



Romano-Byzantine baths of Egypt, the birth and spread of a little-known regional model

Thibaud Fournet, Bérangère Redon

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Collective Baths in Egypt 2

New Discoveries and Perspectives

βαλανεῖα ■ THERMAE ■ حمامات

Edited by

Bérangère Redon



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Romano-Byzantine Baths of Egypt

The Birth and Spread of a Little-Known Regional Model

AFTER THE Ptolemaic period, an era rich in baths,¹ and the Early Roman Empire, for which we have little field data,² the Romano-Byzantine period (spanning the reforms of Diocletian in the late 3rd century to the Arab conquest in the mid-7th century) provides the researcher with an abundant corpus, composed of 45 bath complexes. It has proved possible to produce a standardised plan for 20 of these, which is presented in the catalogue at the end of this volume.³

Our corpus, however, is far from being well documented and, in spite of the large number of structures discovered, the quality of the available information is not entirely satisfactory. The majority of edifices were excavated long ago, few have been published satisfactorily (with the notable exception of the baths of Abu Mina South and North) and their dating often consists only of vague terms such as “Late Roman period”, “Byzantine” or “Coptic”.

Despite this, there have been some advances regarding Egyptian baths, thanks to recent excavations (Trimithis/Amheida, Marea), some of which were directed by us or in which we participated (Buto North, Ezbet Fath’Allah, Karnak, Taposiris). They have provided us with, amongst other things, very useful chronological evidence. In parallel, a project on the baths of Mareotis (Alexandria region) was directed by the present authors with the assistance of a team of architects and archaeologists (M. El-Amouri, J. Le Bomin, M. Vanpeene) beginning in 2006, under the aegis of the *Balnéorient* program and the “Bains antiques et médiévaux” program of the IFAO, and thanks to a collaboration between the project at Taposiris Magna (directed by M.-Fr. Boussac) and the Graeco-Roman Museum of Alexandria (M. Seif el-Din and A. Abd el-Fattah). In this framework, measurements were completed on certain edifices excavated in the past (Mergham, Mit Abul Kom) and a more in-depth study was made of the baths of Ezbet Fath’Allah,⁴ while the baths of Taposiris have been extensively excavated since 2009. As part of this co-operation, we have

1. Fournet, Redon in this volume (a). As a comparison, I. Nielsen’s catalogue, in 1990, counted only 7 edifices for Egypt: Abu Mena (C.279), Alexandria Kom el-Dikka (C.280), Sheikh Zoued (C.281), Karanis (C.282), Kom el-Ahmar (C.283), Kom el-Dosheh (C.284) and Kom Trougah (C.285) (NIELSEN 1990, II, p. 35).

2. Redon in this volume.

3. The bibliography mentioned in this article for each building is deliberately reduced. See the bibliography presented in the catalogue III at the end of this volume for more details.

4. ABD EL-FATTAH, SEIF ED-DIN et al. 2009.

also had access to the excavation archives of the baths of Mit Abul Kom, Mergham and Teiba thanks to Ahmed Abd el-Fattah, past director of the Graeco-Roman Museum of Alexandria, who also accompanied us many times on the bath sites of Mareotis. When it was possible, other baths in Egypt were also visited. Lastly, the composition of the catalogue led us to consult the archives, often unpublished,⁵ which allowed us to complete the plans of some edifices (Buto North, Clysma), even to draw one for the first time (Gherra/Mahemdeyya), to understand better some aspects of their organisation (Abu Mina South, Kom Trugah), and to have access, even if often only partial, to the archaeological material found during excavation (Clysma, Gherra/Mahemdeyya, Sersena, Sheikh Zawyet).

Creating this systematic inventory of the Romano-Byzantine baths of Egypt allows us to present a typological classification, from which one very homogenous group emerges, the baths of Mareotis. The uniformity of their architectural and technical characteristics is noteworthy; they appear to be the culmination of a long evolutionary process, the stages of which can be seen in other edifices in the corpus. Below we will attempt to reconstruct the typological chronology of this process, which we will then place within the broader context of baths in the Mediterranean and Near East.

We will occasionally take into account analyses of papyri which, for the periods that concern us, always evoke bathing as a common practice: we have counted at least 59, mostly dated to the 4th century (23) and 6th century (21). However, despite their number, they are not very descriptive and do not add much to this study which, first and foremost, looks at architectural models and the internal organisation of the edifices. Moreover, the few baths for which we do have some descriptions are baths that do not appear or barely appear in our corpus: the most detailed papyri concern the large gymnasium baths in the town of Oxyrhynchos. Yet, we will see that most of the baths that have been excavated in Egypt were not found in large towns.

THE CORPUS

Elements of a Romano-Byzantine Bath Building

Romano-Byzantine baths in Egypt share all the characteristics also found in the Mediterranean corpus of baths, notably with regard to the equipment provided for bathers and their natural progression through the edifice. The bathhouse, such as it is presented in our corpus, opens onto a large reception area with cloakroom(s), where the bathers hand over their clothes, wait and socialise. They then move to a transitional space (*tepidarium*) on the way to the hot rooms. The first of these rooms is often equipped with a *labrum* or a basin, which identifies it as a *destrictarium*, where

5. Thus, we had access to the archives of the EES for the bath of Buto North (thanks to Guy Lecuyot and Pascale Ballet, director of the French project in Buto, whom we thank), to the archives of B. Bruyère concerning the excavations of the two baths of Clysma (available on-line at <http://www.ifao.egnet.net/bases/archives/bruyere/>), to the archives of H. Wild, who photographed the baths of Kom Trugah in January 1949 for the SCA (photographs preserved at the IFAO), as well as other archives, recently partly published, of Jean Clédât on the two baths of Gherra/Mahemdeyya and Sheikh Zawyet (Louvre Museum, Department of Egyptian Antiquities, E 27427), with the help of Cédric Meurice, conservator at the Louvre Museum, whom we thank greatly. We are also grateful to Hatem el-Tablawy, inspector of the SCA in the Inspectorate of Menoufieh, who showed us the excavation archives of the baths of Sersena. Finally, the excavation archives for the bath of Abu Mina South are available on the site of the DAI Arachne project (<http://arachne.uni-koeln.de/arachne3/drupal/>).

the bathers actually scrub and wash themselves. Next comes a steam room, often called *laconicum*, where the bathers sweat and get rid of any remaining impurities before going to relax in the immersion basins in the hot bathing room (*caldarium*). This canonical organisation of the hot section of Roman baths is perhaps not so clear in Egypt, and though the Egyptian edifices do indeed have a succession of two to five heated rooms, their function seems less specialised (see *infra*). After the relaxing bath, the bathers would go to the *frigidarium* where they could immerse themselves in basins or pools of cold water. This *frigidarium* is generally linked with other bathing areas located near the entrance, in a single multi-functional space, sometimes including the cloakroom, and often also functioning as a social hall. Often associated with this cold section were the collective latrines, sometimes also accessible from the public area. The courtyards or palaestra which usually embellished Roman baths are often missing from our edifices: consequently, the activities usually associated with these spaces must have been carried out in the multi-purpose cold section, which could, indeed, include an open-air part and be bordered with porticoes or exedras. However, it seems that proper sporting activities must be excluded from the practice of bathing such as it is understood through the remains studied.

Aside from the areas open to customers, the baths also comprised service areas, giving access to the technical installations for heating and supplying water. The baths all contain one or more furnaces, which made it possible to heat the hot rooms through the floors (hypocaust system) and the walls (*tubuli* tubes and/or chimneys in the thickness of the walls). In some instances, the furnaces were also used to produce hot water in boilers that were placed above them. The baths are also equipped with wells and/or cisterns, which supply the cold water basins and the boilers. Waste water is drained to the outside of the baths via a system of underground channels which, sometimes, cleans the latrines at the end before joining the exterior drains and connecting with the urban waste water drainage network.

Typological Distribution

Beyond these common characteristics, Egyptian baths can be divided into four sub-groups based on their date of construction and the plan and bathing circuit developed in each, but also based on the construction techniques used (mainly the heating apparatus). Of the 49 edifices of the Roman and Late Roman periods inventoried,⁶ 34 are today sufficiently well documented or preserved to be included in this classification (fig. 1–2). However, it does not always follow strict rules, the edifices having generally suffered numerous transformations during their existence. Some may present only a few of the characteristics of the group to which they are allotted here:

- Byzantine baths of Mareotis (5th to 7th century AD) (11 buildings)—the most uniform group, as much geographically as for its construction period, techniques and plans. It includes more than a third of the classifiable edifices: Abu Mina South (47); Abu Mina North (48); Ezbet Fath'Allah (61); Karm Kandara (65); Kom Khobeiz (69); Marea 1 (70); Marea 2 (71);

6. In this classification, we will reintegrate the few Egyptian edifices from the Early Empire, in order better to understand the evolution of the architectural models and the practices they reveal. For a more detailed presentation of baths from this period (1st to 2nd centuries AD), see the article by B. Redon in this volume.

Mergham (74); Mit Abul Kom (75); Taposiris Magna (87); and Teiba (88). These edifices are organised with a row type itinerary (the bathers follow the same route to and fro, thereby retracing their steps through the rooms they crossed on the way in). Many of the baths are doubled, sometimes in a second phase, into two strictly independent circuits in order to separate the sexes whilst keeping the technical parts in common.

– Imperial-type baths (3 buildings). This model, which is found in all Roman provinces, is characterised by a symmetrical, monumental plan. Bathers have access to double ring type circuits on either side of the main, central rooms common to both circuits (*caldarium*, exit *tepidarium* and *frigidarium*). This group, with its strong architectural and symbolic characteristics, is currently represented in Egypt by only three edifices, spread between the 2nd and 6th century: Kom el-Dikka baths, Alexandria (50); Antinooupolis (52); and Karnak (93). As elsewhere in the Empire, this is a fringe model, found only in the largest cities. They are often well documented because of the monumentality of their remains, but they are the exception and do not reflect the reality of most bath complexes.

– Small baths with a “block” plan (9 buildings). This group, less uniform than the previous two, is characterised by the use of a compact plan, with a cold room that looks symmetrical, whilst the hot rooms, with reoccurring technical characteristics, are generally organised (or could have been organised) on a ring type circuit (the bathers follow a loop that brings them back to their point of departure, without having to retrace their steps): Buto North (56); Mahemdeyya (62); Kom el-Dosheh (68); Kom Trugah (84); Sersena (85) and probably Clysma/Suez 1 (58); Sheikh Zawyet (86); Theadelphia (92) and Trimithis/Amheida (94).

– Small baths with row type itineraries (11 buildings). This group includes edifices whose main point in common is that they do not belong to the other three groups. Spread widely through time and across the whole of Egypt, they are a not very uniform group, much less standardised than the others, no doubt because of their antiquity and/or the limited means available at the time of their construction. However, they do have in common their small size (between 120 and 800 m²) and a row type plan: Alexandria (under Kom el-Dikka) (51); Karanis (64); Kom el-Ahmar (67); Marina el-‘Alamein (72). Also belonging to this group are the small baths found in military contexts, usually within or near a small fort: Abu Shaar (49); Didymoi (60); Iovis (63); Maximianon (73); Mons Claudianus (76); Mons Porphyrites (77); and Xeron Pelagos (95).

The 15 remaining edifices, poorly documented (lacking a complete plan or a detailed description), cannot at this stage be classified in this typology: Bakchias (53); Bubastis 1 (54); Bubastis 2 (55); Canopus-Abukir (57); Clysma-Suez 2 (59); Kellis (66); Nag‘ el-Hagar (78); Nicopolis 1 (79); Nicopolis 2 (80); Pelusium North (81); Pelusium South-East (82); Pelusium, Tell el-Kanais (83); Tell Ishnik (89); Tell al-Luli (90); and Tell el-Ruhban (91). However, as we shall see below, some can be integrated into the development scheme that we are proposing.

THE BYZANTINE BATHS OF MAREOTIS

In order to try to understand the process of adoption and development of collective bathing in Romano-Byzantine Egypt, and in order to suggest a possible chronology for the models developed and possible Egyptian specialisations within the Mediterranean corpus, it seems pertinent

to take, as the starting point for our analysis, the most homogenous group of edifices detected during the inventory. The model developed between the 5th and 7th century in the region of Alexandria, more specifically around Lake Mareotis, indeed seems to represent the culmination of a long process of successive transformations and adaptations of Egyptian baths, characterised by a veritable standardisation of the edifices (fig. 3). The name given to this group must not, however, give the impression that the edifices belonging to it existed only in this particular region, that is, the hinterland of Alexandria. One of the examples is further away, at Kom Khobeiz (69), very close to Xoïs, a nome metropolis in the north-central Delta. It is not impossible that this model spread elsewhere. The baths of Pelusium are little known, excavated but so far unpublished, and they may have followed a similar model.

The architectural characteristics of the group, whilst being partly representative of the evolution of bathing in the Mediterranean basin in late antiquity, nevertheless reflect a regional specificity. They can be used as markers in the process of characterisation of Egyptian baths in the Roman tradition, from the introduction of practices and techniques imported from Italy in the 1st and 2nd centuries, until the Muslim conquests in the mid-7th century.

Organisation of the Plan

All these baths share the characteristic of having an asymmetrical plan and of presenting the bather with a row type itinerary; they also display a marked disproportion between a vast and monumental-looking cold section and a small heated section. The latter comprises one or two rooms equipped with deep, semi-circular or rectangular, individual bathtubs embedded in the walls. More than half the baths in this group have, in addition, the particularity of being doubled: two similar circuits are juxtaposed, or adjoining, thereby allowing the separation of the sexes.

Disproportion Between the Cold Section and the Bathing Block

Strictly speaking, the hot part (“bathing block”) of the baths of Mareotis, composed of three (sometimes four, more rarely two) small vaulted rooms, on average represents only 15% of the total surface area of the spaces open to bathers, not counting the service areas (fig. 4).⁷ This bathing block was preceded by a monumental hall, usually organised around a central courtyard bordered by deep exedras and porticoes. Several cold basins, usually individual, equipped the part closest to the bathing block. Around this space were the vestibule, cloakroom, latrines and side rooms.⁸

This disproportion of the surface area is reflected in the architectural treatment of the two sections: the hot and tepid rooms of the bathing block, always small (rectangular in plan and an average of 12 m², not counting the embedded basins), were completely built of fired bricks and covered by barrel vaults, while in the much more elaborate cold zone, both stone and wood were used

7. This proportion, calculated for complete complexes, varies from 10 to 22%. The average goes up with the overall size of the buildings: the bigger the edifice the smaller the proportion of the heated block. The examples of Abu Mina and Marea are, from this point of view, the most characteristic of this disproportion.

8. Only the largest complexes are equipped with latrines, which sometimes also attain monumental proportions (those of the north circuit of the baths of Abu Mina South alone occupy more than 70 m²).

for its numerous porticoes and a truly ornamented architecture.⁹ The general organisation of this section is symmetrical, or at least axial, and of monumental aspect. The main hall, often on a basilical plan, is generally too wide to have been covered by a wooden roof. The exedras, either apsidal or rectangular, its porticoes and basins are arranged on either side of the axis. All the ornamental effort was deployed here, whereas the actual hot rooms, where the cleansing occurred, were reduced to their simplest functional expression.

The Hot Rooms

The bathing circuit inside the baths is fairly classic: having crossed the vast cold section of the edifice, equipped with cloakroom(s), the bathers were directed towards the bathing block (fig. 5), the entrance to which was systematically located in the axis of the courtyard. The circuit was of the angular row type, generally consisting of three rooms: an intermediate room, indirectly heated, equipped with small benches and sometimes a *labrum*, functioned as the *tepidarium*.¹⁰ It led to the first heated room, then to a second one. This latter had at least two individual bathtubs (Ezbet Fath'Allah baths), more often three, and in fact constituted the *caldarium*. These bathtubs, embedded in the thickness of the walls and generally protruding outwards slightly, are semi-circular, semi-hexagonal or rectangular in shape. They have a bench-step, on which one could sit and be immersed up to the shoulders, with one's back to the room (fig. 6). Their dimensions and form are variable, the benches being 1.1 m long on average. The biggest ones, whose width can reach 1.8 to 2 m, could seat two, or even three bathers; however, the majority of these bathtubs seem to have been intended for individual and "static" immersion, and the size of the edifice has no direct influence on that of these hot basins. The intermediate hot room was, in some cases, also equipped with this type of bathtub and so it too was essentially a room for hot baths, which meant that more bathers could be welcomed at the same time (particularly in the largest edifices of Marea 1, Abu Mina North and South). The notion of the *caldarium* appears in these edifices to be noticeably different from that of the "classic" Roman bath: it is no longer really a room for the hot and collective relaxing bath which came at the end of the circuit, after the sweating and scrubbing activities which took place in the *laconicum* and the *detractarium*. In fact, these last two rooms sometimes disappear from the Mareotic model, or rather, are fused with the *tepidarium* into a single space which, with the *caldarium*, group all the cleaning activities together. Moreover, it is probable that the water in the individual bathtubs was renewed more regularly than in the large collective pools of the more Roman models, which allowed one to wash there. In the Egyptian edifices, given the small number of bathtubs in the other rooms, the *tepidarium* probably took on the role of waiting room, where bathers waited for a bathtub to become free, whilst getting used to the heat and beginning some preliminary ablutions using the basins that were often found there.

9. The most striking example is that of the baths of Abu Mina South (cf. the illustrations of KAUFMAN 1910, pls. 42–44).

10. In the largest edifices, this tepid room was duplicated, the circuit thus comprising four rooms (Abu Mina North and South, Marea 1).

Other examples, however, respect the canonical succession of the Roman bath, and the room preceding the *caldarium*, without basins, probably retains the function of a sweating-room (*laconicum*), whilst the *tepidarium* also takes on the function of the *destrictarium* (Marea 1, Mergham, Mit Abul Kom, Teiba, Ezbet Fath'Allah).

After their hot bath, the bathers retraced their steps, using the path they took on the way in, to return to the large courtyard with porticoes (fig. 7) where they could then bathe in pools or individual immersion basins of cold water. Strictly speaking this is not a *frigidarium* such as exists in the normal Roman baths, that is, a room specifically intended for the cold bath, but rather simply a part of the cold section, or more precisely it is the portico at the entrance to the bathing block. There are usually two basins, sometimes four, more rarely six, arranged symmetrically on either side of the door leading to the *tepidarium*, sheltered in niches cut into the façade of the bathing block (fig. 8), or in exedras located at the ends of the porticoes before the door. These basins are like those in the hot rooms (apart from the temperature), and generally could hold only one or two people at a time (fig. 9).

Double Baths

Of the 11 baths belonging to the Mareotic group, seven edifices are distinguished by having two completely independent circuits, which back onto each other (fig. 3): Abu Mina North and South, Marea 1 and 2, Mergham, Mit Abul Kom and perhaps Taposiris (but the plan of this latter is incomplete). In the best preserved example, the two circuits are almost identical and they contain, in duplicate, the same characteristics as are found in the single baths. The two circuits are more or less dovetailed together so that they can share the service spaces, particularly the heating apparatus. The logical interpretation of this doubling is that the bathers were divided by sex; men and women, who until then would have had to share the same edifice, no doubt with staggered opening hours, now each had their own space, available at all hours. This also doubled the capacity of the buildings.¹¹

In at least four of the seven examples (Abu Mina South, Mergham, Mit Abul Kom and Taposiris), the doubling happened in a second phase: originally they were “single” edifices to which a second circuit was added. In the Abu Mina South bathhouse, which was the object of an in-depth architectural study at the time of its excavation,¹² each stage of these transformations can be followed. The first stage was relatively modest, very similar in plan and surface area to the baths of Karm Kandara. The bathing block was composed of three rooms arranged angularly in which one

11. The hypothesis of the partition of men and women would not seem to be in any doubt, however, in texts from Egypt, and particularly in the papyri, it is not very apparent, but at least one papyrus (*P.Flor.* 3, 384 488/489 AD) mentions a *matronikion* within a bathhouse, which was most probably the part of the edifice accessible to women. In addition, there are a few attestations of baths for women in the Roman period that show that some edifices, or parts of edifices, were reserved for them (*P.Brem.* 23 = *P.Flor.* 3, 333, 116 AD; *P.Leiden* 1 13, 15, 2nd–3rd century; *P.Flor.* 3, 376, 3rd century). The idea of the partition of the two circuits in Egyptian baths by gender is partly based on the discovery of jewellery (bracelets and hair pins) only in the eastern circuit of the baths of Marea 1 (at the mouth of the north channel of Room F), which led the archaeologists to term this the women's bath (SZYMAŃSKA, BABRAJ 2009, p. 218). The discovery of jewellery in edifices with “single circuits” (particularly at Gherra and Sheikh Zawyet) seems to indicate that the non-doubled edifices must have opened at different times for men and women.

12. MÜLLER-WIENER, ENGEMANN, TRAUT 1966.

can recognise a *tepidarium*, a *destrictarium/laconicum* and a *caldarium*, equipped with two fairly spacious basins. The cold section was vast but not very monumental. A second circuit was then added to the north, reached by a different street from the first. Its plan and organisation were the same as the first circuit, thereby doubling the capacity. In parallel to this doubling, the first circuit was enlarged, both in the cold section, which became monumental, and in the bathing block, which gained a new *caldarium* (the first one having been truncated by the construction of the second circuit). A third stage represents the radical enlargement of the cold sector of the second circuit, which almost tripled its surface area and adopted a highly monumental symmetrical plan. It was also endowed with some vast collective latrines with peristyle. However, these last transformations (enlargement of the north and south cold sections) did not increase the capacity of the edifice. In the end, the whole complex, including the service areas, covered nearly 2000 m². As for the truly “thermal” space, it only covered 58 m² for the south circuit and 62 m² for the north circuit.

The baths of Mergham, excavated in the 1990s but still largely unpublished, were only briefly visited by us. Their remains clearly indicate some substantial modifications, particularly the transformation of an apse (a basin?) into a furnace/boiler and the addition, to the east, of two hot rooms and a furnace. These transformations indicate, as at Abu Mina but with less monumentality, a partition of the edifice into two independent circuits. The original circuit remains the larger, with a bathing block composed of three heated rooms, while the new circuit, added on to the east side, is more modest and has only two. The original edifice probably had only a single furnace, to the south of the large *caldarium*. Its off-centred position made it impossible to share, thus necessitating the removal of the basin at the intersection of the two circuits in order to place a new main furnace there, whose boiler could supply all the basins.

The plan of the Mit Abul Kom baths follows a similar pattern: an original building, in the south, with a relatively regular, almost symmetrical plan was doubled when a second circuit was added to the north. The latter had a symmetrical and monumental cold section and a very irregular hot section, inserted as well as possible against the original bathing block. This transformation, which must not have been foreseen at the time of the original construction, ended up with a fairly unsatisfactory layout, the new *caldarium* being far from the main furnace and its boiler. Nevertheless, the intended partition was achieved, and the two circuits had all the elements of the Mareotic plan.

Unlike these three examples, the baths of Marea 1 and Abu Mina North seem, from the very beginning, to have been conceived as double edifices. The way in which the two circuits are dovetailed is better managed, and the similarity of the two circuits, in a row at Marea and angular at Abu Mina, shows well the perfect symmetry of use of the two circuits. The furnace, for the same reasons, is ideally situated at the heart of the hub formed by the two bathing blocks, and is thus perfectly integrated. As a last example, the baths of Marea 2, only the cold sector of which is visible today, were probably also conceived as a single operation. The perfect symmetry of the two circuits, arranged parallel to one another, enhances the monumentality of the edifice, which must have occupied a surface area at least equivalent to that of the main baths of Abu Mina South (the cold sections alone cover over 1000 m²). The builders here probably did not have to adapt to

a particularly restrictive urban environment, which allowed this monumental production. Indeed, this edifice seems to have been part of an ambitious project of extension and development of the town towards the west, a project that also entailed shops and port facilities.¹³

The Heating System

Over and above the strong similarities of the circulation plan, the construction techniques also illustrate the great homogeneity of the baths in the Mareotic group. All make expansive use of fired bricks, particularly in the bathing block, where they are used from the foundations up to the vaults, and all make use of an identical and perfected heating technology.

Based on the same principle as that of “traditional” Roman baths, it uses furnaces (*praeurnia*), sometimes with a boiler on top, linked to a system of hypocausts and heated walls. The arrangement of the furnaces, however, is new: located at a much deeper level than in the more classical examples (where they are usually half buried), they were supplied by service rooms in real basements, located under the bathing rooms. This distinctive feature meant that the furnaces could be placed at the centre of the edifices rather than in a peripheral position. Some rooms of the bathing block, particularly the *tepidaria*, were thus built above the service rooms, which were reached by underground corridors (fig. 10). These corridors could even, in some cases, pass below the level of the hypocausts.¹⁴ The central position of the furnaces permitted by this layout is particularly adapted to double edifices, whose two circuits are arranged around this “central” heating. The combustion chamber of the *praeurnia* was, because of this location, markedly taller than that of normal Roman furnaces. A very similar set-up, called “high-flame furnace” for this reason by W. Kołataj, has been found and described in Alexandria in the main baths of Kom el-Dikka (see *infra*).

In the majority of Mareotic edifices, the principle furnace, often located at the centre of the bathing block, had a boiler above it to heat the water for the bathtubs (fig. 10–11). In the large edifices, other furnaces were used to complete the heating of the rooms. The top of the heating room was formed by a masonry vault that had a central hole through which the heat and flames could pass to heat the water in the boilers that stood on top of the vault. Depending on the size of the space above the heating chamber, and based on the marks left in the mortar used to reinforce the vault, the boilers were made up of one, two or four circular metal bottoms, each around 60 cm in diameter, topped by a masonry cistern. When there were four of them, they were grouped in a square centred over the furnace (for example in the baths of Abu Mina South and North).

The largest edifice (Abu Mina South) contained four furnaces, two of which had boilers. In the small edifices with a single circuit, one furnace sufficed to heat the water and the rooms (Ezbet Fath’Allah fig. 12, Karm Kandara, and first stage of the baths of Abu Mina South). At the centre of the hot rooms in the double edifices there is often a main furnace whose boiler supplied both circuits, backed up by a second and third furnace, one for each circuit (for example at Marea 1 fig. 13, Mergham and Mit Abul Kom). Kołataj noted that, in the case of the main baths of Alexandria, depending on

13. EL-FAKHARANI 1983.

14. For example, this is the case in the baths of Abu Mina South, where the corridor that supplied fuel to Furnace E9 passes under Room B3.

whether or not the furnaces were equipped with a boiler, they probably had a different rhythm of work (e.g. duration of the combustion, intensity of the heat).¹⁵ It is very possible that in the baths of Mareotis the furnaces, both main and secondary, also functioned on different rhythms. Furnaces with boilers had their own chimneys, going up vertically around the reservoirs, as well as a conduit opening onto the hypocaust: it was no doubt possible to modulate their working by adjusting the opening of these chimneys, to improve the heating of the water or of the rooms according to need.

Another special feature of the heating installations in the Mareotic baths is found in the arrangement and construction of the hypocausts. They are not composed of the usual small pillars of round or square bricks, but of parallel rows of brick vaults, that communicate laterally only at a few points (fig. 14). This more solid installation was probably more resistant and avoided the need for specific materials: the commonly available bricks, used equally for building the walls and the vaults, were used here in this installation thereby precluding the need for round bricks or *bipedales*. In the baths of Mareotis, the hot basins were not built on hypocausts as was normally the case: the hypocaust was interrupted before the basin, as a result of which they were not heated from the ground, and so could, instead, be deeper. This choice can probably be explained by the very nature of these basins, the dimensions of which seem to indicate that the water was renewed more frequently than in the large pools of the Roman baths. Thus, it was apparently unnecessary to maintain the temperature of the basins through underground heating, the regular supply of hot water from the boilers being sufficient (which is, in fact, the way our modern baths work, the heating for which comes solely from the hot water supply). The position of the boilers in relation to the basins is also very different from the Roman models; in these latter the normal configuration was to place the boiler and main furnace in the axis of the hot pool, which thus benefited not only from a direct supply of hot water, but also from the heat produced by the furnace, which meant the water could be maintained at a good temperature, sometimes with the additional help of some *testudo alvei* (metal reservoir placed above the furnace and linked directly with the pool). In the case of the Mareotic baths, the proliferation of individual bathtubs, to the detriment of the large axial communal hot pool, made such a system impossible, and justifies the choice of a central boiler to supply the numerous peripheral bathtubs.

The last specific technical detail of the Mareotic baths concerns the heating system of the walls. The walls in the hot rooms of Roman baths generally had truly hollow faces, connected to the hypocaust, taking advantage of the evacuation of smoke and hot gases from the furnaces to heat the room. In most cases, they consisted of columns of hollow bricks (*tubuli*), laterally connected with one another, covering all the wall faces, and at the top, connecting to chimneys usually located in the corners of the rooms. In the case of the baths of Mareotis, the principle is largely the same in that the hypocausts are connected to chimneys that play a part in heating the room. However, the chimneys do not cover all the wall faces, but are limited to a few heating columns, or “cupboards”, distributed around the room, particularly in the corners and the ends furthest from the furnaces (in order to improve the draw under all the floors). This is an intermediate arrangement, between the truly heated wall face and a simple embedded chimney, which in a certain fashion reproduces on the vertical faces what has been observed for the hypocausts: the very uniform, traditional

15. KOŁĄTAJ 1992, p. 176.

Roman arrangement, which creates truly hot surfaces, is replaced by a more linear arrangement, composed of parallel heat conduits. The vertical conduits are made of normal bricks arranged in such a way as to create an empty vertical column about 15 cm deep and between 20 and 60 cm wide (fig. 15), separated from the room by a row of bricks or simply the thickness of the mortar. Tubular elements of fired clay, similar to *tubuli* but more often with a square section, seem to be symmetrically placed in these cavities (at Taposiris, for example, these tubes have a square section of 14 cm and are 23 cm long, almost the same as those found in Marea, with 13 × 13 cm section).¹⁶ When found, these tubes do not have lateral openings, as in Roman examples, aimed at the horizontal flow of hot gas from one column to the next. Each “cupboard” could contain from one to four adjacent vertical conduits.

The important point about these heating systems is the remarkable standardisation from one edifice to the next in the Mareotic group: all share the use of the “high-flame furnace”, vaulted hypocausts and heating chimneys. The majority place the main boiler in a central position, which supplies hot water to the small bathtubs in the bathing block. This standardisation logically reflects that observed in the plans of these edifices, for they too, with greater or lesser means and ambition, follow common principles of organisation.

Chronology

Whether they are accurately dated by excavation (Abu Mina North and South, Marea 1 and Taposiris) or only by surface pottery (Ezbet Fath'Allah, Karm Kandara, Kom Khobeiz, Mergham and Mit Abul Kom), all the edifices of the Mareotic group¹⁷ were built and used between the second half of the 5th century and the late 7th century AD.¹⁸

Their architectural characteristics reveal a very uniform practice of collective bathing in the region. Some of these characteristics seem, however, to evolve with time, which provides a few welcome chronological indicators.

Thus, three or four edifices in the corpus have the particular feature of having been single baths transformed into double baths: Abu Mina South, Mit Abul Kom, Mergham and possibly Taposiris. The transformation of the Abu Mina bath is well dated: the edifice was built on a single plan during the 5th century, and was dramatically enlarged and doubled in the late 5th century. Other edifices were built on a double plan from the start: Marea 1 and 2, and Abu Mina North. Excavation of the Marea 1 baths has provided a definite date of between the late 5th and early 6th century. This period corresponds exactly with the transformation into a double bath of Abu Mina South, and it is possible to suggest the hypothesis of a general tendency from the late 5th century onwards, to double edifices or to build immediately on the double model when means allowed.

16. SZYMAŃSKA, BABRAJ 2008, p. 30.

17. Given the homogeneity of the group, it is very likely that the two poorly dated edifices (Marea 2 and Teiba) belong to the same period.

18. It seems that only the baths of Marea 1 continued to function in the early Islamic period, to be abandoned in the early 8th century: SZYMAŃSKA, BABRAJ 2009, p. 219.

However, several edifices retain traces of a reduction in size of their basins. At Ezbet Fath'Allah, a small rectangular basin was put into a larger semi-circular one, and at Marea 1, several basins are reduced to half their size. And in edifices that were doubled in a second phase, the new circuit generally has smaller bathtubs than those in the original circuit (this is very clear in Mit Aboul Kom, Mergham, and to a lesser extent in Abu Mina 1). This tendency might be explained by a need to economise water if it were not accompanied at the same time, in the case of the double edifices, by a proliferation of basins. Probably, it is better to interpret it as a desire to individualise bathing, whilst still facilitating the renewal of water between each bather.

ORIGIN AND IMPLEMENTATION OF THE MODELS

The edifices grouped together under the geographic name of “Mareotic baths”, are highly standardised and appear in the second half of the 5th century AD and develop until the end of the 7th century. The numerous other bathing edifices discovered in Egypt, often more ancient, allow us in a certain measure to reconstruct the evolution of the architectural models and technical apparatus that produced this very homogenous group in the hinterland of Alexandria, or at least to grasp the origin of some of their characteristics.

The Case of Imperial Baths

In the ancient Mediterranean bathing world, the so-called Imperial baths are a group apart; though numerically a minority, they were highly visible because of their architectural characteristics and often monumental scale. In the more prosperous provincial cities, they reproduced, or attempted to reproduce, the gigantic baths built in Rome during the Imperial period. Though often on a reduced scale, they were organised on the same symmetrical plan: the bathers circulated around a double ring type route, arranged on either side of a central axis; some rooms were doubled, in such a way as to create perfect symmetry at the centre of the edifice. The monumentality of the buildings, reinforced by this symmetry, enjoyed a rich architectural ornamentation and ostentatious luxury. The often imposing bathing block was accompanied by numerous annexes: *palaestra*, courtyards, *exedras*, porticoes etc. The resulting bathing complexes often occupied a central place within the monumental panoply of large Imperial cities, sometimes extending over several hectares.¹⁹

In Egypt, the imperial model seems, at first sight, not to have enjoyed the success that it had in other provinces of the Empire (fig. 16).²⁰ Today, only three edifices belong to this group, whilst in the neighbouring regions alone, there are at least 18 in North Africa, 14 in the Near East and 13 in Asia Minor. Most emblematic and the best preserved of the three Imperial edifices known in Egypt, the baths of Kom el-Dikka in Alexandria were erected in the late 4th century AD in the heart of the town and covered an area of over 6000 m². They were most probably built on the initiative or with the financial help of Imperial power.²¹ The Antinooupolis baths, probably built when the

19. On the model of Imperial baths, see NIELSEN 1990 and particularly THÉBERT 2003, pp. 287–318.

20. See THÉBERT 2003; FOURNET 2012.

21. GASCOU 2012, p. 317, n. 41 suggests seeing this as perhaps being the work of Valens (364–378), who indeed gave his name to one of the baths of the town.

city was founded and mentioned in a papyrus dated to the mid-3rd century, were found by the experts of the French Expedition in Egypt. According to their basic drawing (which is the only document we have on these baths that today have largely disappeared), these baths could have been of the Imperial type. Symmetrically organised, opening through *propylaea* onto one of the main streets of the town, they covered an area of 4600 m², which would tend to back this hypothesis, for the Imperial model was, first and foremost, used for monumental baths.²² A third bath, recently excavated, also follows this model: discovered in Karnak, it does not, however, have the proportions of preceding two (only 1200 m², which makes it the smallest edifice of the imperial type in the Roman world) and its construction was perhaps linked to the presence of a cohort, and later a legion, in Thebes in the second half of the 2nd century.²³ The Karnak baths evolved until they were abandoned in the mid-4th century and, from the mid-3rd century, followed a less regular plan as the transformations progressed. This small number of edifices is probably just the result of an archaeological bias: the presence in Karnak of an edifice which, even if it is of much smaller dimensions, possesses all the characteristics of the large Imperial baths, shows that by the late 2nd century this model was known and spread as far as the south of Egypt. Here, as elsewhere in the Empire, these edifices must have been the privilege of cities that enjoyed an important role in the political, military or administrative organisation of a region, and for this reason developed a deliberately ostentatious architecture. These large cities, metropolises or regional capitals, little known for the imperial period, would not have been without such edifices, but so far archaeology has not yet discovered them, though they are sometimes mentioned in texts.²⁴

Some characteristics of the Mareotic baths seem to come directly from these monumental examples, in particular the use of symmetry in the conception of the vast cold sections. The layout of the baths of Abu Mina South and Marea 2, whose courtyards have exedras, porticoes and pools arranged symmetrically along the axis of the entrance to the bathing block, could have been directly influenced by the very monumental baths of Kom el-Dikka that were still in use in Alexandria when these were built. From this point of view, the baths of Marea 2 are a good example, where the cold sections of the two, strictly symmetrical, circuits are themselves arranged symmetrically in relation to each other in a monumental composition.

In contrast, the bathing block of the Mareotic baths bears no relation to that of the Imperial baths, either in its circuits or in its monumentality. The nature of the basins in the Mareotic baths, smaller in size and often intended to be used by a single person, however, are the result of an evolution that can perhaps already be seen in the two Imperial model edifices of Karnak and Alexandria. In the former, the large pools in the hot rooms were complemented with several individual bathtubs before the mid-4th century, which existed alongside the collective pools. In the baths of Kom el-Dikka, erected in the late 4th century, there is the same juxtaposition of vast pools for collective bathing

22. See the simplified plan on the comparative plate of imperial baths of the eastern Mediterranean (fig. 30) in El-Masekh et al., in this volume.

23. REDON 2009, pp. 415–416. The Karnak baths constitute an adaptation, at a very reduced scale, of a model probably already mastered elsewhere. With regard to the corpus of imperial baths in North Africa (the majority of which date from the late 2nd to the early 3rd century) and of Syria (mostly dated to the 3rd century), it seems that the adoption of the imperial type in Karnak, on the edge of the Empire, cannot be earlier than the late 2nd century, or even the early 3rd century. See El-Masekh et al. in this volume.

24. See REDON 2012b; Redon in this volume and El-Masekh et al. in this volume.

and smaller basins inserted in the exedra. The large pools, inherited from the Imperial models, are in both cases complemented by other equipment that was more in line with the new bathing practices, such as they evolved during the 4th century.

From a technological point of view, certain tendencies begin to appear that would later prevail in the Mareotic baths. Kołataj had already noticed, in his publication of the baths of Kom el-Dikka, the originality of the furnaces intended to heat the hypocausts in the large Alexandrian baths. In addition to the main furnaces topped with boilers, the deeply buried arrangement of the system allowed numerous secondary furnaces to be inserted right into the heart of the edifice, accessible along corridors running under the hypocausts. These secondary furnaces, for which Kołataj coined the name “high-flame furnace”,²⁵ are not far in time or space from the examples of Mareotis. The discovery in Karnak of a closely comparable arrangement, but dated to the 3rd or 4th century, seems to indicate that their invention was ancient and not solely limited to the north of Egypt. As in Alexandria, the furnaces of the Karnak baths are, moreover, arranged in an original way, in a staggered position, and shared between two rooms (the furnace communicates directly, via two heating conduits, with the hypocausts of two neighbouring rooms). The normal sequence of the Roman *caldarium*, where the hot basin, the boiler and the furnace were aligned along the axis of the room, was already absent from the Karnak baths, in spite of the fact that they were organised according to a classic Imperial plan. In the same way, the hot basins were not built on hypocausts and, at least in their final state in the 4th century, the latter were not made of small cylindrical pillars, but on the contrary, of parallel rows of rectangular piles linked to each other by arches, which already prefigure the brick vaults of the Mareotic baths.²⁶

Baths of the Block Group

A series of nine edifices that share numerous architectural characteristics emerges from our corpus: Buto North; Mahemdeyya; Kom el-Dosheh; Kom Trugah; Sersena; Clysmā/Suez 1; Sheikh Zawyet; Theadelphia and Trimithis/Amheida (fig. 17). Up to a point, this group can be considered as illustrative of an intermediate stage between the imperial type bath, probably imported to Egypt in the 2nd century AD, and the very homogenous group of the late baths of Mareotis. These edifices, of medium size (between 200 and 400 m²) and on an asymmetrical plan, are mostly distributed in the central and eastern Delta and in the western oases, but no edifice in this group has been found in Mareotis. These do not aim at the monumentality of the great Imperial baths, but nevertheless possess many of their characteristics. The cold section is often organised symmetrically or tending towards symmetry. Four or five of these edifices (Kom el-Dosheh, Kom Trugah, Sersena, and probably also Gherra and Theadelphia) even fall into the category of semi-symmetrical edifices as defined by Y. Thébert.²⁷ The cold section is almost systematically composed of a central space bordered on two, three or four of its sides by exedras with columns, some equipped with cold basins. This vast

25. KOŁATAJ 1992, pp. 176–178.

26. Several circular bricks, typical of the normal hypocaust pillars, have been found reused in the masonry of the Karnak baths. They indicate the passage from one method of construction to the other between the 3rd and 4th century (see El-Masekh et al. in this volume).

27. THÉBERT 2003, p. 322.

ensemble served as vestibule, cloakroom and *frigidarium* at the same time, and was richly decorated.²⁸ It is difficult to determine if it was roofed or was open air (as in the case of the Mareotic baths), due to the disappearance, in most cases, of potential roofing elements. Some ceiling elements (wooden beams, palm beams and leaves) which covered the central space have, however, been discovered during the excavations of the Amheida baths and a similar roofing is technically possible for the other edifices in this group.

The hot section of the baths presents a grouped arrangement, often associated with a ring type circuit. This organisation, which avoids the bathers having to retrace their steps through the rooms used on the way in and thereby crossing the next customers, corresponds typologically to a “semi-imperial” plan; it offers an intermediate solution between the row type circuit and the completely symmetrical plan. In particular, this is the case in the baths of Kom el-Dosheh, Gherra and Kom Trugah, and probably also in Buto North. The poorly preserved bath of Sersena, excavated long ago and poorly documented, most probably also followed this model. The plan presented by its discoverer mixes subterranean remains from the hot section with levels of circulation in the cold rooms. However, the geometry of the edifice is very similar to that of the baths of Kom Trugah for example, and we suggest for it the following organisation: entrance hall/cloakroom/*frigidarium* (H/F), *tepidarium* (1/5) (divided into three spaces, like in Kom Trugah and Gherra?) above a service corridor, *destrictarium* (2) possibly with a *labrum* in the apse, steam room (3) and *caldarium* (4), with two basins. There is no way of proving it, but we put forward the possibility of slightly reducing the size of the middle room 3, to place the main furnace in the centre of the edifice, like in Kom Trugah and Gherra.

The plan of the four hot rooms in the Clysmā/Suez baths is not sufficiently well preserved to be sure of it, but the layout seems to conform to that of a ring type circuit. Things are less clear in the case of the baths of Theadelphia, where the plan of the hot rooms is quite incomprehensible, and in that of the Sheikh Zawyet baths, which suffered numerous transformations and unfortunately are poorly documented. In its final state, the circuit was a row type, but the layout of the bathing block, very similar to that of the baths of Gherra and Kom Trugah, argues in favour of an original edifice with a ring type circuit. The Amheida baths are more complex,²⁹ and only its last stage fits, more or less, into this group, due to the layout of its cold section and the block organisation of the hot rooms, much like that of Clysmā/Suez.

When there is a ring type circuit, it generally entails the doubling of the tepid room into an entrance *tepidarium* and an exit *tepidarium*. In the largest edifices of this group, the bathing block that results has up to six hot or tepid rooms (Gherra, Kom Trugah): vestibule (thermal insulation lock), entrance *tepidarium*, *destrictarium*, *laconicum*, *caldarium*, and exit *tepidarium*. The other examples have four or five hot rooms which, even if they are of modest size, imply that the bathing block had a significant surface area, occupying on average 45% of the surface area accessible to the bathers. The main room in the bathing block, the *caldarium*, was equipped with two or three immersion basins. In most cases (six of the eight examples of preserved *caldaria*), one of these basins was circular

28. The baths of Theadelphia for example, for which only the cold section is documented, was decorated with mural paintings imitating marble, with a stucco decoration, with pilasters with Corinthian capitals and so on.

29. See Davoli, in this volume.

in plan with an interior diameter varying between 1.20 and 2 m, and was inserted into an apse that protruded greatly on the outside of the building and into which the bathers descended by two or three steps (Buto North, Gherra, Kom Trugah, Sheikh Zawyet, Amheida and Clysma/Suez). These circular hot basins were not, strictly speaking, individual bathtubs and must have welcomed from two to four bathers depending on the case. In contrast, they are generally associated with one or two smaller rectangular basins, and here one finds the juxtaposition of individual and collective practices observed in the two imperial baths in our corpus (Karnak and Alexandria).

From the chronological perspective, few of the edifices in this group are dated. Only the Buto North and Amheida baths have been properly excavated stratigraphically. The former baths date to the second half of the 2nd century (though it is the least “semi-imperial” edifice in the group), and the latter baths (in their final state, which corresponds to our type) date to the second half of the 4th century (but it inherits in part some structures built in the 3rd century AD). The baths of Clysma/Suez, excavated long ago, can be dated less precisely to between the 4th and 5th century. The finds from Sheikh Zawyet (ivory hair pins and mosaics) led J. Clédat to date the edifice to the third and fourth centuries, with no further precision there either. The more monumental examples of Gherra, Sersena, Kom Trugah and Kom el-Dosheh, can only be dated on the basis of typological comparisons. The influence of the Imperial model is clear, these edifices are the adaptation on a reduced scale of the same monumental formulae, in a more modest urban and economic context. From this point of view (see *supra*), they can hardly be earlier than the early 3rd century.³⁰ The presence of circular basins, although very characteristic, does not really provide a chronological indicator; exactly the same type of installation is found in Buto North as early as the second half of the 2nd century, and in Clysma/Suez, possibly dating to the 4th–5th century.

From a technological point of view, in the baths of this group there is a tendency to insert the heating system at the heart of the edifice, thanks to the deeply buried level of the furnaces, which are accessible through service corridors located under the heated rooms. This layout, the precursors of which are attested in Karnak in the 3rd or 4th century, sees its final culmination in the Mareotic baths from the 5th century onwards. The baths following the “block type” plan did not, however, all benefit from this progress: the baths of Buto North in particular, had only peripheral furnaces, as did those of Kom el-Dosheh and Amheida. The furnace of Sheikh Zawyet is partly engaged between two hot rooms, but is accessible from the outside, as in Karnak. It is tempting to turn this layout of the furnaces, more or less centred and buried, into a chronological criterion, which would place the examples of Kom Trugah and Gherra after those of Kom el-Dosheh and Sheikh Zawyet. However, the Mareotic baths have shown that even within that homogenous group, this layout was not systematic, and that in part it depends on the size of the building, and on its being doubled or not into two circuits. The technique of the high-flame furnace in itself appears relatively early on, the oldest example probably being that of Buto North (second half of the 2nd century), where it was partly constrained by the reuse of older furnaces, the buried position of which is largely due to the raising of the circulation levels.

30. The Theadelphia baths should probably follow the same rule, despite the discovery of 2nd century coins (but in what context?).

Another type of installation found in this group, that of walls with *tubuli*, seems able to provide some chronological indication. We have seen that in Mareotis, in the 5th and 6th centuries, the traditional system of hollow walls evolved towards a system of embedded “cupboards” involving only a few adjoining chimneys, irregularly distributed round the hot rooms. The fired clay elements making up these chimneys are square in section, and have no lateral holes. The baths in the block group constitute, from this point of view also, an intermediate stage: some edifices have walls with *tubuli* enhancing all the walls of the hot rooms. The Sheikh Zawyet baths are a good example of this, for this system was preserved at the time of the excavation (fig. 18). The Gherra/Mahemdeyya baths had a fairly similar system, according to the description of them given by Clédat in his excavation notebook.³¹ A double face covered all the walls of the main hot rooms, and consisted of fairly squat rectangular *tubuli* (12 cm × *circa* 20 cm, height only 11.5 cm). Finally, one of the walls of the Amheida baths bears a negative of the presence of a complete face of *tubuli*. Another example to the contrary, at Kom el-Dosheh, illustrates an intermediate system:³² complete faces of *tubuli* are already replaced by groups of four to eight embedded chimneys, arranged around the room in deep (15 to 18 cm) “cupboards”. The fired clay elements that make up the vertical conduits inserted there (designated as “tubes calorifères” [heating tubes] by Daressy) are still very similar to the classic *tubuli*, being rectangular in section and with lateral openings of 4 to 8 cm allowing the lateral flow of hot gases. These are still within the logic of wall faces, even if they only covered a limited area of wall. The Kom Trugah baths had a similar arrangement in which the fired clay elements, wrongly called *tegulae mammatae* by el-Khachab, were already grouped into isolated cupboards.³³ It is also the case at Clysma/Suez, where the chimneys (called “bouches de chaleur” and *cuniculi* by B. Bruyère) are grouped in fours.³⁴

The construction of the hypocausts reveals the same type of evolution: a system of piles directly supporting horizontal slabs (Kom Trugah, Amheida) evolves into one of rows of piles linked by arches (Gherra/Mahemdeyya, Clysma/Suez) fairly similar to the system of vaults in the baths of Mareotis.

However, even if the general tendency is clear, the evolution of these installations (*tubuli* and hypocausts) does not make it possible to “classify” our edifices chronologically. Clearly such installations were fragile and severely constrained, and needed to be rebuilt on several occasions during the long lifetime of the buildings; thus they can never be used to date the initial construction of an edifice. The example of Karnak, where the remains of small circular pillars were found reused in brick masses of the last phase of the hypocaust, is a case in point.³⁵

In light of this varied evidence, it seems prudent to give a broad date for the overall group, from the second half of the 2nd century (Buto North, Theadelphia?) to the early 5th century (Clysma/Suez), the main construction period being between the 3rd and 4th century. They could have

31. Archives of J. Clédat preserved in the Louvre Museum (Department of Egyptian Antiquities, E 27427), notebook 1912, p. 17 with a sketch of the principle. Once again we would like to thank C. Meurice for having given us access to this unpublished and, for us, essential material. It allowed us to include in our study a bath for which we had virtually no published information.

32. DARESSY 1912, p. 179.

33. EL-KHACHAB 1956, pl. III.

34. IFAO archives on line at http://www.ifao.egnet.net/bases/archives/bruyere/?id=MS_2004_0180_009.

35. See El-Masekh et al. in this volume.

continued in use thereafter, since it is rarely possible to define the date of their abandonment. When it is known, for example at Buto North (late 3rd/early 4th century) and Amheida (late 4th century), it is connected with the evolution of the urban context rather than the possible disuse of the baths themselves. A coin of Justinian I (518–527) found in the baths of Kom el-Dosheh indicates that some of these edifices could have lasted at least into the early 6th century (assuming the coin came from the bath, which is questionable).

Several baths retain traces of their successive transformations, which can help us follow the changing practices within the group. The baths of Gherra thus pass from a ring type to a row type circuit, and in the final phase adopt a layout similar to that of the Mareotic baths. The Amheida baths, the originality of which we have described above, saw the cold section gradually develop until, in the final stage, it occupied more than three times the surface area of the hot rooms, organised in a row type circuit. The Sheikh Zawyet baths also adopt a row type circuit after a series of modifications that are difficult to follow. Outside of this group, the transformation from a ring to row type circuit was noted at Karnak (see *supra*), where the double ring type evolves into a double row type circuit during the 4th century. This tendency to abandon the ring type circuit in the 4th century thus seems to be a general phenomenon; it was perhaps a response to the need to make better use of the edifices in terms of capacity, whilst avoiding the need to double some of the hot rooms. Two of the Mareotic edifices, Mit Abul Kom and Teiba (see fig. 3), perhaps also had a ring type circuit in their first phase. At least it would be possible given the symmetrical arrangement of the hot rooms looped around the central furnace.

The “Other Baths”

Amongst the 34 Romano-Byzantine baths whose plans are sufficiently well preserved and documented, 11 edifices do not fit into the three preceding groups. The better studied ones, on the one hand, allow light to be shed on the introduction of these practices at the beginning of the Roman period, particularly in a military context, and on the other hand, to define and nuance the ways in which these practices evolved from the late 2nd century AD onwards, a period marked, at this point in our studies, by a relative standardisation of the architectural models.

The oldest Roman baths found in Egypt—the first to develop the use of baths based on a hot bath, with the succession of cold, tepid and hot rooms and the systematic use of heating by hypocausts, radically different from the hybrid models of the Ptolemaic period—date to the 1st century AD.³⁶ Some of these were erected in a military context, within or near to forts.³⁷ The five examples existing today, at Didymoi, Iovis, Maximianon, Mons Porphyrites and Xeron Pelagos, display a marked architectural diversity (fig. 19). Quite small (their surface area varies between 40 and 165 m²), they all have a row type itinerary, sometimes limited to two rooms, sometimes extended to four or five rooms. When there are more than two rooms, the layout can be linear (Xeron), sometimes angular (Iovis), or more sinuous (Mons Porphyrites). The heating techniques also vary, from very

36. For a more complete analysis of the phenomenon of the introduction of Roman practices and the longevity of the original Greek models, see Redon, in this volume.

37. REDON 2009.

basic installations similar to domestic hearths (Maximianon), up to more developed hypocaust systems (Xeron Pelagos). This feels like a transitory, disorganised phase, in which the construction of edifices occurred without recourse to models, making use of the expertise available at the time of construction and according to the means and needs of the military post, that were often quite limited. Thus, contemporary edifices, less than 30 km apart, developed very different solutions.

The first urban edifices, contemporary or sometimes earlier than these military baths, remain poorly understood. The only two examples that have been found and that have produced a plan that can be interpreted, in Alexandria (under the Imperial baths of Kom el-Dikka) and at Marina el-ʿAlamein, date, in their initial phase, to the 1st century AD and seem to develop a classic linear row type plan. Technologically, and particularly regarding the heating arrangements where they are preserved, their construction is also classic: the hypocausts are built using small square or circular pillars covered with slabs, and *tubuli* are formed into proper wall faces. The baths of Marina el-ʿAlamein³⁸ are a perfect example of this. The relative chronology of the Marina el-ʿAlamein baths is, however, complex and subject to discussion, but it seems that in its first stage, in the late 1st or early 2nd century, the three hot rooms were aligned along a courtyard with portico, which is a layout also found, on a smaller scale, in the baths of Mons Claudianus, dated to the mid-2nd century.³⁹ Two other urban buildings, Bakchias and Amheida, have also produced remains, though less clear, that date to the beginning of the Roman period. The baths of Amheida⁴⁰ seem to confirm the feeling produced by the military baths, of a phase of experimentation; in particular, its oldest remains include a circular *laconicum* (diam. 4.30 m), hitherto unseen in the Egyptian corpus, either in form or technique (mud brick, floor made of wooden planks on crossbeams). This steam room could have been inspired by models with *tholoi* inherited from the Ptolemaic period and still sometimes in use at this time. It could equally be an adaptation of the circular sweating rooms found in certain Roman baths in Italy, imported to Egypt via the army. A comparable circular room, although much smaller and without hypocaust (perhaps replaced here by a brazier), was found in the military bath at Maximianon. The other remains of the first phase of the Amheida baths are not sufficient to reconstruct the route of the bathers. The first phase of the baths of Bakchias,⁴¹ apparently dated to the Augustinian period but heavily reworked until the 3rd century, is no clearer. It is just possible to distinguish an alignment of three rooms (*frigidarium*, a small intermediary hot room and a large *caldarium*), subsequently integrated into a more complex plan, which probably belongs to the group of edifices with a “block plan”.

The example of the baths of Kom el-Ahmar seems to belong to this evolutionary scheme: an analysis of the remains indicates that, contrary to what had been understood at the time of the excavation, the building was not double, but is made up of two successive stages, the second being built almost 2 m higher and replacing the first. The initial edifice, roughly dated to the Early Empire on the evidence of its mosaics, had an angular row type plan. However, the strict alignment of its three hot rooms makes it similar to row type examples. When it was rebuilt, at an unknown date,

38. See Bąkowska, Czerner, in this volume; MEDEKSZA, CZERNER et al. 2011.

39. This edifice, built in a small settlement attached to a fort, is not strictly speaking an urban structure, which explains its modest size.

40. See Davoli, in this volume.

41. GIORGI 2012. See Redon, in this volume, table 1.

the new plan falls within the typology of edifices of the block type, characterised by a bathing block arranged around a main central furnace, accessible through underground corridors, and by a vast and partly symmetrical cold section. The second edifice bears the traces of numerous transformations: the circuits, such as they can be reconstructed in the final stage, are similar to the Mareotic model. Based on the chronology of the evolution of models that we have just established, the second phase of the baths of Kom el-Ahmar could date back to the 3rd century, and continue to evolve until the 5th century.

At this point in the study, in spite of the disparity and the small number of preserved edifices, during the 1st–2nd centuries and after an initial phase of experimentation, the row type plan seems to have become the model preferred by builders when the means allowed.⁴² This layout does not disappear thereafter, when the symmetrical imperial models, or their less monumental, semi-symmetrical and/or simple ring type derivatives appear during the 3rd century: the small baths of Karanis, approximately dated to the 4th and 5th centuries, are organised on the same linear row type plan.⁴³ This layout, which had led Nielsen to date it to the 1st century AD,⁴⁴ clearly shows that the row type plan remained in use well after the adoption of more evolved models, and that it was probably reserved for smaller edifices, built at lower cost. Technologically, the baths of Karanis, though following an apparently archaic plan, benefited from advances in the domain of heating: they are equipped with an installation similar in all aspects, for example, to that of the final state of the Amheida baths (high-flame furnace, boiler), which already prefigures that of the Mareotic baths.

Synthesis of the Evolution of the Models

The architectural analysis of the 34 sufficiently well-documented Egyptian bathhouses and their division into four sub-groups means that the broad lines of a coherent chronological development can be traced step by step (fig. 2). It can be summarised in a few stages:

- Importation of Roman models (1st and 2nd century AD), partly through the army, without any uniformity in the architectural solution. The edifices are modest and of the row type (the bathing block is rarely more than 100 m²). In parallel with the appearance of these new edifices, the “Graeco-Egyptian” bathing practice continues in the 1st century AD, as illustrated by the many hybrid edifices derived from Greek bathing practices.⁴⁵

- The linear row type seems to have spread gradually in the 2nd century, in particular in the first baths erected in urban contexts. Nevertheless, the few buildings dating to this period remained modest (between 100 and 200 m²). Graeco-Egyptian baths disappear; from now on everyone bathed Roman-style. The techniques were also Roman, making use of furnaces, hypocausts and classic wall faces with *tubuli*.

- In the largest urban centres, in the late 2nd or early 3rd century, apparition of edifices built on the Roman imperial model (symmetry, monumentality, double ring type).

42. We also cite the baths of Kellis (67): though not yet excavated, the magnetometer survey has revealed a plan that seems to follow the same principle.

43. CASTEL 2009.

44. NIELSEN 1990.

45. On this transition period, see Fournet, Redon in this volume (a), and Redon, in this volume.

– In parallel, beginning in the late 2nd/early 3rd century, but especially in 4th century, came the development of bathing edifices inspired by Imperial models, but adapted to the means and needs of more modest places. These edifices, covering a surface area of between 200 and 400 m², most often employ a ring type circuit and have a cold section with a symmetrical plan. The ratio between the hot rooms (strictly speaking, the bathing block) and the cold section is in the order of 40% to 60%. Certain smaller edifices keep a row type plan, but the general tendency moves towards this “block type”, characterised by a genuine uniformity of the architectural solutions (illustrated, for example, by the frequent presence of circular pools in the *caldarium*).

– This model persists until the 5th century, but the edifices gradually change: the size of the basins is reduced, and they tend to become for individual use, and circuits are transformed from ring type to row type. Enlargements most often concern only the cold section, which proportionately becomes larger and larger. Changes can equally be observed in the technology, with the gradual use, beginning in the 3rd century, of the high-flame furnace and deeply buried furnaces often arranged in the centre of the bathing block, and of hypocausts consisting of brick pillars and vaults, and not of the traditional small pillars and *suspensura*.

– The typological and technological changes can also be observed in the Imperial model edifices, which persisted in parallel to the “block type”, sometimes well into the Byzantine period.

– In the mid-5th century in Mareotis, a highly standardised group of edifices appeared that marked the outcome of these changes. The surface area covered by the bathing block (tepid and hot rooms) is comparatively very low, on average occupying only 15 to 20% of the total surface area open to the bathers. The basins are smaller, most often only sufficient for individual immersion. In contrast, the cold section develops, often in a monumental fashion. Heating techniques also mark the outcome of an evolution noticed earlier, and the installation of high-flame furnaces and central boilers becomes generalised, whilst the normal arrangement of entire wall faces of *tubuli* is replaced by occasional conduits of only three or four vertical columns of square-section tubes.

– Towards the late 5th or early 6th century, these edifices are doubled and provided with a second bathing circuit, similar to the first. This means that both men and women can come at the same time, each sex having their own circuit. The service spaces, and in particular the heating apparatus, are used for both circuits and are located in the centre of the double bathing block. These double edifices are monumental with regard to their cold sections, which are often enlarged during successive refurbishments, further accentuating their disproportion with the hot section. The latter tends to evolve as well, with the multiplication of individual bathtubs, including in rooms that theoretically, in the canonical succession of *tepidarium* / *destrictarium* / *laconicum* / *caldarium*, did not have them. All hot rooms tend to become *caldaria*, the other heated rooms, if they still exist, are now only waiting rooms, where bathers wait until an individual bathtub becomes vacant.

– These edifices continue to be used until the mid-7th century or a little bit later (Marea 1), although their final changes and how they were abandoned cannot be determined.

The Mareotic group of baths can, in many respects, be considered as the last stage of a slow process of evolution, observable across the centuries over the whole of Egypt. However, this process only provides a general framework, and cannot alone explain the emergence of a group that brings together, in such a limited geographical zone, such a high number of edifices sharing plans and technologies

that are so very uniform. This standardisation suggests the existence of single prototype, or rather of an initial series of edifices (or of designers) that were subsequently reproduced and improved upon. Logically, this stimulus should come from Alexandria. The bathing landscape in the capital during the Byzantine period is, however, fairly limited, and only the Imperial baths of Kom el-Dikka, erected in the second half of the 4th century, in other words some decades before the development of the Mareotic baths model, are known today. Certainly, they share many technical characteristics with the Mareotic baths, but cannot be compared with them in terms of scale and organisation. Other edifices must certainly have existed in Alexandria, as proven in written sources⁴⁶, and indeed, M. Rodziewicz mentions a very large Byzantine bath along the Canopic Way, in the eastern part of the town, which could date to the 4th–5th century.⁴⁷ According to the author, it was as large as those of Kom el-Dikka, and could be comparable to the Mareotic baths. However, so little remains of it that it is difficult to support this hypothesis, and the lack of remains could, actually, argue in favour of a less monumental architecture than that of the large baths of Kom el-Dikka. In any case, the argument from negative evidence does not work, since, in the end, there have been very few excavations in the town.

EGYPTIAN BATHS IN CONTEXT

Much work has been carried out in recent years in the Near East, particularly as part of the Balnéorient project, which has resulted in a better understanding of the bathing phenomenon in late antiquity in the eastern Mediterranean.⁴⁸ The broad tendencies and changes observed in Egypt, logically enough, find numerous parallels. Some of the characteristics noted, however, concern only Egyptian territories, while others can perhaps be more closely related to the history of African baths, better known since the work of Thébert.⁴⁹ From this point of view, our work on the little-known heritage of Egyptian bathing can be seen as the last piece in the Mediterranean puzzle, the other pieces of which are already in place.⁵⁰

In Egypt as Elsewhere...:

Homogenous Changes in the Eastern Mediterranean

An initial comparison between our results and those from North Africa or, even more clearly, those from the Near East, reveal a great similarity in the evolutionary process, from the adoption of the Roman bath through to the late changes in the 7th and 8th centuries.

In the first place, the introduction of bathing practices seems to be comparable to that observed in the Near East, even if in both cases, the number of preserved edifices being very small, any assessment suffers from lack of archaeological evidence: the adoption is relatively late and begins with rather

46. GASCOU 2012.

47. RODZIEWICZ 2009, p. 166, fig. 1.7.

48. See in particular BOUSSAC et al. 2014a; BOUSSAC, FOURNET 2015.

49. THÉBERT 2003.

50. Another region, modern Libya (the Roman provinces of Tripolitana and Cyrenaica), missing from Thébert's synthesis, has recently been studied (MARÉCHAL 2013) and 34 edifices have been inventoried, dated from the 1st to 7th century.

small edifices. In Egypt, as in ancient Arabia, one must wait until the turn of the 1st/2nd century AD, and then following a few pioneering experiments (military forts in the Eastern deserts or the minor palatial phenomenon of the Herodian baths in Palestine), an initial architectural model is developed in an urban context. These edifices are then comparable in the two regions: they adopted a layout along classical lines, where *frigidarium* and two or three hot rooms are aligned along a courtyard in a row type circuit. This model, known as Pompeian or Campanian, seen in Alexandria (in baths below the baths of Kom el-Dikka), at Mons Claudianus and at Marina el-‘Alamein, can also be found in the same period in southern Syria (Sleim), Jordan (Dharih) and Libya (Apollonia). More broadly, the same model and the same technologies exist throughout the Roman world, from Glanum to Ostia.⁵¹ Thus Egypt is perfectly integrated from this point of view into the bathing history of the Mediterranean, despite its originality in the preceding period and the surprising success of baths in the Greek tradition that have been found there.⁵²

As in the rest of the eastern Mediterranean world, the Egyptian models develop rapidly towards greater monumentality, even if here too archaeology provides only rare examples: thus the 2nd and 3rd centuries see the first edifices to develop an Imperial type plan appear in both the Near East and Egypt, edifices whose function was as much about bathing as politics and urban life. The few Egyptian edifices (only Karnak and Antinooupolis for this period) nonetheless suffice to show the continuity of this phenomenon, which touches all the large towns of North Africa, Libya and the Near East from the 2nd century AD and onwards as the cities developed.⁵³ In Egypt, as elsewhere, or perhaps more than elsewhere, these monumental edifices constituted an exception in a bathing landscape mainly composed of much more modest edifices. The architectural model that takes hold in Egypt between the 3rd and 4th centuries, inspired by symmetrical and monumental architectural solutions but on a reduced scale, that we have named “block type”, finds numerous parallels in neighbouring regions. The choice of a ring type itinerary, sometimes semi-symmetrical, seems to belong to this period, and one finds typologically very similar edifices to those of Mahemdeyya, Kom el-Dosheh and Kom Trugah in North Africa, in Libya (Regio VII baths in Sabratha, Hunting Baths in Leptis Magna) and as far as the borders of the eastern provinces (baths of Dura Europos and Sha‘ara). This model, as Thébert has shown,⁵⁴ constitutes an adaptation of the imperial model to a limited space. It is used in edifices that are generally much larger than those which opted for a row type circuit, and in Africa were used systematically when the edifices had more than three hot rooms.⁵⁵ Its use also provided a good way for local benefactors to show the splendour of their constructions without recourse to state funds to do so. The use of this model, even if developed at a much more modest scale than in North Africa, is somewhat surprising in a few Egyptian examples; a case in point is the obscure community of Kom el-Dosheh, the ancient name of which remains unknown, but which must not have been a regional centre. Nevertheless, the process is the same as in Africa: the 3rd–4th centuries see the spread of architectural solutions used in the large urban centres into the most modest places. The variety of edifices persists, however, and in parallel to examples following “block type” plans that are sometimes semi-symmetrical, others are built along less ambitious plans.

51. THÉBERT 2003, p. 407.

52. Fournet, Redon in this volume (a).

53. On the spread of the Imperial model in the Middle East, see FOURNET 2012.

54. THÉBERT 2003, pp. 318–340.

55. THÉBERT 2003, p. 356.

It is in the following centuries, particularly from the 5th century onwards, that the changes observed in Egypt fall best in line with those observed in the Near East. The whole region is, first and foremost, marked by an impressive vitality in its bathing practices. In the Near East as in Egypt, more than half the edifices in the corpus date to later than the 4th century. To this vitality is added the uniformity of the architectural models. The typological table in fig. 20 brings together a few edifices representative of the “small baths” of the Near East for comparative purposes. Comparing them with the small Egyptian baths at the same scale is enlightening. It demonstrates the similarity of the phenomena and the level of standardisation of these edifices. The broad lines of this evolution of baths in the Byzantine period are well known.⁵⁶

The transformation of the cold section is probably the most visible change: it gradually gains importance in the edifices, and in a single space brings together the functions that were, until then, distributed between the *frigidarium*, courtyards, cloakrooms, gymnasia etc. In this multi-functional space, the bathers gathered and waited for a free space in the hot rooms, and then took their cold bath on leaving them. Other collective activities, social and/or political, went on there, and gradually grew in importance over more traditional activities. In particular, sporting activities tend to disappear,⁵⁷ while the *frigidarium* is manifested only by one or two cold basins located on either side of the entrance to the hot section. Proportionally, the hot section now occupies only a reduced surface area. This evolution, for a while wrongly interpreted as the response to a need to economise fuel,⁵⁸ is clearly much more complex: the cold section becomes the principle space for socialising in these edifices, where the bathers spend the most time, where virtually all the ornamentation is found and where a certain degree of monumentality is maintained. The hot section of these Byzantine-period edifices in the Near East almost systematically adopts an angular row type circuit, usually consisting of three rooms. The surface area of these rooms becomes smaller and smaller in proportion with the total surface area available to the bathers. However, the hot bath does not lose its importance: the smallness of the rooms optimises the heating, which is more efficient in smaller spaces than in the vast *caldaria* of the Roman period. These characteristics start to appear in the 4th century AD and culminate in the 8th century in a series of Umayyad baths in the Near East. The Byzantine baths of Egypt follow the same general evolution. The case of the Mareotic baths is almost a caricature: at the end of their transformations, some edifices have plans in which the hot section occupies only 10% of the total surface area.

Another tendency, observed in Egypt but common to the whole eastern Mediterranean in the Byzantine period, concerns the size of the pools, which slowly evolve towards individual bathtubs. This change, no doubt like the disappearance of sporting activities, reflects an evolution in society towards more modesty and intimacy.⁵⁹ It accompanies, and partly explains, the other transformations noted above: the act of washing oneself (once again) becomes individual. The bathers, who so far would have found themselves in the *caldarium*, the high point of imperial edifices, from now on

56. See NIELSEN 1990 pp. 115–118; GINOUVÈS 1955; THÉBERT 2003 pp. 424–426; CHARPENTIER 1995.

57. For Egypt, see REMIJSEN 2015, p. 119.

58. NIELSEN 1990, pp. 58, 115 makes a link between the reduction of the hot rooms and a supposed economic recession, imaginary in the East.

59. Here too, one must not retain the economic explanation put forward by Nielsen (1990, p. 116), at least in the Near East. The reduction in size of the basins in no way implies that less water was used in them: potentially it was changed more regularly (see *supra*).

gather in the cold room. Only the time required for washing was spent in the hot rooms, which was improved by the efficiency of the heating system and the more frequent renewal of water in the individual bathtubs. The basic operations of Roman baths are preserved, but the way in which they are taken has evolved radically, in Egypt as elsewhere.

This uniformity of practices—and of the resulting edifices—in the Byzantine period is, however, only partial, or in any case insufficient to form a characterisation of the bathing landscape of the 5th–7th centuries. It has recently been shown that the imposing edifices of the Imperial type, which in the West decline at the end of the 4th century, continue to develop in the Near East, often even in a monumental manner, until the 5th and 6th centuries.⁶⁰ At this time, one observes the juxtaposition of two types of building which seem to be quite opposite to each other: the gigantic baths, maintained and enlarged in the centre of the most important cities, which stand alongside new but much more modest buildings adapted to the new bathing practices. The former, inheritors of the Imperial period, preserve the role of an economic and political showcase, but are unable to adapt to the evolution of the bath due to their monumental dimensions: the *caldaria* covers a space 10 or 20 times larger than in the “new” baths. However, they do evolve; the cold section is developed, housing vast halls (or “bathing basilicas”), and the hot rooms acquire individual bathtubs, as well as vast *solia*, sometimes as late as the 8th century.

Egypt illustrates wonderfully the contemporaneity of the two models and the reciprocal influences that they exercise on each other. Imperial baths certainly continued to exist in the nome metropolis, such as in Oxyrhynchos in the 5th–6th centuries,⁶¹ but it is in Alexandria that the comparison is the clearest. The gigantic baths of Kom el-Dikka, built in the 4th century on a typically Imperial plan, continue to develop until at least the 7th century, whilst at the same time, in the hinterland of Alexandria, around Lake Mareotis, a very different sort of edifice is spreading. The design of the baths of Kom el-Dikka and that of the Mareotic baths have very little in common, but nonetheless they evolve in parallel, and share some characteristics, particularly technical ones. It is possible that the monumentality of some of the Mareotic baths (Marea 2 in particular) was directly influenced by the symmetry and scale of the Alexandrian baths, while in Alexandria, the installation of small bathtubs next to the huge hot pools illustrated the evolution of practices. In any case, in Egypt one finds yet again what is observed in the Near East: monumental edifices in town centres, particularly in the 6th century, stand alongside a multitude of small, more “modern” edifices, which spring up in the neighbourhoods, in medium-sized towns and even in some villages.

This spread of baths right into the smallest villages of the territory could appear to be an Egyptian characteristic that was already observable before the Byzantine building boom. Indeed, baths have been found in all periods in extremely modest locations, reproducing the phenomenon observed

60. FOURNET 2012. This assessment counters that of Nielsen (1990, p. 104), who saw the disappearance of the monumental *thermae* as being a direct consequence of the rise of Christianity. The disappearance of physical activities (and thus of the nudity of gymnasts), however, seems real enough: the presence of vast *palaestrae* in 5th and 6th century baths should be dissociated from sporting activities (in any case they are usually paved, which is incompatible with the practice of most sports).

61. Several papyri continue to mention one or more public baths (*demosion loutron*) in the town, and their monumental nature is not in doubt (see *P. Oxy.* 34, 2718, 5th century, *P. Oxy.* 36, 2780, 6th century). The “imperial” baths of Karnak, by contrast, have disappeared by this date. However, this abandonment was not linked to the evolution of bathing practices, but to the disappearance of a whole quarter. See El-Masekh et al. in this volume.

in the Hellenistic period.⁶² Texts complement and add detail to the archaeological evidence. In the Late Roman Empire, in parallel with baths in the cities,⁶³ they mention several edifices built in villages or on private agricultural estates.⁶⁴ This impetus, encouraged in part by elites owning large estates in the *chora*,⁶⁵ partly explains the presence of small edifices in Mareotis, but it is sometimes difficult to distinguish whether they are private and public. For this region developed in the Roman and Byzantine periods at the time when viticulture was spreading.⁶⁶ Large estates were emerging, some of which have left traces in archaeology (a villa with presses) and in place names.⁶⁷ Unfortunately, the context in which most of the baths in our corpus were discovered is poorly documented. When it is documented, it is not clear whether the baths were integrated into another edifice, such as a villa. But the baths could certainly have been part of estates: thus the Mergham baths, located on the south bank of Lake Mareotis, stand beside some fairly monumental stone constructions, as well as a workshop producing wine amphorae (and perhaps also beside a quay). The Ezbet Fath'Allah bath was located close to a large mudbrick structure with stone jambs, which could have been a wealthy wine-growing villa. At Karm Kandara, the baths were discovered close to two presses probably belonging to a villa. Finally, the baths of Mit Abul Kom are located only 300 m from a densely built area, which could be a villa or a pilgrims' hostel on the road to Abu Mina. However, compared to the private baths in rich dwellings of the Mediterranean world,⁶⁸ these baths are often relatively large and completely independent architecturally. Perhaps they were private baths open to a wider clientele than simply the masters of the villa. We know that at Theadelphia, in the 3rd century, the workers had access to the baths of the estate on which they worked. It is also not impossible that a fee was charged to enter the baths.⁶⁹

However, in this too, Egypt is no exception, and parallels exist elsewhere of baths in small places like villages. The best example is probably the group of small baths in the northern Syrian countryside: the economic and demographic high point of the hinterland of Apamea on the Orontes, or of Antioch, displays the same proliferation of small baths, under the direct impetus of a wealthy elite. Some examples, particularly the one in the village of Sergilla,⁷⁰ where the baths are associated with a building interpreted as being an inn, are quite similar to the layout of the baths of Ezbet Fath'Allah and Mit Abul Kom.

62. Fournet, Redon in this volume (a).

63. The baths of Oxyrhynchos, Hermoupolis and Aphrodito in particular are the subject of several documents regarding their working or their maintenance.

64. See the example of the baths owned by the large Apion family on several of their properties in the Oxyrhynchian countryside (*P. Oxy.* 16, 1921 and 1925, 7th century AD), or the private baths of Hermoupolis Magna, rented by an important person from Alexandria (*P. Flor.* 3, 384, 488/489 AD).

65. On these large estates, KEHOE 1992 (on the beginnings of the institution), RATHBONE 1991; ROWLANDSON 1996.

66. EMPEREUR, PICON 1998; RODZIEWICZ 1998.

67. DÉCOBERT 2002.

68. PIRAUD-FOURNET 2014 on private baths in the Byzantine east.

69. RATHBONE 1991, pp. 125–126, 198–200, part. p. 199.

70. CHARPENTIER 1994.

A Few Regional Traits Nevertheless

It should not, however, be concluded that bathing practices from Carthage to Antioch, by way of Karnak, were exactly the same. The general framework is certainly consistent, the same tendencies are found from one region to the next, particularly in late antiquity, but there is nevertheless room for some variation. And from this point of view, Egypt, like other regional sub-groups, developed its own characteristics.

A question of surface area—comparison of the typological plates (figs. 3, 17, 20) indicates, despite a strong similarity in organisation, a difference in scale between the Near East and Egypt. This difference is also apparent, perhaps greater, if one compares Egyptian baths with those of North Africa (in Thébert's catalogue): proportionately, the Egyptian baths are very small edifices. On average they cover only 500 m² (total footprint); more than half of the 21 better preserved baths cover less than 400 m². The sub-groups that have been identified confirm this impression: baths which adopt a sometimes semi-symmetrical ring type circuit generally cover an average of 300 m², whilst the same plan, when used in North Africa, is found only in edifices of between 1000 and 3000 m². One might imagine that this lack of imposing edifices could be explained by its distribution: in the end, many of the small edifices in Egypt might have complemented the service offered elsewhere by a few much larger edifices. To the network of "large urban baths" in Egypt, there would have been a corresponding denser chain of small neighbourhood and village baths, perhaps linked to specific land use in Egypt. Such an interpretation is highly hypothetical given our present knowledge (there is currently nothing to say that there were more small baths here than elsewhere), but it could explain the choice of "luxurious" architectural formulae even in the smallest edifices. The Karnak baths are a case in point: as already mentioned, this is the smallest Roman edifice to adopt an Imperial type plan. Its monumentality rests solely in the use of the doubled symmetrical plan, not in the size of the building, which was very modest. Thébert made a direct link between the use of the Imperial plan and the status of cities. The towns which have it are systematically towns with political and economic power. However, he excluded Egypt from his analysis,⁷¹ believing that it formed a case apart. The only two truly monumental examples are indeed exceptions: in Alexandria, the baths of Kom el-Dikka are a reflection of the capital, backed by the Egyptian economy, and the only town whose economy is truly international. Antinooupolis is a different case, but just as particular. Its monumental baths are a truly "Imperial" foundation, *i.e.* the direct result of the will of the emperor. The town's economic power probably had little to do with it. Archaeology perhaps increases this effect since few large Egyptian cities have been excavated, nevertheless there is an overall phenomenon that is so far unexplained: during the whole Roman period, Egyptian baths are sometimes luxurious but are small or even very small.

The assessment is more or less the same for the sub-group of the Mareotic baths which, compared to other Byzantine baths in the Near East, prove to be very small; the bathing block in particular covers, on average, only half the surface area devoted to it elsewhere. The cold section, by contrast, remains relatively large, sometimes monumental, so that in the end these edifices have a total surface area comparable to or larger than that of the Near Eastern baths. However, proportionally,

71. THÉBERT 2003, pp. 299, 304.

the bathing block represents on average only 15% of the total surface area open to bathers, against 30% in the Near East (fig. 4). This is not the only particularity to appear when a comparison is made. For, if until now we have underlined the homogeneity of Byzantine baths across the Eastern Mediterranean (the tendency to develop the cold sections, the reduction in size of the basins and heated areas, a return to more individual rather than collective bathing practices, etc.), certain other architectural and technical characteristics of the Mareotic baths are clearly regional.

Heating techniques—the installations observed in the Mareotic baths, which were gradually put in place in the 3rd and 4th centuries (Buto, Karanis, Amheida, Clysma, Karnak, etc.), diverge from the traditional Roman systems. The furnaces are deeply buried, accessible along underground corridors and develop the technology of the “high-flame furnace”. Their position, often in the centre of the edifices, allows the development of sophisticated boilers, intended to supply all the small basins distributed around the hot rooms. These very deep basins, embedded in the peripheral walls, are no longer built above hypocausts, nor heated using an arrangement of *testudo alvei*, which were incompatible with the new layout. Hot water, the temperature of which can no longer be maintained, is probably renewed in these basins more frequently, thanks to their reduced volume. The rooms themselves are equipped with hypocausts and heated cupboards, and their temperature is no doubt improved by the smallness of the space.

In the Near East, heating installations also evolve, but in a different direction.⁷² The classical Roman layout, in which the furnace and boiler are arranged in the axis of the main hot basin, is kept and the main basin, though shallower, is still built on hypocausts at the outlet of the furnace. However, thanks to the excellent state of preservation of some edifices, a change in the installation of the boiler can be observed: the *testudo alvei* disappear, the metal cylinder in which the water was heated becomes a masonry cistern which, as well as the hot water for the basins, produces steam intended to spread across the rooms. An opening between this cistern and the main hot room attests to this revolution. At the end of the Byzantine period in northern Syria, and more systematically in the Umayyad period as far as Jordan, steam is deliberately produced and is an active participant in heating the baths. This system would continue to improve in the early centuries of Islam, and would culminate in the medieval hammam.⁷³

The two roads taken by the baths in Egypt and the Near East in late antiquity appear to be radically different. In both cases, though, the techniques accompany the same changes in bathing practices, and it is difficult to understand the reasons for such a divergence. A partial explanation was put forward by Kołataj during the study of the Kom el-Dikka baths in Alexandria, which also used the “high-flame furnace”. Such a system might be linked to the fuel used—reeds and straw—the calorific value of which was not the same as that of the wood used elsewhere and which had to produce fierce flames in order to reach appropriate temperatures.⁷⁴ We now know that the fuel supply was more varied than the simple reeds and straw mentioned by Kołataj,⁷⁵ but it must be noted that furnaces in Ptolemaic baths were already quite tall (over 2 m in Karnak, 1.70 m in Taposiris and over 1.10 m at Buto North), which could support this hypothesis. In any case, the form of

72. CHARPENTIER 1995.

73. The excavation of the baths of El-Bara allows this change to be followed over several centuries, see CHARPENTIER 2014.

74. KOŁATAJ 1992, p. 176.

75. Bouchaud, Redon, in this volume.

the furnaces and the tall combustion chambers do not explain everything: it was perfectly possible to adapt the classical system to this particular type of furnace, which in no way explains the choice of a central location for the boilers, or of the multiplication of hot bathtubs unconnected to the boilers. Another unanswered question at this stage concerns the production of steam: the state of preservation of Egyptian baths contemporary with the Syrian examples studied by Charpentier is not good enough to know whether the boilers could, like in the Near East, produce steam as well as hot water (this system was, logically, located in the upper part of the walls). A prototype of such an installation does, however, seem to have existed at Karanis, in the 4th century, where a ceramic channel is preserved that linked the area of the boiler with the hot room. Such an innovation, in a very modest edifice in Fayoum, is unlikely to be unique: we have seen the striking similarity between the boilers of Karanis and Amheida that are also similar to those of Marea and Abu Mina. A comparable system allowing steam to fill the hot rooms could easily have existed in the Mareotic baths, which could even explain, in the case of double baths, the central location of the furnaces intended to supply steam to both circuits at the same time. In addition, the morphology of the furnaces, that were entirely enclosed, allowed the steam to be channelled easily and prevented it from dispersing in the strictly separated service rooms.

The first hammams were built in the new capital of Egypt, Fustat, straight after the conquest in the mid-7th century.⁷⁶ However, unlike in Syria, where the remains allow the evolution of techniques to be traced over several centuries and its linearity to be understood, Egypt unfortunately has not produced remains of baths dating to the early centuries of Islam. Thus it is currently difficult to understand the mechanisms that gave birth to the modern hammams studied in this volume and their link with the baths from late antiquity.⁷⁷ But whether or not steam played a role in heating the Mareotic baths, the emergence of an original standardised technical system brings to mind, to a certain extent, what has already been observed in the Ptolemaic period, which saw the emergence of original heating technologies, different from what was being developed in parallel in the West.⁷⁸ Such Egyptian originality is seen again several centuries later, in the Fatimid period, in the traditional hammams that distinguish themselves from “Turkish baths” through a surprising heating system in which the boiler, placed in the roof, produces hot water which streams by gravity into the basins creating steam as it shoots down from the ceiling.⁷⁹ Thus, at all periods, the heating system in Egyptian baths was original, for reasons that still remain largely unexplained.

Double baths, the Egyptian exception?—The tendency to double the edifices in Mareotis into two completely independent circuits is just as original within the Mediterranean corpus. The formula is not, however unprecedented, since double baths are attested in other provinces from the 1st century onwards.⁸⁰ Most often they answer to the need to separate men and women without having recourse to staggered opening hours. It was also necessary to adapt to the seasons, and

76. DENOIX 2009.

77. Data from Africa does not provide any more details (THÉBERT 2003, pp. 423–424), nor from Libya, even if S. Maréchal announces, unfortunately with no details or references, that after the 5th century the baths in the hinterland of Cyrene adopted a mixed heating system that used steam (MARÉCHAL 2013, p. 220).

78. Fournet, Redon a, in this volume; FOURNET, REDON 2013.

79. Husam al-Din Isma‘il, Tuchscherer, Vanpeene, in this volume.

80. NIELSEN 1990, pp. 146–148. For this practice in the Hellenistic period and the questions it raises, see Fournet, Redon, in this volume (a).

one often finds in the sources that summer baths were doubled by winter baths. The archaeological distinction between these two types of double baths is not always simple: in both cases, one of the circuits is larger (bath for men or summer bath) and has a *palaestra*, while the other, smaller, circuit (women's or winter bath) often does not have one.⁸¹ The only criterion that really distinguishes between a separation for the sexes rather than for the seasons (apart from epigraphy) is technical: if the furnaces are used for both sides and the two circuits cannot be heated or function one without the other, the separation must be for the sexes. Nevertheless, the phenomenon remains very limited during the imperial period: adjoining double baths, explicitly intended to allow women to bathe at the same time as men within the limits of morality, represent only a maximum of 5% of edifices dated between the 1st and 4th centuries AD.⁸² Sources indicate a marked intensification of criticisms regarding mixed bathing, linked to the rise of Christianity, in the fourth and especially the 5th century.⁸³ These criticisms show clearly that the separation between men and women was not systematic at that time, and they seem to have had little effect on the ground; the truly double baths remain a minority and only a few rare edifices bear witness to the creation, at around this time, of a second circuit backing onto the main one (the only examples given by Nielsen, apart from in Egypt, are at Epidauros, in Greece, and at Wadi Senab, in Libya.⁸⁴ She also cites two examples in Constantinople known from texts⁸⁵). The strict gender separation, which seems to impose itself gradually and to become the norm in the 7th century,⁸⁶ is thus rooted in staggered opening hours, or in edifices open to one sex only, rather than in double edifices, which remain the exception. Though numerous, none of the Byzantine baths of the Middle East have revealed a double circuit.

Thus, Egypt clearly distinguishes itself from the rest of the Mediterranean: at Mareotis, beginning in the 6th century, six or seven of the 11 baths known are composed of two independent but adjoining circuits (that is around 70%). Moreover, these two circuits, which both use the same furnaces, are in general identical: there is no question of giving the women a secondary circuit cut out of the main circuit, such as seems to be the norm elsewhere. The two circuits both enjoy monumental spaces, porticoes, latrines and are equipped with the same number of hot rooms and bathtubs. Only the discovery of utensils or specific jewellery sometimes allows a circuit to be ascribed to one sex or the other. The exact symmetry of the Marea 2 baths is the clearest illustration: the two circuits, when the means allowed, were exactly identical.⁸⁷

How can this special feature of Egypt, or at least of the Mareotic region be explained? The most monumental examples of double baths are found in Abu Mina and in relatively large towns (Taposiris, Marea and Mit Abul Kom) close to pilgrimage routes leading to that large regional

81. NIELSEN 1990, pp. 138–140; THÉBERT 2003, pp. 462–463.

82. Calculation based on Nielsen's 1990 catalogue, incomplete but probably representative, and in any case, in proportion.

83. NIELSEN 1990, pp. 147–148; HOSS 2005, pp. 90–91, both after BERGER 1982 (*non vidi*).

84. NIELSEN 1990, cat. C267 and C331. Nielsen's inventory also gives the example of the "city baths" of Ptolemais, in Libya (C330), which would have been doubled around 400 AD. This interpretation is dismissed in MARÉCHAL 2013.

85. NIELSEN 1990, p. 148: "*Anth. Gr. IX 624* from the sixth cent. AD, in which it is stated that a small bath was added to the Zeuxippus Baths in Constantinople, and *Anth. Gr. IX 620* mentions a double bath separated by a closed door in the same city."

86. HOSS 2005, pp. 89–91.

87. It is not until the mid-16th century that one finds, in the Haseki Hürrem hammam in Istanbul, an edifice that puts into practice the separation of the sexes in such a symmetrical way.

centre of the Byzantine period.⁸⁸ Chronologically, this spread of double baths begins in the late 5th century and seems to result from the development of pilgrimage, which happens to take off in the second half of the 5th century.⁸⁹ The obligations of hospitality linked to these large movements of pilgrims, and even more so the economic opportunities that they offered, perhaps explain in part why such a service developed specifically in this region. No doubt concerned more than others to conform to the recommendations of the church on the question of mixed bathing, a clientele of both male and female pilgrims desiring, for ritual reasons or the constraints of travelling, to bathe at the same time, might provide an explanation for this phenomenon. It is clear that baths linked more or less directly with pilgrimage places are not entirely for lay people, and that some filled a therapeutic role linked to the worship of saints. By this nearness “they gain a touch of sanctity which allows the moral dangers of the hedonistic practice of the pleasures of bathing to be hidden or forgotten,”⁹⁰ pleasures denounced by the church. The desire for the strict separation of men and women is not so surprising.

However, numerous other large pilgrimage centres exist in the eastern Mediterranean, and several have baths for pilgrims. P.-L. Gatier’s inventory of them⁹¹ shows clearly that apart from the Mareotic examples, those bathing edifices are never monumental and, in particular, that none of them have a double circuit.⁹² Why is it different around Lake Mareotis? A single example perhaps illustrates the same phenomenon outside Egypt: excavations at the St. Hilarion sanctuary, close to Gaza, have brought to light a new bathing edifice intended for pilgrims;⁹³ its plan and chronology are not so different from those of the Mareotic examples, particularly in the distribution of its tiny hot rooms (fig. 20). It seems perfectly possible, in the light of the Egyptian corpus, that its two adjoining hot circuits (groups 2 and 3) did not succeed one another but were, on the contrary, a doubling of the edifice in a second phase. The heating techniques, in contrast, have nothing Egyptian about them and are closer to Near Eastern traditions. This edifice could provide the link between Egyptian and Syrian-Palestinian models. Its location in Gaza, at the cultural interface between these two geographic groups, is not surprising.

The uniformity of characteristics found in Mareotis in late antiquity and the possible influence of this model as far as Gaza poses the question of standardisation: the presence of many edifices that are so similar can be explained by a specific economic and geographic context. Elsewhere we find the emergence of “regional sub-types” beginning in the 4th century. Charpentier has highlighted two very uniform sub-groups in northern Syria (baths of the Apamea and Antioch regions),⁹⁴ and a “southern type” exists in Palestine.⁹⁵ In regions sharing a strong cultural and economic unity,

88. A hostelry has been found to the south of Marea, 300 m to the east of the baths of Mit Abul Kom. The building, certainly intended for housing pilgrims, was also separated into two sections around two large peristyle courtyards (EMPEREUR 1998, p. 235). On Abu Mina as a pilgrimage centre, cf. BANGERT 2010.

89. GROSSMANN 1986; BANGERT 2010.

90. GATIER 2009.

91. GATIER 2009.

92. Unfortunately we do not know what type of plan was developed in the Pelusian baths in the eastern Delta although at least one of them was built close to a church.

93. ELTER, HASSOUNE 2008.

94. CHARPENTIER 1995.

95. HOSS 2005, pp. 57–66.

these “local” bathing cultures develop reoccurring architectural solutions. The emergence of these models is linked with the movement of know-how and is consolidated by emulation on a regional scale. The case of the Mareotic baths is a good example: the model that developed, even if its technical or typological characteristics are not always explicable, displays a rare degree of uniformity and is, in the end, a reflection of the Alexandrian hinterland.

In conclusion, above and beyond highlighting the very homogenous sub-group of the Mareotic baths, the analysis of the Romano-Byzantine bathing corpus has, during the course of our study, turned out to be much richer than we had expected. Rich in edifices, the inventory having grown from seven edifices noted by Nielsen to 45 entries in our catalogue. Rich in the originality of the characteristics brought to light in the baths of our corpus, which for too long have remained outside overviews of the history of bathing. Their study allows a broader history of bathing to be written today than has hitherto been possible, in particular by filling in the geographical gap between Africa and the Near East, two other large regions of bathing culture. If it does not bring back into question the incredible homogeneity of bathing practices brought to light by Thébert all around the Mediterranean, it does at least confirm Egypt’s originality.

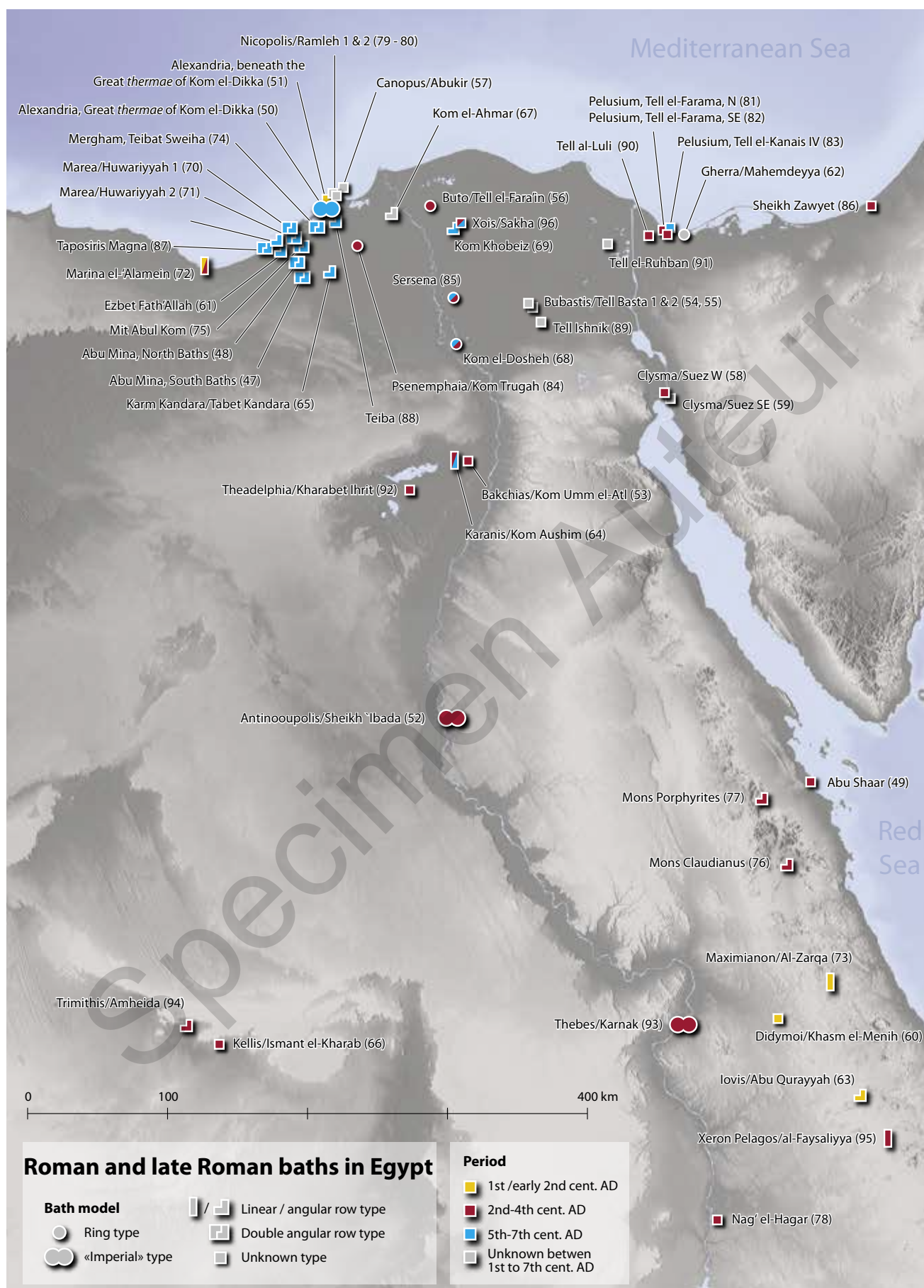


Fig. 1. Roman and Byzantine baths in Egypt (Th. Fournet, after a Google Map, 2012).

Chrono-typology of Egyptian baths

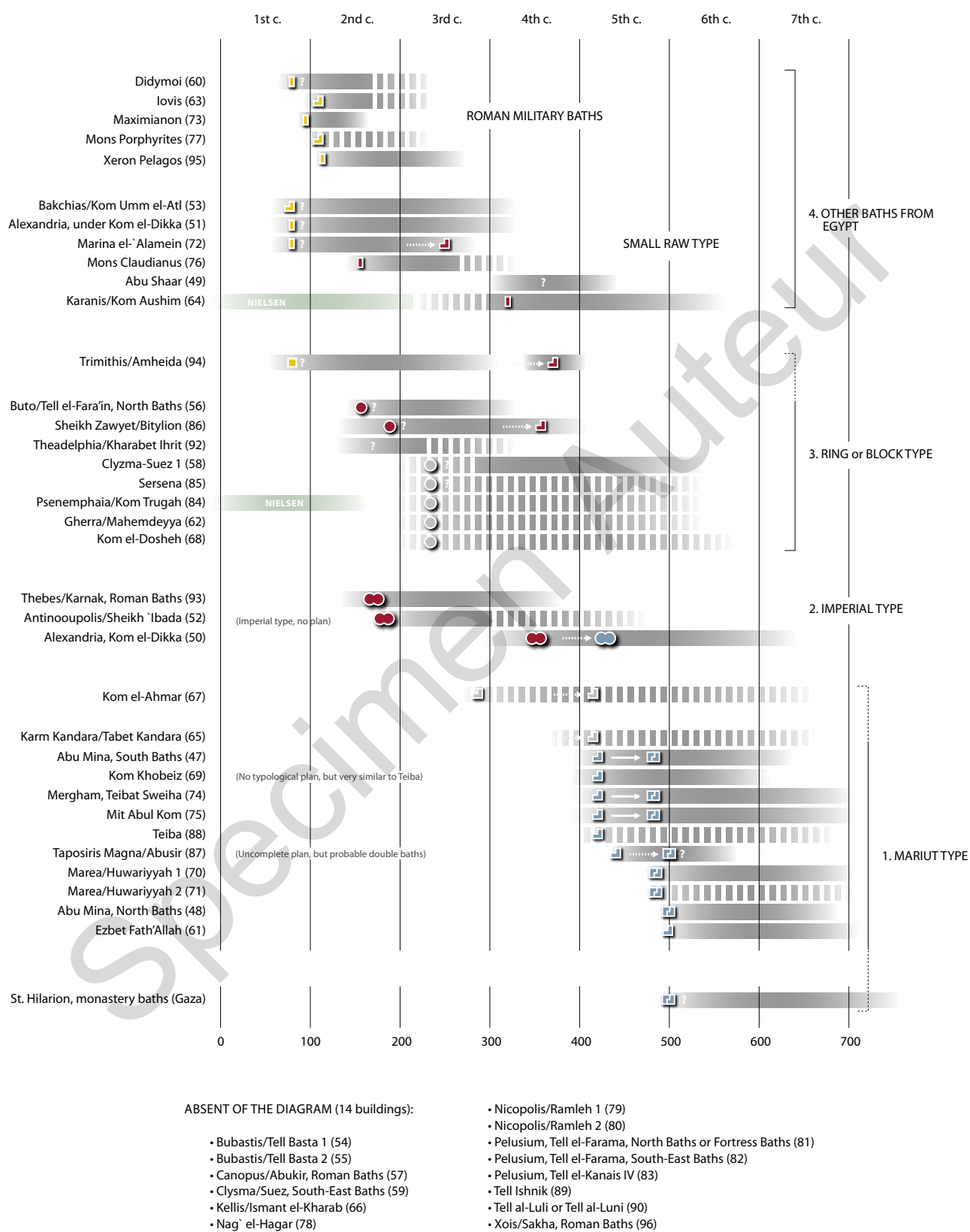


Fig. 2. Chrono-typology of Egyptian baths (Th. Fournet).

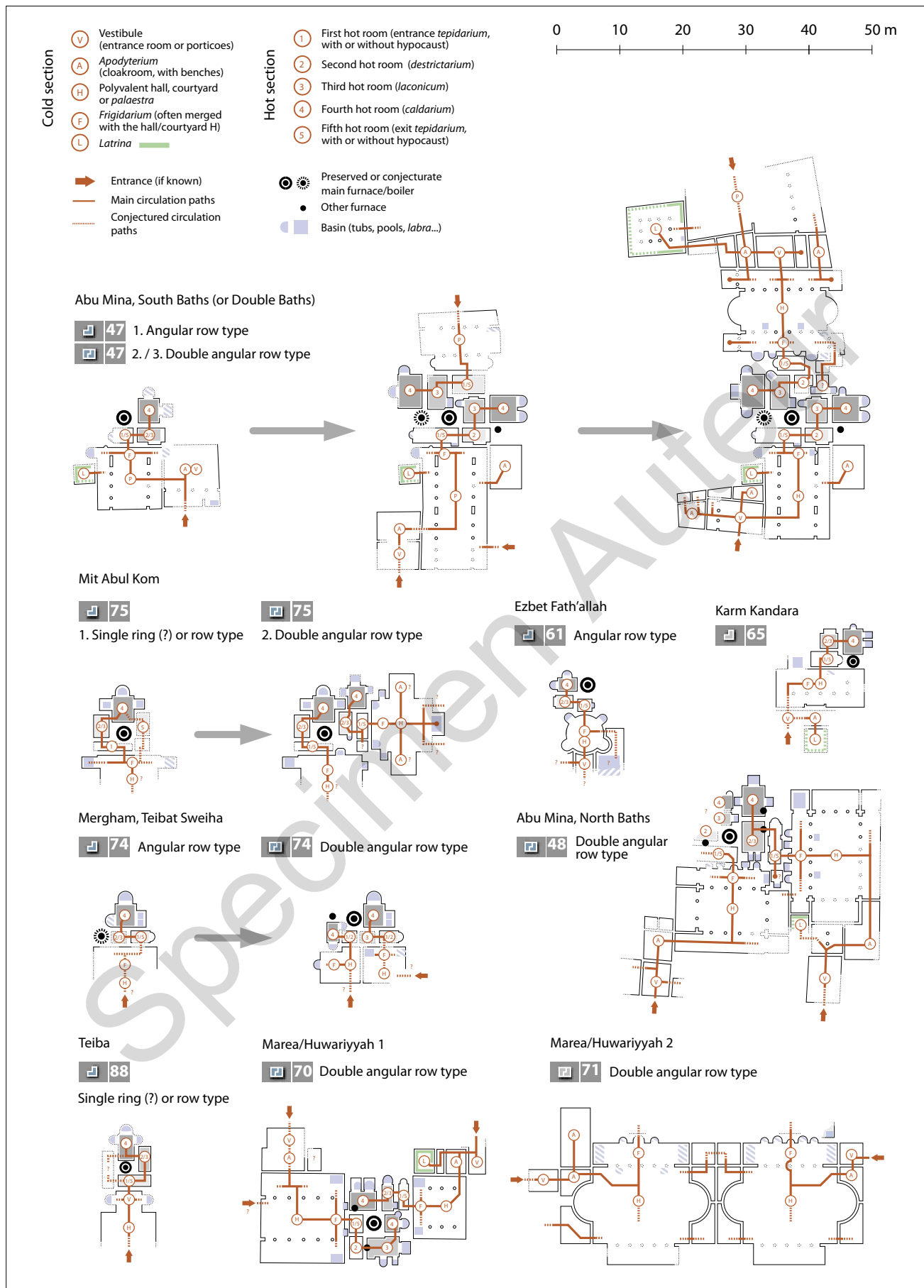


Fig. 3. Typological plate (1): baths of the Mareotic group (Th. Fournet).

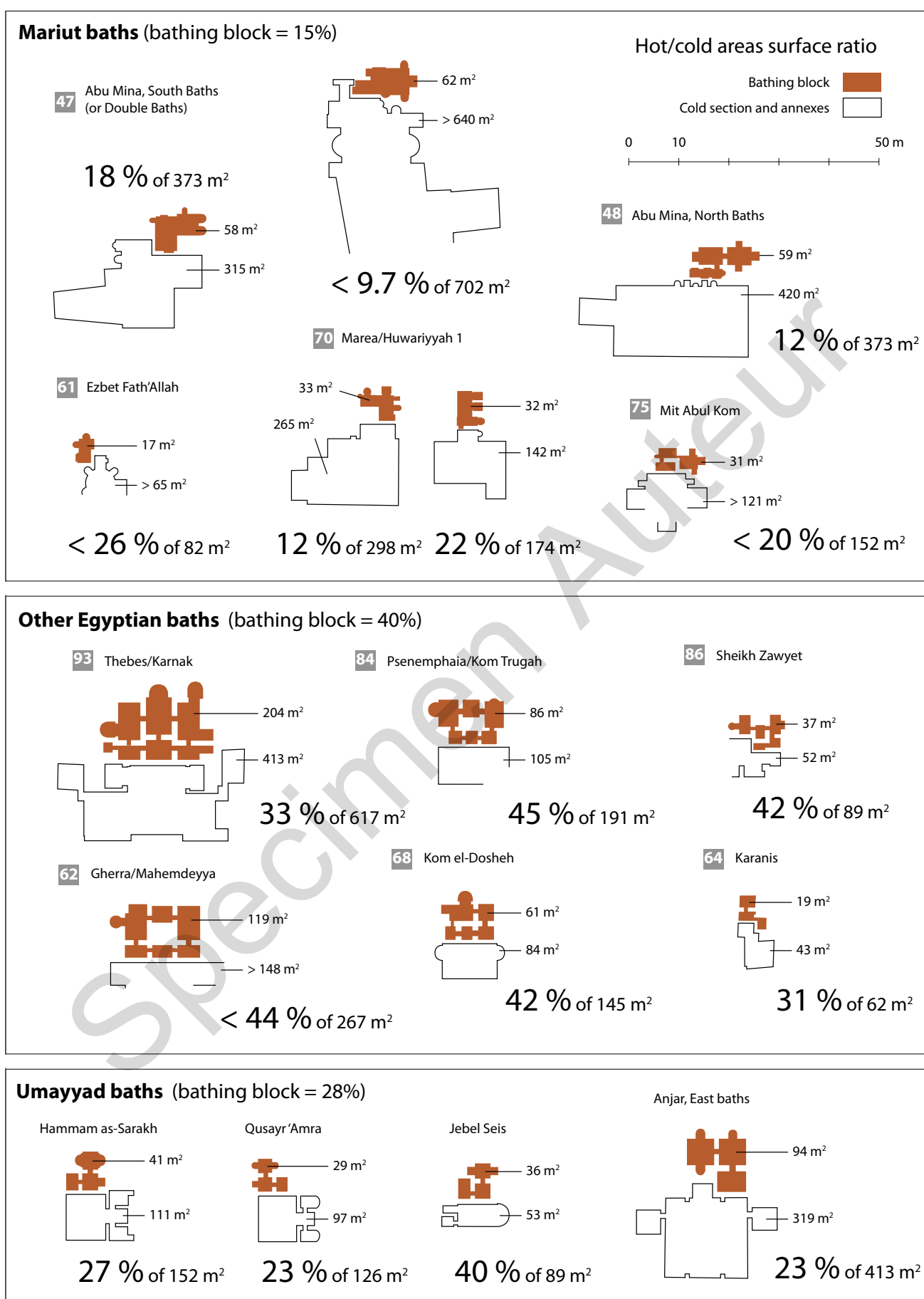


Fig. 4. Comparative plate: surface area of the hot rooms and of the cold sector (Th. Fournet).



Fig. 5. Abu Mina South baths, general view of the central block, from the east (Th. Fournet, 2005).

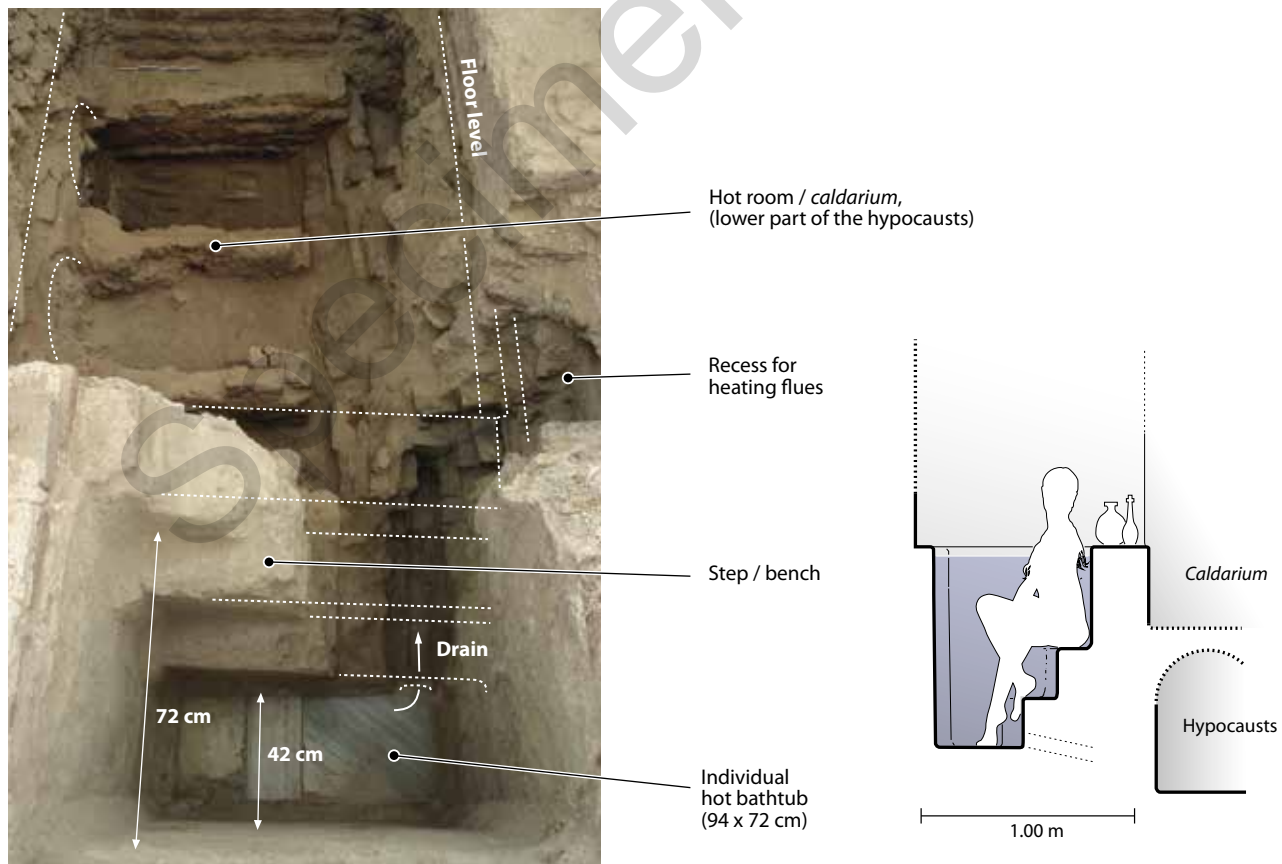


Fig. 6. Taposiris Magna, Byzantine baths, top view and section of a hot bathtub (Room 9, Th. Fournet, after M. El-Amouri, MAFTM 2009).



Fig. 7. Abu Mina South baths, north courtyard and porticoes (A1) from the east (KAUFMAN 1910, pl. 43).



Fig. 8. Ezbet Fath'Allah baths, circular cold room (1) from the east (Th. Fournet, 2005).



Fig. 9. Ezbet Fath'Allah baths, cold bathtub in room 1 (Th. Fournet, 2005).

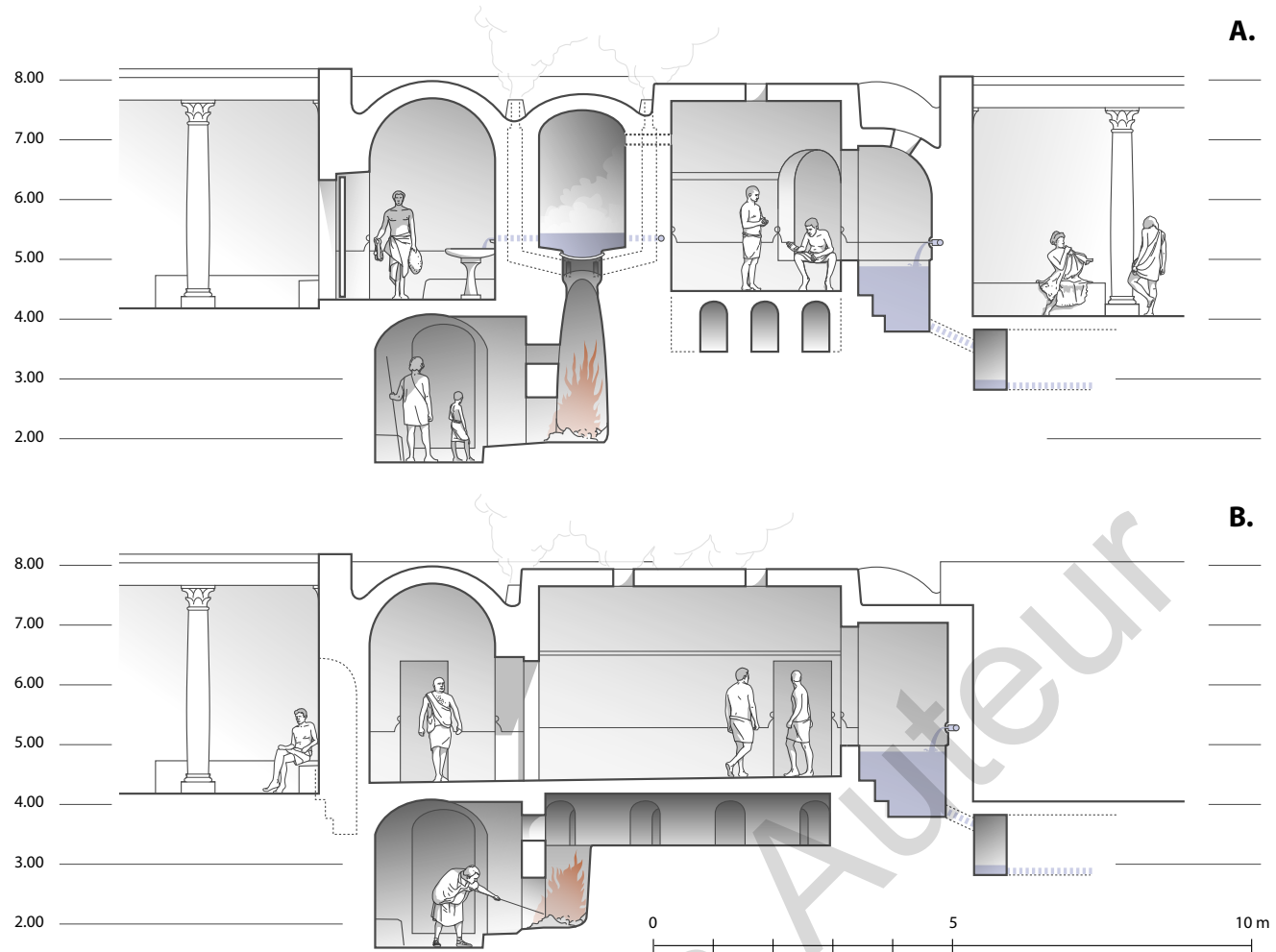


Fig. 10. East-west sections of Marea's double baths: central boiler and high-flame furnace (A), secondary furnace and hypocaust system (B). Hypothetical reconstruction and drawing Th. Fournet (after plan and section from D. Tarara, in SZYMAŃSKA, BABRAJ 2008).



Fig. 11. Marea's double baths: central high-flame furnace mouth, under the boiler, from the subterranean corridor (Th. Fournet, 2005).



Fig. 12. Ezbet Fath'Allah, opening of the furnace, connected to the caldarium's hypocaust (in the background) and originally topped by a boiler (Th. Fournet, 2005).

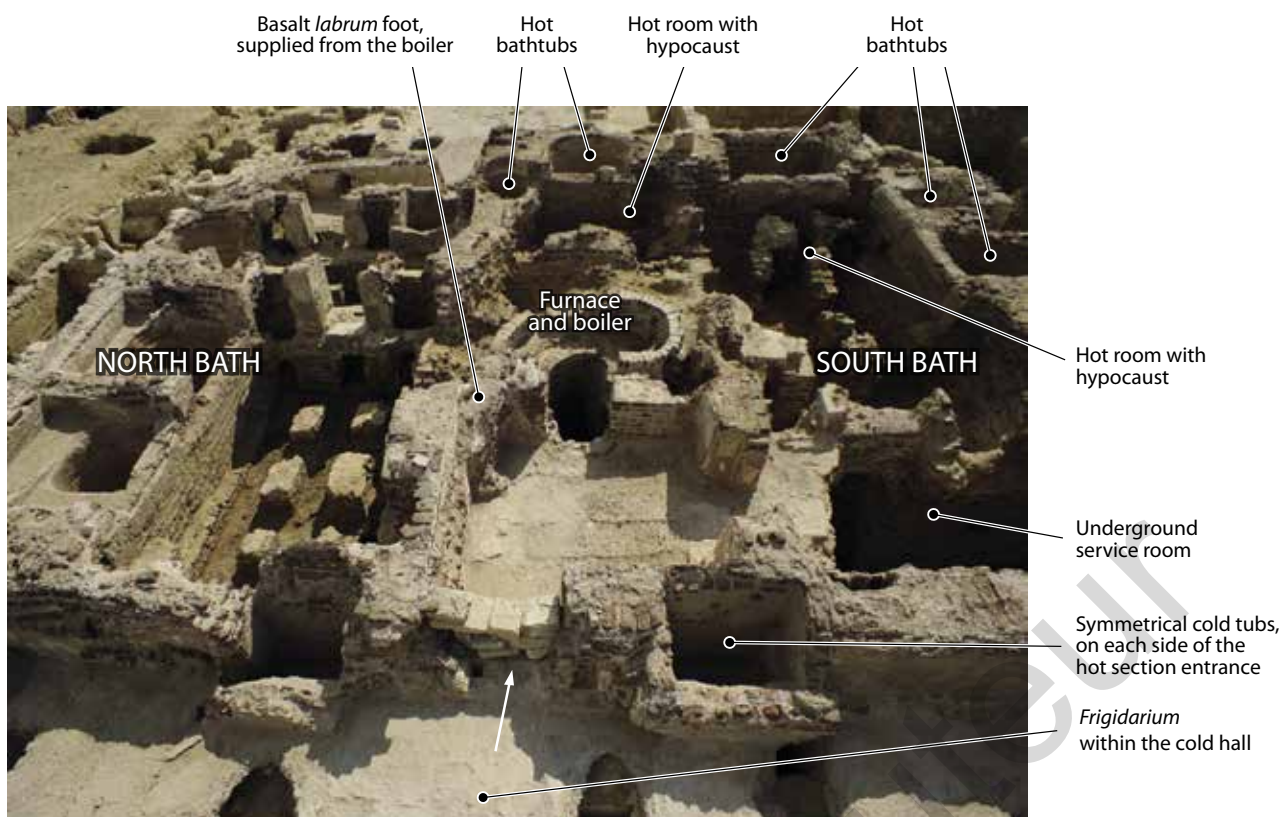


Fig. 13. Marea, double Byzantine baths, general view of the central block, from the west (Th. Fournet, after SZYMAŃSKA, BABRAJ 2008, fig. 12).

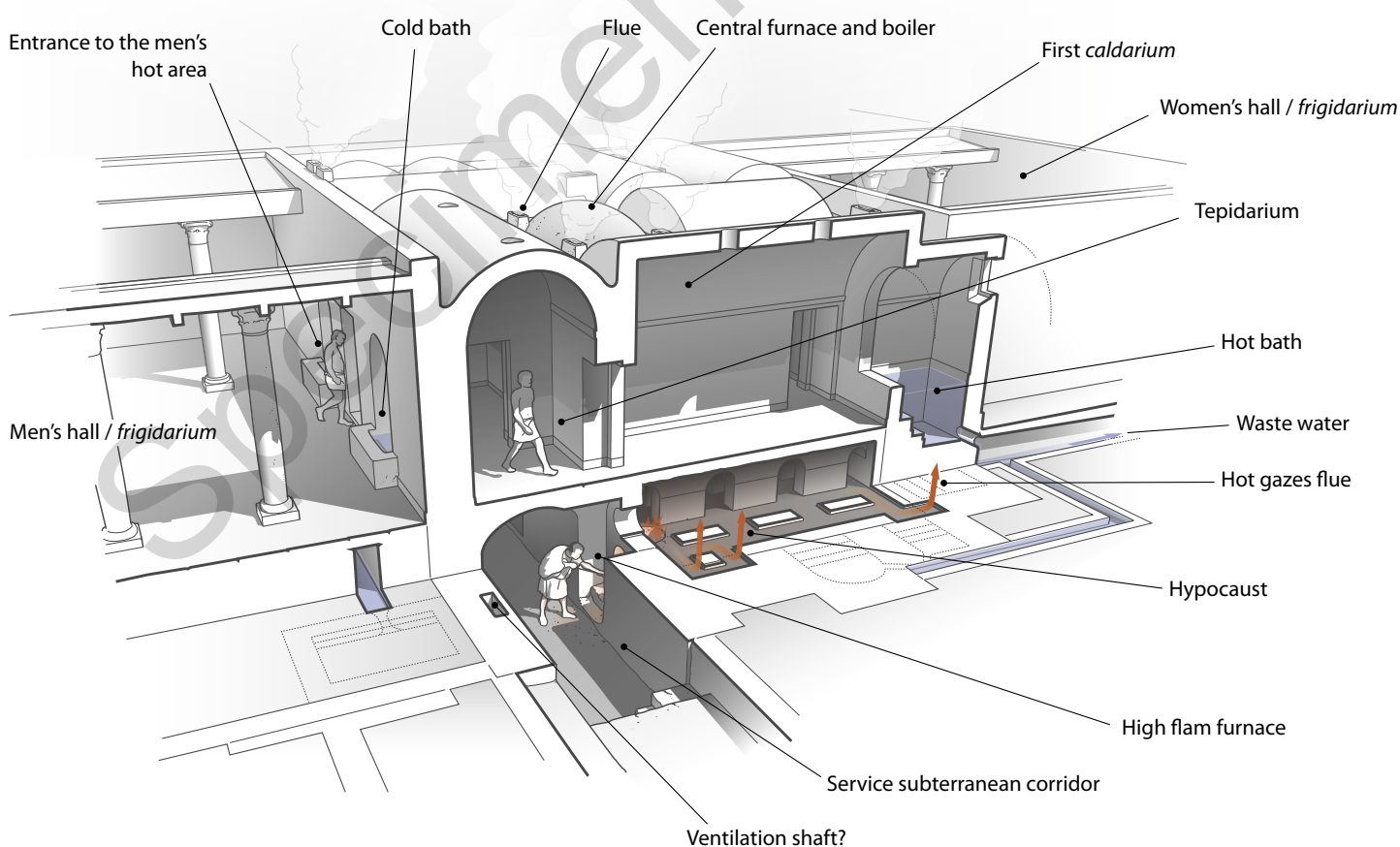


Fig. 14. Hypothetical perspective section of Marea's double baths: service corridor, high-flame furnace, hypocausted floor and water system (Th. Fournet, after plan and section from D. Tarara, in SZYMAŃSKA, BABRAJ 2008).

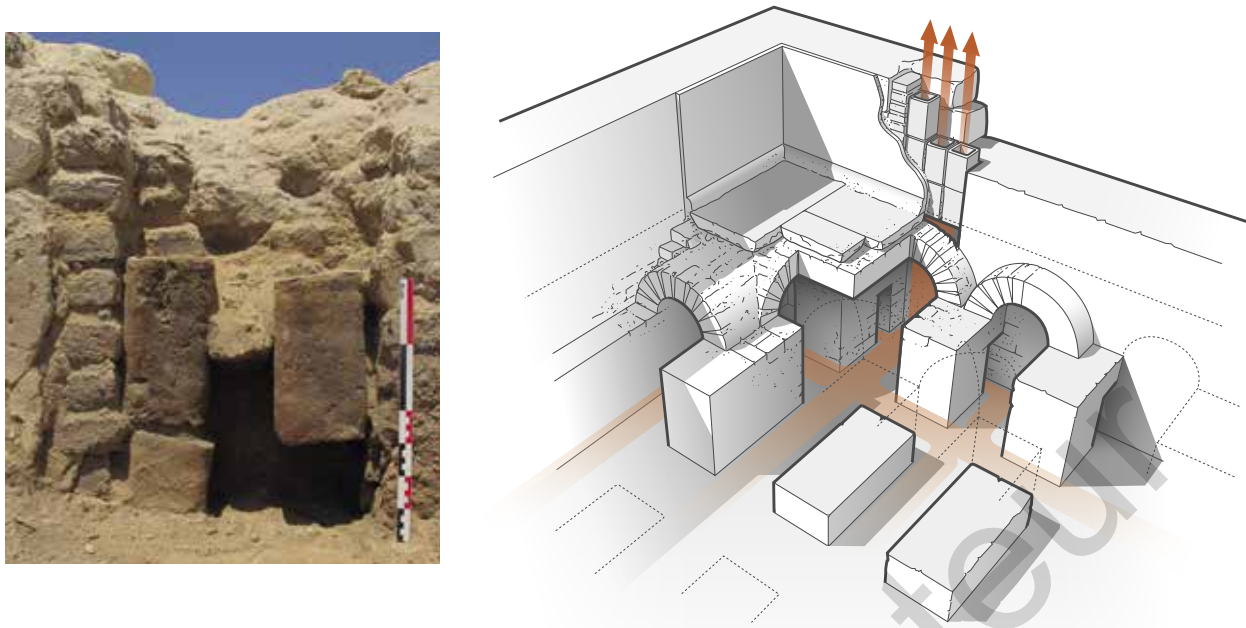


Fig. 15. Chimney flues (*tubuli*) built in the wall (Taposiris Magna Byzantine baths, photo M. El Amouri 2013), and perspective reconstruction of the connection between hypocausted floor and wall heating system of Mareotic baths (Th. Fournet).

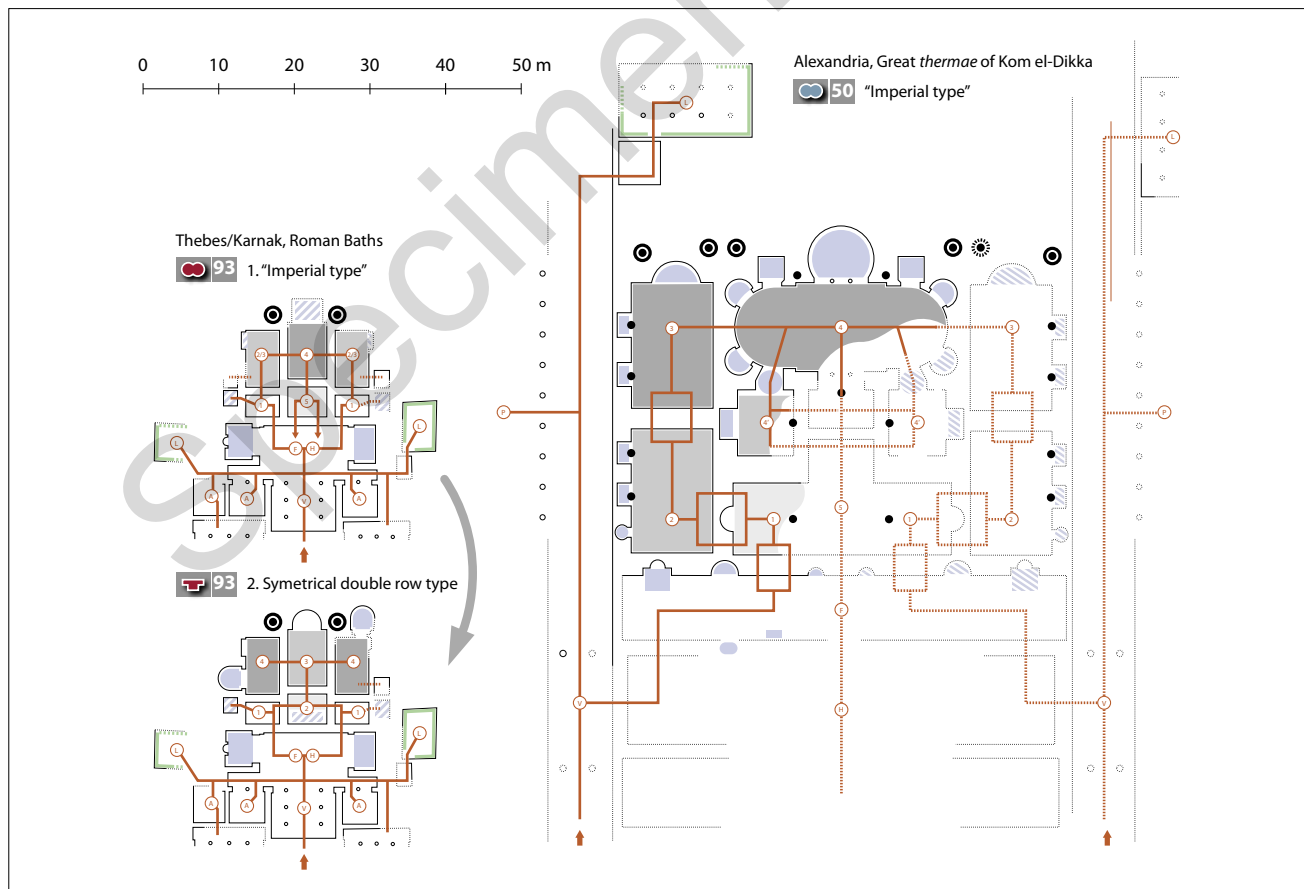


Fig. 16. Typological plate (2): baths of the Imperial type group (Th. Fournet).

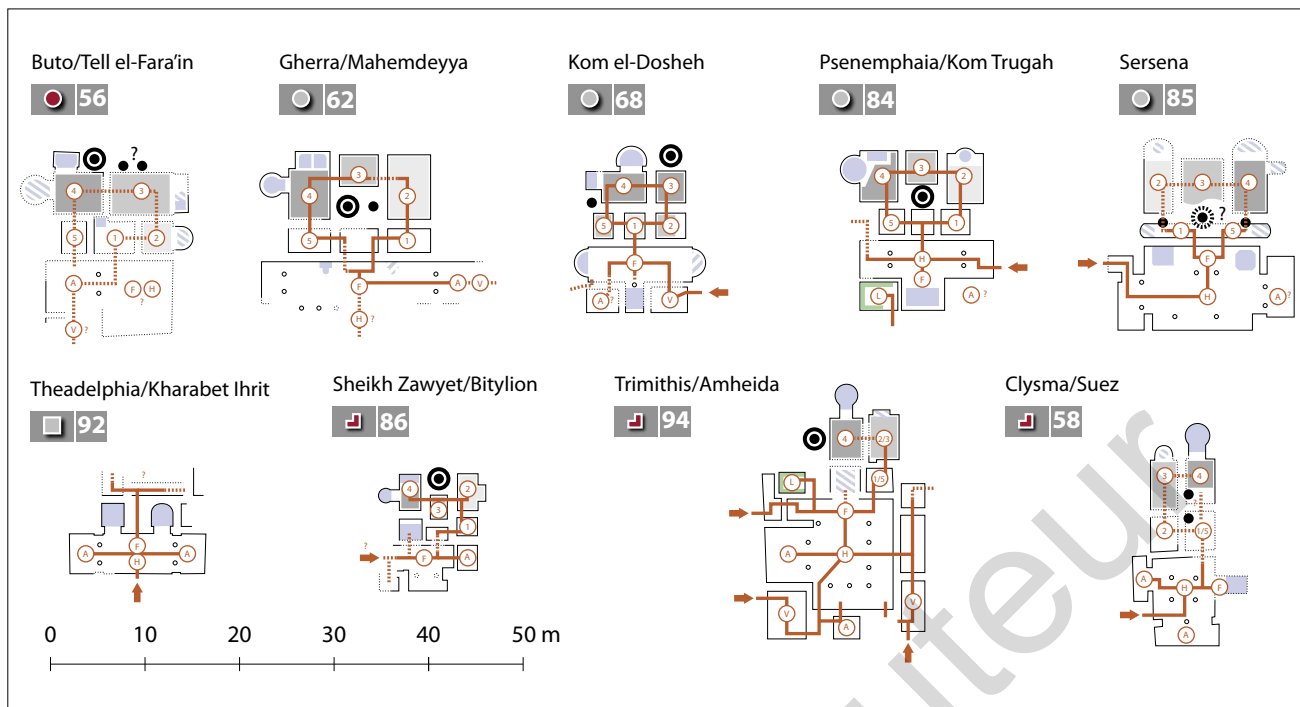


Fig. 17. Typological plate (3): baths of the Block Group (Th. Fournet).



Fig. 18. Chimney flues (*tubuli*) in the west wall of the caldarium, Sheikh Zawyet baths (archives J. Clédat, IFAO).

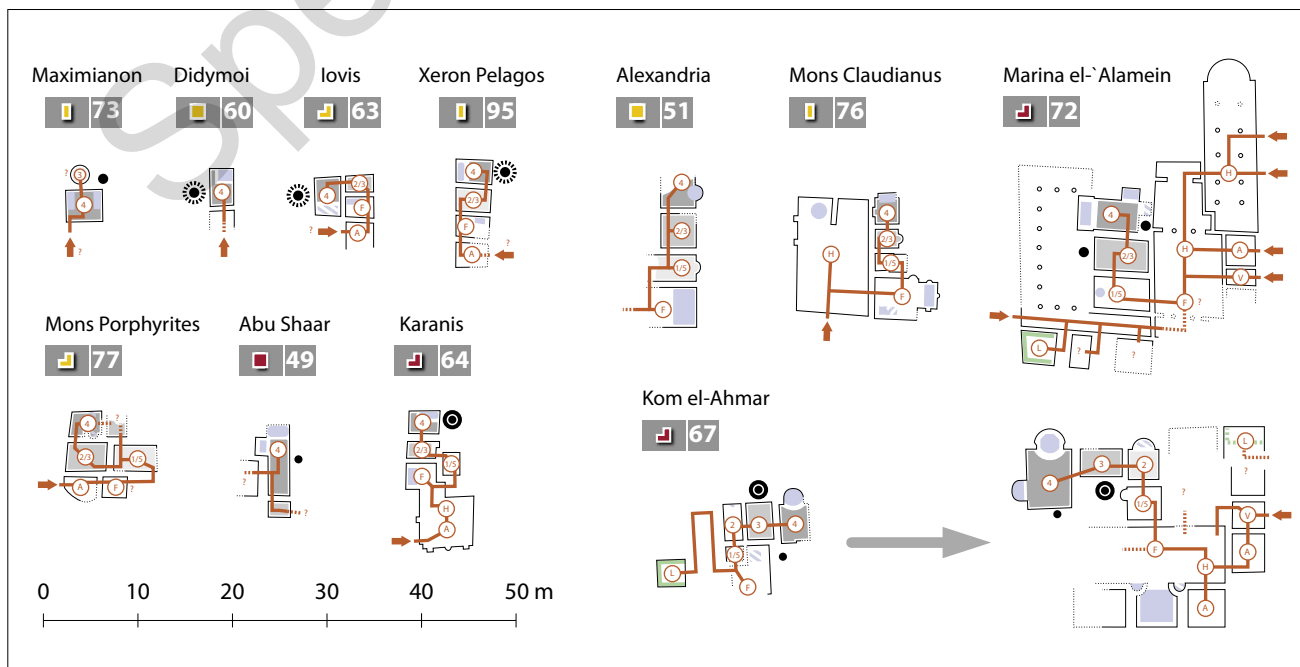


Fig. 19. Typological plate (4): other baths from Egypt (Th. Fournet).

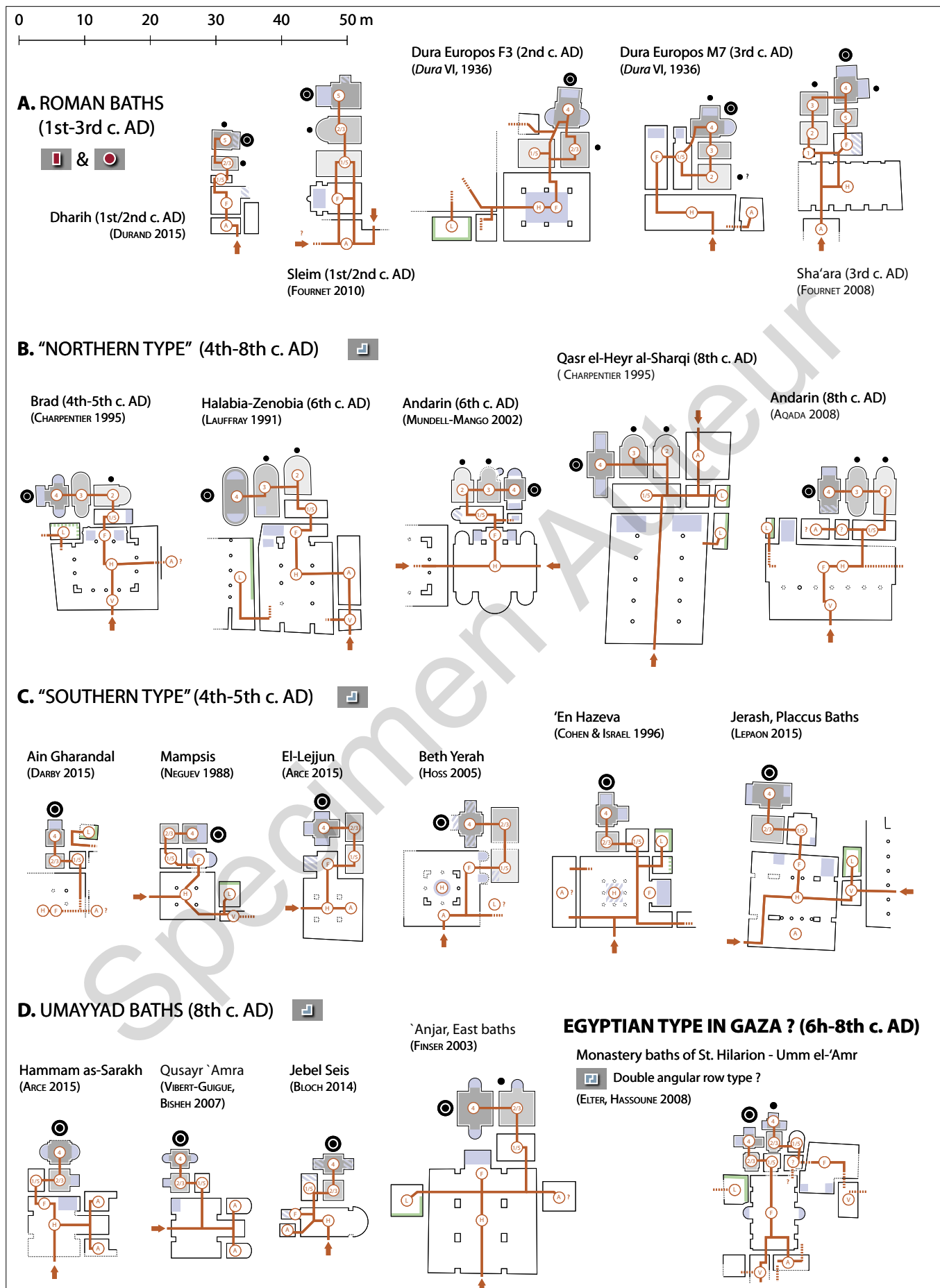


Fig. 20. Typological plate (5): selection of baths from the Near East (Th. Fournet).

Specimen Auteur

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