed. To the West of the internal area the swimming was constructed with its water pipes and a swallow carving to the NE for the collection of the filth, the rectangular room to its South and the cistern to the immediate East.

After that, a second phase follows during the second quarter of the 3rd cen. BC (pl. 14) after the pottery fragments (pl. 23b) and the coins of Cassander and Demetrius the Besieger. A new monumental, tripartite entrance is forming now on the East side (internal dimensions: 14,50 N-S X 5,00 E-W): three spaces, which preserve mainly their pavements, are oriented N-S. The pavement of the North room (5,20 X 5,00 m, pl. 15) was obviously damaged and consequently fixed, so the preserved materials in it are different, but it was all plastered by hydraulic mortar; in the middle (6,80 X 4,70 m, pl. 16a) for the pavement were used marble and tile pieces and for the South one (5,20 X 4,25 m) rubble stones (East part) and pebbles (West part, pl. 16b). The benches were considered as partition walls delimiting each room, belonging to the inner walls of the first phase, when the rooms were divided in two parts. On the back of the middle room, a tripartite opening led to a corridor giving access to the inner parts of the bath.

On the North side (pl. 17) the rooms are unified in one single space in the most of the NW part, converted into an auxiliary wing. The rest of the North side is partially occupied by the rotunda, which shares the same corridor with the rectangular space on the South, giving access on both constructions. This fact in addition to the

30 Μ. Λιλιμπάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 100
31 The NW part was fabricated by tile pieces, the South by small rubble stones and the East by pebbles. An earlier pavement was discovered there too.
32 This differentiation is probably due to the division of the internal space by a wall (oriented N-S), used as a bench. On the other hand, the differentiations on the material is justified because of the continuing use, so the pavements were repaired many times [Μ. Λιλιμπάκη-Ακαμάτη, «Δημόσιο Λουτρό Πέλλας. Εργασίες συντήρησης και νέα ανασκαφικά στοιχεία», ibid. (under publication)].
33 Μ. Λιλιμπάκη-Ακαμάτη, «Συγκρότημα εργαστηρίων και λουτρών στην Πέλλα», ibid., p. 198; Μ. Λιλιμπάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 103. For a confusion in the identification of these three room in Μ. Λιλιμπάκη-Ακαμάτη, ibid., p. 198-199 and the controversy in regard to Μ. Λιλιμπάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 103, see part 1.3.
similarities on the constructive techniques of the tubs and of the pavements doesn’t leave any doubt that both bath spaces are contemporary.34

During its final phase about the last quarter of the 2nd cen. BC [according to the vases with relief (pl. 24a), the mould-made lamps, the urguentaria (pl. 24b) and a bronze coin of Pella] the bath complex is partially remodeled (pl. 18a). It is now that the building undergoes significant changes, but yet it retains its previous characteristics. The entrances of the previous phases are modified [the North and middle rooms on the East side expand for 1,60 m to the road (pl. 18b-c) – serving as an antechamber – under the form of a porch], so the South wall of the building does not exist anymore in order unify the complex with the open space to its South according the new ideals in domestic architecture. On the NE corner of the building a few small rooms have been constructed, but it is not certain, if they have to do with this development (see 1.1.3)35.

But the most important change is the construction of the underground kiln providing a new heating system, the source of which comes from underneath the pavement and heats the above situating room36. For this reason on the narrow corridor between the rotunda and the rectangular space, a new room has been constructed and its pavement was covered by hydraulic mortar. Three similar constructions can be identified on the NE corner of the building, orientated N-S37. Moreover, a new floor of tile pieces covers the individual tubs of the rotunda, which changes its function, enriched with a bench in its perimeter, if the identification of a low wall on the North side as such is correct38. In parallel with the subterranean kiln, another one has been created on the ground floor, on the NW of the swimming pool39; thus, two heating systems coexist on the same building.

It is generally accepted that most of the buildings at Pella were abandoned after their destruction by an earthquake in the beginning of the 1st cen. BC. But a number of coins found in various areas suggests the limited use of some of them. The

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34 Μ. Λιλιμάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 100, 103
35 Ibid., p. 105
36 Ibid., p. 103-104
37 Μ. Λιλιμάκη-Ακαμάτη, ibid., p. 198
38 Μ. Λιλιμάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 104-105
39 Μ. Λιλιμάκη-Ακαμάτη, ibid., p. 200
The main feature of a bath complex is the spaces, where bathers take their bath. In Pella’s balaneion such spaces were excavated and represent the evolution of bath culture through its three phases. Although the first phase is not archaeologically very well attested, it is obvious enough that the central point of bath interest was the swimming pool on the internal open space. Things become more concrete concerning the following phases: bath establishments multiply after the construction of the two spaces – the circular and the rectangular ones – with the individual tubs. During the second phase the rotunda served as the area for the hot bath (caldarium), the rectangular space for the tepid bath (tepidarium) and the swimming pool for the cold bathing (frigidarium).

The situation changed during the last phase, after the introduction of the underground heating system: although the swimming pool and the rectangular space continued to function as previously, the rotunda was converted into a steam room (ἔφιδρωτήριον) and it seems that a new section for the hot bathing was added above the subterranean kiln, a room with an apsidal East side, as it could be deduced by the cuttings of the tile edging and the sheets of a lead basin, maybe placed below the tub.

Speaking of bathing, the obligatory element is the water, which will make functional the various spaces. In order to deposit water, a cistern is need: in Pella’s public baths such a construction is situated on the SE of the swimming pool and the purpose for its existence is the collection of pluvial water. Nevertheless, an additional way to supply the complex with water was made by water pipes from the outside; at

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41 It is possible that the poor archaeological finds concerning bath establishments of this phase has to do with the slow evolution of this architectonical type and its technology.

42 M. Λιλιμπάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 103

the same time, other pipes evacuated the bathing facilities from unclean water: such types can be seen either in the vicinity of the swimming pool\textsuperscript{44} or in the rectangular room with the tubs\textsuperscript{45}.

Apart the supply, the heating of water is also a sine qua non element of a bath. It is not very clear the heating systems of the two first phases, but the existence of consecutive layers of black – because of the fire – soil clearly indicates that the water should have been prepared outside the bathing spaces or inside them in braziers and then carried over in clay or copper vessels\textsuperscript{46}. It is in the third phase that an elaborate system is introduced, the underfloor kiln with an antechamber in the West and a staircase for the descent there, which coexists with a simple, grounded furnace on the NW of the pool, from where the boiled water was carried in the bathing establishments.

 Somehow related to the “water transporting system” is the N-S row of rooms found on the NE corner during the excavating season 1997. The presence of low wall in the internal perimeter of the NE room, but mostly of pavements plastered with hydraulic cement led then to the presumption that they functioned as bathtubs for cold bathing, filled in with water carried in vessels from elsewhere\textsuperscript{47}. But the strong argument for this identification was almost exclusively the presence of pavements covered by hydraulic cement, so when the terrain was excavated completely in 2007, new data came to light that changed the estimation about the use of these spaces: the find of the proper bathing facilities, identified in the circular and rectangular rooms, withdrew the first use-proposal of the three rooms, which were considered now as the monumental entrance from the East side of the building.

 A last observation concerns the auxiliary rooms. The rectangular on the South of the swimming pool was taken for a changing room (ἀποδυτήριον), a necessary facility for the bathers attested in all baths. As a service facility was also considered the unified space on the NW half of the North side of the building during the second phase\textsuperscript{48} and the remains on the South part of the SE corner, meanwhile the tile-paved, narrow, oblong rooms on the East part of the same spot were identified either as the

\textsuperscript{44} Μ. Λιλιμάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 100
\textsuperscript{45} Μ. Λιλιμάκη-Ακαμάτη, ibid., p. 199
\textsuperscript{46} Μ. Λιλιμάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 106
\textsuperscript{47} Μ. Λιλιμάκη-Ακαμάτη, p. 198-200
\textsuperscript{48} Μ. Λιλιμάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 100
gatehouse (pl. 19b) either as a religious post (pl. 20)\(^{49}\). In fact, this last observation is related to the excavation of a big dimensioned pit (pl. 7.11), where a large amount of vases and figurines was revealed\(^{50}\). Their dating is related to the second and the third phase of the complex and possibly some of them are connected to a religious facility to the East, where a similar one – but excavated in a deeper stratum – was previously in use\(^{51}\).

1.1.4. Building materials

The state of preservation of the walls is largely damaged: what remains from the external ones (pl. 21. 22), is only the foundation and a restricted part of the first course of blocks\(^{52}\). This is a general phenomenon in Pella, because stone was used for the foundation until the toichobate and successively mud bricks, which consist the preservation of walls a difficult matter\(^{53}\), so we have to believe that a similar case happens also to the balaneion. In some cases previous building material was now reused\(^{54}\). From some examples in the interior walls, we have to imagine that all the walls were plastered in their inside and outside faces\(^{55}\). A similar case regards the swimming pool: for its construction were applied squared stones, covered by hydraulic mortar. The same type of mortar was used too for the plastering of the interior face of the walls in the rectangular room, where the individual tubs were fixed\(^{56}\).

Strong hydraulic cement was used additionally of the covering of the pavements. For their construction different kind of materials was used such as pebbles

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\(^{49}\) Ibid., p. 105; M. Lilimpaki-Akamati – I. Akamatis, ibid., p. 190

\(^{50}\) Concerning the situation in the South side during the third phase of the bath some remarks must be done based on personal observations: the existence a duct from the rectangular “tepidarium” Southwards (pl. 7.10, 19a) implies than an opening should have exist in the North wall, because it would be easier the passing of the duct trough it than a massive wall, which should have been partially demolished for the passing of the duct; that a North wall really stood there is certain due to its remains in its Western course (though now, after the resent restoration, it is all filled up in one single line). If this is the case, then a gatehouse should be necessary. On the other hand the religious nature of the room to the North of the so-called gatehouse could be suggested by the small construction before the East wall of the bath (pl. 20a).

\(^{51}\) M. Λιλιμπάκη-Ακαμάτη, «Δημόσιο Λουτρό Πέλλας. Εργασίες συντήρησης και νέα ανασκαφικά στοιχεία», ibid. (under publication)

\(^{52}\) M. Λιλιμπάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 100

\(^{53}\) I. M. Ακαμάτης, «Η Αγορά της Πέλλας» in M. Λιλιμπάκη-Ακαμάτη – I. M. Ακαμάτης (eds), Η Πέλλα και η περιοχή της» (Αθήνα 2004), p. 41

\(^{54}\) M. Λιλιμπάκη-Ακαμάτη, «Συγκρότημα εργαστηρίων και λουτρών στην Πέλλα», ibid., p. 199

\(^{55}\) Ibid., p. 199-200
(rotunda, its initial phase; the rectangular bathing room), tile pieces (rotunda, final phase; the finishing of the individual bath-tubs), marble pieces and small rubble stones (a combination of all these materials can be traced in the three room of the East monumental entrance).

The construction of the underfloor kiln is a case per se: its West side was made by stone, the North and South by bricks and tiles and the ceiling by tiles placed in a series of projecting courses. Its pavement was of pounded ground, vitrified by the high temperature of the fire during heating, meanwhile that of the antechamber was of pounded clay; flagstones and bricks were placed in front of the opening into the furnace proper\textsuperscript{57}.

Finally, the bedrock was also used in some cases: the lower part of the cistern, NE of the swimming pool, was carved in it (on the contrary, the upper one was built and the whole construction was paved by stones in its external environment)\textsuperscript{58}, as well the air duct from the subterranean kiln (only its East part was paved by tile pieces)\textsuperscript{59}.

1.1.5. Technological innovations

The bath complex of Pella occupies a particular place among similar buildings because of its heating system, a forerunner of the hypocaust, seen in specific – and so many – public bath all over the Greek world and the first, which appears in Macedonia. The technological improvement, caused by introduction of this particular system, is the heating of the room and the water from underneath, because the bath takes place above the kiln and its air ducts, in a suitable arrangement of the room\textsuperscript{60}.

In the mean time, earlier heating systems co-exist, like the boiling of water in independent ovens and their transportation, where needed, in vessels. Besides, in the Pella complex could be combined different elements, like the presence of circular and rectangular bath spaces, a non common practice, and of a large swimming pool, which fits in bigger constructions, like the gymnasium\textsuperscript{61}.

\textsuperscript{57} Μ. Λιλιμάκη-Ακαμάτη – Ν. Ακαμάτης, ibid., p. 104
\textsuperscript{58} Μ. Λιλιμάκη-Ακαμάτη, ibid., p. 200
\textsuperscript{59} Μ. Λιλιμάκη-Ακαμάτη – Ν. Ακαμάτης, ibid.
\textsuperscript{60} Ibid., p. 106
\textsuperscript{61} Μ. Λιλιμάκη-Ακαμάτη, ibid.
1.2. Thessalonike (pl. 25)

Describing Thessalonike in Hellenistic period consists a major problem, because later building phases have destroyed remain from this periods. On the other hand, literary sources don’t speak analytically for the city and its topography during the first centuries of its existence, so archaeology is the only factor that can provide answers, till one point, to our questions. One such example is the case of the bath complex, discovered in 1995 in the SE corner of the Roman Agora in the centre of the city (modern Φιλίππου & Αγνώστου Στρατιώτου streets), during the enhancement of the archaeological site, unknown by literary sources or epigraphical data. Its find is a true challenge that can give a push to scientific research concerning the city topographic in Hellenistic times62.

1.2.1. Description of the bath complex

In the heart of the excavated area a circular room (diam. 7.50 m), a rotunda like in Pella, was revealed [pl. 26b (a), 27]. Its pavement was decorated by white tesserae of unequal size put inside a gray layer of mortar and placed in zones in the perimeter of the rotunda’s centre, a circular, stone construction in opus caementicium (diam. 1.20 m), and upon the pavement 25 individual tubs disposed around the centre of the room. The individual tubs were of small dimensions, stone, bricks and marble pieces were applied in them and they were plastered by hydraulic mortar in the finishing, where a circular deepening is visible63.

To the North of the rotunda a rectangular room (7.60 X 5.35 m) was found connected to it by a common doorway [pl. 26b (e), 28-29]. The North wall (width 0.90 m) of the rectangular was the external one of the bath complex and on the same time the limit of the building block. The lack of entrance opening in it forces us to seek such one on the East or the South side of the building. One the interior of the room there was a pavement similar in its construction to the previous one on the rotunda differentiating in its arrangement: in the present pavement the tesserae were

set in parallel to the length axis of the room and their shade varies from grey to white through blue and green.\textsuperscript{64}

To the East, sharing a common wall with the rotunda without communication in between via an opening, in a higher level than the rotunda itself another space was identified of a possibly hexagonal form [pl. 26b (ζ)], although its Eastern half proceeds under the modern street and its Southern part was destroyed by modern constructions. The pavement of the space was initially plastered by mortar and white stone pieces, just like the pavement of the rotunda, but later on a thick layer of hard hydraulic cement covered the previous one and square terracotta slabs were inserted into it.\textsuperscript{65}

On the other side of the rotunda, to the SW, a new, but smaller, circular space inscribed in square was excavated [pl. 26b (α)], bearing a low brick wall (maybe a later phase).\textsuperscript{66} A brick pipe [pl. 26b (β)] of considerable height following an Eastern direction led from a kiln to other spaces of the bath in order to heat them by the gases produced in high temperature inside a kiln.\textsuperscript{67} Such a rectangular space was found to the East of the circular SW space [pl. 26b (γ)]; on its North a circular well was traced\textsuperscript{69}.

1.2.2. Use of the various spaces of the building

The best preserved room of the complex is the rotunda [pl. 26b (δ)]. The small size and dimensions of the individual tubs clearly indicates that the bathers were seated (pl. 49a) in there or they were standing inside, before they’ve been washed away. But the rotunda was not heated by a nearby kiln. The circular construction in its centre had maybe to do with the heating of the room: either same kind of hearth was installed there or heated stones, adding successively boiled water. In both cases the result should be the production of steam, so the rotunda construction was a steam


\textsuperscript{66} Unfortunately a part of this construction is covered by modern Philip Street and it is lost forever.

\textsuperscript{67} Its East part was destroyed in modern ages.

\textsuperscript{68} Π. Αδάμ-Βελένη, «Ανασκαφικές Εργασίες. Νομός Θεσσαλονίκης. Θεσσαλονίκη. Αρχαία Αγορά» in AA 51 (1996) Β2 Χρονικά, p. 423

\textsuperscript{69} Α. Ουλκέρογλου, Οι λουτρικές εγκαταστάσεις στη Μακεδονία κατά τη ρωμαϊκή αυτοκρατορική και την πρωτοβυζαντινή περίοδο Α´ (Θεσσαλονίκη 2016), p. 132
room\textsuperscript{70}, like the third phase rotunda at Pella. An alternative interpretation of the central circle is the positioning of a pillar supporting the roof like in the bath at Philippi, but even if this is the solution, the result still remains the creation of steam by the nearby spaces\textsuperscript{71}.

The heating of the bath is due to a kiln making part of a greater system, located in the second circular room of the complex to the SW of the rotunda, which is the praefurnium according to the excavator’s initial publication [pl. 26b (α)]. Nevertheless, the finding of a part of a brick pillar was interpreted as part of the substructure, where the floor was based (the support of an arch) and also had been heated from underneath. After this explanation the SW circular room was a (dry) sweat bath and the kiln should have been placed to its West\textsuperscript{72}. If such the case, then the kiln wouldn’t served for heating the water\textsuperscript{73}: in fact, the high temperature provoked by the burning was conveyed through pipes [pl. 26b (β)] to the spaces of the bath complex, the circular SW sweat room and the rectangular space to the East [pl. 26b (γ)]. This and the covering of its walls by hydraulic mortar led to the identification as a swimming pool for hot bathing\textsuperscript{74}. However, it must be stressed the destruction of the major part of the bath by later constructions, such as the Roman Forum (middle of 2nd cen. AD), so some remarks should be confronted with caution\textsuperscript{75}.

\textsuperscript{70} Π. Αδάμ-Βελένη, «Ανασκαφικές Εργασίες Νομός Θεσσαλονίκης. Θεσσαλονίκη. Αρχαία Αγορά» in ΑΔ 52 (1997) Β2 Χρονικά, p. 632; Π. Αδάμ-Βελένη, «Βαλανείο προγενέστερο της Αγοράς Θεσσαλονίκης», ibid., p. 353-355. For the naming of the room as an ἐφυδρωτήριον, πυριατήριον or laconicum see the next part.

\textsuperscript{71} Π. Αδάμ-Βελένη, «Βαλανείο προγενέστερο της Αγοράς Θεσσαλονίκης», ibid., p. 353 n. 7

\textsuperscript{72} Π. Αdam-Veleni, ibid.; T. Fournet et alli, “Catalog” in S. K. Lucore-M. Trümper (eds), ibid., p. 301

\textsuperscript{73} Supporting this observation it could be said that the heating of the water took place near the kiln, the hottest place of the heating system (T. Fournet et alli, ibid.).

\textsuperscript{74} Despite the relatively small dimensions, which were made smaller on a latter period, when in the bottom a stone bench was built alongside its narrow side (Π. Αδάμ-Βελένη, ibid., p. 351 n. 1).

\textsuperscript{75} Π. Αδάμ-Βελένη, «Ανασκαφικές Εργασίες Νομός Θεσσαλονίκης. Θεσσαλονίκη. Αρχαία Αγορά» in ΑΔ 51 (1996) Β2 Χρονικά, p. 423. To be noted that the bath in the Roman agora has not been revealed to its entire surface for practical reasons, so the possibility that it was belonging indeed to a gymnasmium cannot be rejected (Π. Αδάμ-Βελένη, «Βαλανείο προγενέστερο της Αγοράς Θεσσαλονίκης», ibid., p. 358; Α. Ουλκέρογλου, ibid., p. 221, who supports this hypothesis, because of the general formation of the place, which aids the creation of baths with heating systems, its vast surface, where a gymnasmium could be developed, and the presence of water springs). But it has been also suggested (P. Adam-Veleni, ibid., p. 207) that the industrial district in the neighbor of the balaneion had been declined about the end of the 3rd cen. BC, succeeded by then and during the first half of the next by private houses. Serving the convenience of the inhabitants and the visitors from the harbor, a balaneion was built. When after the middle of the 2nd cen. BC the city was expanded Southwards, the balaneion was incorporated to the city inside its walls, so it should be associated by then with a gymnasmium.
Another swimming pool was identified to the East of the rotunda [pl. 26b (ζ)], again because of the mortar, which covered the surface. Given the fact that it wasn’t upon the air pipe [pl. 26b (β)], it was considered as pool for the cold bath\textsuperscript{76}.

The room to the North of the rotunda [pl. 26b (ε)] had not the features of a bathing space and it seems that it functioned somehow as a service facility. The finds\textsuperscript{77} unearthed there can help us to clarify its use: a great variety of daily use vases in clay (pl. 30a-b) and glass (pl. 30d) (cups, plates, amphorae, lamps, perfume bottles) and metallic objects (braziers, pots, ladles) for cooking, storage and transportation, copper coins and abundant bones (bovine or of birds and fishes) and sea-shells may lead to the conclusion that in the rectangular room a tavern was housed\textsuperscript{78}. Nevertheless, the lack of cooking facilities may indicate that the kitchen was located elsewhere, possibly to a next room Eastwards, and here the consumption and storage of food were taken place\textsuperscript{79}.

All these finds were traced on the ground-floor of the room. More important is the discovery of the upper layer of finds: among others there were revealed plastered fragments from walls and roof pieces, bearing the hydraulic mortar upon their back side, of a pavement in opus sectile. Only a few still preserve their colours and fewer were decorated after plant themes. Additionally, some fragments were decorated in both sides, so it could be said that there was existed an upper floor, divided in many rooms: the double face plastered fragments could belong to the partition walls. The existence of a floor is furthermore strengthened by the discovery of roof tiles between the plastered pieces\textsuperscript{80}.

The use of the floor can be result by the finds: lamps in various forms (pl. 30c), terracotta statuettes (pl. 31a-b) and clay theatrical masks (pl. 31c) in abundance, vases, a glass vase with relief decoration of Tyche holding cornucopia, a red-ware
skyphos with phallus-shaped spout (pl. 31d-e), a phallus image and two ithyphallic figurines (pl. 31f). It is plausible that it was the case of a “house of pleasures” or a luxurious brothel, given the erotic nature of same finds and the quality of others. It is known from literary sources that prostitutes frequented in baths in order to find clients though the archaeological attestation of a combined bath-brothel is not that easy.

1.2.3. Building materials

It will be repeated once more that the bath complex was excavated and revealed only partially, consequently we are still ignoring many things. As a result of this reality we can see also only in a certain degree the material used for the construction of the complex. So for the external, visible in the North wall of the rectangular room, rubble stones were applied, though it seems that in other spots schist stones were also used, connected by mud; the circular stonewall of the kiln room was mudded too, while the upper part of the rotunda was constructed by special designed bricks (0,292 X 0,43/0,482 m) in trapezoid form (their narrow side was curved).

For the interior spaces there no much to say. Stones, bricks and marble pieces were used for the individual tubs in the rotunda and they were plastered by hydraulic mortar; coloured gray, blue, light red, white and green square, triangular, polygonal and oblong tesserae were shaping the pavements on the rotunda and on the

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81 Ovidius, Ars Amandi, 3, 638-640; Martialis, Epigrams, 3, 93, 4; Lucian, Hippias, 4; Digesta, 3.2,4.2. Greek ancient writers of 5th–4th cen. BC are often negative to the bathing, because they considering it a decadent habit, a sign of voluptuousness and immorality, but there is connection in them to prostitution (I. Nielsen, ibid., p. 7).
82 The Suburban Baths at Pompeii preserve frescoes depicting various sex arts, at Herculaneum graffiti on the walls of the Suburban Baths leave erotic messages, at Ephesus’ Varius Baths a damaged inscription (Die Inschriften von Ephesos, teil II, 455) mentions the repairing of a latrine (θᾶκος) and a brothel (παιδισκεῖον). See G. Fagan, Bathing in Public in the Roman World (The University of Michigan Press 2005), p. 34-36, where sex and prostitution are discussed.
rectangular room to its North\textsuperscript{86}. Colour (white, blue, green and red) can also traced in the plastered fragments from the walls of upper floor of the rectangular, while a tile roof was covering the whole space. The pavement of the floor should have been covered by hydraulic mortar too\textsuperscript{87}. On the contrary, the limited quantity of roof tiles, found inside the rotunda after its collapse, indicates that the covering should have been made by a wooden roof under the condition that a double layer of plaster should have been applied for the protection of the whole space from moisture according to Vitruvius\textsuperscript{88}.

1.2.4. Destruction of the bath complex and its dating

The destruction of the Thessalonikan bath is due to an earthquake, which provoked a fire, burning completely the facilities. The seismic activity should be taken for granted, because breach sections were traced on the building. The collapse of the roof in the rectangular construction crushed the floor and the roof of the ground floor too and all the broken pieces were concentrated towards the centre of the ground floor. The ruins covered every object of the facility and among the two layers of destruction – one for each floor – there were also ashes, explaining thus the fire\textsuperscript{89}. The destruction layers were left intact, they didn’t remove, so the dating concerning the life and the end of the bath is secure. According to the collected pieces, mostly coins and sherds of black-glazed and West Slope pottery, the earlier of them could be dated towards the end of the 3\textsuperscript{rd} cen. BC. The destruction should be occurred during the reign of the emperor Vespasian (69-79) because of the coins found under his name\textsuperscript{90}. 

\textsuperscript{86} Π. Αδάμ-Βελένη, «Ανασκαφικές Εργασίες. Νομός Θεσσαλονίκης. Θεσσαλονίκη. Αρχαία Αγορά» in ΑΔ 53 (1998) Β2 Χρονικά, p. 551

\textsuperscript{87} Π. Αδάμ-Βελένη, «Ανασκαφικές Εργασίες. Νομός Θεσσαλονίκης. Θεσσαλονίκη. Αρχαία Αγορά» in ΑΔ 53 (1998) Β2 Χρονικά, p. 550; Π. Αδάμ-Βελένη, «Βαλανείο προγενέστερο της Αγοράς Θεσσαλονίκης», ibid., p. 357

\textsuperscript{88} Π. Αδάμ-Βελένη, «Ανασκαφικές Εργασίες. Νομός Θεσσαλονίκης. Θεσσαλονίκη. Αρχαία Αγορά» in ΑΔ 52 (1997) Β2 Χρονικά, p. 632

\textsuperscript{89} More or less the same situation stands for the rotunda, but the examination of the finds inside the rectangular is more interesting because of their variety and their quantity, offering this way a larger sample for study, so the extraction of conclusions is safer, exactly due to the extension of the pieces.

\textsuperscript{90} P. Adam-Veleni, ibid., p. 206-207. This proposed dating consists a review of the previous one [Π. Αδάμ-Βελένη, «Ανασκαφικές Εργασίες. Νομός Θεσσαλονίκης. Θεσσαλονίκη. Αρχαία Αγορά» in ΑΔ 52 (1997) Β2 Χρονικά, p. 632; Π. Αδάμ-Βελένη, «Βαλανείο προγενέστερο της Αγοράς Θεσσαλονίκης», ibid., p. 356; Π. Αδάμ-Βελένη, «Ανασκαφικές Εργασίες. Νομός Θεσσαλονίκης. Θεσσαλονίκη. Αρχαία Αγορά» in ΑΔ 53 (1998) Β2 Χρονικά, p. 550] about a century later. Except the finds, it supposed that the general idea, reported to n.75 about the development and the expansion of the habitat in this district about the same era, i.e. the end of the 3\textsuperscript{rd} cen. BC, gets this date stronger. But, if the expansion and the transformation of the ex industrial district into a residential zone began then, it should be expected that a balaneion wasn’t built immediately. Given the extra muros nature of this zone about the end of the 3\textsuperscript{rd} cen. BC, it should have passed a short period of time – entering into the 2\textsuperscript{nd} cen. BC – before the regularization of life into the new neighborhood.
2. Baths in public buildings

As it has been exposed previously, it possible to trace bathing construction as part of other buildings, like the gymnasia. A famous case in Macedonia is that of Amphipolis, where a late Hellenistic gymnasium hosts among others a bathing establishment. A somewhat more complicated case concerns Pella and its palace. In fact, we have there a palace complex, where various facilities are combined. One of them is the palaestra for the training of the king and the members of the royal court with an adjacent bath. Because of the gigantic size of the palace, a populous personnel and staff lived inside there, having bathing facilities apart, so a second bath was also revealed. For this reason a brief presentation will takes place now, beginning once more from Pella.

2.1. Baths in the palace complex of Pella (pl. 6)

The palace (pl. 32a) is located in the middle of three small hills, which delimit Pella from the North, and it is 370 m distant from the last building blocks. Its nucleus consists by four building (I-II, IV-V) in the East side of the plateau. The gymnasium (pl. 32b) is situated in building V (the NW of the nucleus), but its bathing facilities (the “Big Baths”, called this way because of their dimensions) share the NW part of the nearby building IV on the NE of the palace’s nucleus. On the other hand, the modest “Small Baths”, destined for the personnel, belong to building VI to the West of building V.

2.1.1. The “Big Baths”

Building V is considered the palaestra (70 X 60 m) for the training of the palace’s distinguished inhabitants. In the centre a spacious courtyard (40 m N-S X 50 m E-W) was limited by a wooden peristyle. Behind the North stoa an oblong corridor had been formed and behind it the rooms for the needs of the palaestra were built. In the middle should have been placed the ἐφηβείον, a teaching room, and to its West the ἀποδυτήριον (changing room), the ἀλειπτήριον (the chamber where the athletes smeared their bodies with oil), the ἐλαιοθέσιον (where the oil was kept) and on the NW corner maybe the facilities for the tepid and hot bath; on the East of the ἐφηβείον the κονιστήριον or κονίστρα, the space for the wrestling training, next to it the
κωρυκείον for the boxing training and to the NE corner the swimming pool for the cold bath\textsuperscript{91}.

The NE corner of the building V – named space Δ (13,30 X 8,50 m) – was divided according to its morphology to the higher North part, where the swimming pool was constructed (pl. 33b), and to the lower paved South part. The bedrock was initially curved and consequently lay out with limestone slabs plastered in the end by strong hydraulic cement in order to create the pool (7,50 X 5,00 X 0,95 m), which enriched with a staircase on the NW corner for the ascent and descent in there and with a circular hole for its cleaning on its West side\textsuperscript{92}. To the lower South paved space (width 3,60 m), remains of brick constructions were traced, belonging possibly to the lower part of a wooden building, where the necessary accessories for taking the bath were warehoused\textsuperscript{93}.

To the East of the swimming pool was an open cistern (external dimensions: 9,50 X 1,90/1,60 X 2,60 m, pl. 33a, 34a), curved in the bedrock on the NW corner of building IV. Although its function should have been the supply of the pool with water, the exact way of such a function is not clear\textsuperscript{94}. Southwards of the cistern an underground room (numbering E) was revealed after curving the bedrock (9,50 X 13,00 m) on the East of the swimming pool (pl. 33a, 35)\textsuperscript{95}. The underground basement was pillared (34b-c): the West row of stone pillars preserved four of them in situ, the East one only one, while the existence of one more row furthermore to the West should be discussed\textsuperscript{96}. The strength and durability of the stone pillars were capable to support the overlooking pavement of the ground floor\textsuperscript{97}. The whole area – the swimming pool and the South paved room (building V, space Δ) and the underground room (building IV, space E) – should have been roofed\textsuperscript{98}.

Buildings V and IV are divided by a long corridor leading Northwards to the underground room\textsuperscript{99}. Despite the two spaces are divided by a common partition wall,

\textsuperscript{92} Π. Χρυσοστόμου, «Λουτρά στο ανάκτορο της Πέλλας» in AEMΘ 2 (1988), p. 117
\textsuperscript{93} Ibid., p. 118
\textsuperscript{94} Β. Μισαηλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας» in AEMΘ 3 (1989), p. 67-68
\textsuperscript{95} It lacks the wall on the North side of the room upon the brow of the bedrock.
\textsuperscript{96} Β. Μισαηλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας, Τομέας “Υπόστυλου Δωματίου”» in AEMΘ 2 (1988), p. 103-104
\textsuperscript{97} Β. Μισαηλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας, Τομέας “Υπόστυλου Δωματίου”», ibid., p. 71
\textsuperscript{98} Πάυλος Χρυσοστόμου, ibid., p. 118-119
\textsuperscript{99} Β. Μισαηλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας, Τομέας “Υπόστυλου Δωματίου”», ibid., p. 103
by two rows of blocks, there is no access from the one to the other. Nevertheless, the vicinity between of them, the connection between the pool, the cistern and the underground room and the similarities of construction between the latter two show explicitly a common architectural program\textsuperscript{100}. Comparing the form of the underground room with other known examples it could be cautiously said that it is a forerunner of a hypocaust heating system. The construction of these facilities could be dated during the reign of Cassander (306-297 BC), so the chronological distance to the first certain hypocaust, that of Gortys in the Peloponnese about the middle of 3rd cen. BC, is not so far\textsuperscript{101}. If this is the case, then room A and corridor Z to the South should be related to it and the heat supply, Z functioning as an air duct\textsuperscript{102}.

2.1.2. The “Small Baths”

Building VI is placed on the NW side of the palace, to the West of building V (pl. 32a, 36a). A corridor orientated N-S divides it into two sections, VIa and VIb to the East and West respectively (pl. 36b); main feature of both sections is the presence of a peristyle courtyard (pl. 36c). About in the middle of the North side of building VIb’s peristyle is located a space composed by rooms I-IV (pl. 36d), the “Small Baths”, surrounded by other rooms and corridors. Room I (4,40 X 3,00 m) lies in the extreme South. On the NW part of the pavement, covered by hydraulic cement, an individual bath-tub (1,70 X 0,20 m) from limestone was found: it was boxed inside the pavement and placed in parallel to the North wall of the building, almost touching it. Its bottom and the edging were plastered. The cleaning of the tub from impure water was facilitated by a clay pipe connected to the tub trough a hole on its bottom. Room I gave access to room II (2,15 X 2,70 m) to its NE. The pavement here was also plastered by hydraulic cement and alongside its South wall a bench was curved. To the North this room communicated with room III (3,05 X 3,10 m), having a plastered by mortar pavement, where a triangular base was built, upon which a wooden (triangular) table should be put for the required staff during bathing\textsuperscript{103}.

\textsuperscript{100} Β. Μισιμιλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας», ibid., p. 70
\textsuperscript{101} Β. Μισιμιλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας. Τομέας “Υπόστυλου Δωματίου”», ibid., p. 108-109; Π. Χρυσοστόμου, ibid., p. 119; Β. Μισιμιλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας», ibid., p. 71
\textsuperscript{102} Ibid., p. 71. Of course this is a preliminary evaluation. Differences still exist like the unequal, circular, form of the Gortys’ bath or the constructive details, such as the sparse formation of the pillar (ibid).
\textsuperscript{103} Π. Χρυσοστόμου, «Το Ανάκτορο της Πέλλας», ibid., p. 110-112
To the West of II and III, room IV (5.70 X 2.15 m) was lied. On the partition wall to room III, about in the middle of its length, a semicircular furnace (1.50 X 1.00 X 0.50 m) was walled. Although a part of it was based on the floor of room III, it was closed from that side: its only opening can be seen from the West, that is, from room IV, because it was fed from there. From this construction only its lower part is still preserved: it was fabricated by tile pieces and hydraulic mortar and for the pavement stones were applied covered with mortar, upon which three rectangular sandstone bases were holding a brazier. Alongside the South and the West walls benches have been constructed for the placement of copper utensils and fuel. The heated water should be carried over from the brazier to the tub, so a doorway way should be existed on the South wall of room IV towards room I, despite the absence of a visible opening. But the main function of the brazier was the creation of steam, so room IV was a πυριατήριον (or steam room, pl. 36e)\textsuperscript{104}.

The humble construction of the bath, its limited space and its position to the perimeter of the palace complex justify its attribution to the servants of the court for the fulfillment of their needs and the preservation of hygiene conditions. According to the pottery finds and the coins these baths could be dated during the reign of Antigonus II Gonatas (277-239 BC)\textsuperscript{105}.

2.2. The gymnasium of Amphipolis

The late Hellenistic gymnasium of Amphipolis is situated on the SE side of the city (pl. 37, 38) and its main section was the poros constructed palaestra (47 X 36 m) in Doric order and isodomic masonry, having a central peristyle courtyard (15,50 X 25,50 m) with two entrances, the principal (and monumental) one on the East side and a secondary on the West. Rooms were founded along the four sides of the courtyard, but the most certain identification concerns the two ones on the corners of the North side\textsuperscript{106}.

The room on the NE corner [12,17 X 7,10 m, pl. 38a (ε), 38b (ζ), 39] is better preserved (and the larger one) and it has clearly to do with a bathing establishment. Its floor is paved and marble benches on three of the wall (E, N, W) have to support marble bathtubs. Four of them were found alongside the South wall and originally they had been situated upon the benches before they got removed. The water arrived

\textsuperscript{104} Ibid., p. 112-113
\textsuperscript{105} Ibid., p. 113
\textsuperscript{106} Κ. Λαζαρίδη, «Το γυμνάσιο της αρχαίας Αμφιπόλεως» in ΑΕΜΘ 1 (1987), p. 314-315
in the room through a lead tube and a semicircular plastered channel was carved on the North wall giving water to walled spouts, which were destined to fill the tubs. Clay pipes were found also in the room on the NW corner [(7,15 X 7,10 m, pl. 38a-b (ζ)], which is extremely destroyed, but can be deduced that its structure was similar to that of the NE room: the same watering channel is still visible on the North wall, supplying water the tubs through walled spouts. From these tubs, however, nothing remains but traces of their positioning on the wall. The entrance to the room was placed on the South and through it a carved ditches removed the water to a clay pipe on the exterior of the entrance. The clay pipes are led to a larger curved pipe in front the monumental staircase of the East entrance, serving as main draining one of the palaestra107.

For the water supply of the palaestra a facility was constructed (16 X 8 m) about 25 m from its NW corner Northwards (pl. 38a). A long corridor led to this facility, in which poros and isodomic masonry were also applied. Its interior was divided to eight rooms, however the use of all of them isn’t clear. We know for sure the existence of two continuing cisterns (4,60/4,75 X 2,50 X 0,42 m per each) to its West part (pl. 38a, 40). The creation of the two cisterns is due to a wall oriented E-W, which divided in two the once single square cistern; hydraulic mortar and coloured pebble had covered the walls and the pavements respectively. Two vertical walls (N-S) cut the horizontal one (E-W), creating this way four narrow spaces (2,00/2,58 X 1,15/1,27 X 0,85 m) on the external corners of the double cistern, but their use is not identified; maybe it is the case of smaller cisterns, because a lead tube (diam. 0,09 m) was revealed on the NW side of the facility, or of two corridors surrounding the large cisterns. In general, the whole construction, contemporary of the Hellenistic palaestra, should be a bath outside it, a kind of a swimming pool, given the fact that the internal, individual, shallow tubs were inconvenient and insufficient for a comfortable immersion bath108.

The Hellenistic phase of the gymnasium ends during the first half of the 1st cen. BC, when the city was attacked by Thracian tribes. Many buildings were destroyed and the signs of this disaster (fire and plundering) can been seen. During

107 Κ. Λαζαρίδη, «Ανασκαφές και έρευνες στην Αμφίλοπη» in ΠΑΕ 1984Α, p. 35; Κ. Λαζαρίδη, «Ανασκαφή Γυμνασίου Αμφιπόλεως» in ΠΑΕ 1985, p. 71; Κ. Λαζαρίδη, «Το γυμνάσιο της αρχαίας Αμφιπόλεως», ibid., p. 315

the reign of Augustus (27 BC-14 AD) it was rebuilt until the middle of the 1st cen.,
when it was abandoned after a firing\textsuperscript{109}.

3. Baths in other places, under other occasions

A puzzling situation till today concerns the palace of Vergina/Aegae and the
lack of a bathing establishment there. In is very peculiar, indeed, the fact that in the
ceremonial palace of the royal dynasty, where the king, his court and hosts sojourned
for several days banqueting and feasting, baths haven’t been discovered yet, unless
this fact is due to pure luck; though baths should have been existed. Probably the
answer can be given by the SW wing of the palace\textsuperscript{110}: in its angular SW room 1969β
(pl. 41, 42a) fragments of a clay (individual) bath-tub were found and a hole on the
pavement, where an amphora was disposed\textsuperscript{111} – its pieces were discovered too – as it
was the common habit concerning the individual tubs, known also from the baths at
Pella and Thessalonike. The belief that the SW section of the palace, in connection to
the bath-tub, hosted a bathing establishment gets stronger after the tracing of two clay
water pipes [the one orientated N-S under the pavement of the room 1969α on the NE
corner of the NW section (pl. 41.1), the other mounted on the West, external wall of
the room 1969δ (pl. 41.2)] and a stone drain one from the peristyle of this wing
Westwards (pl. 41.3, 42b)\textsuperscript{112}. All these constructions attest the care taken for the
hygienic conditions and for the watering of the palace\textsuperscript{113}.

The presence of a single tub can be observed for the first time in Macedonian
soil in some private houses at Olynthus of the Classical period (pl. 42b). Beside a
room with a chimney, a small bath was disposed, where a clay tub was arranged in
order to bathe in a seated position; the warm up of the water was prepared
in the chimney-room or in a hearth on the centre of the bathing room\textsuperscript{114}. During Hellenistic
era such rooms with a tub for cleansing were found at the late 4th-early 3rd cen. BC
settlement of Lefkopetra (pl. 43a)\textsuperscript{115}, at Amphipolis (pl. 43b) of the same dating\textsuperscript{116}
and at Thessalonike\textsuperscript{117}.

\textsuperscript{109} Ibid., p. 316
\textsuperscript{110} Π. Χρυσοστόμου, «Λουτρά στο ανάκτορο της Πέλλας», ibid., p. 120
\textsuperscript{111} Γ. Μπακαλάκης-Μ. Ανδρόνικος, «Ανασκαφή Βεργίνης» in ΑΔ 25 (1970) Β2 Χρονικά, p. 390
\textsuperscript{112} Ibid., p. 393
\textsuperscript{113} Α. Κατάφα, ibid., p. 271-272, 285
\textsuperscript{114} W. Müller-Wiener, ibid., p. 182; W. Heerfner et alii, «Η εποχή των Ελλήνων» in W. Heerfner
(ed.), Ιστορία της κατοικίας 5000 π.Χ.-500 μ.Χ. (Θεσσαλονίκη 2005), p. 288
\textsuperscript{115} Α. Στεφανή, «Η οργάνωση του χώρου σε μία ημιορεινή περιοχή του Βερμίου: το παράδειγμα της
Λευκοπετρας Ημαθίας» in ΑΕΜΘ 16 (2002), p. 537

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In many cases the problem concerning the identification of bathing facilities in private houses is related to the existence of a presupposition, meaning the creation of great watering and draining infrastructures. In the Hellenistic cities of Petres (pl. 43c), Florina and Aiane (pl. 43d) such water and drain pipes, fountains, cisterns and wells and rooms paved with hydraulic cement have been excavated\(^\text{118}\), but it isn’t necessary that all these prove without any doubt the existence of baths in private houses; the consist just an indication. On the other hand it is clear enough that people were concerned about the worth living conditions on their cities, so they took the necessary measures for the water supply and the cleaning in their establishments\(^\text{119}\).

In other cases, the problem of the preservation of bathing facilities in private houses can be focused in their simple form, because a single tub inside a small dimensioned room, availing a water and drain system, was sufficient to cover the hygienic needs of the inhabitants. However, if the tub is missing\(^\text{120}\), the bathing nature of the facility is not always evident only by the single architectonical elements. A more or less similar situation can be detected at Pella, where small rooms, usually disposed in the perimeter of a house, with drain pipes, pavements and walls having benches and covered by hydraulic mortar can be confused with cisterns\(^\text{121}\). Such a situation stands for the North part of the block, where the “palstered house” was built (pl. 6.3, 44): on the West of the andron, a room (5,10 X 2,50 m) was paved with strong hydraulic cement. On its East part a shallow cavity in the pavement bearing an overhead edging probably was served for the gathering of the water, which cleared out into a central drain pipe. The partition wall to the next East room was covered

\(^{116}\) An intact individual tub was found at the South of the ancient city inside a room (4,35 X 2,30 m) of a house with careless built masonry (Δ. Λαζαρίδης, «Ἀνασκαφαί καὶ ἐρευναὶ εἰς Ἀμφίπολιν» in \textit{ΠΑΕ} \textbf{1965}, p. 48). On the Westernmost edge of the ancient city a 4th cen. BC house was revealed with two rooms (α, β) and a corridor (γ) on their East; on its SE (internal) corner a tub was found in pieces (Δ. Λαζαρίδης, «Ἀνασκαφαί καὶ ἐρευναὶ εἰς Ἀμφίπολιν» in \textit{ΠΑΕ} \textbf{1971}, p. 54).

\(^{117}\) In the corner of 20 Sophokleous Street & Halicarnassou, where a late-Hellenistic building in rubble stone of at least five spaces was excavated. The tub (2,00 X 1,40 X 0,80 m) was found in the NW space of the field, was carved in the bedrock and covered by white plaster and had its corners curved [Ν. Καρύδας, «Ἀνασκαφικές εργασίες. Νομός Θεσσαλονίκης. Θεσσαλονίκη. Οδός Σοφοκλέους 20» in \textit{ΑΔ} \textbf{53} (1998) Β2 Χρονικά, p. 615].

\(^{118}\) Π. Αδάμ-Βελένη, Πέτρες Φλώρινας (Θεσσαλονίκη 2000\(^2\)), p. 46, 50, 52; Μ. Ακαμάτη-Διλιμπάκη – Ι. Μ. Ακαμάτης, \textit{Η ελληνιστική και ρωμαϊκή περίοδοι στη Μακεδονία Ι} (Θεσσαλονίκη 2008), p. 18-23 (Petres), 24-25 (Florina), 36-38 (Aiane).

\(^{119}\) Α. Γ. Καϊάφα, \textit{Συστήματα ύδρευσης και αποχέτευσης κατά την ελληνιστική και ρωμαϊκή περίοδο στη Μακεδονία Ι} (Θεσσαλονίκη 2008), p. 275-276

\(^{120}\) Ibid., p. 276

\(^{121}\) Μ. Λιλιμπάκη-Ακαμάτη, «Λουτρικές εγκαταστάσεις στην Πέλλα», ibid.
internally with the same kind of cement. A marble tub was destined to serve the bathing necessities of the inhabitants, however it was collected from the area of the East cemetery.

Maybe belonging to a public building was another clay tub, found on the block 3 of the sector I, between the houses of Helen’s rapture and Dionysus (pl.6.6, 44). Although the buildings excavated on the North and South sides of this block were characterized as private houses, the presence of a round and a niche construction inside the North building and the existence of a square-planed fountain with its underneath watering pipes on the South may indicate the public nature of this area, which conventionally was considered the gymnasium (or palaestra) of Pella. A fountain on the middle of the North stoa and this tub are the only scarce evidence of bathing facilities (including the water pipes) in the so-called Gymnasium. The strictly rectangular shaping of the tub is early enough and it is dated about the third quarter of the 4th cen. BC. Its form is closer to the tubs of Olynthos than those curved of Amphipolis and Lefkopetra of 3rd-2nd cen. BC.

An indubitably public building at the SW part of the archaeological site of Pella is the sanctuary of the healing god Darron (pl. 6.2, 45a-b) with an early dating since the end of the 4th or the beginning of the 3rd cen. BC. The area is divided in East and West sections by a long wall oriented N-S; alongside a pipe was placed. The entrance of to the BW section was made by a paved street to the West. Three bipartite spaces were contacted directly to the street. The Westernmost of them had a cistern on its SE angle. The tile wall and the pavement were covered by hydraulic cement (pl. 46a). Behind the third space a courtyard was shaped with a well (pl. 46b). On the SW part around the large courtyard rows of rooms were disposed on the South, East and North sides: inside one of them on the North, with a pavement covered by hydraulic cement, an individual tub was revealed (pl. 46c). On the SE part another atrium was organized bearing a horseshoe-shaped fountain. The bathing nature of this part of

122 M. Λιλιμάκη-Ακαμάτη, «Νέες ανασκαφές στην Πέλλα» in ΑΕΜΘ 14 (2000), p. 408 n. 10
123 M. Λιλιμάκη-Ακαμάτη, «Λουτρικές εγκαταστάσεις στην Πέλλα», ibid., p. 396
124 Χ. Μακαρόνας, ΑΔ 16 (1960) Πίνακες, pl. 88
126 Α. Γ. Καλώφα, ibid., p. 210, 250
the sanctuary is getting stronger by the features of its patron deity as a healing god: in comparison with other similar cases, like the cult dedicated to Asklepios, water and purging occupied a crucial role on the rituals practiced in there.128

The cult of Darron was not, of course, the only one connected to water. A series of others, like in honour of Asklepios or of Isis at Dion, were also linked to this element, but their dating concerns mostly the Imperial times. Nevertheless, during Hellenistic period the sanctuary of Egyptian gods at Thessalonike attests the presence of water.129 Although the epigraphic evidence is relatively late, of 37/36 BC, clearly reveals the existence of an “ὑδρῆον”, a non monumental fountain of different form wherever excavated.131 The importance of the information is that this “ὑδρῆον”, though not a bath, can be related to ritualistic purifications and ablutions like those of the gymnasia.

128 Ibid., p. 90. Μ. Λιλιμπάκη-Ακαμάτη, «Λουτρικές εγκαταστάσεις στην Πέλλα», ibid., p. 395-396 is referring to the connection of other sections of the sanctuary, especially the restaurant, where some cisterns were unearthed, to the functioning of the baths, but in Μ. Λιλιμπάκη-Ακαμάτη, «Ένα νέο κτιριακό συγκρότημα στην περιοχή του καναλιού της Πέλλας» in ΑΕΜΘ 9 (1995), p. 114 the role of the cisterns is entirely related to the water needs of the restaurants. I believe that a restaurant has such needs, so the reference to baths is not the only explanation.

129 A Serapeion at Thessalonike is attested epigraphically (IG X 2.1, 3) during the reign of Philip V (221/220-179 BC) and archaeologically during the Hellenistic period despite the lack of publication especially of the first excavation season of 1917 [for that of 1939 see Χ. Μακαρόνας, «Ἀνασκαφαί καὶ ἔρευναι κατά τὸ ἐτος 1939» in Μακεδονικά 1 (1940), p. 463-477].

130 IG X 2.1, 83

PART II
COMPARING GREEK AND ROMAN BATHS

In order to extract some clues about the functioning of the Greek-type bath, a comparison with the Roman one will be made. It is true that Romans perfected baths and gave a decisive push to bathing culture, but Greeks were the forerunners. Does that mean that they influenced the Romans? And, if the answer is affirmative, till which point? For finding out, a comparison between the two types is necessary. It is needless to say that the Greek type was not a fixed one from its origin, but it underwent through time an evolution process from improvising to elaboration in form and technology.

1. The Greek bath

As it was said previously, bathing facilities in the ancient Greek world can be seen as a part of the gymnasia and independently, as baths per se, the balaneia. To begin with, the starting point will be the first category: not only the earliest survived examples of baths come from gymnasia, but, in addition to that, many of its spaces can also be found in the balaneia, so the problematic is more or less common.

1.1. Baths on gymnasia complexes

1.1.1. Some general remarks

Physical exercise in ancient world required a body covered by oil and dust before the athlete go to the sports ground, so after that a bath was necessary for the removal of the muddy mixture (pl. 2)\footnote{The results of a hot bath are more drastic, but we lack archaeological evidence, at least for earlier periods (F. Yegül, ibid., p. 21).}. In the Archaic gymnasium a fixed establishment was not available and bathing was exercised either in close rivers and in nearby fountains or in transportable individual tubs. We lack information also for the form during the 5th cen. BC, it seems, however, that an evolution was occurred: the first known gymnasium, that at Olympia (pl. 4b), can be dated around 400 BC and it presents a well organized structure with fixed facilities. From now on and during Late Classical and Hellenistic times, the gymnasium will be monumentalized complexes with a palaestra and running-tracks. These tracks were covered (ξυστοί) or open (παραδρομίοι) ones and were destined for running training and games (pl. 4a). On
the other hand, the palaestra was a sporting field organized around a colonnaded courtyard, bearing stoas with rooms on one or more sides\footnote{I. Nielsen, ibid., p. 10; Χ. Μπούρας, ibid., p. 319-320. The connection between the palaestra and the running-tracks depended mostly on the morphology of the terrain: the tracks in the palaestrae of Olympia, Delos and Priene seem like and extension of it and they disposed next to it, meanwhile at Delphi they are arranged on a parallel terrace above the palaestra (F. Yegül, ibid., p. 17).} The sporting area was the cause of the palaestra’s existence, where training was exercised in the centre of the tamped soil courtyard. Behind the stoas of this courtyard, were arranged rooms having to do with the facilities of the establishment: a changing room (ἀποδυτήριον), an anointing room (ἄλειπτήριον), a cold water bath (λουτρόν) and sometimes a pool (κολυμβήθρα), a sweat bath (πυριατήριον), a wrestling training room (κονιστήριον) and a boxing training room with the punching ball (κωρυκείον)\footnote{I. Nielsen, ibid.}.

1.1.2. The Vitruvian perception of Greek gymnasium

A major literary source of knowledge concerning the form and the plan of the gymnasium is the work \textit{De Architectura}\footnote{V, 10 (bathes)-11 (palaestrae)} of the architect and theoretic Marcus Vitruvius Pollio (80/70-after 15 BC). His writings, however, must be accepted in a general view, because the terminology he uses isn’t verified by epigraphic data and the described planning doesn’t find always an archaeological correspondence to the excavated gymnasia. In order to explain this contradiction, we have to imagine that either Vitruvius in writing has in mind one specific building he had seen once (in South Italy?) either he produces a pure theoretical approach, a synthesis of all kinds of gymnasia. It is also important to keep in mind that Vitruvius writes towards the end of the 1st cen. BC and he addresses to a Roman public. The use of modern terms and, more important, of technology and habits of his own time is more than apparent, when he attributes the advance heating and bathing systems used by the Romans to Greek baths. On the other had about that time many gymnasia underwent significant changes, influenced by Roman innovations\footnote{F. Yegül, ibid., p. 14, 21}.

According to Vitruvius’ description the most important room of the palaestra was the \textit{ephebeum}, where the young athletes met, placed on the centre of one of the colonnaded sides. To its right he describes the \textit{coryceum} (where the punching bag was, useful for boxing training), the \textit{conisterium} (for dusting the body before training) and the \textit{loutron} (for the cold bath). On the other side he proceeds with the \textit{elaeothesium} (for oil keeping and anointing the bodies with it) and a section for cold
and hot bath consisting by the frigidarium (the cold water pool), the concamerata sudatio (hot and wet-steam room, covered by a barrel vault), the laconicum (a round domed hot and dry-steam room) and at the end the calda lavatio for the warm bath137.

1.1.3. The elements of the gymnasium (based on archaeological evidence and literary sources)

Ἀποδυτήριον. The changing room should be always present. Physical exercise in ancient world happened always in a naked way, so the athletes should be changed their cloths somewhere and put them on again before their departure. The problem is that in the majority of cases this room is not easily identifiable, because it doesn’t bear some characteristic marks allowing the notice of its use. Benches and shelves should be such an element, but the preservation of the revealed walls usually doesn’t go after the foundation line, so identifying a changing room consists mostly a problem138.

Λουτρόν. The training in naked results necessarily the cleaning of the body after that and bathing was obligatory, so as the construction of baths. The Archaic practice consisted on an improvised way of bathing, when man was adopted to the environment and its sources. Fixed establishments were out of the question apart from the transportable means and, maybe, a fixed, elevated, round basin (pl. 48d). Iconography in vases is very useful in order to understand, how things worked back then (pl. 48a-c)139. The Late Classical and Hellenistic continues the Archaic tradition, however changes happen: now the gymnasium and its bath take an organized, housed form and the simple, round basin slowly is abandoned, replaced by rectangular tubs, which are easier to arrange the one by the other140.

According to the evolution, the gymnasium bath was housed in a rectangular room and in its walls were placed the tubs in rows and in a sink level, called “ληνοί”141. The water was poured either from spouts on the walls142 or by vessels,

137 Ibid., p. 15, 21. To be noticed the absence of a changing room.
138 I. Nielsen, ibid.
139 J. Delorme, ibid., p. 304, 307; R. Ginouvès, ibid., p. 126, 128
140 R. Ginouvès, Balaneutiké, ibid., p. 130-131
141 I. Nielsen, ibid., p. 10-11. For the naming, originating from Delian inscription (IG, XI, 2, 159, A, l. 46), see J. Delorme, ibid., p. 306 and R. Ginouvès, ibid., p. 132. Following R. Ginouvès, Dictionnaire Méthodique l’architecture grecque et romaine, III, ibid., p. 101 the “ληνοί” were destined to a hip baths: the bather was seated and only a part of his body was covered by the water. See also n. 160.
142 I. Nielsen, ibid., p. 11
carried by servants\textsuperscript{143}. The position of the bath, usually in the one of the corner of the North side, was not accidentally\textsuperscript{144}: on the contrary, it was a well calculated action, meaning to facilitate the water supply and drainage. Given the fact that the watering was more convenient from the corners, the bath was located there. The only exception to this spatial organization is given by the gymnasium of Delphi, which preserves some Archaisitic features and retains the loutron independently from the palaestra in its NW side (pl. 4a)\textsuperscript{145}.

Μάκρα or κολυμβήθρα. When environment can’t offer an opportunity, then man interferes. Behind this general practice, we can trace the origins of the swimming pool: when gymasia begun to be built, the selection of a positioning in a natural landscape with grass and water springs was not always easy, that’s why a construction was made, echoing a landscape\textsuperscript{146}. This is the origins of the swimming pool. Nevertheless, its presence was not necessary in a gymnasium because of the expense, caused by its large dimensions\textsuperscript{147}.

The use of the swimming pool was for an immersion bath and especially for a cold one. The large dimensions didn’t facilitate the heating of the water, the quantity of which should be tremendous in order to fill it up completely. Thus the supply and the filling were made by vessels and the water evacuation by a pipe according to the experience at Delphi (pl. 50a)\textsuperscript{148}. But in other cases the pool was located near the bath to accomplish the water supply\textsuperscript{149}.

Πυριατήριον. Under this name it is meant a sweat-room, but this case is very problematic. Since 5th cen. BC Eupolis and Aristophanes mention such a room, having nothing to do with the gymasia\textsuperscript{150}. But it is certain that there were furnaces

\textsuperscript{143} R. Ginouvès, ibid., p. 101
\textsuperscript{144} At Olympia washing rooms were in the NE and NW corners of the palaestra, in the Lower Gymnasium of Priene a row of basins is visible on the North wall of the NW corner and in the Upper Gymnasium of Pergamon the original row of basins is still preserved in the middle room of the West wing (F. Yegül, ibid., p. 21).
\textsuperscript{145} J. Delorme, ibid., p. 309-310; F. Yegül, ibid.
\textsuperscript{146} J. Delorme, ibid., p. 312. The most representative example is the round pool at Delphi, the earliest is the rectangular one at Olympia (the shape of the swimming pools was generally rectangular, consisting once more Delphi an exceptional case). However, according to literary sources, pools are mentioned ever earlier in Sicily, although in reality it should be just the case of cisterns (I. Nielsen, ibid., p. 11 n. 46).
\textsuperscript{147} R. Ginouvès, Balaneutikè, p. 134-135
\textsuperscript{148} Ibid., p. 133-134
\textsuperscript{149} I. Nielsen, ibid., p. 11
\textsuperscript{150} R. Ginouvès, ibid., p. 137 n. 3, 4
and heated rooms, although the dating is questionable: despite Aristotle doesn’t clarify the situation, it is understandable that inside the πυριατήριον was creating a high temperature in order to produce sweating (pl. 27c)\textsuperscript{151}. In addition to a passage of Athenaeus, informing that the bath cauldron could be named also “πυρία”, we may reach to the conclusion that the πυριατήριον was a room for steam-bath, because the principal ideas of heated water and its steam are connected\textsuperscript{152}. Maybe the earlier attestation consists a donation of a heating system in the gymnasium of Chios by king Attalos I (269-197 BC) of Pergamon\textsuperscript{153} and the donation (also during the same century) to Hermes, one of the patron deities of gymasia, of a πυριατήριον and κόνσιμα by Onasipolis, the gymnasiarch in Cythera\textsuperscript{154}.

Cassius Dio characterizes the Agrippa’s thermae in Rome as a “γυμνάσιον” and on the same time as a “λακωνικόν πυριατήριον”\textsuperscript{155}. For the meaning of “λακωνικόν” Strabo is a useful source, because he states that sweating was caused by hot stones dealing with the Lacedaemonian habits, and Vitruvius offers a greater help, who uses the word “laiconicum” as a noun in order to name after that a rotunda domed room having an open fire or a brazier in its centre. The round plan of the building was helping the circulation of the heat, which was regulated by a hole for a copper plate on the centre of the dome. Such rotundas were found during Vitruvius’ era in both baths and gymasia\textsuperscript{156}.

Archaeological finds are very helpful in understanding the situation. Bathing facilities after a round plan and a barrel vault are known as “θόλος” and they have been discovered in contexts outside gymasia. Their features are the strong mortared walls and a furnace in the centre of the room, where a brazier was placed in order to produce high temperature: the identification as πυριατήρια is more than certain\textsuperscript{157}. As a consequence, similar θόλοι structures in the gymasia should be identified as πυριατήρια too: at Eretria and at Assos traces of fireplace have been identified in the middle of the room and signs of fire have been traced in the two rotundas at the Agora

\textsuperscript{151} J. Delorme, ibid., p. 313
\textsuperscript{152} Ibid.
\textsuperscript{153} R. Ginouvès, ibid., p. 136 n. 2
\textsuperscript{154} Ibid., p. 136-137 n. 9
\textsuperscript{155} I. Nielsen, ibid., p. 11 n. 51
\textsuperscript{156} I. Nielsen, ibid., p. 11
\textsuperscript{157} Such structures are very characteristic in Oiniadai and in the Athenian Ceramicus (J. Delorme, ibid., p. 313-314).
of the Italians on Delos. About the use of these two buildings, of which the one is smaller than the other, it can be said that the small one was destined for a dry sweat-bath and the large probably for a steam-bath, because there were found traces of water supply and drainage.\footnote{I. Nielsen, ibid.}

**Ἀλειπτήριον.** In connection to the πυριατήριον was the ἀλειπτήριον, where the bodies of the athletes were anointing before and after the physical exercise. One more time literary sources at least from 3rd cen. BC and on inform us about, describing it as a heated room.\footnote{R. Ginouvès, ibid., p. 138} Unfortunately the bad archaeological condition of the gymnasia remains doesn’t allow us to extract any conclusion about the interior arrangement of these rooms,\footnote{Ibid., p. 138-140} but a straight relation to training and cleaning after that is obvious: anointing the body with oil was the usual practice before the exercise, so a steam-bath was a good way to get clean afterwards, and before the departure from the gymnasium and the return in daily activities an oil friction was the best loosening for the body. Both practices were exercised in the same room and during friction the condition of the oil, applied to the body, was heated, so the physical results were better.\footnote{Ibid., p. 140-144}

Elaeothesium. Although Vitruvius informs that the position of the elaothesium was to the left of the ephebeum, he doesn’t refer to its use. According to its etymology it should be the room, where the oil was kept. Maybe the total silence in sources is due to oil’s expense; on the other hand, we know the practice of anointing and the representation of oil vessels (usually the “ἀρύβαλλοι”) in the iconography of vases. Because of its expensive nature, probably the athletes carried their own oil from home and after training they took it back away (pl. 50b). The fact that Vitruvius mentions a special room for oil storage, suggests that about his time gymnasia had already acquired a fixed position for a certain quantity of oil. This change should be explained by the initiative of some generous citizens, who gave donations to the community either by money directly or by public constructions indirectly in order to receive a social prestige.\footnote{J. Delorme, ibid., p. 301, 304} In fact the history of Hellenistic era is full of such examples.
1.2. The balaneia

1.2.1. The architecture of a balaneion

As a matter of fact, a balaneion is not quite a single building rather a complex one, because it is consisting of different elements, among which the most characteristic one is the “θόλος” or rotunda. When such a construction is preserved, the identification of the complex as a bathing one is facilitated. Nevertheless, the balaneion didn’t obtain a regular, fixed form, which could characterized it typologically – except the rotunda case – that’s why its plan is a random one and its internal spaces haven’t a predefined positioning in relation between each other.

In all excavated balaneia the upper part of the wall isn’t preserved, so they should built in bricks, stone kept only for the foundations, which should be solid enough in order to hold the superstructure. From fragments found inside the buildings it appears that wall were often painted. The roof was of two types, usually a conical dome for the rotundas and apparently a flat for the oblong rooms. In the interior the floors were generally paved with impenetrable material, such as stone, clay slabs, mosaic or opus signinum.

1.2.2. Hot baths in rotunda buildings

The kind of bath exercised par excellence at balaneia was the hot one, which was taking place in rectangular individual tubs called “πύελοι” (pl. 10, 11, 27, 42c, 43a-b, 45a-b, 46c). They are flat basins cut-rock or manufactured from clay or stone, sometimes with strengthen sides by extra stone slabs (protecting the bather from the splashing water of his neighbors) and always plastered with hydraulic mortar. A seat was available on the back side (about the one third of the length), a semicircular hole at the foot end, the “ὀμφαλός”, and a vase inside it (usually an

163 Another way of identification could be offered by its technology, like the water and drain pipes, or the “ὀμφαλοί”, opened on the floor before the foot end of a tub.
164 I. Nielsen, ibid., p. 9. On the contrary Roman thermae had a regular plan.
165 Ibid.
166 It has been already state in the introduction that heating systems were used since the Archaic period.
167 The “πύελοι” were opposed to “ληνοί” according to their depth, which adjusted the short of bathing, if it would be a “total” one (immersion style) or a “partial”, only of a part of the bather’s body (see R. Ginouvès, Dictionaire Méthodique de l’architecture grecque et romaine, III, ibid.). According to the explanation in Α. Γ. Καθόρα, ibid., p. 216 (n. 323), the “ληνοί” were shallow tubs in the form and shape of a trough, found in gymnasia, suitable for ablution of the hands and of the legs after the training in the gymnasia.
amphora), where the water after bathing was collected (pl. 48e). The usual practice of bathing was the ablution (that is, a “partial” bath), when the bather was seated (hip-baths, pl. 49a) or standing and the water was poured either by a servant holding a vessel full of hot water (pl. 49b) or by spouts on the walls (just like a shower). But there were also some cases (ex. at Gortys) of deeper tubs, suitable for immersion bath\textsuperscript{168}.

The disposal of these individual bath-tubs was made in two kinds of building, a rectangular or a round one. In both cases their place was along the (internal) perimeter of the wall, but, although in the round buildings no problem occurred, because the tubs were forming a short of hoop, in rectangular ones the placement on the corners was extremely problematic, because of the narrow space, occupied by the adjoining tub; for this reason the dominant solution was a diagonal disposal\textsuperscript{169}. These rotunda buildings were the “θόλοι”, known since the 5th cen. BC by the comedian poet Cratinus and sometimes during excavations rotundas of different types have been revealed inside the same complex: there are “θόλοι” of equal size with tubs of similar dimensions, one “θόλος” could be larger than the other or could dispose larger tubs and lastly the one could bear tubs, but the second one not (as in Gortys). If such the scenarios, the two first categories of “θόλοι” were destined for use by both sexes: this is verified, indeed, by inscriptions with the epithets “γυναικεῖος” or “ἀνδρεῖος”. The third category is much more puzzling, it appears, however, that the same establishments could be used by men and women, but not simultaneously, although the interpretation of the vacant (meaning without the tubs) rotunda is not yet clear\textsuperscript{170}.

1.2.3. Rotundas for steam-bath

Apart the hot bath inside rotundas, these buildings could also be used for other purposes, without the flat tubs, inside the same bath complex. These rotundas or “θόλοι” were roofed by a dome, which bear a central opening, the “ὀμφαλός”, for lighting and temperature regulation, succeeded by a copper plate put there and

\textsuperscript{168} R. Ginouvès, \textit{Balaneutiké}, p. 187-189; I. Nielsen, ibid., p. 7-8; F. Yegül, ibid., p. 24. These could be round-bottomed tubs from stone or rubble and mortar and bath was taken there lying. Immersion tubs are not seen in establishments of Western Mediterranean apart from the North section of the Stabian Baths at Pompeii, being in an earlier phase hip-baths (I. Nielsen, ibid., p. 8).

\textsuperscript{169} R. Ginouvès, ibid., p. 191. The best preserved circular arrangement can be found at Gortys, rectangular ones at Olympia or Colophon (see ibid., p. 192-196 for a presentation of various examples). For a general comparison between all baths and their facilities see T. Fournet et alii, ibid., p. 280-303 (including the cases of Colophon and Pergamon).

removed according circumstances. Athenaeus\textsuperscript{171} who uses the grammarian Timarchus, states clearly the round plan of the baths, where high temperature was developed: in fact, the rotundas were efficient enough to enclose the greatest possible space inside a small perimeter. This description is directly connected to Vitruvius’ information about the \textit{laconicum}. But the same author opposes this building to the \textit{sudatio}\textsuperscript{172}: it seems that the difference between the two is the nature of steam, being dry and sweat respectively\textsuperscript{173}.

However, a rotunda construction isn’t meant to be a heated space since its origin: some examples from Pompeii can prove its use for a cold bath too. And, when the case is the one for hot bath, the way of heating is not the same. Although the most elaborate heating system, that of a “ύπόκαυστον” or “ύποκαυστήριον”, is attested in a fully developed form for the first time in Gortys about the middle of the 3rd cen. BC (pl. 56, 57), is not the rule, at least not before the 1st cen. BC. Consequently, when a furnace is missing, heating was succeeded by other means, like transportable braziers. In literary sources – Theophrastus or Plutarch among others – information can be spotted about the utensils for achieve heating\textsuperscript{174}.

1.2.4. The use of swimming pools

Like in gymnasia, in balaneia as well we can see swimming pools, but not so frequently (ex. at Piraeus\textsuperscript{175} or at Gortys). In any case their dimensions are significantly larger, so as to occupy an entire room by themselves. Pools were used not only for the cold water bath, but also for immersions, given their large space. Bathers could also wash themselves with cold water at fountains, where a basin based on a pedestal could be built\textsuperscript{176}.

1.2.5. Bathing procedures according to the Greek way

When we are talking about the Greek way of bathing, we should keep our distances from the Roman practices. In reality we know nothing about bathing procedures without the assistance of latter sources, but it seems that the cleansing happened before the immersion bath and the hot bath was preceding the cold one. In

\begin{itemize}
\item \textsuperscript{171} XI, 501 e-f
\item \textsuperscript{172} V, 10, 5
\item \textsuperscript{173} R. Ginouvès, ibid., p. 199-200; F. Yegül, ibid.
\item \textsuperscript{174} R. Ginouvès, ibid., p. 202-205
\item \textsuperscript{175} Despite Ginouvès’ attestation, this “pool” could be just a water tank. In T. Fournet et alii, ibid., p. 300 nothing is said about the existence of a swimming pool.
\item \textsuperscript{176} Ibid., p. 189; I. Nielsen, ibid., p. 8. It seems, however, that in South Italy and Sicily an underground system was already applied in order to heat collective immersion pools: I. Nielsen, ibid.; T. Fournet et alii, ibid., p. 271, 273, 275-276, 278-279.
\end{itemize}
complexes with flat tubs, deep tubs (heated) or a pool (cold water) the priority in use was given in the flat tubs. Concerning the steam room, either dry or wet, and the relation to the hot bath, there is no strict rule having to do with the priority of each one\textsuperscript{177}. The absence of an organized practice in bathing is clearly echoing in the spatial planning of the Gortys’ bath\textsuperscript{178}. We should wait until Imperial times for a real bath ritual.

2. Technology and innovations

2.1. Water supply

An indispensable element for the functioning of a bathing establishment is the water. This natural resource has his very interesting history in the ancient world – Greek and non Greek – because it is unbreakably related to life itself. Water is needed in order to survive a community, that’s why since the foundation of a settlement water supply was a problem that has to be solved immediately. But it was during the Archaic era mostly that state’s authorities tried to find a permanent solution by the construction of major public works such as fountains and aqueducts\textsuperscript{179}.

2.1.1. Wells and cisterns for water collection

In Macedonia an enormous number of wells has been found alongside an organized system of water supply through pipes and tubs indicating the general concern in watering the settlement in daily base. Nevertheless the exact number of water collectors in each city depends on the conditions of water in them and on its disposal. Although the primary goal of these collectors is the fulfilling of water needs in private houses (pl. 51d-e), the supply also of handicraft units, sanctuaries and public buildings can’t be excluded (πλ. 46a)\textsuperscript{180}. Another common practice is the

\textsuperscript{177} R. Ginouvès, ibid., p. 209-210

\textsuperscript{178} For instance, in the rotunda C were placed two fountains with hot and cold water each one, where the ablutions could be exercised and in the rotunda G the flat tubs for cleansing. But the bather inside the G should return in C in order to enter in the room D, where deep tubs were arranged (Ibid., p. 210).

\textsuperscript{179} Among other are worth noting the fountains Γλαύκη and Πειρήνη (pl. 51a) at Corinth and the Έννεακρονός (Fountain of Nine Spouts) at Athens and the aqueduct of Eupalinos at Samos. In Hellenistic Macedonia such public works can be identified at Petres by the fountain (pl. 51b-c) – which gave the naming too to the quarter, where found – and at Aiane by a large and deep circular cistern (low diameter 4,50 m, depth 2,00 m and over, pl. 52b) of 2nd cen. BC (A. Γ. Καύης, ibid., p. 315 and 165 respectively).

\textsuperscript{180} Ibid., p. 138-139; Μ. Καύης-Σαροπούλου – Γ. Καραδέδος, “Η διαχείριση του νερού στη Μακεδονία” in Δ. Γρημένος (ed.), Στην Μακεδονία από τον 7ο αιώνα π.Χ. οι της νερικής αρχαιότητα.
collection of pluvial in public or private cisterns (pl. 51c, 52a-b) and its storage in vessels despite the few samples found till today in Macedonia: the wells were destined to be the most popular way of water collection\textsuperscript{181}.

The form of the vast majority of the wells is circular (pl. 46b, 53) – the rectangular one is a limited minority, represented in Macedonia by examples at Thessalonike and in Thasos – and their shaping was either the simple cut on the bedrock during the carving (pl. 53b) or a coating in the wall’s surface by clay (pl. 53c), stones (pl. 53a) or bricks; the covering of the surfaces by hydraulic mortar is not always the rule. All these categories of wells coexist chronologically\textsuperscript{182}. Given the lack of concrete archaeological evidence, it could be said that the pumping of water was made either by hands either by mechanical means (mainly by pulleys)\textsuperscript{183}.

2.1.2. Water distribution

An organized way of transporting water into the settlement and its buildings was the construction of a central aqueduct. In Macedonian soil such hydraulic works are attested since Classical era in Pydna, Stageira, Olynthus and Amphipolis (pl. 53e), despite the insufficiency of complete archaeological evidence from the source, maybe a spring, to the final destination, that is, the distribution inside the settlement itself; unfortunately, in all available cases, only parts of these aqueducts came to light. Hydraulic constructions were, obviously, generalized during Hellenistic period\textsuperscript{184}.

The water is transported from its source via clay cylindrical pipes (pl. 43c), which were larger in their one edge and narrower to the other and placed inside an underground ditch, so they were covered and unseen. The Hippodamean plan system was facilitated the structure of this pipe-net, because it was easy to line up according to the settlement’s arrangement: central pipe and lateral branches were simply following the organization of streets and building blocks; usually water was also carried out by pipes from one room to another inside the same building. For the public use of the water the pipes’ terminal was concluded in fountains (and then transported

\textsuperscript{181} Α. Γ. Καΐάφα, \textit{ibid.}, p. 130-131, 162-163; Μ. Καΐάφα-Σαροπούλου – Γ. Καραδέδος, \textit{ibid.}
\textsuperscript{182} Α. Γ. Καΐάφα, \textit{ibid.}, p. 143-153
\textsuperscript{183} Ibid., p. 158
\textsuperscript{184} Ibid., p. 170-171
home). Pipes were plastered internally for better sealing and often were cleaned up for better efficiency. Lead was not often used for the construction of water pipes during Hellenistic era (apart the case of the Amphipolis’ gymnasium, pl. 53f), so as the stone-built watering channels\textsuperscript{185}.

The application of such description can be clearly seen at Pella (pl. 54a), built after the Hippodamean system: the watering source was situated outside the city, to its NE, in a certain distance, and the water was brought there by sealed clay pipes, connected between them by lead pieces. In crossroads, branches were created, where lid coverings were applied in order to facilitate cleaning. Additionally wells and cisterns were also created for the effective watering of the city\textsuperscript{186}. A similar situation can be also found in the gymnasium of Amphipolis: built near a stream, which was used as the watering source, it disposed a central duct with a diagonal orientation from NW to SE (pl. 38a); it was composed by singular clay pipes bearing cleaning covers and placed inside a ditch (pl. 53f). From the central artery, branches were supplying with water the complex, where it was necessary, like the baths of the palaestra, the altar, the cisterns and the pool. In some selective points of the branches were used lead pipes\textsuperscript{187}.

2.2. Drainage

A particular care was also shown for the draining of unclear water or other sewage. Concerning the interior spaces, the pavement was slightly inclined, so poured water during bathing was either removed outside the rooms through holes on the walls either put on vases placed on a hole inside the pavement. Outside the rooms clay or lead pipes, incorporated on the walls near (their base or elsewhere) removed the filthy water from the building onto drain ducts. These ducts were of several forms and shapes: either circular clay pipes or stone-built channels in the reverse \(\Pi\) form; or simple ground-level ditches, constructed carefully concerning their pavements and walls, and underground ones of low constructive quality. Whatever the case, the

\textsuperscript{185} Ibid., p. 174, 186-188, 190, 194; Μ. Καϊάφα-Σαροπούλου – Γ. Καραδέδος, ibid., p. 485-486
\textsuperscript{186} Χ. Μακαρόνας-Ε. Γιούρη, ibid., p. 13-14
\textsuperscript{187} Δ. Λαζαρίδης, Αμφίπολη (Αθήνα 1997), p. 52, 59; Α. Γ. Καϊάφα, ibid., p. 247-249
removable water through this structures was finally led onto central sewers dug under
the street level\textsuperscript{188}.

2.3. Heating systems

However the most important element to a bathing establishment was maybe the boiling of the water and the relative system applied for this purpose. Fire was also used for warming the interior of the facilities. As already it has been described, what was indispensible, it was a firing place, a furnace or a kiln. Upon this firing place a brazier was set either in order to boil water – and then carry it away to the tubs – or to produce (weat) steam for the transpiration on the suitable spaces of the bath. This was the most common and easier way to heat. To produce wet steam was also possible to place hot stones and the pour water upon them\textsuperscript{189}. Beside that system it existed one more elaborate than the previous, the “\textit{ὑπόκαυστον}” (hypocaust)\textsuperscript{190}, which heated the space from underground. But, to understand better, it is necessary to stress out that we are in front of a terminology question: not all the underground heating systems can be defined as hypocausts.

The differentiation is that a real hypocaust system doesn’t need a brazier to warm water: the floor of the space above it – either a pool either a room – can be heated by the high temperature produced by the underneath kiln and additional air ducts can transport steam or hot air in a short distance, warming this way a room destined to dry transpiration. In fact, this is literally the meaning of “\textit{ὑπόκαυστον}”: a system (kiln and ducts) which produces heat from the underneath (and warms the pavement)\textsuperscript{191}. The use of this system presents advantages and disadvantages: although the heating was effective in full scale in comparison to the previous system and there was no need to carry water from elsewhere, heating was not complete, because it had to do only with the contact points, which the kiln could effected directly. Consequently this fact means that the bather could have been burned on the feet,

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\textsuperscript{188} Α. Γ. Καϊάφα, ibid., p. 223-225; Μ. Καϊάφα-Σαροπούλου – Γ. Καραδέδος, ibid., p. 486-487
\textsuperscript{189} I. Nielsen, ibid., p. 8, 12
\textsuperscript{190} According to R. Ginouvès, ibid., p. 205, 206 n. 3 the word \textit{ὑπόκαυστον} is the simple Greek correspondent of the Latin term \textit{hypocaustum} and is used only by Latin authors. The Greek equivalents are “\textit{ὑποκαυστήριον} (τοῦ βαλανείου)”, “\textit{ὑποκάυστρα}” or “\textit{πυρόκαυσις}” and are attested in papyri documents after the 1st cen. AD.
\textsuperscript{191} I. Nielsen, ibid., p. 8
\end{flushleft}
because the warmth couldn’t spread out all over the place in a homogeneous way, so other points inside the same room could have been rest cold\textsuperscript{192}.

Hypocaust systems can be found all over the Hellenistic Greek-speaking world around the Mediterranean, so its origin is not clear\textsuperscript{193}. As a concrete group can be distinguished the baths in Western Mediterranean, that is Sicily and Southern Italy (or Magna Graecia), where a double heating system was used: a bottle-shaped furnace heated the upper oblong space in front of the “θόλοι” with hip-bathtubs, as well as the water destined for them, and a hypocaust channel heated the collective immersion pool\textsuperscript{194}. The application of this system can be clearly seen at Gela (end of 4th cen. BC, pl. 54b), Caulonia (3rd cen. BC), Locri (maybe 3rd cen. BC), Megara Hyblaea (maybe middle of 3rd cen. BC, pl. 54c), the North Baths of Morgantina (second quarter or middle of 3rd cen. BC), Syracuse (about the middle of 3rd cen. BC, pl. 55a) and Velia (after the second half of 3rd and 2nd cen. BC, pl. 55b)\textsuperscript{195}.

In proper Greece things were functioning in a slightly different way\textsuperscript{196}, because only a small amount of bathing establishments used the hypocaust system. In such a case the hypocaust was heating the hip-bathtubs, the individual tubs for immersion bath and the sweat room: the hip-bathtubs were placed in the vicinity of the furnace, so their water was the first to be heated, then the immersion tubs, because they were located upon the hypocaust channel, and at last the sweat room with a subterranean heating ring. The most representative example of this system was

\textsuperscript{192} Ibid., p. 20-21
\textsuperscript{193} J. DeLaine, “Some observations on the transition from Greek to Roman baths in Hellenistic Italy” in MeditArch 2 (1989), p. 125 suggesting the origin of the hypocaust in Magna Graecia explains that the economic and political growth and wealth after the pacification of Sicily by Timoleon (about 338 BC) created the conditions for urban revival, expressed by the construction of large-scale public buildings. She relates, furthermore, the appearance of baths with Agathokles of Syracuse (317-304 as a tyrant, 304-289 BC as a king), who continued Timoleon’s urban expansion and was originated from Thermai Himeraiai, the most famous hot springs of Sicily. She objects a technological development in proper Greece during the same period, because of the continuous wars.
\textsuperscript{195} T. Fournet et alii, ibid., p. 271 (Cat. no 1), 272 (Cat. no 2), 273 (Cat. no 3), 275 (Cat. no 5), 276 (Cat. no 6), 278 (Cat. no 8), 279 (Cat. no 9) respectively
\textsuperscript{196} Meanwhile, a third category can be identified with the baths in Ptolemaic Egypt. This category presents peculiarities concerning heating (if hip and immersion tubs were gathered inside the same room, then they were heated both by a hypocaust, but, if only the immersion tubs were placed aside in a single room, then they were heated alone, a hot water tank being reserved for the hip-bathtubs in another room). For a complete presentation of new evidence from Egypt see T. Fournet-R. Bérangère, ibid., p. 239-263.
applied at Gortys (ca mid-3rd cen. BC, pl. 56, 57). A major – technological – step forward is considered the heating facilities of the bath at Olympia (Sitz-Bath, pl. 58), to South of the gymnasium, during its final phase (IV period, ca 100 BC), which concluded to a complete and sophisticated hypocaust system: to the South of a long hall, a bathing room was raised, with its floor relying on 90 brick pillars, which were topped by large roof tiles, thus forming a flat bed of support for the floor. The furnace was a vaulted channel with brick on its sides, which led to the hollow space under the bathing room through an arch opening.

3. The Roman bath

3.1. Dealing with definitions

A similar bipolarity like that seen in the Greek world between balaneia and gymnasia can also be traced in Roman ambience, where a distinction between balnea and thermae is more than obvious. And, if the derivation of Roman balnea from Greek balaneia is etymologically more than evident, the question about thermae is more complex, because there is no a clear correspondence of thermal establishments from the gymnasia; more than that Vitruvius himself admits that the gymnasium was not among the Roman habits. Things are getting confused also by the fact that simple bathing facilities are sometimes characterized as “thermae”.

In fact, as in Greek world, balnea were modest establishments with no aspirations of magnificence. But ancient sources often use the terms without distinction in a contradictory way, so it is not evident after so many centuries to conclude in a secure criterion in order to define each typology. To understand the puzzling nature of the question, it is very characteristic that the terms are used with variation from writer to writer and within the works of the same writer.

It seems, though, that during Republican days the term “thermae” does not appear and its introduction by sources begins during the 1st cen. AD in contrast to balnea, which denoted the previous baths of the Republican Rome. During that century the luxury in Imperial Rome was in raise and the decoration of thermal establishments, especially those built by emperors, such as Nero or Titus to name only

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197 T. Fournet-R. Bérangère, ibid., p. 258, 260
198 The suspensurae according to the Latin terminology.
199 F. Yegül, ibid., p. 377, 379
200 V, 11, 1
201 G. Fagan, ibid., p. 14-15
the firsts who gave to populus Romanus truly magnificent buildings\footnote{In 65 and 81 respectively. Then follows Domitian in 95, Trajan in 109, Commodus in 185, Caracalla in 217 and Constantine the Great in 315 [K. Αντωνόπουλος, «Βαλανεία και θέρμες. Οι "καθεδρικοί ναοί" της σάρκας» in Corpus 69 (March 2005), p. 46, but Trajan is lacking from its catalog, added here according to G. Fagan, ibid., p. 113].}, is very exquisite, so these constructions were characterized as “Imperial thermae”. It is not surprising that, apart the bathing wings, there were incorporated other facilities too, like libraries, gymasia or even gardens. As a result, the “Imperial thermae” were magnificent indeed, combining not only enormous dimensions\footnote{The Diocletian’ thermae could host more than 3.000 bathers daily (K. Αντωνόπουλος, ibid.)}, but, above all a splendid decoration, so splendor could be the key element to distinguish thermal buildings from simple balnea\footnote{G. Fagan, ibid., p., 17}.

3.2. Local forerunners and influences on Roman baths

It is an undisputable fact that the first bathing establishments in Italian soil are placed in Magna Graecia. The baths of Gela (pl. 54b) are the oldest (310-280 BC) to contain a rotunda and individual hip-bathtubs; in the rotunda was used a primitive system that heated the floor by furnaces connected between them via underground channels\footnote{F. Yegül, ibid., p. 48}. But, independently from the Greeks, bathing did exercised in central Italy: when Aqua Appia was erected in 312 BC, the first aqueduct of Rome, the first true swimming pool, the Piscina Publica, was also constructed outside the Porta Capena in connection with it. Until then Romans practiced bathing, probably swimming, in the Tiber, especially during military maneuvers on the Campus Martius. About the same time a large swimming pool has been placed to the North of the Agora at Poseidonia\footnote{I. Nielsen, ibid., p. 13 (n. 89 provides the Latin sources related to the Piscina Publica)}.

Another local bath practice can be traced in rural Latium and Campania, in farmhouses and villas. A small circular domed room next to a kitchen with a furnace served as a (dry) sweat-bath after gathering the gasses and steam from the adjoined kitchen, a kind of laconicum or assa sudatio, as described later by Vitruvius. Next to it was situated a chamber, protecting the sweat-bath from the cold and serving as a passage and changing room (apodyterium) to the lavatrina, a cold washing room or frigitarium. Bathing in the lavatrina was exercised individually and not collectively,
not even between members of the same family. It seems that there were not used proper tubs, but a kind of wash-bowls\textsuperscript{207}.

These facilities were evolved in private ambience dated to the early 2nd cen. BC. The adjoin with the kitchen was crucial, because they shared a heated system—despite its primitivism—like boilers or furnaces for the heating of the floor and walls. For more sophisticated techniques, it was necessary the coming of the 1st cen. BC\textsuperscript{208}.

Nevertheless, probably under Greek influence, another kind of structure was developed: in Hellenized Campania a gymnasium can be traced at Pompeii during 6th and 5th cen. BC in what became later the Stabian Baths (pl. 59b). Initially, on the North side of a rectangular courtyard (30 X 40 m) a humble (unheated) bathing establishment disposed hip tubs for the cleansing of the gymnasium members (pl. 60). Moreover, until the 3rd cen. BC three larger bathing spaces were added on the North (pl. 61a)\textsuperscript{209}. But during the next century major modifications occurred in the spatial organization (completed by a restoration about 80 BC, according to an inscription), when the plan changed by the addition of new bathing facilities on the East side (pl. 61b), like an anointing room (destictarium) and a laconicum (pl. 62a), which was altered in a circular pool before the end of the century, thus transformed into a frigidarium; about the same era the West side was altered too (a process lasting till early 1st cen. AD) by the creation of an open-air pool and a series of rooms (pl. 62b).

What matters most is the arrangement in the order of the rooms in a straight relation between them, which echoes the process of bathing in a concrete axis maybe for the

\textsuperscript{207} Ibid.; F. Yegül, ibid., p. 50. In fact, F. Yegül presents an old theory by De Capua [“Appunti su l’origine e sviluppo delle terme romane” in Accademia di architettura, lettre e belle arti 20 (Napoli 1940), p. 81-160], which cannot be proved by archaeological evidence, as I. Nielsen stipulates rightly. The primary element to this theory is the therapeutic capacities of the “good sweat” produced by the kitchen’s furnace curing cold, flues or rheumatic pains. On the contrary, I. Nielsen considers the lavatrina as the proper (and only) bathing facility in the rural areas, destined for hot bath, thus supplied with hot water from the kitchen by a channel or a hole on the separating wall. For the sweat-bath she considers that it was common practice among other peoples (n. 86 with citations to ancient sources), but she uses Plautus (Stichus, 226f) clearly testifying that sweating (and anointing too) were Greek habits.

\textsuperscript{208} F. Yegül, ibid.

\textsuperscript{209} H. von Hesberg, Ρωμαϊκή αρχιτεκτονική (Θεσσαλονίκη 2009), p. 195. According J. DeLaine, ibid., p. 117-119, who explains H. Eschebach’s Die Stabianer Thermen in Pompeji (Berlin 1979), this conclusion is due to the presence of niches in the walls of these spaces (which later became the latrine, the apodyterium and the tepidarium in women’s wing of the baths), suitable for the placement of tubs following Greek practices.
first time. In connection to this is also the installment of a hypocaust system, which facilitated this order\textsuperscript{210}.

But if we want to follow the beginnings of the hypocaust system in Roman baths, then it is important to clarify its characteristics and how did this system work, in order to distinguish this from the Greek one.

3.3. The Roman hypocaust system (pl. 63)

To define the Roman hypocaust, we must admit that the same principal dominates in here as in the Greek one, that is, a firing system that heats the bathing space from underneath. Despite this admission, the development and the execution of the above principal is completely different in Roman ambience, if compared to Greek antecedents. The effectiveness of the common aim is due now to other means, which shall be explained in brief.

3.3.1. Heating the floor (pl. 64, 65)

A kiln or a furnace (praefurnium) was providing the necessary fire for the heating of the bath. The heat was reaching the spaces through a firing channel until the hypocaust’s spaces below the pavement, which was elevated (suspensura). This elevation was achieved by the construction of low pillars (pilae) of round or square bricks. The hypocaust’s underfloor spaces were low heighted and the air was circulating there easily\textsuperscript{211}.

3.3.2. Heating the walls (pl. 66)

The heating of a bath was completed, after the heating of its walls has be done: in this case hot air was conveyed through walled tubes of two types, either tubuli or tegulae mammatae. The first ones were round or square tubes in contact with the walls and the second simple clay plaques producing a hollow between them and the

\textsuperscript{210} J. DeLaine, ibid., p. 119; F. Yegül, ibid., p. 61. I. Nielsen, ibid., p. 30 does not follow the phases of the Stabian Baths, divided by Eschebach, and dates the introduction of the hypocaust for the first time in 90-80 BC in order to coincide with the activity of Orata, thus creating her period V of the baths (occupying a part of Eschebach’s period IV). According to her based on an inscription of 80-50 BC, after 80 BC, when the Roman colony of Pompeii was found, a reconstruction occurred, resulting the reconstruction of the portico in the palaestra and the establishment of the destrictarium and the laconicum (hers period VI, which may overlap period V, or Eschebach’s period V). I. Nielsen first published her opinions in “Le prime fasi dell’evoluzione dell’edificio termale romano” in \textit{Analecta Romana Instituti Danici XIV} (1985), p. 81-112. A brief critic on her analysis has been exercised by J. DeLaine, “Recent research on Roman baths” in \textit{JRA I} (1988), p. 14-17.

\textsuperscript{211} Κ. Αντωνόπουλος, ibid., p. 41. For the meaning of the terms and brief information about them, I. Nielsen ibid., p. 161-162 (a thematic division of terms in her Appendix p. 153-166) and F. Yegül, ibid., Glossary, p. 487-494 in the entries under discussion.
wall and in the inside gasses and hot air were circulating. In both types the surfaces were plastered and covered by marble revetment. In the majority of cases the selected architectonical type of the space was the dome or barrel vault, because the heating was facilitated in such interiors\textsuperscript{212}.

3.3.3. The produced results

The application of this system was very useful, because the heating of such large construction as the Roman baths was very effective. The praefurnium was the key element to the whole system, because it heated directly the water and through its air the rooms\textsuperscript{213}. The temperature was not fixed, but it was adopted each time according to the climate; in any case the internal temperature could be extremely high\textsuperscript{214}, given the fact that the architectonical form was selected exactly for this reason, resulting the keeping of a stable temperature and its uniform circulation. The fire was always lighted, because it was hard to burn out the furnace and to kindle the fire again: the necessary time for the warming of the baths was long enough\textsuperscript{215}.

3.4. The debate on the inspiration and origins of the Roman hypocaust. A comparison to the Greek one

All Latin tradition\textsuperscript{216} attributes the “invention” of (Roman) hypocaust to G. Sergius Orata, a rich entrepreneur from Baiae, Campania, who lived around 100 BC. It is supposed that his idea was inspired by natural environment in Campi Flegrei to the North of Neapolis, an area of particular volcanic activity, like eruptions of steam and hot springs on the surface and on the underground, which pointed out it as suitable for thermal baths. Indeed, after the beginning of the 2nd cen. BC and at least of the 1st cen. BC the whole area – and especially Baiae – was a popular spa resort among Roman upper classes and bathing facilities were built, connected to the hot springs\textsuperscript{217}.

In order to achieve this connection and to relate the springs and their steam to the baths, the construction of channels was obligatory, because these sources were often underground. The creation of such a channel system has a double effect, on the
one hand the realization of a steam-bath and on the other the indirect heating of a space from underneath via the hot air through the channels. Back to the initial story, Orata was an oyster-grower. He used the volcanic heat under the floor and, when there was not available a spring of hot water, he used in parallel a furnace for the heating of his oyster beds. It seems that this was the first application of a “hypocaust” system: if the heating of oysters in basins was easy to achieve, then the adoption of the same idea for the heating of pools and bath-chambers should be the next step and Orata made a fortune introducing bathing facilities arranged after this idea in the villas of Romans in Campania\(^218\).

Nevertheless, this story is attested only in literary sources, not archaeologically. To identify an trace of veracity in it, we have to find examples of Roman/Italic baths dated in the early 1st cen. BC (or slightly earlier), that is, the years of Orata’s life and activity. The Pompeian Stabian (pl. 59b, 60, 61, 62) and Republican Baths (pl. 67a) would fit in these outlines. The latter dispose two caldaria with hypocausts of parallel rubble walls and immersion pools for communal bathing with benches and curved back. Such a hypocaust organization can be found in Sicily, where a series of heating channels in parallel (Gela, pl. 54b) exists and also heated – by hypocausts – communal immersion pools with seats [Megara Hyblaea (pl. 54c), Syracuse (pl. 55a)], if the identification of the long narrow spaces is correct. The heating channels in parallel of the examples in Sicily are what later became the basic element of the Pompeian axial system\(^219\). And if we take in consideration that the arrangement of the room in the Stabian Baths after a linear order, the above argumentation gets stronger; in fact the hypocaust extends over the caldaria in men’s and women’s wings\(^220\).

After all, the hypocaust found in Gortys (pl. 56, 57) is different from the above cases, both Sicilian and Pompeian. Although the use of the hip-baths inside the rotundas and the scale of the buildings are similar between Gortys and Sicilian baths, their differences cannot be ignored: in the formers an oblong corridor is placed between the rotunda and another room, probably providing hot water or air, meanwhile in Gortys a series of annular hypocaust was established; furthermore, in

\(^{218}\) Ibid., p. 21-22  
\(^{219}\) J. DeLaine, “Some observations on the transition from Greek to Roman baths in Hellenistic Italy”, ibid., p. 120  
\(^{220}\) Ibid., p. 119
Sicily immersion pools with benches, heated directly by the hypocaust, are attested and not in Gortys\textsuperscript{221}.

And the differences will increase, if Gortys gets compared to Roman/Italic examples: the scale is smaller for both the whole size of the building and the individual rooms; the arrangement of rooms in Gortys is not regular and a variety of room forms, shapes and sizes can be seen, meanwhile in the other case an order dominates, which helps the extend of the hypocaust in all over the area of the rooms in concern, in which the floor is supported on terracotta constructions and the hot air provides elevated temperatures through tubulations. To this last remark the comparison to Gortys has only a room (E), which is fully heated by the hypocaust, but the floor in trapezoidal bricks hasn’t an upper surface finish, resulting the transfer of the heat inside the room through the floor. Finally, the masonry is different too: while ashlar, rubble and mud-brick techniques are applied in Gortys, brick and reticulate faced concrete walls are used in Pompeian Forum Baths (pl. 67b) and the lightweight vault of the first can be opposed to the strong barrel-vault of the second example\textsuperscript{222}.

\textsuperscript{221} Ibid., p. 115-117
\textsuperscript{222} Ibid., p. 112-114
CONCLUSIONS

I

At about the reign of Philip II (360/59-336 BC) and Alexander III (336-323 BC) Macedonia had reached the pick of its glory not only in political and military field, but also in cultural and artistic. The power, the wealth and the success of the kingdom attracted many personalities, activated now in Macedonian soil. As a result Macedonia was transformed in a cultural centre in vanguard in artistic or technological sphere. The conquests of this civilization can be detected, among others, in hydraulic works.

The drainage of the swamps around Philippi by Philip II – and maybe some similar work around Pella – was a major achievement, which transformed the marshy area into fertile, capable to feed the newly founded city (356 BC). More than that, also important was the protection of Dion against the Vaphyra river. Hydraulic capacities are hidden under the construction of the Macedonian tombs too, because the great tumuli, covering the grave monuments, should be resist against the rain, so they were constructed by altered fine and gross material. However, apart these collective works, singular ones also exist in rather later periods: the hydraulic clock in the Athenian Agora by Andronikos from Kyrrhos in Bottiaea (about the middle of 1st cen. BC) and the instrument called “hydraulic” of Dion (found in a building of 1st cen. AD)\(^{223}\).

According to this general framework, Macedonia was indeed in the front line of artistic/technological evolution. Pella was organized after a rational city plan and enriched with supporting structures like the water supply and the drainage system all over the surface of the settlement. A major concern is well obvious for the hygienic conditions – the drain of unclean water – combined with prosperity. Although the existing plan is dating during the Hellenistic era, a similar organization can be traced in the nearby Classical Olynthus, founded in 432 BC. Pella was founded slightly later during the reign of Archelaus (413-399 BC), occupying originally the South half of its later surface. The original phase of the bath complex can be related to this period according to the most radical scenario, which dates it up to the first decades of the 4th cen. BC. But, even if a dating down to the end of the century is closer to reality, the Pellan bath preserves some traces of conservatism, like the open air swimming pool.

\(^{223}\) Α. Γ. Καϊάφα, ibid., p. 135-137
seen also at Delphi’s gymnasion despite the difference in shapes (round there, rectangular in Pella).

What is interesting with the Pella’s bath has to do with the successive phases: during the second one (after the second quarter of the 3rd cen. BC) two spaces are introduced, a rectangular and a round, both equipped with individual tubs for hip-bath (destined for tepid and hot bathing respectively). This is pretty peculiar, because the combination of different forms of bathing rooms is rare in Greece (the case of Gortys must be examined apart): usually coexist either two rotundas or two rectangulars (a possible explanation will be presented in the next part). Concerning the final phase (after the last quarter of the 2nd cen. BC) the key element is the introduction of a real hypocaust system. This fact should be examined in combination with the Thessalonikan balaneion, not only because of their common dating, but also due to the existence of some kind of hypocaust system there too.

It must be taken in consideration that those years were tardy ones, when Macedonia was already under Roman influence (after 168 BC) and occupation (after 148 BC). But they were also years of experimentation and advanced artistic and technological achievements. The “invention” of the hypocaust system could be treated as part of these tendencies. A stable relatively chronology is the middle of the 3rd cen. BC, when the Gortys’ hypocaust is generally dating. Nevertheless, it wouldn’t be surprising, if an earlier introduction had been occurred in Pella about the beginning of the century or the end of the previous one during the reign of Cassander, who showed a special interest in cities: he rebuilt Thebes in Boeotia and founded Cassandreia in Chalcidice and Thessalonike in Mygdonia. During his days Pella reached the apex of its expansion and its palace took a decisive form. Because of the wars between Alexander’s Successors at about the same time, engineering was developed enormously, so an experimentation leading to the hypocaust is not completely out of question.

An open question remains yet the introduction of the hypocaust in the bath complex, partly because its late dating after the advent of the Romans. What is important to stress, is the surprises that Macedonian soil still hides. The discussion about the status of Greek hypocaust was reanimated with new facts after 1996-7,

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224 For a collective examination of excavated bathing facilities in Greece see T. Fournet et alii, ibid., p. 280-301.
225 It is the case of space E in building IV in the “Big Baths” of the palaestra inside Pella’s palace.
when the baths at Tessalonike and Pella were discovered, especially after 2007, when the hypocaust of the last one was unearthed. The relatively recent discoveries should be examined with caution as a part of the common Hellenistic heritage. But we will return to this matter later on.

II

In general Macedonia follows the rest of the Greek world in what concerns bathing habits and practices. This is very clear in the organization of bath sectors in gymnasia: basins (Amphipolis) or pools (Pella’s palace, “Big Baths”) are used for immersion bath cleansing, meanwhile individual tubs existed for hip-bathing (Amphipolis and probably “Small Baths” in Pella’s palace). Cleansing in hip-bathing tubs was the common habit, following the practice from Archaic era as it is depicted in vases. When gymnasia took a more or less fixed form, hip-bathing rooms are organized all over. To understand the commonness of the constructions, a comparison between them is sufficient enough: we may revisit the bath sections in the North gymnasion of Eretria with tubs destined in the – partial – cleansing of the body, of hands and feet\(^{226}\) or that on Nemea\(^{227}\). The mentality is the same.

Concerning simple baths or balaneia, things are not quite the same and a variety can prevail till to a point. Despite the fact that some of the Hellenistic baths were partially revealed, some elements are well and largely attested. Usually one/two rotunda(s) or a rectangular space are destined for bathing, thus tubs were placed in them\(^{228}\). Pools or basins for immersion bath are rather rare\(^{229}\). Once more it will be reminded that the Gortys bath is a unique case, because of its true hypocaust system and the combination of spaces and uses in them (pl. 56a).

A firing chamber (Y) was placed close to the rotunda (G) with the hip-battubs, so the water in there was heated immediately by the furnace. Then hypocaust channels lead the air through the hollow part of the floor first to the

\(^{226}\) P. Ducrey et alii, Οδοιπορικό στην Ερέτρια (ESAG, 2004), p. 200; N. Kaltsás et alii, Ερέτρια. Ματιές σε μιά αρχαία πόλη (Αθήνα 2010), p. 177

\(^{227}\) St. G. Miller, Νεμέα. Μουσείο και αρχαιολογικός χώρος (Αθήνα 2005), p. 120, 124

\(^{228}\) The next categorization follows T. Fournet et alli, ibid. One rotunda (certain or possible): Athens, Dipylon Baths (p. 281), Athens, Piraeus Gate Baths (p. 282), Athens, Diochares Gate Baths (p. 283), Athens, SW Baths (p. 284), Dilesi (p. 287), Phiotian Thebes/Nea Anchialos (p. 299). Two rotundas: Ambrakia (p. 280), Eleusis (p. 288), Eretria, Harbor Baths (p. 289), Oiniadai (p. 293), Pireaus, Serangeion Baths (p. 300). Rectangular space: Corinth, Centaur Baths (p. 285), Delos, Theater Baths (p. 286), Hephaistia/Lemnos, Harbor Baths, phases a-b (p. 291-292), Olympia, Old Baths, all four phases (p. 293-296).

\(^{229}\) Ibid., p. 292 (Hephaistia/Lemnos, phase b), 293 (Oiniadai, phase b)
individual immersion tubs (D), placed directly upon the channel, then to a round sweat room (E), which subterranean structure was hollow (diam. 2.50 m): a central pillar was leaving vacant an annular area, where the hot air was circulating heating the room above\textsuperscript{230}.

Comparing the remaining baths in the rest of Greece with the Macedonian examples, none of them fit with the case of Pella’s phases b and c, where a round and a rectangular space and a pool and a basin (only during phase c) coexist. It must be stressed that two rotundas (often of different dimensions) in the same bath complex were destined for different use by both sexes, as it has been mentioned previously; nevertheless here the form of one of the bath spaces is not round. But it has been already said that the two hip-bathtubs bearing spaces were used differently during phase b, the round for hot and the rectangular for tepid bath. Maybe an explanation can be given by the Gortys’ bath, where the larger round space disposed hip-bathtubs and the smaller was used as sweating bathroom, so the differentiation was expressing difference in use, all though in Pella that kind of differentiation was expressed not only in size, but in form and shape too. One reasoning for such originality may be the wealth and the advanced civilization of the Macedonian capital during Hellenistic era, a real cosmopolitan destination, when the other excavated sites – except Delos or Olympia – even Athens, were of secondary rank during the same period.

But even the case of Thessalonike seems quite unusual and doesn’t have a parallel to compare with, except one: the late Hellenistic baths at Olympia (pl. 68)\textsuperscript{231}. The similarities are astonishing enough, given the fact that here exist a small heated round sweat bath and a larger rotunda with 17 hip-bathtubs, meanwhile for the immersion bath two individual bathtubs (to the North of the sweating room) are used. A hypocaust channel passing underneath the immersion tubs and the sweating bath heats these spaces before its replacement and remodeling. Another common element, providing a possible explanation for the similarities, is the dating of both baths during the same period, that is, from mid or late 2nd cen. BC to 1st cen. AD\textsuperscript{232}.

\textsuperscript{230} R. Ginouvès, L’
établissement thermal de Gortys d’Arcadie, ibid., p. 166; J. DeLaine, ibid., p. 112-113; T. Fournet-R. Bérangère, ibid., p. 258; T. Fournet et alii, ibid., p. 290
\textsuperscript{231} T. Fournet et alii, ibid., p. 297
\textsuperscript{232} A remote analogy to Gortys may be identified, because here and there a large rotunda and a small one coexist having the same use. But instead for basins, in Gortys individual immersion tubs were placed and the large rotunda was heated directly by the furnace.
All the enlisted excavated examples cover a large period of time with a possible beginning in some cases already from the 5th cen. BC\textsuperscript{233}. It is well understandable that this period of time is not uniformed, because many things were in continuing progress. The most crucial from among them is the firing systems. From an examination is clear enough that the majority of the baths use the simplest of all, composed by a furnace or a firing chamber. In a short number firing channels exists, so there is a resemblance of a hypocaust. Except the two baths from Macedonia – and Gortys, of course – only the case of two baths from Olympia, mentioned previously, are compatible between each other. The most interesting is the common dating of all four in 2nd cen. BC.

Nevertheless, one more factor should be taken in consideration: the existence of a true hypocaust system in Magna Graecia already during the 3rd cen. BC, which has more similarities to the examples in Macedonia, given the fact that upon the firing channel a basin for hot bath was situated like the collective immersion pools in Magna Graecia. What is different in Macedonian examples is the “treatment” towards the rotundas: despite their adjacent position to the firing chambers in Magna Graecia, in Macedonia they have nothing to do with it. And, all though in Magna Graecia they could have been used as sweat or steam bathrooms, exploiting the heating system\textsuperscript{234}, in Macedonia inside the large rotundas steam was produced either by poured on heated floor water or the a heated cauldron. But the small round sweat room at Thessalonike was heated directly by the firing channel.

To sum up the consequence of evidence, a short of hypocaust system was introduced on the Western part of the Greek-speaking world during 3rd cen. BC; meanwhile after the middle of the same century – if not later – another hypocaust was presented at Gortys. During the next century a hypocaust system with similarities to the Western one, that of Magna Graecia, is installed in Tessalonike and in Pella. Despite the fact that is tempting to reason the origin of the Macedonian application from the Western hypocaust, the parallel similarities in other details with Gortys (or Olympia) prevent such arbitrary conclusion. Unfortunately the known sample for the Greek peninsula is poor, as it has been already suggested and, if it is not the case of a vacuum studii, then it would be maybe better to expect more archaeological

\textsuperscript{233} For instance the Athenian baths at the Dipylon and Piraeus Gate (ibid., p. 281-282).
\textsuperscript{234} T. Fournet-R. Bérangère, ibid.
discoveries, which may lead to more secure conclusions; nevertheless, Macedonian soil was proven full of surprises. Until then – and instead of waiting – we can stick to the general idea that the Hellenistic world was full of inspiration, experimentation and innovation, serving a dynamic process unknown before. The dominant cosmopolitan spirit gave the opportunity of traveling for both people and ideas, so proposing (and applying) something new was not odd; still remains sometimes puzzling to us today.

III

Before finishing, it lasts one point yet: the relation with Roman type bath. Seen from the end backwards, Roman bath has a little to do with the Greek type. But this impression is formed mostly because of the monumentality and luxury happened in Roman examples. But these gigantic, in some cases, dimensions were not so a need for expression, as a result of Roman technical capacities: the construction of enormous aqueducts resolve once for more the problem of water supply of the baths and the current and renewed water improved the hygienic conditions. The truth is that the Roman contribution in this metamorphosis – or rather evolution – has to do with other, more technical issues.

By all means the decisive push to this direction is strictly connected to the Roman hypocaust type. Because of its introduction, a significant change occupied: the individual immersion tubs were replaced by collective immersion pools, heated by the hypocaust. What, however, really happened as a result of this particular hypocaust, was the arrangement of the bathing spaces according to a logic of convenience: now some kind of hierarchy prevails and bathing procedure takes a “ritualistic” form, though the bather simply follows the atmospheric conditions necessary his body temperature. For this reason the cold rooms are separated from the warms and the baths are organized around the rooms for cold (frigidarium) and hot bathing (tepidarium, caldarium), so the bather proceeds step by step from cold to warm and his body progressively adapts in the analogous temperature.

235 Compare with the most Greek baths, supplied by wells and cisterns, where the water was stagnant (K. Αντωνόπουλος, ibid., p. 42).
236 R. Ginouvès, ibid.; J. DeLaine, “Recent research on Roman baths”, ibid., p. 16; G. Fagan, ibid., p. 44. For a brief summary of D. Krencker’s typology of Roman baths, see Κ. Γούναρης, Το βαλανείο των Φιλίππων και τα βόρεια προσκτίσματα του Οκταγώνου των Φιλίππων (Αθήνα 1990), p. 7-9.
But, before we arrive at the end of the trip, the beginning is more important: which was the influence to the creation of the Roman bath? It has been told that all evidence points to Hellenized Campania under Roman control in the beginning of the 3rd cen. BC\textsuperscript{237}. Before that it seems logical that Campanian establishment were influenced by the nearby bathing complexes of Magna Graecia. Nevertheless, no Roman type appears before entering into the 1st cen. BC. This is very characteristic, because Roman rule over metropolitan Greece had already began about the middle of the 2nd cen. BC, when bathing facilities like than at Gortys, Olympia, Thessalonike and Pella had formed by then. So could they have influenced directly the Romans in modeling their own type?

The answer in this question is not at all an easy one. Taken in mind that no Roman bath exist before the Roman conquest of Greece, an affirmative answer to the question may be logical, but is it possible? The problem is the scarce evidence in Greek soil, because we have a sample of five baths – Gortys, two in Olympia, Thessalonike and Pella – form which the one in Olympia must be exclude, because of its marginal dating, about 100 BC, to the appearance of Roman baths; moreover objections have been expressed too against such an early dating\textsuperscript{238}. From the remaining ones that of Thessalonike doesn’t preserves the kiln, so a general idea in order to make a complete comparison with Roman structures is lacking. As a result only three Greek facilities are available, a rather poor number, for this comparison.

Among them the Gortynian bath complex presents a fully evolved form and technology that makes it unique between Greek baths. The idea promoted in there could have influenced, hypothetically, Roman baths, but no strong argument exists in order to transform this hypothesis to a possibility. On the other hand, the heating system in Pella presents externally some resemblance to the later Roman praefurnia, but it is merely the case of a kiln. The placement of a water basin upon the air duct is also seen earlier in the Greek West. Once more it lacks the decisive argument.

I believe that it is clear enough the deadlock of the research in present time with the available data in disposal, as described previously. If we stick in them, then a possibility of a direct influence of Roman baths by that in Greek mainland doesn’t

\textsuperscript{237} G. Fagan, ibid.
\textsuperscript{238} F. Yegül, ibid., p. 379
seem strong. But I also believe that the nature of the question has been put in an absolute, “closed” way. In a cosmopolitan world all over the Mediterranean open in ideas and foreign influence, where artists and scholars circulated freely transmitting their conquests, it wasn’t necessary just on centre of influence. Exactly because of a multicenter cultural environment, a variety of experience and knowledge was offered openly to all, so someone had only to choose what he was considering proper to him and his aims. Back to the initial discussion, after this explanation there is no need for a polarization and a selection like “Greece or Magna Graecia”, “Magna Graecia or Campania”, “Campania or native Latium”. The Romans had a practical way of thinking and were taking from the others what was useful to them, so basically the nature of the original question may be founded after a modern perception.

Archaeological discoveries don’t stop to amaze and it seems that the soil is always full of surprises, an inexhaustible source of knowledge and inspiration. And this is something real, not a rhetorical way of speaking: till 2007, just 10 years ago, we were unaware of the hypocaust in Pella’s bath. It may be sad, if a research doesn’t reach a clear, concrete conclusion, but after all, this is archaeology, the extraction of arguments from the available data. Waiting for some revealing and resolute discovery, would be, however, useful to remember a last but crucial point about the influence and the origin of Roman baths: that all argumentation has been based on a single element, that is, their appearance during the 1st cen. BC and not before it. If this collapses in the future, then the discussion should be founded in a whole new basis.
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APPENDIX

PLATES
a. Red-figure vase in Berlin Staatliche Museen (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 19)

b. Black-figure hydria PC63 in Rijksmuseum Van Oudheden (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 20)
Red-figure kylix E83 in British Museum, two views (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 21)
The Academy in Athens, restored hypothetical site plan by M. Barbié du Bocage (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 1)
a. Delphi, Gymnasium. Plan of the palaestra and the running tracks by Yegül (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 6)

b. Olympia, plan of the palaestra after Kunze and Schleif (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 8)
Olympia, plan and restored cutaway view after Kunze and Schleif (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 474)
Plan of the bath complex (Μ. Λιλιμπάκη-Ακαμάτη – Ι. Μ. Ακαμάτης, Συντήρηση- Ανάδειξη αρχαιολογικού χώρου Πέλλας και περιοχής της (2002-2015), εικ. 88)

1. swimming pool, 2. kiln, 3. rectangular space, 4. cistern, 5. pipe, 6. pipe, 7. rotunda with tubs, 8. rectangular space with tubs, 9. air duct, 10. duct, 11. pit
a. The swimming pool from the South (personal archive)

b. The kiln from the West (personal archive)
a. The rectangular space with the water pipe from the NE (personal archive)

b. The cistern from the NE (personal archive)
The rotunda with the tubs from the South and NE respectively (personal archive)
The rectangular space with tubs from the SW and SE respectively (from personal archive)
The air duct from the East, West and SW respectively (personal archive)
Plan of the second phase [M. Λιλιμπάκη-Ακαμάτη – N. Ακαμάτης, «Το δημόσιο λούτρο της Πέλλας. Ανασκαφική περίοδος 2007» in ΑΕΜΘ 21 (2007), pl. 3]
a. The North room on the NE corner of the bath from the North (personal archive)

b. Detail of the pavement (Western part) of the North room from the North (personal archive)
a. The middle room on the NE corner of the bath from the East with the tripartite opening on the back (personal archive)

b. The Western part of the South room on the NE corner of the bath from the East (personal archive)
a. The North side (first and second phase) from NW (personal archive)

b. The North side (first and second phase) from NE (personal archive)

b-c. The NE projection onto the street from the North and the South respectively (personal archive)
a. The duct from the rectangular “tepidarium” to the South wall from the North (personal archive)

b. The “gatehouse” from the SW (personal archive)
a. The construction before the East wall on the religious place from the West (personal archive)

b. The religious post from the NE (personal archive)
a. The North external wall (after restoration) from the NW (personal archive)

b. The North external wall (after restoration) from the NE (personal archive)
a. The Southern part of the East external wall (after restoration) from the SE (personal archive)

b. The South external wall (after restoration) from the SE (personal archive)


b. Urgentaria found in the bath [Μ. Λιλιμάκη-Ακαμάτη – Ν. Ακαμάτης, «Το δημόσιο λουτρό της Πέλλας. Ανασκαφική περίοδος 2007» in ΑΕΜΘ 21 (2007), fig. 10]
Topography of Thessaloniki and its monuments through time. Inside the red circle the later Roman Agora (Forum) and the blue mark inside the circle the position of the balaneion
(https://commons.wikimedia.org/wiki/File:Thessaloniki_historical_center_el2.png, May 6, 2014, 16:54)

b. Plan of the balaneion [Π. Αδάμ-Βελένη, «Βαλανείο προγενέστερο της Αγοράς Θεσσαλονίκης» in ΑΕΜΘ 11 (1997), pl. 2]
a. The central pavement of the large rotunda from SE (personal archive)

a. A view of the rectangular space and the rotunda in front from SE (personal archive)

The vertical wall in both pictures belongs to another constructive phase
a. The rectangular space from SE (personal archive)

b. The rectangular space from SE (personal archive)
a. Terra sigillata pottery, oriental type A [Π. Αδάμ-Βελένη et alii, «Αρχαία αγορά Θεσσαλονίκης: η οικοσκευή του βαλανείου» in ΑΕΜΘ 12 (1998), fig. 10α, β]

b. Terra sigillata pottery, oriental type B [Π. Αδάμ-Βελένη et alii, «Αρχαία αγορά Θεσσαλονίκης: η οικοσκευή του βαλανείου» in ΑΕΜΘ 12 (1998), fig. 11α, β]

c. Italian lamps [Π. Αδάμ-Βελένη et alii, «Αρχαία αγορά Θεσσαλονίκης: η οικοσκευή του βαλανείου» in ΑΕΜΘ 12 (1998), fig. 11α, β]

a-b. Statuettes of dancers and gladiators [Π. Αδάμ-Βελένη et alii, «Αρχαία αγορά Θεσσαλονίκης: η οικοσκευή του βαλανείου» in ΑΕΜΘ 12 (1998), fig. 13, 14]

c. Theatrical masks [Π. Αδάμ-Βελένη, «Βαλανείο προγενέστερο της Αγοράς Θεσσαλονίκης» in ΑΕΜΘ 11 (1997), fig. 12]

d-e. Left and right side of a skyphos with a phallus spout [Π. Αδάμ-Βελένη, «Βαλανείο προγενέστερο της Αγοράς Θεσσαλονίκης» in ΑΕΜΘ 11 (1997), fig. 13α, β]

f. Phallus image and ithyphallic figurine [Π. Αδάμ-Βελένη, «Βαλανείο προγενέστερο της Αγοράς Θεσσαλονίκης» in ΑΕΜΘ 11 (1997), fig. 14]
a. The palace complex of Pella. In red the “Big Baths”, in yellow the “Small Baths” [Π. Χρυσοστόμου, «Το Ανάκτορο της Πέλλας» in ΑΕΜΘ 10A (1996), pl. 1]

a. Plan of the “Big Baths” [Β. Μισαηλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας» in ΑΕΜΘ 3 (1989), pl. 1]

b. The NE angle of the swimming pool [Λιλιμπάκη-Ακαμάτη, Μαρία – Ακαμάτης, Ιωάννης Μ. (eds), Η Πέλλα και η περιοχή της (Αθήνα 2004), p. 37 fig. 31]
a. The cistern and its staircase in its NW angle from the East [B. Μισαηλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας» in ΑΕΜΘ 3 (1989), fig. 1]

b. A cutting onto the bedrock for the placement of the SE pillar in room E from the East [B. Μισαηλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας. Τομέας “Υπόστυλου Δωματίου”» in ΑΕΜΘ 2 (1988), fig. 2]

c. Column and plaster from wall inside room E found in situ from the East [B. Μισαηλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας. Τομέας “Υπόστυλου Δωματίου”» in ΑΕΜΘ 2 (1988), fig. 3]
a. Plan of underground room E [Β. Μισαηλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας, Τομέας “Υπόστυλου Δωματίου”» in ΑΕΜΘ 2 (1988), pl. 3]

b. The underground room E from the West [Β. Μισαηλίδου-Δεσποτίδου, «Ανασκαφή στο ανάκτορο της Πέλλας, Τομέας “Υπόστυλου Δωματίου”» in ΑΕΜΘ 2 (1988), pl. 1]
d. Plan of building VI with the “Small Baths” [Π. Χρυσοστόμου, «Πέλλης βασίλειον» in _AEMΘ_ 22 (2008), pl. 2]

b. The courtyard of building VIβ, c. The uncovered corridor between buildings VIα and VIβ [Π. Χρυσοστόμου, «Πέλλης βασίλειον» in _AEMΘ_ 22 (2008), pl. 14, 12 resp.]

d. The “Small Baths” from the S, e. The firing place of steam room (IV) from the W [Π. Χρυσοστόμου, «Το Ανάκτορο της Πέλλας» in _AEMΘ_ 10A (1996), fig. 7, 8 resp.]
a. The topography of Amphipolis. In blue the gymnasium [Δ. Λαζαρίδης, Αμφίπολις, (Αθήνα 1997²), fig. 35]

b. The gymnasium and the monumental staircase from the East [Δ. Λαζαρίδης, Αμφίπολις, (Αθήνα 1997²), fig. 29]
a. Plan of the gymnasium [Δ. Λαζαρίδης, Αμφίπολις, (Αθήνα 1997), fig. 33]

b. The palaestra area from NW [Δ. Λαζαρίδης, Αμφίπολις, (Αθήνα 1997), fig. 31]
a. The NE angle with the bathing room NW [Δ. Λαζαρίδης, Αμφίπολις, (Αθήνα 1997), fig. 30]

b. The NE bathing room from the North [Κ. Λαζαρίδη, «Το γυμνάσιο της αρχαίας Αμφιπόλεως» in AEMΘ 1 (1987), fig. 6]
a. The cisterns from the NW [Δ. Λαζαρίδης, Αμφίπολις, (Αθήνα 1997), fig. 32]

b. The cisterns from the East [K. Λαζαρίδη, «Το γυμνάσιο της αρχαίας Αμφιπόλεως» in ΑΕΜΘ 1 (1987), fig. 11]
The palace of Vergina/Aegae. The SW wing [Γ. Μπακαλάκης-Μ. Ανδρόνικος, «Ανασκαφή Βεργίνης» in ΑΔ 25 (1970) Β2 Χρονικά, pl. 1]

c. Olynthus, the house of the figurines. Room with a “πύελος” (personal archive)
Individual bath-tubs or “πύελοι” a. from Lefkkopetra [Δ. Στεφανή, «Η οργάνωση του χώρου σε μία ημιορεινή περιοχή του Βερμίου: το παράδειγμα της Λευκοπέτρας Ημαθίας» in ΑΕΜΘ 16 (2002), fig. 15], b. from Amphipolis (Εργον 1965, fig. 30)

c. Petres, fountain district. View of the main pipe [Π. Αδάμ-Βελένη, Πέτρες Φλώρινας (Θεσσαλονίκη 2000²), fig. 27], d. Aiane, the house with the staircase. Part of the carved water duct (personal archive)
Μ. Σιγανίδου, «Η αστική κατοικία στην αρχαία Πέλλα» in Αρχαιολογία 2 (1986), pl. 2
a-b. An individual bath-tub from Pella’s block 3/sector I [Χ. Μακαρόνας, ΑΔ 16 (1960) Πίνακες, pl. 88]

Pella, Sanctuary of Darron a. The cistern, b. The well, c. The individual tub [M. Λιλιμπάκη-Ακαμάτη, «Ανασκαφική έρευνα στην περιοχή του καναλιού της Πέλλας κατά την περίοδο 1988-1991» in AEMΘ 5 (1991), fig. 4, 3 and 6 respectively]
A reconstruction of Vitruvius’ gymnasium (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 13)
a-c. Individual tubs in vases representation, d. A fixed elevated round tub from Olynthus (all from Α. Γ. Καϊώφα, Συστήματα ύδρευσης και αποχέτευσης κατά την ελληνιστική και ρωμαϊκή περίοδο στη Μακεδονία II plates, pl. CXXXVIIIα-γ, ζ resp.)
e. A vase destined for the “ομφαλός” from Phylakopi [R. Ginouvès, Balaneutikè, recherché sur le bain dans l’antiquité grecque (Paris 1962), pl. IX, 27]

b. A reconstruction of the East bathroom (from the N) of the Nemea bath. The “poured” way of bath [St. G. Miller, Νεμέα. Μουσείο και αρχαιολογικός χώρος (Αθήνα 2005), fig. 88]
a. Delphi, gymnasium. The loutron with the round pool from the West (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 24)

b. Illustrations of utensils used in baths from the Archaeological Museum of Naples West (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 33)
PLATE 51

a. The Πειρήνη fountain at Corinth (Α. Γ. Καϊάφα, Συστήματα ύδρευσης και αποχέτευσης κατά την ελληνιστική και ρωμαϊκή περίοδο στη Μακεδονία II plates, pl. CXXXIVa)

Petres, district of the fountain, b. plan, c. the remains of a cistern on the West of the fountain (Α. Γ. Καϊάφα, Συστήματα ύδρευσης και αποχέτευσης κατά την ελληνιστική και ρωμαϊκή περίοδο στη Μακεδονία II plates, pl. CXXXIa, β respectively)

Pella, a fountain in the house of the abduction of Helen, d. plan and section, e. general view [Χ. Μακαρόνας-Ε. Γιούρη, Οι οικίες αρπαγής της Ελένης και Διονύσου της Πέλλας (Αθήνα 1989), fig. 9, 8 respectively]
a. Pella, house of Poseidon: a cistern [Χ. Μακαρόνας, ΑΔ 16 (1960) Πίνακες, pl. 63α]

b. Aianē, the cistern [Γ. Καραμήτρου-Μεντεσίδη, Αιανή (Αθήνα 2001²), fig. 6]
Hellenistic wells: a. Thessaloniki-ΧΑΝΘ, b. Thessaloniki-Agora, c. Amphipolis, d. Pella (A. Γ. Καϊάφα, Συστήματα ίδρευσης και αποχέτευσης κατά την ελληνιστική και ρωμαϊκή περίοδο στη Μακεδονία II plates, pl. XCVβ, XCIΙε, XCIΙΙγ, Cγ respectively)

Amphipolis e. The Classical aqueduct, f. The water pipe of the gymnasium (A. Γ. Καϊάφα, Συστήματα ίδρευσης και αποχέτευσης κατά την ελληνιστική και ρωμαϊκή περίοδο στη Μακεδονία II plates, pl. CXIβ, CXXIIIγ respectively)
a. Pella, a street in the West of block 3 with the water pipe [X. Μακαρόνας, ΑΔ 16 (1960) Πίνακες, pl. 51γ]


The hypocaust in rotunda E [R. Ginouvès, Balaneutikè, recherché sur le bain dans l’antiquité grecque (Paris 1962), pl. LV, 155 and XXXIX, 126]
a. Pompeii, house of the Faun. General plan and detail of the bath (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 47a). To be noted that the bath disposed a hypocaust (ibid., p. 51), so the plan is useful only for the arrangement of bathing spaces.

b. Pompeii, Stabian Baths. The palaestra from NW (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 61)
Plan of the Stabian Baths. Eschebach’s period I (a) and II (b) [I. Nielsen, *Thermae et balnea: II Catalogue and plates* (Aarhus 1990), fig. 32]
Plan of the Stabian Baths. Eschebach’s period III (a) and IV (b) [I. Nielsen, *Thermae et balnea: II Catalogue and plates* (Aarhus 1990), fig. 33]
Plan of the Stabian Baths. Eschebach’s period V (a) and VI (b) [I. Nielsen, *Thermae et balnea: II Catalogue and plates* (Aarhus 1990), fig. 36]

b. Plan and two sections of a hypocaust-heated room with praefurnium, flues, tubulations etc [I. Nielsen, *Thermae et balnea: II Catalogue and plates* (Aarhus 1990), fig. 15]
a. Schematic hypocaust system by Yegül (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 442)

b. Pompeii, Central Baths: the hypocaust. Schematic section through the pool (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 443)
a. Dion, Big Thermae. Square pilae of the hypocaust (personal archive)

a. Pompeii, house of the Labyrinth. Wall of the tepidarium heated by tegulae mammatae, b. Ostia, Forum Baths. Tubuli, c. Diagram of wall heating systems by Yegül (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 48, 454, 455a, b resp.)
Pompeii, a. Republican Baths, b. Forum Baths (F. Yegül, *Baths and Bathing in Classical Antiquity*, fig. 57, 65 respectively)
Olympia, Late Hellenistic Baths: 1st phase (mid-/late 2nd cen. BC) a. Rotunda with 13 hip-bathtubs, b. heated round sweat bath, c. two heated individual immersion bathtubs, e. hypocaust channel, 2nd phase (major remodeling in 1st cen. BC-abandonment in 1st cen. AD) a. the rotunda, b and c. the round sweat bath and the individual immersion bathtubs no longer heated by hypocaust channel, probably abandoned, g. new hypocaust channel to the W of the old one for unknown purpose [T. Fournet et alii, “Catalog” in S. K. Lucore-M. Trümper (eds), *Greek bath and bathing culture. New discoveries and approaches* (Leuven-Paris-Walpole 2013), p. 297 no 25]