

SHALL WE GO «AD AQUAS»? PUTTING ROMAN HEALING SPAS ON THE MAP

¿NOS VAMOS «AD AQUAS»? PONIENDO LOS BALNEARIOS ROMANOS EN EL MAPA

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Abstract

Bathing constructions are currently one of the better preserved and studied monuments of the Roman Empire. Nevertheless, there remains a significant research gap as to the nature of water exploited within. The mineral-medicinal waters, in fact, conditioned not only the location, but also the function and, consequently, the architecture of these features. Hence, one of the main objectives of our current study is to highlight some of the main architectonic and functional characteristics of these bathing complexes from a selection of the better preserved and/or better documented spas using mineral-medicinal waters in the Roman Empire (henceforth referred to as healing or thermal spas/baths). This paper thus presents an initial distribution map, reviews the current state of research on this subject as well as some of the drawbacks to their study.

Keywords

Healing spas; Ancient thermalism; Roman Empire; thermal architecture.

Resumen

Hoy en día los edificios de baños son uno de los monumentos mejor conservados y estudiados del Imperio Romano. Sin embargo, existe un significativo vacío en su caracterización en función del agua utilizada en ellos. Las aguas mineromedicinales, de hecho, condicionaron no solo la localización, sino también la función, y consecuentemente, la arquitectura de estos edificios.

De acuerdo con esa consideración, uno de los principales objetivos de este estudio es proporcionar una primera síntesis de los rasgos más característicos de estos complejos de baños, a partir de una selección de los edificios balnearios con aguas mineromedicinales mejor conservados y documentados del Imperio Romano. En ese sentido, se presenta un primer mapa de distribución, así como una revisión del

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estado de la investigación sobre estos establecimientos, atentos a algunas de las dificultades de su estudio desde una perspectiva global.

Palabras claves

Balnearios; termalismo antiguo; Imperio romano; arquitectura termal.

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1. INTRODUCTION

The last decades have seen a great amount of research on Roman bath structures centred on their identification and description.² These general approaches have highlighted the great diversity of their constructions and functions, but have rarely focused on the question of the specificities of their water.³ In this regard, in spite of their obvious contrasts, that research has rarely included general studies of ancient bathing buildings exploiting mineral-medicinal springs (referred to in this paper as healing or thermal spas/baths). This problem could stem from the lack of familiarity with the multiple uses of these waters⁴ or to confusion with classical baths exploiting fresh water, but fortunately in modern studies, as can be seen in the bibliography added, this perception is changing.

As is well-known today, mineral-medicinal water use leads to specific topographical, technical and functional implications that must be considered in their research. These implications will, furthermore, have a direct impact on factors such as location, architecture and hydraulic makeup. They will also bear an influence on a number of organisational, administrative, social, economic, religious and political aspects of their respective territories. Consequently, particular features of complexes exploiting mineral-medicinal waters in some cases have not yet been correctly identified. Additionally, their research, at times, has suffered from applying theoretical concepts specific to classical baths that are not applicable to mineral-medicinal sites. Likewise, these misinterpretations have led to the erroneous identification of the nature of certain rooms in their buildings. Similarly, a number of publications have not applied an appropriate terminology to describe their architectonic reality and organisational features.

Recognition of this problem in the research of healing spas is not new. It has been highlighted in certain pioneering archaeological studies, from a historicist perspective, assembling and describing the archaeological and patrimonial evidence. In this regard, J.G.H. Greppo (1846), and particularly L. Bonnard (1908), although limited to a specific geographic area (France and surrounding areas of Switzerland, Belgium, Germany), produced catalogues and laid the guidelines to interpret and characterise the archaeological evidence of mineral-medicinal features. One of

2. The study of bathing culture has been analysed from multifactorial points of views. To consider some examples of architectonical studies from a comparative perspective, see in particular, HEINZ 1983; MANDERSCHIED 1988, 2000; NIELSEN 1990; YEGÜL 1992; BOUET 2003; THÉBERT 2003 or GARCÍA-ENTERO 2005, among others, with some specific considerations, for example, in DELAINE and JOHNSTON 1999 or KREINER and LETZNER 2011.

3. Certain specialists of Roman 'hygienic' baths have highlighted this problem. I. Nielsen, for example specifies that these types of baths were not included in her study because of their singularities. This author noted the following: «As the thermal baths serve a different purpose and, for that reason among others, have a different architectural form, I have found it reasonable to exclude them from further discussion» (NIELSEN 1990: 5). F. YEGÜL (1992: 92-127), likewise, signals this problem in a specific chapter in his general study of thermal baths in Antiquity. A. BOUET (2003: 193, 291-92, 297-99), in turn, not only places emphasis on the importance of taking into account the type of water when studying and developing the model of these types of buildings, but indicates that they merit study as independent units.

4. A reflection about modern terminology applied to these sites and their treatments can be seen, for example, in GÓMEZ PÉREZ *et alii* 2017, where a brief summary of the historical applications and uses of minero-medicinal waters can be consulted.

their greater contributions to Roman thermo-mineral baths research was to record, throughout the 19th and early 20th centuries, the archaeological features brought to light during the construction or renovation of modern spas.



FIGURE 1. THERMAL SPA OF CHAVES [66] DISCOVERED IN 2006. Photo courtesy S. Carneiro.

Fortunately, the pioneering surveys in France were followed by a series of specific studies by A. Grenier (1960), A. Pelletier (1985) and R. Chevallier (1992) that include advanced notions that serve even today as excellent introductions to the subject. It was precisely in the 1990s when archaeological studies of the buildings of mineral-medicinal baths experienced a great impetus due, among others, to the inclusion of a chapter on this subject by W. Heinz (1983: 157-175), the bibliographical references of H. Manderscheid (1988), G. Garbrecht and H. Manderscheid (1994: A, 83-87; B, 327-385), and mainly the studies of F. Yegül (1992: 92-127) who analysed the architectonical evolution of some of these buildings. These authors offered preliminary overviews of the architectural features of these types of sites. This leap in research was bolstered by the proceedings of several scientific meetings focused only on this subject celebrated in France (Pelletier 1985; Chevallier 1992; Grange 1997), followed by the proceedings of meetings in Italy (Gasperini 2006) and in the Iberian Peninsula (Peréx Agorreta and Bazzana 1992; Peréx Agorreta 1997). Research on this subject was boosted once again by the convergence of the revitalisation of the sector of modern thermal spas at the end of the 20th and early 21st centuries with an increase of publications of modern preventive stratigraphic archaeological interventions.

The outset of the 21st century experienced a keen renewal of ancient thermal bath research with new projects striving toward obtaining a broader perspective of their characteristics and archaeological evidence, and focusing on advancing the understanding of the multiple historical implications linked to their use. These studies were nonetheless designed mostly along the lines of either modern

or Antique geographical limits (i.e. countries or regions or Roman provinces)⁵. Among the more notable are those carried out in Italy⁶, France⁷, Germany⁸ and Switzerland⁹, Portugal¹⁰, Spain¹¹, the Middle East¹² and North Africa¹³.

With some exceptions, the most common approach to the study of mineral-medicinal bath sites has been focused on their religious facet due to the presence of ex-votos or epigraphical elements. Nevertheless, it must be recognised that the recovery of these types of artefacts does not always unequivocally designate a mineral-medicinal water exploitation as these deposits are also characteristic of other types of Roman sites such as water sanctuaries.

However, a global and deeper review from an architectural and functional approach to these sites, by contrast, that can reveal key aspects serving to identify and understand the buildings of these mineral-medicinal complexes, has yet to be carried out. It is also noteworthy that a wide ranging survey of these types of complexes spanning the totality of the Roman Empire is yet to be published. Only a few studies have attempted to discern their general spread in Roman times,¹⁴ thus limiting identification of their regional architectural and functional features.

Despite these drawbacks, there is a growing interest in these complexes and analyses of a number of new finds are altering their overall view. Among them are, for example, the recent archaeological interventions¹⁵ in Chaves (Figure 1)¹⁶, São Pedro do Sul¹⁷, Archena and Fortuna¹⁸, Caldes de Montbui¹⁹, Lugo²⁰ and

5. We could consider some exceptions such as the *Symposium Aquae* (Chaves –Portugal- 2014) coordinated by S. Carneiro, or the recent publication by BASSANI *et alii* 2018, in which some studies about different areas of the Roman Empire were compiled.

6. Obviously, this is the area of the Roman Empire which has been studied more in depth: for example, in ALLEN 1998; GUÉRIN-BEAUVOIS and MARTIN 2007; BASSANI *et alii* 2011; GHEDINI *et alii* 2012; BASSANI *et alii* 2013; ANNIBALETTO *et alii* 2014; GUÉRIN-BEAUVOIS 2015.

7. GRANGE 1997; BOURGEOIS 2000; MARCATO 2017.

8. ZANETTI 2017.

9. PAUNIER 1992.

10. FRADE 1993; 1997.

11. Mainly, including the Iberian Peninsula, in MORA RODRÍGUEZ 1981; ORÓ FERNÁNDEZ 1995; Díez de VELASCO 1998; GONZÁLEZ SOUTELO 2012-2013, 2013a, forthcoming; PERÉX AGORRETA and MIRÓ 2017; GONZÁLEZ SOUTELO and MATILLA SÉQUER 2017.

12. Specifically, DVORJETSKI 1999; 2007 and recently BORGIA 2018.

13. See the studies, among others, JOUFFROY 1992; WILSON 1997; PETTENO 1998; ALLEN 2001; and recently KÖHLER 2018.

14. For example, see interesting approaches in HEINZ 1983; YEGÜL 1992; KÖHLER 2002; 2003; 2006; BROISE 2015. Also, from a social and cultural perspective, some researchers have proposed interesting approaches to this subject mainly considering descriptions of classical authors (ALLEN 1998; DVORJETSKI 2007; CAMPBELL 2012: 330-368; GUÉRIN-BEAUVOIS 2015, among others).

15. See Table 1 for some of the most relevant bibliographical references.

16. Archaeological digs were directed by S. Carneiro to who I am grateful for his helpfulness and kindness. See the last publication about this site in CARNEIRO 2017.

17. New archaeological research is being carried out at this site by P. Reis, to whom I am thankful for her indications.

18. Archaeological studies have been done in Archena and Fortuna in the last years directed by G. Matilla Séiquer. My thankfulness for his kindness and discussions about these sites. See MATILLA 2017, MATILLA and OVEJERO 2017.

19. New archaeological digs have been carried out in 2017.

20. I would like to thank the directors of the Thermal Spa of Lugo; to M. Crecente, archaeologists and other colleagues, for their helpfulness and collective effort in the study of this Roman spa. CRECENTE and GONZÁLEZ SOUTELO 2016.

Ourense²¹ (in the Iberian Peninsula) as well as the new discoveries in Burgas²² or Hissarya²³ (Bulgaria), Baden (Switzerland)²⁴, Varadinske Toplice (Croatia), Bansko (North Macedonia)²⁵, Sarikaya (Turkey)²⁶, Montegrotto Terme (Italy)²⁷ and Jebel Oust (Tunisia)²⁸, but we are sure that the examples will greatly increase in the coming years.

The aim of this article is therefore to draw up a series of preliminary conclusions as to the singularity of Roman minero-medicinal baths. Specifically, this study compiles a number of notions as to the identification, current state of research, some architectural characteristics and conservation of the buildings of Roman thermal spas as a starting point to determine the origin and significance of the first golden age of thermalism. This study also offers an introductory map of the distribution throughout the Roman Empire of some of the better preserved and documented examples of spa buildings (from an architectonic point of view) linked to thermal mineral-medicinal waters considered in this article (Table 1).

2. THE DRAWBACKS OF ATTEMPTING SURVEYS OF ROMAN THERMAL SPAS: ASPECTS TO BE CONSIDERED IN THEIR STUDY AND UNDERSTANDING

The distribution of the thermal-mineral bath complexes designated by the map reveals a limited and unequal spread throughout the Empire (Figure 2). This disparate distribution obviously derives from the fact that mineral-medicinal springs are limited to very specific settings where these types of waters emerge from the ground. Indeed, the choice of these specific locations to construct large Roman thermal spa buildings is subject to three basic aspects: 1) the technical capacity of adapting the architecture to the hydrological, geographic and geomorphological characteristics of the mineral-medicinal spring and to the water's essential physical-chemical properties (composition, temperature, type of usage), 2) the symbolic and strategic function of some of these springs, and 3) the attributes linked to health associated with certain water sources that will result in their transformation into centres of veneration and pilgrimage. These factors undoubtedly conditioned the

21. For a summary about this site, see RODRÍGUEZ CAO and EGUILLETA FRANCO 2017. My gratitude to these authors.

22. My thankfulness to the staff of the Regional Historical Museum of Burgas (Bulgaria) for their indications.

23. A new thermal spa complex (closer to the building published by PRESS 1984) has been excavated by the Archaeological museum of Hisarya over the last years. I would like to thank Dr. Radka Nankina for her indications.

24. A complete publication about the last archaeological excavations will be published in the next years. Our thankfulness to A. Schaer for her explanations and indications.

25. I would like to thank V.P. Sekulov from the Institute for Protection of Cultural Monuments and Museum of Strumica for his kindness and his comments about this site.

26. My gratitude to H.K. Şenyurt, from the Yozgat Museum, Ministry of Culture and Tourism of Turkey, for his information about this archaeological site.

27. For further information, see the *Aquae Patavinae* project <<http://www.aquaepatavinae.it/portale/>> and the derived publications (BASSANI *et alii* 2011, 2013; ANNIBALETTO *et alii* 2014, among others). My gratitude to the authors for their discussions.

28. A new publication about this site is in progress. See, among others, the latest publication (BROISE 2015; CURIE *et alii* 2018). I would like to thank to H. Broise and other colleagues for their indications.

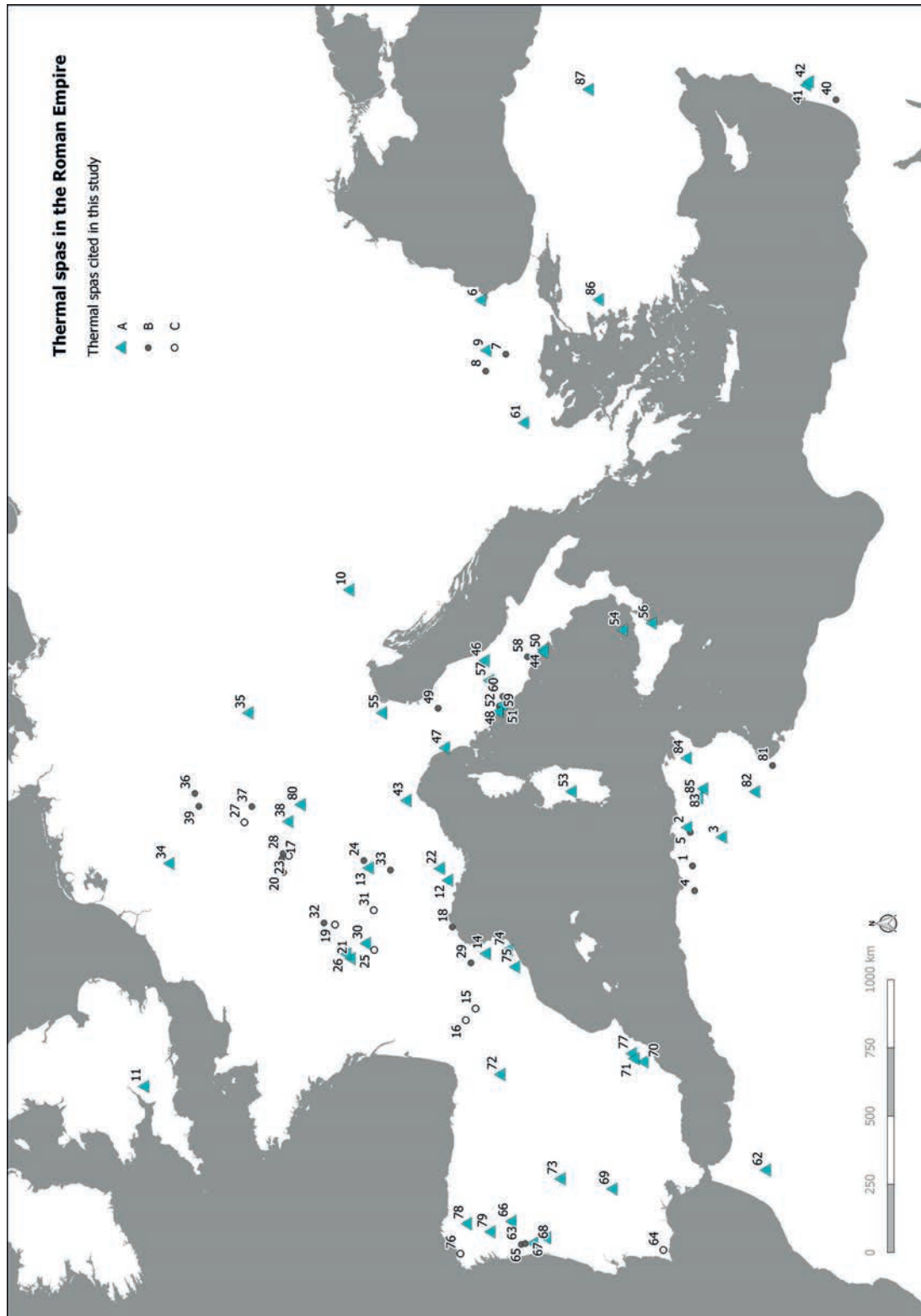


FIGURE 2. DISTRIBUTION OF THE BETTER PRESERVED AND/OR DOCUMENTED ROMAN THERMAL SPAS CONSIDERED IN THIS RESEARCH. THEIR NUMBERS AND CLASSIFICATION CORRESPOND TO THE SITES LISTED IN TABLE 1.

constructive characteristics of these sites and differentiated them from the other types of Roman baths.

Certain mineral-medicinal springs gained fame preceding the Roman period.²⁹ Pre-Roman interest in these waters was, in fact, linked to territorial aspects as these waters played an active role in the subsequent development of settlements and their control over the surrounding lands (Plin., *NH* 31, 1-2). Thus, the therapeutic value of the waters recognised by pre-Roman populations and the progressive arrival of visitors-pilgrims could also be linked to strategic factors. Yet it was only after the Roman conquest that these sites were progressively equipped with infrastructures, at times monumental, leading to an adequate and comfortable usage of their waters. The geomorphological criteria of these springs near rivers and valleys served, in fact, as decisive factors in the development of the main thoroughfares of the Roman Era and thus bolstered the development of *mansiones* or stopping places along the Roman itineraries commonly evidenced by the toponym *Aquae*. Moreover, the development of thermal complexes was pivotal in the rise of the settlements and towns frequently identified in Ptolemy's *Geography*, in the Antonine Itinerary, in the Ravenna Cosmography, and particularly in the Peutinger Map³⁰.

The study of these sites at the local, provincial and global scale is nonetheless plagued by serious barriers. These problems of identification are due mainly to two factors: The first is that these sites have been exploited for more than 2,000 years and consequently were subject of transformations which damaged or concealed their earlier Roman features. The superposition over time of new structures exploiting their waters also led to the destruction, transformation or concealment of the older Roman phases. Thus, although Antique written sources suggest the existence of many eminent thermal sites, the truth is that, with some exceptions, evidence of these features are rare due to their poor conservation. The second problem is the lack of research and bibliographical references. Moreover, the older few existing studies of individual sites either do not include stratigraphic descriptions nor explanations about different building phases. Additionally, access to this information is generally difficult as publications were made in local magazines or books.

Likewise, although fortunately certain ancient texts yield data as to the nature of the infrastructures before their disappearance, these sources are most often partial and handicapped by erroneous and subjective interpretations. Consequently, we consider that the study of the architectural structures associated with thermo-medicinal waters needs a wide survey to reconsider all these aspects.

29. See, e.g., SAMAMA 2015 or GUÉRIN-BEAUVOIS 2015, for reflections on this question in Greek culture.

30. Some considerations regarding this aspect, can be seen in ALLEN 1998; ALLEN 2003; JOUFFROY 1992; PERÉX AGORRETA and RODRÍGUEZ MORALES 2011.

3. AN OVERVIEW OF THE MAIN FEATURES OF HEALING SPA BUILDINGS, ACCORDING TO SOME OF THE BETTER KNOWN ROMAN SPAS

Although there are many healing spas evidenced in publications by monumental infrastructures or constructions all around the Mediterranean world, only 87 buildings or structures were retained for this study³¹. The criteria serving for this retention are: identification of their type of mineral-medicinal waters, a good state of preservation, well-recorded thermal bath structures and/or the existence of a complete floor plan. It goes without saying, therefore, that some healing spas have not been included due to a lack of information about them. Other thermal bathing complexes that conserve only a few poorly documented characteristic features or with waters that are not yet clearly defined have been confined to a subsequent study.

Even though research on ancient thermalism must be approached from multiple perspectives (e.g. epigraphy, toponymy, classical sources, territory), this study focuses on the formal description of the different characteristics of their buildings, an essential aspect to distinguish their structures and functions. However, although



FIGURE 3. AERIAL VIEW OF THE THERMAL SPA OF SARIKAYA, A RECENTLY RECOVERED MONUMENTAL BUILDING [87]. Photo courtesy E. Şahin. Indications H.K. Şenyurt.

31. Depending on their state of preservation and study potential, buildings selected for the current analysis have been classified into three general categories (Table 1): a) The better-documented thermal bath that are totally or partially preserved and can be visited (group A). This group also includes sites subject to recent archaeological excavations applying modern methods that provide rich information about their buildings. This is the case, as we have already mentioned, of Varadinske Toplice, Aachen, Agnano, Montegrotto Terme, Bansko, Burgas, Chaves, São Pedro do Sul, Alhama de Murcia, Archena, Caldes de Montbui, Fortuna, Lugo, Ourense, Jebel-Oust and Sarikaya (Figure 3). This group also exceptionally includes Alliano, a monumental, well-preserved complex subject to extensive analysis that since 2010 is flooded under the waters of the Yortanli dam (YARAŞ 2004; 2011), and Baden, although this archaeological site has only preserved a small section of the Roman building in the end; b) Noteworthy thermal bath buildings of uncertain preservation and visit (group B). This group comprises well-published sites that although often illustrated by floor plans, are difficult to interpret, recognise or visit. Moreover, in certain cases there are doubts as to if the archaeological remains still exist. These uncertainties arise from factors such as location, abandonment, subsequent transformations, or the difficulty of accessing recent publications defining their current status; c) Destroyed or disappeared thermal bath buildings (Group C). This last group includes well-documented sites that were either destroyed or no longer visible. It cannot be ruled out, however, that future archaeological research might recover part of their structures.

The omission of other sites such as, for example, Pamukale (Hierapolis, Turkey), undoubtedly one of the main thermal centres of Antiquity (D'Andria 2013), is due to the fact that it reveals no characteristic buildings linked to a thermal spa. Nevertheless, they will be considered in future studies. Finally, this group also excludes a series of Roman buildings without sufficient evidence of the use of mineral-rich waters in them, or others exploiting waters with both low temperatures and levels of mineralisation that, in spite of being identified in publications as healing spas (e.g. Fontaines Salées, France. BONNARD 1908; RENÉ 1943; DELOR 2002) could evoke other type of structures, like water sanctuaries, due to their architecture (a difficulty which has already been detected and pointed out by different authors, like CAZANOVE and SCHEID 2003). This aspect, nonetheless, remains unclear and merits further in-depth analysis. See Table 1 for a selection of references of each site cited in this text.

this study attempts to establish an overview of their general constructive features, the details pertaining to each site require consulting the original publications as the sites are *unica* linked to specific hydrogeological, cultural, historical and social realities.

Common constructive and architectonic characteristics of the thermal buildings considered in this paper can be analysed according to:

3.1. LOCATION

The whereabouts of mineral-medicinal water spas are linked essentially to hydrogeological conditions. Yet the location of their emergence to the surface, often in low topographical areas (zones of hydraulic discharge) such as river beds or valleys along tectonic faults (which can also be affected by earthquakes), is not always conducive to raising constructions. Their position near fluvial courses therefore leads to two frequent phenomena.

On the one hand, the thermal spas are subject to the fluctuations of river levels which can lead to occasional flooding or obstruction of the flow of the springs. Roman engineers adopted several solutions more or less successfully to deflect the force of the rivers. These countermeasures included, for example, raising retaining walls (e.g. Lugo, Archena, Valchetta, Rennes-les-Bains and Hammam es-Salihinne) or constructing *opus caementicium* and/or *signinum* beds or bases of different thickness as in the case of Lugo (Figure 4), Chaves, Plombières-les-Bains, Saint-Honoré-les-Bains and Évaux-les-Bains that raise, protect and isolate the mineral springs from river filtrations. This is likewise a factor to be taken into account when studying and preserving thermal heritage due to the construction, since the 20th century, of dams that have drowned many Roman healing spas, the most recent and controversial, as mentioned above, at Allianoi (Yaraş 2011).



FIGURE 4. ROMAN THERMAL SPA OF LUGO. THE BASEMENT OF THE ROMAN STRUCTURES IN *OPUS CAEMENTICIMUM* AND *OPUS SIGNINUM* IS STILL PRESERVED [78]. Photo: author.

On the other hand, although the proximity of thermal complexes to rivers can often lead to calamities, this topographical position can be beneficial as a strategic element in the development and monumentalisation of many of these sites. Thus, mineral-medicinal springs often can become points of interest when developing road³² acting as the nuclei of future *mansiones*, settlements and road crossings that often gave rise to strategic settlements. This is evidenced, in particular, in the Peutinger Map, as these types of sites are listed by their toponyms (i.e. Chaves, *Aquae Flaviae*; Caldes de Malavella, *Aquae Voconiae*; Aix-en-Provence, *Aquae Sextiae*; Aachen, *Aquae Granii*; and Montegrotto Terme, *Aquae Patavinae*). Furthermore, the Peutinger Map has served as the starting point of several analyses of thermal complexes linked to road itineraries.³³

3.2. CONSTRUCTIVE QUESTIONS

Bearing in mind, therefore, that location plays a determining role in the choice of the building of these mineral-medicinal complexes, the following organisation and constructive issues should be taken into account:

3.2.1. Water supply

The question of the mineral-medicinal water supply is without a doubt an aspect that merits detailed analysis. The existence of thermal waters emerging at the surface is the main element of a bath complex and the reason for its construction. The characteristics of the waters and their point of emergence will, in fact, determine the location of these features, as well as the complexity of their constructions, and/or distribution and position of each of their structures³⁴. At the same time, the water supply system offers elements to identify the most sacred and protected points of the buildings related to the main spring.

There are a number of architectural solutions linked to the different means of exploiting the main spring. The source of water, to be exploited to its full advantage, must be either near or within the confines of the building. Depending on the area's geology and topography, as well as the characteristics of the water, it is possible to determine the following catchment water types: 1) springs gushing from a mine or cave as is the case of the baths of Lipari, the minor thermal baths of Baia (Fig. 5),

32. With reference to this proposal see, e.g., RODRÍGUEZ COLMENERO *et alii* (2004: 47-48); or according to the methodological approach in GÜIMIL-FARIÑA and PARCERO-OUBIÑA 2015, it can be considered a nodal factor, for example, on the road to Chaves –*Aquae Flaviae*–. Additionally, some conclusions regarding this subject can be viewed in CAMPBELL (2012: 330-368); GUERIN-BEAUVOIS (2015: 300) for Italy; and MATILLA SÉIQUER and GONZÁLEZ SOUTELO (2017), in some articles, for the Iberian Peninsula.

33. See note 28. For some specific studies about spas and the Tabula Peutinger, among others, ALLEN 2003; PERÉX AGORRETA and RODRÍGUEZ MORALES 2011; FODOREAN 2012; MORANDINI 2013.

34. Regarding this subject, see specifically, some preliminary considerations in GONZÁLEZ SOUTELO 2015; RAMÓN SÁNCHEZ and GONZÁLEZ SOUTELO (forthcoming).

Agnano and Alhama de Murcia, where the building is adapted to exploit the natural steam or thermal water; 2) spring catchment in the form of a well or *castella* at times designed with different infrastructures and with platforms of *opus caementicium* so as to isolate them from discharges or overflows of nearby rivers or springs. This is the case, for example, of Lugo, Chaves, Nérís-les-Bains, Bagnères-de-Luchon, Balaruc-les-Bains, Borbonne-les-Bains, Plombières-les-Bains, Luxeuil-les-Bains and Évaux-les-Bains; 3) springs emanating from natural fractures in the bedrock where the flow is associated with sacred spaces, e.g. Fortuna, Gréoux-les-Bains, and Jebel Oust; and 4) springs emerging directly through narrow fissures or crevices feeding tanks or pools, e.g. Chaves, Aix-en-Provence, Hammat Gader, Varaždinske Toplice, ¿Menthon?, ¿Caldas das Taipas?, ¿Niederbronn? and Hammam Berda, that serve mostly for collective bathing or as *castellum aquae* to distribute water.

Another aspect to take into account in the models of exploiting springs is the distance between the point of water emergence and the building itself. This factor can require the adoption of complex solutions, especially when exploiting waters with exceptionally high temperatures such as at Chaves (73°C), Caldes de Montbui



FIGURE 5. THE MINOR THERMAL BATH OF BAIA [50]. ITS CONSTRUCTION WAS ADAPTED TO THE GEOMORPHOLOGY OF THE HILL TO TAKE ADVANTAGE OF THE HOT STEAM. Photo: author.

(73°C), Acqui Terme (74°C), Plombières-les-Bains (85°C) and Hammam Meskoutine (98°C). Thus, as pointed out by Seneca (*QNat.* 3, 24-25), water temperature could be regulated by piping it through a circuit of pre-determined length allowing a progressive cooling before its arrival in the pools. This could explain the long stretch of pipes at Hammam Es-Salihinne (Laporte 2006: 199-200) and Jebel Oust (Broise 2015). Moreover, this method goes beyond the traditional technique of mixing hot and cold waters (as appears to be the case at Fordongianus. (Taramelli 1903: 475) and maybe at Hammat Gader (Hirschfeld 1997: 46), a method that would not have been

common as it provokes a loss of the beneficial properties of the mineral-medicinal waters. Another cooling method put to use until recent times, identified at Hammat Gader by Antoninus of Placentia in the 6th c. A.D. (Yegül 1992: 124), consisted of controlling the arrival of the thermal water into the pools, especially at night, so as to naturally reduce their temperature.

In any case, it is compelling to analyse the question of the subsequent reuse of many of the features of hydraulic supply associated with these springs after Roman times as they confirm their quality and durability in spite of being made, in some cases, of perishable materials, notably wood.³⁵

3.2.2. Water distribution and evacuation

It is essential, when determining the organisation and function of thermal bath complexes based on the above notions, to assess temperature, water type and usage. Data of this nature can be gleaned from the survey of Broise (2015) and from the publications of certain well-preserved sites such as Chaves (Carneiro 2016; 2017) Jebel-Oust (Broise and Curie 2014), Hammat Gader (Hirschfeld 1997; Broise 2003) (Figure 6), Hammam es-Salihinne (Gsell and Graillot 1893; Laporte 2006), Bath (Cunliffe 1971: 50) and Stara Zagora (Nikolov 1968; Garbrecht and Mandersheid 1994: Vol. A, 83-87; vol. B, 327-385; Broise 2015). These publications shed light on an aspect essential to understanding the functions of the different rooms and pools, and their different temperatures that result from the circulation of water from either its point of emergence or from its mixture with waters from other springs or pipelines.

Likewise, the nature of the water exploited at a number of these sites has conditioned the preservation of certain hydraulic infrastructures that distributed its flow. The properties of water can then be a factor serving to elucidate certain aspects, for example, linked to the different renovations and constructive phases. Calcareous rich waters, for example, leave concretions on the surface of features that can offer information as to certain transformations in buildings as these deposits tend to obstruct channels and pools. Nevertheless, these type of waters can also be a positive factor as they can serve to identify the site's water circuit and result in a stratigraphic sequence that facilitates the interpretation of the function of their buildings.³⁶

Finally, water evacuation features are another element offering data to understand a site's organisation. In general, after regulating the course of the water toward the pools by means of sluices and channels, the overflow must be evacuated. This hydraulic system can be seen in São Pedro do Sul (Frade and Beleza

35. This aspect identified in Roman spas is brought up in the pioneering studies of LAUNAY (1899) and MOLLIÈRE (1893). Also see the notions on this phenomenon in GONZÁLEZ SOUTELO 2014, 2015; GONZÁLEZ SOUTELO and RAMÓN SÁNCHEZ 2016; and COSTA VAZ *et alii* 2015.

36. The recent study of Jebel Oust published by BROISE and CURIE (2014) offers significant data on this question. The doctoral thesis of J. CURIE (2013) is focused on this aspect. See, also, the examples of Caldes de Malavella and Varaždinske Toplice.



FIGURE 6. ROOM OF THE OVAL HALL AND POOL AT HAMMAT GADER [42], NEAR THE THERMAL SPRING. Photo: author.

Moreira 1992: 527), Chaves (Carneiro 2016: 294–295), Hammat Gader (Hirschfeld 1997: 38 and fig. 29) and Bath (Cunliffe 1971: 24), for example, and the overflow is directed toward a nearby river or stream. This is often the case, as noted above, as most of these thermal complexes were raised near water courses. Yet, the overflow could also at times be diverted for use in agriculture or production after reducing its temperature and lowering its level of mineralisation.

3.2.3. Bathing spaces: pools and other infrastructures

Mineral-medicinal waters were exploited (e.g. by consumption,³⁷ steam baths or thermal muds) in a number of different ways to treat and cure a wide variety of ailments in function of their composition and temperature.³⁸ Yet most of the evidence gathered in this study points to their use to fill large immersion pools (with or without individual small adjacent basins) set in the centre of rooms.

Another aspect is that the protagonism of fire-fuelled hypocaust heating systems disappears in healing spas (contrary to baths using fresh water). Thus, with few

37. The architectural remains of sites linked to drinking water are poorly known, for example, as they need less infrastructures and are more easily destroyed. As most of them are not identified as bathing buildings, these structures have thus been excluded from this inventory, although they will be considered in forthcoming studies. See sites like Vichy (CORROCHER 1981), and other sites possibly linked to sanctuaries such as Fontaines Salées (RENÉ 1943; GALLIOU 2006) and Saint-Honoré (VURPILLOT 2013).

38. For example, physicians such as Herodotus (2nd century A.D., known through the work of Oribasius, X, 5, 1), aware of these differences, recognised the necessity of the correct use of these spring waters according to their physical-chemical properties.

exceptions, fire-fuelled hypocaust systems are occasionally present in subsequent construction phases³⁹. The few cases of this type probably served to progressively offer a greater capacity or other services (e.g. Alhama de Murcia, Badenweiler, Bath and Royat). Moreover, as advanced by Bonnard (1908: 40-45), and hypothesised by Fagan (2001: 423), the origin of *hypocausta* could have originally been linked to the exploitation of natural hydrothermal phenomena. In these cases the buildings took advantage and channelled hot water sources emerging along steep slopes through floors and double walls where the water's natural vapour heated the steam bath rooms (as in the case of *laconica*⁴⁰). This use (such as a *sudatorium* or *laconicum*) is confirmed at sites in volcanic districts such as the celebrated thermal baths of Baia⁴¹ or where the springs are well-known for their high temperatures such as at Plombières-les-Bains (Greppo 1846: 44), Hammam es-Salihinne (Laporte 2006: 311), Bansko (Taseva and Sekulov 2017: 10-11) and Caldes de Montbui (Miró i Alaix 1992: 268).

In any case, as noted above, the most characteristic features of thermal baths exploiting mineral-medicinal waters are the vast rooms furnished with large central pools fed by a constant flow of water circulating throughout the complex. Hence the necessity of an adequate system of water collection and distribution.

As indicated in a previous study (González Soutelo 2011a), these types of buildings are furnished primarily by either rectangular or circular pools. The choice of shape depends on functional and other organisational factors.⁴²

The circular pools on the map feature flights of steps along their perimeter that vary in number of steps (e.g. Montegrotto Terme; Hammam Berda; Baden-Baden;



FIGURE 7. RECTANGULAR ROMAN HALL AND POOL AT CALDES DE MONTBUI [75]. Photo: author.

39. YEGÜL (1992: 110-118), considers this aspect in the evolution of thermal establishments in the Roman period. Nevertheless, we should consider that some cold mineral waters had to be heated, like for example could be in São Vicente de Pinheiro, Uriage-les-Bains or Bad Gögging.

40. This proposal is suggested by Antyllus in Oribasius X, 40 «Natural stoves are not only good because of hot and dry steams which rises from them; in fact, in this respect artificial stoves (*hypocausta*), created using natural stoves as a model, produce the same effect, but they lack the special properties...». (personal translation after DAREMBERG and BUSSEMAKER –trad.-1851-1876).

41. New studies (MEDRI 2013; NIEBERLE 2016) offer new information about the site of Baia that could be linked to nearby bathing complexes sharing similar characteristics (e.g. Agnano Terme).

42. Circular shaped pools, according to H. BROISE (2015: 55), could be equated with the hottest baths. Yet, for example, there are many thermal spas without circular pools. There is, nonetheless, no doubt that the form of the pool plays a role in retaining the temperature of the water destined to still use and to different degrees of immersion, an aspect currently under analysis.



FIGURE 8. ONE OF THE CENTRAL POOLS SURROUNDED BY SMALL BASINS AT THE ROMAN SPA OF BADENWEILER [38]. Photo: author.

Bagnères-de-Bigorre; Bourbon-Lancy; Caldas das Taipas; Évaux-les-Bains; Burgas; Jebel Oust). Moreover, these pools are also frequently placed in the centre of circular rooms and at times flanked by four apses (e.g. Alange, Baños de Montemayor, Hammam es-Salihinne, Nérís-les-Bains –South building–, Allianoi, Averno, Baia). Their diameters range greatly from 35 m (Hammam Berda) to 2,08 m, such as that of Baños de Fitero, probably destined for individual use.

Rectangular pools, the more common type of immersion feature, also occupy the central area of rectangular rooms and are often surrounded by an ambulatory. Examples are known at Bath (main pool), Amélié-les-Bains, Neris-les-Bains, Bains-les-Bains and Caldes de Montbui (Figure 7). Although they usually feature steps along their perimeter (Amélie-les-Bains, Badenweiler, Caldes de Montbui, Acqui Terme, Chaves –piscine B–, Hammam es-Salihinne, Hammam Meskoutine, Fortuna, Wiesbaden, among many others) they were also accessed from their two smaller sides (e.g. São Pedro do Sul, Hissarya –old building–, Bath –pool B–). Another option was to place flights of steps only at one side (e.g. Terme Taurine; Aachen; Chaves –pool A– Hammam Beni Guecha) or semicircular or triangular steps at the angles (e.g. Hammam es-Salihinne, Bansko, Haskovo and Montegrotto Terme). In the case of the steps along the perimeter of these pools, in addition to serving as access, they probably acted as rest areas for the bathers, as noted by the classical author Antyllus (Oribasius X, 3). The larger dimensions of rectangular pools also vary, for example, from 23,3 x 12,8 m at Sarikaya (Şenyurt 2016: III) to 20,5 x 9 m at São Pedro do Sul (Frade and Beleza 1992: 524).

Square or pseudo-square pools are much less common (Caldes de Malavella; Bansko; Nérís-les-Bains, south building; Plombières-les-Bains). These are most often accessed by flights of steps along three or four of their sides. There are also



FIGURE 9. POOL AND SMALL BASINS (FOOT BATHS?) OF THE ROMAN SPA AT TERME TAURINE, CIVITAVECCHIA [59]. Photo: author.

cases revealing complex shapes such as the rectangular pools flanked by one or two apses on their smaller sides at Casale dei Bagni, Ficoncella, Hammat Gader and Aachen, and pools of diverse geometrical shapes at, for example, Aix-les-Bains, Hammat Gader, and Hammam Guerguour.

Besides the large central pools linked to collective use for different numbers of bathers (according to the nature and temperature of the water, clientele expectations, or anticipation of a large influxes of local population, ill travellers or pilgrims), there were also small pools intended for individual or selective treatments. These structures are identified at, for example, Hammat Gader, Terme Taurine, Badenweiler (Figure 8), Chaves, Amélie-les-Bains, Hammam-es-Salihinne, and probably Caldes de Malavella. Similar even smaller features, such as foot baths or ablution basins, are also known at Hammat Gader, Terme Taurine (Figure 9) and Jebel-Oust. Likewise, certain treatments could be linked to baths equipped with showers or jets as appears to be the case at Jebel Oust (Broise 2015: 61), Badenweiler (Bonnard 1908: 463) and Évaux-les-Bains (Grenier 1960: 420). It must be noted, nonetheless, that the poor preservation of the elevation of the walls of these buildings greatly hinders their observation.

3.2.4. Other rooms or halls

Unfortunately, chambers adjacent to «pool rooms» are not very well documented and it is difficult to define their function. Certain thermal spas were provided with large lateral rooms featuring a bench running along a wall. These types of features are, in some cases, interpreted as spaces to practice sports (*palaestrae*).

Nevertheless, the advice of modern physicians to users is to avoid strong physical activity during the use of mineral-medicinal waters. Hence this study proposes that these courtyards or porticoes, identified at the archaeological sites of São Pedro do Sul, Lugo, Terme Taurine, Badenweiler, Chaves, Hammat Gader, Hammam Guergour and Nérís-les-Bains, could have been intended, as in the case of peristyles, lobbies or large accesses, for outdoor rest and leisure.

Small rooms at certain spas are also associated with the use of thermal water for diverse types of treatments or rest⁴³. The examples of Amélie-les-Bains, Bagnères-de-Bigorre, Évaux-les-Bains, Alange, Caldes de Malavella and Baia tend to support the notion of these functions despite the lack of archaeological evidence and the problem of the overlap of constructive phases complicating their interpretation. Features interpreted as dressing rooms, such as those at Bansko (Taseva and Sekulov 2017: 8), Badenweiler (Yegül 1992: 119), Hammat Gader⁴⁴ or Bath (Cunliffe 2000: 84, 89) are also poorly identified elements at Roman spas.

3.2.5. Sanctuaries or sacred areas

The mineral-medical waters of Roman thermal centres are also known to have been endowed with sacred qualities. Evidence of features linked to sacred areas or religious cults are present for the most part at centres exploiting thermal waters, although sanctuaries have not always been well identified.⁴⁵ The sites of Bath, Fortuna, Jebel Oust, Chaves and Mont-Doré, in addition to the presence of temples or sacred precincts linked to their waters, share other elements revealing that they were considered sacred places. These other elements mainly include ex-votos depicting human and animal anatomical parts (e.g. Chamalières,⁴⁶ Luxeuil-les-Bains, Montegrotto Terme), coin deposits in the main spring –which would be the most sacred point in the building– (more than 4,000 coins were collected, for example, at Bourbonne-les-Bains. Grenier 1960: 449; Sauer 2005), and largely votive altars⁴⁷ (e.g. 14 altars were located in Lugo, most of them dedicated to the nymphs. Hervés Raigoso and Meijide Cameselle 2000; Crecente Maseda and González Soutelo 2016; or 21 altars in Baños de Montemayor dedicated to the nymphs, Fontana and Salus. Roldán Hervás 1965; Díez de Velasco 1998, 2002).

43. Some studies have been carried out regarding this subject. For some proposals, see, e.g., JACKSON 1990; ORÓ FERNÁNDEZ 1996; ALLEN 1998; DVORJETSKI 2016; KÖHLER 2016.

44. As suggested by YEGÜL 1992: 121; and BROISE 2003: 227 in the long corridor of Hammat Gader.

45. Some considerations about this subject can be seen in SCHEID 2015, GOLOSETTI 2016: 71 and BOLDER-BOOS and CALAPÀ 2018, where the identification about sacred places or sanctuaries cannot be so easily detected in archaeology. Also, for the link between thermal spa architecture and religious areas see, for example, some proposals in BASSANI *et alii* 2018, including CARNEIRO and GONZÁLEZ SOUTELO 2018 in the Iberian Peninsula; ZANETTI 2018 in *Germaniae* and *Raetia*; MARCATO 2018 in Gaul; or BASSANI 2013, 2018 in the Italian Peninsula.

46. This site, most likely a water sanctuary, is not included in the list of spas as it lacks characteristic features. It is, nonetheless, one of the most significant examples of the cult to mineral-medicinal waters due to the numerous finds of wooden figurines (AUDIN *et alii* 2000).

47. Surveys of these votive deposits in the Iberian Peninsula see, e.g. Díez de VELASCO 1998 and ORÓ FERNÁNDEZ 1995. For Italy, see especially ALLEN 1998 and BASSANI 2013.

3.2.6. Lodgings for bathers

A last aspect to take into account in the study of thermal complexes, in particular those distant from larger settlements, is the presence of buildings or annexes interpreted as having accommodated the sick, pilgrims or simply bathers attracted to the complex by the fame and prestige of the waters. Examples of these types of lodgings, that evidence the arrival of outsiders for more than just a simple daily sojourn⁴⁸, are attested, among others, at the bathing complexes of Archena (Matilla Séiquer and Ovejero 2017), Terme Taurine (Köhler 2007, 2011), Fortuna (Matilla Séiquer 2017), and possibly Jebel Oust.⁴⁹

3.3. THERMAL COMPLEX CHRONOLOGY

Assigning a broad chronology to thermal complexes is an arduous task as each site is subject to its own historical and geographical conditions, as well as to different degrees of archaeological scrutiny and number of phases of construction.

It is evident that the beneficial properties of thermal waters were known very early to local populations as indicated by discoveries of artefacts next to a series of thermal springs in both Prehistoric (e.g. Bagni di Vicarello. Gasperini 2008: 92) and Etruscan contexts⁵⁰. Yet the widespread, deliberate exploitation of thermal bathing complexes evidenced by elaborate constructions did not take place until after the Roman expansion. Roman structures begin to appear, in fact, in early contexts possibly at the outset of the 2nd century B.C. in the Italian Peninsula at sites such as Baia (Dubois 1907; Guérin-Beauvois 2015: 127–131) or Terme Taurine (Köhler 2007: 116). Their expansion throughout the provinces took place progressively in the 2nd to 1st century B.C. as evidenced by features at Caldes de Malavella (Llinàs i Pol and Nolla i Brufau 2011: 106) and Alliano (Çekirge and Gürdal 2011: 152). However, it was not until the end of the 1st century B.C., in particular in the Imperial period, that saw the first monumental constructions raised throughout all the provinces of the growing Empire.

Therefore, it was common in the 1st century A.D. that thermal sites exploiting hot flowing waters were transformed into monumental constructions deliberately designed for reasons of health, as a reflection of these waters reputation⁵¹. Over time they were subject to different renovations and extensions resulting in substantial alterations of their features. These reconditionings were most often linked to maintenance (mainly due to malfunctions caused by mineral concretions), but also intended to offer larger facilities, newer services and amenities, adapting at

48. It is frequently cited in classical authors that ill people and pilgrims flocked to Hammat Gader, and a residential quarter was identified towards the north of the thermal spa (HIRSCHFELD 1997: 8).

49. BEN ABED *et alii* 2001: 538; BEN ABED *et alii* 2004: 706–712, including a discussion about the interpretation of the building associated to this Roman spa as a *hospitalia* or residence.

50. See, e.g., REGIONE LAZIO 2007; BASSANI 2012; BASSANI 2013.

51. Some considerations about this aspect have already been discussed in YEGÜL 1992: 110–116 and more recently GUÉRIN-BEAUVOIS 2015: 352.

times facets characteristic of thermal complexes exploiting common water. By way of example, as suggested by Yegül (1992: III-II6), certain transformations in later centuries incorporated fire hypocausts so as to expand their facilities and offer more services (e.g. Bath and Alhama de Murcia). These later sites also integrated pools of cold water, a type of feature recorded, for example, at the second phase of Bansko (Taseva and Sekulov 2017: 8) (Figure 10) probably following fashions and customs established throughout the Roman Empire.



FIGURE 10. GENERAL VIEW OF THE LATE ROMAN THERMAL SPA OF BANSKO, STRUMICA [61]. Photo courtesy V. Sekulov.

With the exception of destruction resulting from either natural phenomena such as floods or earthquakes (e.g. Archena. Matilla Séiquer and Ovejero 2017: 239-240; and Chaves. Carneiro 2017: 65) or misfortunes such as fires (Hamмам Guergour. Wilson 1997: 325; and Varazdinske Toplice. Gamulin 2001: 1; CIL III 04121) or abandonment due to lack of maintenance, certain thermal sites persisted far beyond Roman times. In the better cases, they were adapted to new cultures and traditions as, for example, the complex of Hammat Gader and Alhama de Murcia that became an Arab thermal spa. In the cases of abandonment, by contrast, these waters nonetheless continued to serve after undergoing minimal modifications or improvements in Roman buildings until their rediscovery, integration or reuse during the second golden age of hydrotherapy between the 18th and 20th centuries. It was this period that saw the greatest destruction of the older Roman features.

4. SUMMARY AND FUTURE RESEARCH

As we have tried to show in the previous discussion, the interpretation of Roman healing spas has to face numerous issues and difficulties derived from their own constraints. It goes without saying that new study approaches that take into account their many unique characteristics will be a key aspect in their research.

As noted in this article, the chance to bring together, put on the map and compare the best-known buildings of Roman spas from a global interdisciplinary perspective, can allow us to recognize some of the main characteristics of these buildings. Therefore, a detailed approach will be carried out in the coming years.

Fortunately, as we have seen, there are a large number of well-preserved sites and new archaeological digs are being developed in the last years. Furthermore, we are convinced that the number of Roman spas which can be placed on the map will increase in the coming years thanks to new meticulous archaeological excavations combined with thorough architectural studies. Our aim in this article has been to put down on paper some of the most representative Roman spas as a starting point to bringing these buildings out of their isolation and therefore, reach a deeper understanding of them. The final objective of our project will be to recognize the architectonic characteristics of these types of features in the framework of Roman architecture.

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Table 1. Table listing the better preserved/documented thermal spas in the Roman Empire considered in this research. The list, sorted by country, includes their ancient names, some of the main bibliographical references and assigned category.

n°	Country	Roman spa	Ancient name	Some of main bibliography	Main remains	Cat.
1	ALG	Hammam Beni Guecha		Vallet 1923; Wilson 1997; Thèbert 2003	Building	B
2	ALG	Hammam Berda / Bradaa	<i>Heliopolis?</i>	Fiorini 1935; Hamriot 1911; Jouffroy 1992; Wilson 1997	Pools	A
3	ALG	Hammam es-Salihine / Khenchela / Henchir el-Hammam	<i>Aquae Flavianae</i>	Gsell and Graillot 1893; Hamriot 1911; Birebent 1964; Wilson 1997; Laporte 2006	Building	A
4	ALG	Hammam Guergour	<i>Ad Sava</i>	Guéry 1966; Wilson 1997	Building	B
5	ALG	Hammam Meskoutine / Hammam Chellela	<i>Aquae Thibiltanae</i>	Marty and Rouyer 1892; Hamriot 1911; Fiorini 1935; Jouffroy 1992; Wilson 1997; Pettano, 1998	Pool	B
6	BUL	Burgas / Burgaski	<i>Aquae Calidae / Thermopolis</i>	Fillov 1911; Drazheva 2010; Paunov 2013; Regional Historical Museum of Burgas 2018	Building	A
7	BUL	Haskovo / Kolsovo		Hoddinott 1975; Yegül 1992	Pool	B-C
8	BUL	Hissar / Hisarya	<i>Diocletianopolis</i>	Press 1984; Manderscheid 1988	2 Buildings	A-B
9	BUL	Stara Zagora / Starozagorski Bani	<i>Augusta Traiana</i>	Nikolov 1968; Hoddinott 1975; Press 1984; Yegül 1992	Building	A
10	CRO	Varaždinske Toplice	<i>Aquae Iasae / Iassae</i>	Manderscheid 1988; Gamulin 2001; Rendić-Miočević 2015; Arheoloski muzej u Zagrebu 2015	Pool, building	A
11	ENG	Bath	<i>Aquae Sulis Minerva/Aquae Calidae</i>	Cunliffe 1971, 2000	Building, temple	A
12	FR	Aix-en-Provence	<i>Aquae Sextiae</i>	Greppo 1846; Bonnard 1908; Grenier 1960; Guyon <i>et alii</i> 1998; Mocci and Nin 2006	Pools	A
13	FR	Aix-les-Bains / Aix-en-Savoie	<i>Aquae (Domitianae?) / Aquae Gratianae</i>	Greppo 1846; Bonnard 1908; Grenier 1960; Canal 1992; Leveau 2007	Building	A
14	FR	Amélie-les-Bains / Arles-les-Bains	<i>Aquae Calidae</i>	Bonnard 1908; Grenier 1960; Pezin and Bouet 2002; Kotarba <i>et alii</i> 2007	Building	A
15	FR	Bagnères de Luchon	<i>Thermae Onesiorum / Aquae Onesiae</i>	Greppo 1846; Lambión 1860; Bonnard 1908; Sablayrolles and Beyre 2006	Building	C
16	FR	Bagnères-de-Bigorre	<i>Vicus Aquensis</i>	Bonnard 1908; Grenier 1960; Lussault 1997	Building, structures	C
17	FR	Bains-les-Bains		Bonnard 1908; Michler, 2004; Marcato 2017	Pool, walls	B
18	FR	Balaruc-les-Bains		Bonnard 1908; Lugand and Bermond 2001; Bermond and Pelletier 2002; Marcato 2017	Structures, wells, building	B
19	FR	Bourbon-Lancy	<i>Aquae Nisinei or Nisincii?</i>	Greppo 1846; Bonnard 1908; Grenier 1960; Vurpillot 2014a	Building	C

20	FR	Bourbonne-les-Bains	<i>Indesina?</i>	Bonnard 1908; Lugand and Bermond 2001; Rameau 1978; Sauget and Sauget 1980; Thévenard 1996; Sauer 2005; Février y Maligorne 2009; Vurpillot 2014b	Building	B
21	FR	Evaux-les-Bains	<i>Ivaunum?</i>	Greppo 1846; Bonnard 1908; Grenier 1960; Dusot 1989; Maniquet 2014	Pools, wells, structures	A
22	FR	Gréoux-les-Bains	<i>Grisélia / Grisellum</i>	Bonnard 1908; Bonnet <i>et alii</i> 1988; Bérard 1997; Bouet 2003	Pool, building	A
23	FR	Luxeuil-les-Bains	<i>Luxovium?</i>	Bonnard 1908; Bonvallot and Card 1991; Faure-Brac 2002; Vurpillot 2014c	Pools, wells, structures	C
24	FR	Menthon-Saint-Bernard		Bonnard 1908; Broise, 1984; Bertrand <i>et alii</i> 1999; Bouet 2003; Marcato 2017	Pool, building	B
25	FR	Mont-Doré		Greppo 1846; Bonnard, 1908; Grenier 1960; Audin 1985; Provost and Mennessier-Jouannet 1994; Dousteysier y Nectoux 2016; Marcato 2017	Building, temple	C
26	FR	Néris-les-Bains	<i>Aquae Neri</i>	Boitrot-Desserviers 1822; Bonnard 1908; Grenier 1960; Desnoyers 1985; Corrocher <i>et alii</i> 1989	2 buildings, pools	A
27	FR	Niederbronn-les-Bains		Bonnard 1908; Flotté and Fuchs 2000; Prevost-Boure and Gerold 2007; Zanetti 2017	Wells, structures	C
28	FR	Plombières-les-Bains		Jutier et Lefort 1862; Bonnard 1908; Schneider 1974; Michler 2004	Pools	B
29	FR	Remes-les-Bains	<i>Aquae Calidae</i>	Bonnard 1908; Alessandri and Rancoule 2002; Bouet 2003; Ournac <i>et alii</i> 2009	Pools, structures	B
30	FR	Royat		Audin 1985; Bonnard 1908; Grenier 1960; Provost and Mennessier-Jouannet 1994; Darteville and Le Barrier 2010	Pools, building	A
31	FR	Saint-Calmier	<i>Aquae Segetae</i>	Greppo 1846; Bonnard 1908; Lavendhomme 1997; Marcato 2017	Building?	C
32	FR	Saint-Honoré-les-Bains	<i>Aquae Nisinae?</i>	Bonnard 1908; Vurpillot 2013	Building, wells	B
33	FR	Uriage-les-Bains		Greppo, 1846; Bonnard, 1908; Perazza, 1992; Souchon, 2006	Pool, building	B
34	GER	Aachen / Aix-le-Chapelle	<i>Aquae Grami</i>	Manderscheid 1988; Cüpper 1982; Schaub 2011; 2018	Buildings, pools	A-B
35	GER	Bad Gögging		Manderscheid, 1988; Nuber 2011	Structures, pool	A
36	GER	Bad Vilbel	<i>Civitas Taunensium?</i>	Manderscheid 1988; Zanetti 2017	Building	B
37	GER	Baden-Baden	<i>Aurelia Aquensis / Aquae Aureliae</i>	Bonnard 1908; Manderscheid 1988; Schallmayer 1989; Zanetti 2017	Building, pools	B
38	GER	Badenweiler		Bonnard 1908; Grenier 1960; Yegül 1992; Hiller 2004	Building	A
39	GER	Wiesbaden	<i>Aquae Mattiacae</i>	Bonnard 1908; Schoppa 1974; Czysz 1994; Manderscheid 1988; Zanetti 2017	Building	B-C
40	ISR	Emmaus	<i>Nicopolis</i>	Gichon 1979; Dvorjetski 2007	Building	B
41	ISR	Hammam-Tiberias	<i>Tiberias / Aquae Calidae</i>	Dothan 1983; Dvorjetski 2007	Structures	A-B

42	ISR	Hammat Gader	<i>Emmatha / Thernae Heliae</i>	Yegül 1992; Hirschfeld 1997; Broise 2003	Building	A
43	IT	Acqui Terme	<i>Aquae Statiellae</i>	Zanda 2002; Zanda and Bachetta 2005	Building	A
44	IT	Agnano	<i>Thernae Alinarum?</i>	Macchioro 1912; Yegül 1992; Allen 1998; Giglio 2016	Building	A
45	IT	Averno		Maiuri 1958; Amalfitano <i>et alii</i> 1990	Building	A
46	IT	Bacucco / Viterbo	<i>Aquae Passeris</i>	Chellini 2002; Regione Lazio 2007	Building	B
47	IT	Bagni de Vicarello	<i>Aquae Apollinares Novae</i>	Chellini 2002; Allen 2003; Gasperini 2007	Pool, building	B
48	IT	Bagni di Stigliano	<i>Aquae Apollinares Véteres</i>	Gasperini 1976; Chellini 2002; Regione Lazio 2007	Building, Sanctuary?	B
49	IT	Bagno di Romagna		Ortali 2004	Building, Sanctuary?	B
50	IT	Baia	<i>Baiae / Aquae Cumanae</i>	Dubois 1907; Amalfitano <i>et alii</i> 1990; Yegül 1995; Medri 2013; Nieberle 2016	Building	A
51	IT	Casale dei Bagni, Sasso di Furbara	<i>Aquae Caeretanae</i>	Cosentino 1992; Cosentino and Sabbatini 1989; Chellini 2002; Regione Lazio 2007	Building	A
52	IT	Ficoncella	<i>Aquae Tauri</i>	Köhler 1999; Chellini 2002; Stracci and Toti 2017	Pool, room	A
53	IT	Fondongianus	<i>Forum Traiani? / Aquae Ypsitanæ</i>	Taramelli 1903; Zucca 1913; Serra y Bacco 1996; 2014	Building	A
54	IT	Lipari o Terme di San Calogero		Bernabò Brea 1994; Regione Lazio 2007	Structures, pool	A
55	IT	Montegrotto Terme	<i>Aquae Aponi / Aquae Patavinæ</i>	Lazzaro 1981; Ghedini <i>et alii</i> 2012	Pools, buildings	A
56	IT	Santa Venera al Pozzo?		Cosentini and Pavone 1966; Manderscheid 1988	Building	A
57	IT	Terme di Cotilia	<i>Aquae Cutiliae</i>	De Palma 1985; Regione Lazio 2007	Building	A
58	IT	Terme di Suio / Castelforte	<i>Aquae Vescinae / Nesevinæ?</i>	Allen 1998; Regione Lazio 2007	Building	B
59	IT	Terme Taurine	<i>Aquae Tauri</i>	Heinz 1986; Yegül 1992; Köhler 2007; 2011	Building	A
60	IT	Valchetta / Bagni della Regina	<i>Véio</i>	Jones 1960; Yegül 1992; Fusco 2018	Pools, structures	B
61	MAC	Bansko, Strumica	<i>Tiberiopolis?</i>	Sekulov 2009; Taseva and Sekulov 2017	Building	A
62	MAR	Moulay Idriss		Wilson 1997	Pool	A?
63	POR	Caldas das Taipas		Fernandes 1912; Acciaiuoli 1941; Frade 1993; Cachada 2006	Structures	B
64	POR	Caldas de Monchique		Ferreira, 1963; González Soutelo and Capela 2016	Structures	C
65	POR	Caldas de Vizela		Queiroga 2006, 2013	Building?, pools	B
66	POR	Chaves	<i>Aquae Flaviae / Ad Aquas</i>	Cameiro 2013, 2017	Building	A

67	POR	S. Pedro do Sul / Caldas de Lafoes		Frade and Beleza 1992	Building	A
68	POR	S. Vicente do Pinheiro		Fortes 1902; Frade 1993	Building	A
69	SPA	Alange		Álvarez Martínez 1972, 1973; Carmona Barrero 1999, 2017	Building, Pools	A
70	SPA	Alhama de Murcia		Baños Serrano 1996, 2017	Building	A
71	SPA	Archena		Matilla Séiquer 2007; Matilla Séiquer and Ovejero 2017	Structures, guesthouse	A
72	SPA	Baños de Fitero		Medrano Marques 2004; Olcoz Yanguas 2017	Pool	A
73	SPA	Baños de Montemayor		Roldán Hervás 1965; González Soutelo 2013b	Pool, building	A
74	SPA	Caldes de Malavella	<i>Aquae Voconiae / Aquae Calidae</i>	Merino <i>et alii</i> 1994; Llinàs i Pol <i>et alii</i> 2004; Llinàs i Pol and Nolla i Brufau 2011	Building	A
75	SPA	Caldes de Montbui	<i>Aquae Calidae?</i>	Miró i Alaix 1992; Hernández and Monleón 2007; Peréx Agorreta and Miró i Alaix 2017	Building, pools	A
76	SPA	Carballo		Casado González and Franco Maside 1998; González Soutelo 2011b	Building	C
77	SPA	Fortuna		Egea Vivancos <i>et alii</i> 2003; Matilla Séiquer 2003 ; 2017	Building	A
78	SPA	Lugo	<i>Lucus Augusti</i>	Mejide and Hervés 2000; González Soutelo 2012b; Crecente and González Soutelo 2016	Building	A
79	SPA	Ourense, As Burgas	<i>Vicus auriensis?</i>	Eguileta Franco and Rodríguez Cao 2013; Rodríguez Cao and Eguileta Franco 2017	Building	A
80	SWI	Baden	<i>Aquae Helveticae</i>	Wiedemer 1969; Doppler 1976; Schaefer 2015	Building, pools	A
81	TUN	Hamma du Gabès / Hamma de l'Arad	<i>Aquis Tacapa / Aquae Tacapitanae</i>	Jouffroy 1992; Wilson 1997; Petteno 1998	Rooms	B
82	TUN	Gafsa	<i>Capsa</i>	Wilson 1997; Petteno 1998	Pools	A
83	TUN	Hammam Biadha / Biada	<i>Aquae Aptuccensium / Aptucca</i>	Jouffroy 1992; Wilson 1997; Petteno 1998; Broise 2015	Building	A
84	TUN	Jebel-Oust	<i>Aquae Calidae? / Aquae Persianae?</i>	Ben Abed and Scheid 2005; Ben Abed <i>et alii</i> 2011; Broise 2015	Building, temple, guesthouse?	A
85	TUN	Oued Hammam Mellègues		Thébert 2013; Broise 2015	Building	A
86	TUR	Allianoi / Paça Thermal	<i>Allianoi</i>	Conze 1912; Yaraş 2004; Çekirge and Gürdal 2011; Yaraş 2011	Building, sanctuare	A*
87	TUR	Sarıkaya / Terzili Hamam	<i>Aquae Sarvenae / Basilika Therna</i>	Manderscheid 1988; Şenyourt 2016	Building	A

* Recently, under the waters of the Yortanlı dam.

REFERENCES

- ACCIAIUOLI, L. DE M.C. 1941: *Águas de Portugal. Relatório referente à exploração das nascentes de águas minerais e de mesa durante o ano de 1939*. Ministério da Economia. Direcção Geral de Minas e serviços geológicos. Inspeção de águas. Lisboa.
- ALESSANDRI, P. and RANCOULE, G. 2002: «Rennes-les-Bains (Aude)». In J.L. Fiches (dir.): *Les agglomérations gallo-romaines en Languedoc-Rousillon*, Vol. 1, 138–147.
- ALLEN, T.J. 1998: *Roman healing spas in Italy: a study in design and function* (Ph.D. diss.). University of Alberta.
- ALLEN, T.J. 2001: «Ad Aquas: Roman Spa Bathing in Tunisia». *Mouseion: Journal of the Classical Association of Canada* 1: 139–166. <<https://doi.org/10.1353/mou.2001.0023>>.
- ALLEN, T.J. 2003: «Romans Healing Spas in Italy: the Peutinger map revisited». *Athenaeum Athenaeum: Studi di letteratura e Storia dell'antichità* 2: 403–416.
- ÁLVAREZ MARTÍNEZ, J.M. 1973: «Alange y sus termas romanas», *Rev. Estud. Extremeños* 29: 445–494.
- ÁLVAREZ MARTÍNEZ, J.M. 1972: «Las termas romanas de Alange», *Habis* 3, 267–290.
- AMALFITANO, P., CAMODECA, G. and MEDRI, M. (EDS.) 1990: *I Campi Flegrei. Un itinerario archeologico*. Venezia.
- ANNIBALETTO, M., BASSANI, M. and GHEDINI, F. (eds.) 2014: *Cura, Preghiera e benessere. Le stazioni curative termominerali nell'Italia romana*. Padova University Press, Antenor Quaderni 31, Padova.
- ARHEOLOSKI MUSEJ U ZAGREBU 2015: *Aquae Iasae. Recent discoveries of Roman Remains in the Region of Varazdinske Toplice*. Zagreb.
- AUDIN, P. 1985: «Les eaux chez les Arvernes et les Bituriges». In A. Pelletier (dir.): *La Médecine En Gaule. Villes d'eaux, sanctuaires des eaux*. Paris: 121–144.
- BAÑOS SERRANO, J. 1996: «Los Baños termales minero-medicinales de Alhama de Murcia». *Memorias de Arqueología*, 5. Murcia, 354–381.
- BAÑOS SERRANO, J. 2017: «El balneario romano de Alhama de Murcia. Un ejemplo de identidad y diversidad de arquitectura balnearia». In G. Matilla Séiquer and S. González Soutelo (eds.): *Termalismo Antiguo en Hispania: Un análisis del tejido balneario en época romana y tardorromana en la Península Ibérica*, Anejos de Archivo Español de Arqueología 78. CSIC. Madrid: 259–296.
- BASSANI, M. 2012: «La schedatura dei contesti culturali presso sorgenti termominerali. Osservazioni preliminari su aspetti strutturali e materiali». In F. Ghedini, M. Bassani and M. Bressan (eds.), *Aquae Patavinae. Montegrotto e il termalismo in Italia. Aggiornamenti e nuove prospettive di valorizzazione* (Padova University Press, Antenor Quaderni 26. Padova: 366–389).
- BASSANI, M. 2013: «Spazi sacri e materiali culturali nei contesti termominerali» in M. Bassani, M. Bressan and F. Ghedini (eds.), *Aquae Salutiferae. Il Termalismo Tra Antico e Contemporaneo. Atti Del Convegno Internazionale (Montegrotto Terme, 6-8 Settembre 2012)*. Padova University Press, Antenor Quaderni 29. Padova: 91–108.
- BASSANI, M. 2018: «Shrines and healing waters in Ancient Italy. Buildings, cults, deities». In M. Bassani, M. Bolder-Boos and U. Fusco (eds.): *Rethinking the concept of healing settlements: water, cults, constructions and contexts in the Ancient world*. Archaeopress Roman Archaeology 52. Oxford, 9–20.

- BASSANI, M., BOLDER-BOOS, M. and FUSCO, U. (EDS.) 2018: *Rethinking the concept of healing settlements: water, cults, constructions and contexts in the Ancient world*. Archaeopress Roman Archaeology 52. Oxford.
- BASSANI, M., BRESSAN, M. and GHEDINI, F. (EDS.) 2011: *Aquae Patavinae. Il termalismo antico nel comprensorio Euganeo e in Italia*. Padova University Press, Antenor Quaderni 21. Padova.
- BASSANI, M., BRESSAN, M. and GHEDINI, F. (EDS.) 2013: *Aquae salutiferae. Il termalismo fra antico e contemporaneo. Atti del Convegno Internazionale (Montegrotto Terme, 6-8 settembre 2012)*. Padova University Press, Antenor Quaderni 29. Padova.
- BEN ABED, A., BROISE, H., METZLER, J. AND SCHEID, J. 2001: «Jebel Oust [Jbel al Wost] (Tunisie)». *Mélanges L'École Française de Rome* 113 : 531-539.
- BEN ABED, A. and SCHEID, J. 2005: «Nouvelles recherches archéologiques à Jebel Oust (Tunisie)», *Comptes rendus des séances de l'Académie des Inscriptions et Belles-Lettres* 149: 321-349. <<https://doi.org/10.3406/crai.2005.22855>>.
- BEN ABED, A., SCHEID, J., BROISE, H. and BALMELLE, C. 2011: «Le sanctuaire de source de Jebel Oust (Tunisie)», *Les nouvelles de l'archéologie* 124 : 10-14.
- BERARD, G. 1997: *Carte Archéologique de la Gaule, 4: Les Alpes-de-Haute-Provence*. Paris.
- BERMOND, L. and PELLECUER, C. 2002: «La presqu'île balaruoise (Hérault). 25. Balaruc-le-Vieux. 26. Balaruc-les-Bains», in J.L. Fiches (dir.), *Les agglomérations gallo-romaines en Languedoc-Rousillon*, I. Lattes : 379-398.
- BERNABO BREA, L. 1994: «La source thermale de San Calogero (Lipari)». In R. Ginouvès (ed.) : *L'eau, la santé et la maladie dans le monde grec. Actes du colloque, Paris 25-27 Novembre 1992*. Paris: 169-181.
- BERTRANDY, F., CHEVRIER, M. and SERRALONGUE, J. 1999 : *Carte Archéologique de la Gaule 74: La Haute-Savoie*. Paris.
- BIREBENT, J. 1964 : *Aquae romanae: recherches d'hydraulique romaine dans l'Est algérien*. Service des antiquités de l'Algérie. Alger.
- BOIROT-DESSERVIERS, P. 1822 : *Recherches historiques et observations médicales sur les eaux thermales et minérales de Nérès, en Bourbonnais*. Delaunay. Paris.
- BOLDER-BOOS, M. and CALAPÀ, A. 2018: «Cult places and healing: some preliminary remarks». In: M. Bassani, M. Bolder-Boos and U. Fusco (eds.): *Rethinking the concept of healing settlements: water, cults, constructions and contexts in the Ancient world*. Archaeopress Roman Archaeology 52. Oxford: 115-119.
- BONVALLOT, N., RICHARD, A. and CARD, CH. (eds.) 1991: *Luxovium: retour aux sources [exposition, Luxeuil-les-Bains, 1991]*. Centre régional de documentation archéologique. Besançon.
- BONNARD, L. 1908. *La Gaule thermale : sources et stations thermales et minérales de la Gaule à l'époque gallo-romaine*. Plon-Nourrit. Paris.
- BONNET, R., CHEMIN, R., DIQUERO, B. and MAURIN, M. 1988 : *Gréoux-les-Bains. Thermes gallo-romains. Dossier archéologique. Rapport de fouilles 1988*. Gréoux-les-Bains.
- BORGIA, E. 2018: «Preliminary considerations on Thermal Spas in the Eastern Roman Provinces: the case of Asia Minor». In: M. Bassani, M. Bolder-Boos and U. Fusco (eds.): *Rethinking the concept of healing settlements: water, cults, constructions and contexts in the Ancient world*. Archaeopress Roman Archaeology 52. Oxford: 81-94.
- BOUET, A. 2003 : *Les thermes privés et publics en Gaule narbonnaise*. Collection de l'École française de Rome, 320. Rome.
- BOURGEOIS, C. 2000 : *Divona, tome 2. Monuments et sanctuaires du culte gallo-romain de l'eau*. Editions De Boccard, Paris.
- BROISE, H. 2003 : «À propos des thermes de Hammat Gader». *Syria* 80 : 217-235.

- BROISE, H. 2015 : «Thermes «classiques» et thermes «curatifs». Réflexions sur l'architecture et l'organisation interne des thermes utilisant l'eau des sources thermales chaudes durant l'Antiquité». In J. Scheid, M. Nicoud, D. Boisseuil and J. Coste (eds.): *Le thermalisme. Approches historiques et archéologiques d'un phénomène culturel et médical*. CNRS Editions. Paris, 45–64.
- BROISE, H. and CURIE, C. 2014 : «Contribution à l'étude des travertins carbonatés à l'analyse diachronique, fonctionnelle et architecturale des thermes: l'exemple des thermes du sanctuaire de Djebel Oust (Tunisie)». In M.-F. Boussac, S. Denoix, Th. Fournet y B. Redon (eds.): *Balaneia. Thermes et Hammams. 25e Siècles de Bain Collectif -Proche Orient, Égypte et Péninsule Arabique (Damas 2-6 Novembre 2009)*. Damas, 753–784.
- BROISE, P. 1984 : *Le vicus gallo-romain de Boutae et ses terroirs*. Société des Amis du Vieil Annecy. Annecy.
- CACHADA, A. 2006: *Caldas: Caldas das Taipas dos origens ao final do século XIX monografia e roteiro turístico (Caldas das Taipas)*. Guimarães.
- CANAL, A. 1992 : «Aix-les-Bains: De l'âge du fer à la période contemporaine». In R. Chevallier (ed.) : *Les eaux thermales et les cultes des eaux en Gaule et dans les provinces voisines*. Caesarodunum 26. Tours-Turin: 171–176.
- CAMPBELL, B. 2012: *Rivers and the Power of Ancient Rome*. Chapel Hill. The University of North Carolina Press.
- CARMONA BARRERO, J.D. 1999: *Aquae. Análisis del desarrollo histórico-arquitectónico de Alange y sus baños romanos*. Almendralejo.
- CARMONA BARRERO, J.D. 2017: «Arquitectura y espacios de época romana en el complejo termal de Alange». In G. Matilla Séiquer and S. González Soutelo (eds.): *Termalismo antiguo en Hispania: un análisis del tejido balneario en época romana y tardorromana en la Península Ibérica*. Anejos de Archivo Español de Arqueología 78. CSIC, Madrid: 171–196.
- CARNEIRO, S. 2013: «As termas medicinais romanas de Chaves». In Associação dos Arqueólogos Portugueses: *Arqueologia em Portugal. 150 Anos*. Lisboa: 793–802.
- CARNEIRO, S. 2016: «The water supply and drainage system of the Roman healing spa of Chaves (Aquae Flaviae)». In *I Congreso Internacional del Agua «Termalismo y Calidad de Vida» (Ourense, 23-24 de septiembre de 2015)*. Ourense: 289–298.
- CARNEIRO, S. 2017: «New data from the Roman healing spa of Aquae Flaviae (Chaves, Portugal)». In G. Matilla Séiquer and S. González Soutelo (eds.): *Termalismo Antiguo en Hispania: Un análisis del tejido balneario en época romana y tardorromana en la Península Ibérica*. Anejos de Archivo Español de Arqueología 78. CSIC. Madrid: 65–94.
- CARNEIRO, S. and GONZÁLEZ SOUTELO, S. 2018: «Healing by water: therapy and religion in the Roman spas of the Iberian Peninsula». In M. Bassani and U. Fusco (eds.): *Rethinking the Concept of «Healing Settlements»: Cults, Constructions and Contexts in the Western Roman Empire*. Archaeopress. Oxford: 61-79.
- CASADO GONZÁLEZ, G. and FRANCO MASIDE, R.M. 1998: «O Balneario romano de Carballo segundo as fontes do Arquivo do Reino de Galicia». *Gallaecia* 17: 251–287.
- CAZANOVE, O. DE and SCHEID, J. (EDS.) 2003: *Sanctuaires et sources. Les sources documentaires et leurs limites dans la description des lieux de culte*. Collection du Centre Jean Bérard 22. Naples.
- ÇEKIRGE, N. and GÜRDAL, H. 2011: «Allianoi: the antique thermal settlement of Anatolia and its importance for medicine and architecture». *La presse thermale et climatique* 148: 149–162.
- CHELLINI, R. 2002: *Acque sorgive salutari e sacre in Etruria (Italiae regio VII) : ricerche archeologiche e di topografia antica*. BAR International Series 1067. Oxford.

- CHEVALLIER, R. (ED.) 1992. *Les eaux thermales et les cultes des eaux: en Gaule et dans le provinces voisines: actes du colloque, 28-30 septembre 1990, Aix-Les-Bains*. Centre de recherches A. Piganiol. Paris.
- CONZE, A. 1912: *Altertümer von Pergamon (Band I, Text 1): Stadt und Landschaft*. Berlin.
- CORROCHER, J. 1981 : *Vichy antique*. Presses Univ Blaise Pascal. Clermont-Ferrant.
- CORROCHER, J., PIBOULE M. and HILARIE, M. 1989: *Carte Archéologique de la Gaule, 3: L'Allier*. Paris.
- COSENTINI, C. and PAVONE, F. 1966: *Descrizione e interpretazione dei ruderi della Terme di Santa Venera al Pozzo, Memorie e Rendiconti, Serie I, Vol. VI*.
- COSENTINO, R. 1992: «Il complesso termale di Aquae Caeretanae». In E. Herring et alii (eds.): *Papers of the Fourth Conference of Italian Archaeology* 4: 17–22.
- COSENTINO, R. and SABBATINI, P. 1989: «L'edificio termale delle Aquae Caeretanae». *Miscellanea Ceretana. Quaderni del centro di studio per l'archeologia etrusco-italica*: 95–113.
- COSTA VAZ, F., MARTÍN-SEIJO, M., CARNEIRO, S. and TERESO, J.P. 2015: «Waterlogged plant remains from the Roman healing spa of Aquae Flaviae (Chaves, Portugal): Utilitarian objects, timber, fruits and seeds». *Quaternario International, Archaeobotany of wild plant use: Approaches to the exploitation of wild plant resources in the past and its social implications* 404, Part A: 86–103. <<https://doi.org/10.1016/j.quaint.2015.09.063>>.
- CRECENTE MASEDA, M. and GONZÁLEZ SOUTELO, S. (eds.) 2016: *2000 años del Balneario de Lugo: Un modelo de activación del patrimonio termal*. Lugo.
- CUNLIFFE, B. 1971: *Roman Bath discovered*. Bath.
- CUNLIFFE, B. 2000: *Roman Bath discovered*. 3rd Edition. Bath.
- CURIE, J. 2013: *Les travertins anthropiques, entre histoire, archéologie et environnement : étude géoarchéologique du site antique de Jebel Oust (Tunisie)*. PhD in Géographie. University of Bourgogne. Bourgogne.
- CURIE, J., PETIT, C., BEN ABED, A., BROISE, H. and SCHEID, J. 2018: «Les dépôts carbonatés en contexte archéologique, mémoire d'une gestion de l'eau: l'exemple du site de Jebel Oust, Tunisie». In V. Brouquier-Reddé, et F. Hurler (eds.): *L'eau dans les villes du Maghreb et leur territoire*. Bordeaux : 273–285.
- CZYSZ, W. 1994: *Wiesbaden in der Römerzeit*. Stuttgart.
- DAREMBERG, C. and U. BUSSEMAKER (trans.) 1851: *Oeuvres d'Oribase : texte grec, en grande partie inédit, collationné sur les manuscrits*. Tome I. L'Imprimerie Nationale. Paris.
- DARTEVELLE, H. and LE BARRIER, C. n.d. : *Les thermes de Royat/Chamalières - Augustonemetum, Clermont-Ferrand romain*. <<http://www.augustonemetum.fr/News/Info-432/Les-thermes-de-Royat-Chamalières.html>> (accessed 15/03/18).
- DE PALMA, G. 1985: «Terme di Cotilia». In St. Quilici Gigli (ed.): *Archeologia Laziale VII, Settimo incontro di studio del comitato per l'archeologia Laziale*. Roma: 185–192.
- D'ANDRIA, F. 2013 : «Il Ploutonion a Hierapolis di Frigia». *Istambuler Mitteilungen* 63: 157–217.
- DELAINE, J. and JOHNSTON, D.E. (EDS.) 1999: *Roman baths and bathing: proceedings of the first International Conference on Roman Baths held at Bath (England, 30 March - 4 April 1992)*. Journal of Roman archaeology; Supplementary series no. 37.
- DELOR, J.-P. 2002: *Carte Archéologique de la Gaule, 89/2. L'Yonne*. Paris.
- DESNOYERS, M. (ed.) 1985: «Néris-les-Bains (Allier), ville thermale gallo-romaine». In J. Pelletier (ed.): *La médecine en Gaule. Villes d'eaux, sanctuaires des eaux, Revue archéologique du Centre de la France* 21-22. Picard, Paris : 39–64.
- DÍEZ DE VELASCO, F. 1998: *La sacralización del agua termal en la Península Ibérica y el norte de África en el mundo antiguo*. Ilu: Revista de Ciencias de las Religiones, monografías, 1. Servicio de Publicaciones Universidad Complutense. Madrid.

- DÍEZ DE VELASCO, F. 2002: «O balneário de Baños de Montemayor. Inscrições votivas». J. Cardim Ribeiro (coord.): *Religiões da Lusitania. Loquuntur saxa*. Lisboa: 141–44.
- DOPPLER, H.W. 1976: *Der römische Vicus Aquae Helveticae Baden - Archäologische Führer der Schweiz* 8. Gesell. für Schweizerische ur- und Frühgeschichte. Baden.
- DOTAN, M. 1983: *Hammath Tiberias 1: Early Synagogues and the Hellenistic and Roman Remains*. Israel Exploration Society. Jerusalem.
- DOUSTEYSSIER, B. and NECTOUX, E. 2016: «Bâtiments publics monumentaux gallo-romains au fond d'une vallée «perdue» de l'Auvergne : Le Mont-Dore (Puy-de-Dôme)». In A. Bouet (ed.): *Monumental ! La monumentalisation des villes de l'Aquitaine et de l'Hispanie septentrionale durant le Haut-Empire Actes du colloque de Villeneuve-sur-Lot. 10-12 septembre 2015*. Aquitania, Suppl. 37/1. Bordeaux : 693-721.
- DRAZHEVA, T. 2010. «Akve Khalide-therma, the city of the hot mineral baths (Burgas, Bulgaria)». *Nis i Vizantija* VIII: 433–440.
- DUBOIS, C. 1907 : *Pouzzoles antique. Histoire et topographie*. Paris.
- DUSSOT, D. 1989. *Carte Archéologique de la Gaule, 23: La Creuse*. Paris.
- DVORJETSKI, E. 1999: «Social and cultural aspects of medicinal Roman baths in Israel according to Rabbinic sources,». In J. DeLaine and D.E. Johnston (eds.): *Roman baths and bathing: proceedings of the first International Conference on Roman Baths held at Bath, England, 30 March - 4 April 1992. Part 1: Bathing and society and Part 2: Design and context* Journal of Roman archaeology. Supplementary series 37. Portsmouth: 117–30.
- DVORJETSKI, E. 2007: *Leisure, pleasure, and healing: spa culture and medicine in ancient eastern Mediterranean*. Brill. Leiden, Boston.
- DVORJETSKI, E. 2016: «The medicinal properties of the thermo-mineral baths in the Levant in Ancient Times». In J. Patrich, O. Peleg-Barkat and E. Ben-Yosef (eds.): *Arise, walk through the Land. Studies in the Archaeology and History of the Land of Israel in Memory of Yizhar Hirschfeld on the Tenth Anniversary of his Demise*. Jerusalem: 29–52.
- EGEA VIVANCOS, A., ARIAS FERRER, L., MATILLA SÉQUER, G. and GALLARDO CARRILLO, J. 2003: «El santuario romano de las aguas de Fortuna (Murcia)». *Bolskan* 20: 131–140.
- EGUILETA FRANCO, J.M. and RODRÍGUEZ CAO, C. (EDS.) 2013: *Aqua divi urbs = Auga, deuses e cidade: escavações arqueológicas nas Burgas (Ourense): casa dos Fornos e traseiras das rúas do Vilar, Cervantes e do Baño*. Ourense.
- FAGAN, G. 2001: «The genesis of the Roman public bath: Recent approaches and future directions», *American Journal of Archaeology* 105 (3): 403-426. <<https://doi.org/10.2307/507363>>.
- FAURE-BRAC, O. 2002: *Carte archéologique de la Gaule, 70: la Haute-Saône*. Paris.
- FÉVRIER, S. and MALIGORNE, Y. 2009 : «Contribution à l'étude des thermes publics de Bourbonne-les-Bains et de leurs abords immédiats : planimétrie, décor architectonique, chronologie et approche fonctionnelle». *Bulletin Société Archéologique Champenoise*: 33-53.
- FERNANDES, A. 1912. Estancia hidromineral das Taipas. Dissertação inaugural apresentada á Faculdade de Medicina do Porto (Porto).
- FERREIRA, O. DA V. 1963: «Acerca das ruínas do balineum lusitano-romano das Caldas de Monchique». *Revista Engenho* 18: 13–17.
- FILLOW, B. 1911: «Archäologische Funde in Jahre 1910. Bulgarien». *Jahrbuch des kaiserlich deutschen archäologischen Instituts* 26: 349–357.
- FIORINI, S. 1935: *Hamam Meskoutine. Antique station thermale*. Les Presses Modernes. Paris.
- FLOTTE, P. and FUCHS, M. 2000: *Carte archéologique de la Gaule, 67/1: Le Bas-Rhin*. Paris.
- FODOREAN, F. 2012. «'Spa' vignettes in Tabula Peutingeriana. Travelling Ad Aquas: thermal water resources in Roman Dacia,» *Ephemer. Napoc.* XXII, 211–221.

- FORTES, J. 1902: Balineum Luso-Romano de S. Vicente do Pinheiro (Penafiel), (Archeologia Portuguesa. Typographia Central, Porto).
- FRADE, H. 1993: «As termas medicinais da época romana em Portugal». In *Actas do II Congresso de História Antiga (Coimbra, 18-20 de Outubro de 1990)*. Coimbra: 873-900.
- FRADE, H. 1997: «Outros casos de estabelecimentos termas romanos em Portugal». In M^a.J. Peréx Agorreta (ed.): *Termalismo Antigo, I Congreso Peninsular. Arnedillo (La Rioja), 3-5 Octubre 1996*. Madrid: 303-306.
- FRADE, H. AND BELEZA, J. 1992: «A arquitectura das Termas romanas de S. Pedro do Sul». In M^a.J. Peréx Agorreta and A. Bazzana (eds.): *Termalismo antiguo. Actas de la mesa redonda Aguas mineromedicinales, termas curativas y culto a las aguas en la península ibérica (Madrid, 28-30 de Noviembre de 1991)*. UNED. Madrid: 515-544.
- FUSCO, U. 2018: «The thermo-mineral springs at Veii (RM) and its territory: new discoveries and old excavations». In M. Bassani, M. Bolder-Boos and U. Fusco (eds.): *Rethinking the concept of healing settlements: water, cults, constructions and contexts in the Ancient world*. Archaeopress Roman Archaeology 52. Oxford, 21-36.
- GALLIOU, P. 2006: «Water, Water Everywhere...Water, Ailing Bodies and the Gods in Roman Gaul and Britain». In A. Cossic and P. Galliou (eds.): *Spas in Britain and in France in the Eighteenth and Nineteenth Centuries*. Cambridge Scholars Press. Newcastle: 3-10.
- GAMULIN, S. 2001: «The Two Millennia of Varadinske Toplice (Varazdin's Spa)», *Croatian Medical Journal* 42, 1: 1-3.
- GARBRECHT, G. and MANDERSCHIED, H. 1994: *Die Wasserbewirtschaftung römischer Thermen: archäologische und hydrotechnische Untersuchungen (vol. A: Forschungsbericht. Garbrecht, G. and Manderscheid, H.; vols. B and C: katalog der Befunde and Bilddokumentation zum Begundkatalog: Manderscheid, H.)*. Mitteilungen Heft 118. Leichtweiss-Institut für Wasserbau der Technischen Universität Braunschweig. Braunschweig.
- GARCÍA-ENTERO, V. 2005: *Los «Balnea» domésticos: -ámbito rural y urbano- en la Hispania romana*. Anejo de Archivo Español de Arqueología 37. Madrid.
- GASPERINI, L. 1976: *Scoperte archeologiche a Stigliano (Canale Monterano) guida-catalogo della Mostra*. Associazione «Forum Clodii» di Archeologia, Storia ed Arte nel Braccianese. Bracciano.
- GASPERINI, L. (ED.) 2006: *Usus veneratioque fontium: atti del Convegno internazionale di studio su «Fruizione e culto delle acque salutari in Italia» (Roma-Viterbo 29-31 ottobre 1993)*. Tipigraf. Tivoli. Roma.
- GASPERINI, L. 2008: «El tesoro de Vicarello. Un gran descubrimiento arqueológico del s. XIX». *Gerión* 26-2: 91-102.
- GHEDINI, F., BASSANI, M. and BRESSAN, M. (EDS.) 2012: *Aquae Patavinae. Montegrotto e il termalismo in Italia. Aggiornamenti e nuove prospettive di valorizzazione*. Padova University Press. Antenor Quaderni 26. Padova.
- GICHON, M. 1979: «The Roman Bath at Emmaus: Excavations in 1977». *Israel Exploration Journal* 29: 101-110.
- GIGLIO, M. 2016: «Nuove indagini presso il complesso archeologico di età romana delle Terme di Agnano». In G. Camodeca and M. Giglio (eds.): *Puteoli. Studi di storia ed archeologia dei Campi Flegrei*. Napoli: 233-258.
- GOLOSETTI, R. 2016 : *Archéologie d'un paysage religieux: Sanctuaires et cultes du Sud-Est de la Gaule (Ve s. av. J.-C - IVe s. ap. J.-C)*. Osanna Ed. Venosa.
- GÓMEZ PÉREZ, C., GONZÁLEZ SOUTELO, S., MOURELLE, M.L. and LEGIDO SOTO, J.L. 2017: «Spa techniques and technologies: from the past to the present». *Sustainable Water Resources Management* 2019, 5: 71-81. <<https://doi.org/10.1007/s40899-017-0136-1>>.

- GONZÁLEZ SOUTELO, S. 2009: «La configuración arquitectónica de los balnearios de aguas mineromedicinales en época romana: una propuesta de estudio». *Bolletino di Archeologia online Especial*, 1–9.
- GONZÁLEZ SOUTELO, S. 2011a: «Thermal Spas in the Roman Age: An approximation to the architectonic configuration of baths with mineral-medicinal water in Hispania». In R. Kreiner and W. Letzner (eds.): *SPA, Sanitas Per Aquam, Tagungsband Des Internationalen Frontinus-Symposiums Zur Technik- Und Kultureschichte Der Antiken Thermen*. Aachen, 18.-22. März 2009. Aachen: 79–86.
- GONZÁLEZ SOUTELO, S. 2011b: El valor del agua en el mundo antiguo: sistemas hidráulicos y aguas mineromedicinales en el contexto de la Galicia romana (Fundación Barrié-CSIC, A Coruña).
- GONZÁLEZ SOUTELO, S. 2012: «El balneario romano de Lugo: una nueva interpretación arquitectónica y funcional», *Saguntum Papeles Lab. Arqueol* (Valencia), 167–182.
- GONZÁLEZ SOUTELO, S. 2012-2013: «Los balnearios romanos en Hispania. Puesta al día de los principales enclaves de aguas mineromedicinales en España», *Anales de Arqueología Cordobesa* 23–24: 175–200.
- GONZÁLEZ SOUTELO, S. 2013a: «¿De qué hablamos cuando hablamos de balnearios romanos?. La arquitectura romana en los edificios de baños con aguas mineromedicinales en Hispania». *Cupauam. Cuadernos de prehistoria y arqueología* 39: 123–150.
- GONZÁLEZ SOUTELO, S. 2013b: «El balneario romano de Baños de Montemayor (Cáceres): descripción arqueológica de un complejo termal salutífero de época romana». *Zephyrus. Revista de Prehistoria y Arqueología* 71: 223–219.
- GONZÁLEZ SOUTELO, S. 2014: «El original sistema romano de captación y distribución de las aguas mineromedicinales en el Balneario de Lugo: nuevos datos». *Lucentum* 33: 191–200.
- GONZÁLEZ SOUTELO, S. 2015: «Mineral waters collection systems in Healing Roman spas: a proposal of characterization from Hispania's best examples». In *XVIII Congreso Internacional de Arqueología Clásica (Mérida 2013)*. Mérida, 209–212.
- GONZÁLEZ SOUTELO, S. (forthcoming): «Descubriendo las *aquae*: 40 años de investigación sobre los baños romanos de aguas mineromedicinales en la península Ibérica». In: J.M. Noguera Celdrán, V. García-Entero and M. Pavía Page (eds.): *Congreso internacional 'Termas públicas de Hispania' (Murcia-Cartagena, 19- 21 de abril de 2018)*. Murcia.
- GONZÁLEZ SOUTELO, S. and CAPELA, F. 2016: «Caldas de Monchique (Portugal): Estado de la cuestión sobre un balneario romano en el suroeste de Lusitania». *Zephyrus. Revista de Prehistoria y Arqueología* 78: 111–129.
- GONZÁLEZ SOUTELO, S. and MATILLA SÉIQUER, G. 2017: «Inventario y revisión de los principales enclaves de aguas mineromedicinales en Hispania. Un estado de la cuestión,». In G. Matilla Séiquer and S. González Soutelo (eds.): *Termalismo Antiguo en Hispania: Un análisis del tejido balneario en época romana y tardorromana en la Península Ibérica*. Anejos de Archivo Español de Arqueología 78. CSIC. Madrid: 495–602.
- GONZÁLEZ SOUTELO, S. and RAMÓN SÁNCHEZ, L. de 2016: «El sistema romano de captación, distribución y uso del agua minero-medicinal en el Balneario de Lugo». In M. Crecente Maseda and S. González Soutelo (eds.): *Dos mil años del balneario de Lugo: Un modelo de activación del patrimonio termal*. A Coruña: 320–335.
- GRANGE, B. 1997 : *Eaux guérisseuses et sources sacrées dans l'Aquitaine romaine, du 1er siècle av. J.-C. au VIe siècle ap. J.-C. Un exemple de thermalisme gallo-romain*. PhD in History. Université de Bordeaux-Montaigne. Bordeaux.
- GRENIER, A. 1960: *Manuel d'archéologie Gallo-Romaine. 4 Partie, les monuments des eaux*. Picard, Paris.

- GREPPO, J.G.H. 1846 : *Études archéologiques sur les eaux thermales ou minérales de la Gaule à l'époque romaine*. Leleux. Paris.
- GSELL, S. and GRAILLOT, R. 1893: «Exploration archéologique dans le département de Constantine (Algérie): ruines romaines au nord de l'Aures», *MEFRA* 13 : 461-541.
- GUERIN-BEAUVOIS, M. 2015 : *Le thermalisme romain en Italie: Aspects sociaux et culturels aux deux premiers siècles de l'Empire*. Bibliothèque des écoles françaises d'Athènes et de Rome BEFAR 364. Rome.
- GUERIN-BEAUVOIS, M. and MARTIN, J.-M. (eds.) 2007 : *Bains curatifs et bains hygiéniques en Italie de l'antiquité au moyen âge (actes du colloque réuni à Rome les 22 et 23 mars 2004)*. Ecole française de Rome 383. Rome.
- GUERY, R. 1966 : «Les thermes d'Ad Sava Municipium (Hammam Guergour).», *Bulletin d'archéologie algérienne* 2 : 95-106.
- GÜMIL-FARIÑA, A. and PARCERO-OUBIÑA, C. 2015: ««Dotting the joins»: a non-reconstructive use of least cost paths to approach ancient roads. The case of the Roman roads in the NW Iberian Peninsula». *Journal of Archaeological Science* 54: 31-44.
- GUYON, J., NIN, N., RIVET, L. and SAULNIER, S. 1998: *Aix-en-Provence. Atlas topographique des villes de Gaule méridionale*. 1. *Revue Archéologique de Narbonnaise*. Suppl. 30. Paris.
- HANRIOT, M. 1911 : *Les eaux minérales de l'Algérie*. H. Dunod, E. Pinat. Paris.
- HEINZ, W. 1983: *Die römischen Thermen: Badewesen im Badeluxus im Römischen Reich*. Edition Antike Welt. Hirmer Verlag München. München.
- HEINZ, W. 1986: «Die «Terme Taurine» von Civitavecchia, ein römisches Heilbad». *Antike Welt* 17, 4: 22-43.
- HERNÁNDEZ, J. and MONLEÓN, A. (eds.) 2007: *Visió històrica de Caldes de Montbui*. Caldes de Montbui.
- HERVES RAIGOSO, F.M. and MEIJIDE CAMESELLE, G. 2000: «O Culto ás ninfas nas termas de Lugo», *Gallaecia* 19, 187-196.
- HILLER, H. (ed.) 2004: *Römische Badruine Badenweiler: Entdeckung, Erforschung, Faszination. (Stadt Freiburg i Br. Museum für Ur- und Frühgeschichte)*. Badenweiler.
- HIRSCHFELD, Y. 1997: *The Roman Baths of Hammat Gader: Final Report*. Israel Exploration Society. Jerusalem.
- HODDINOTT, R.F. 1975: *Bulgaria in antiquity: an archaeological introduction*. London, Benn.
- JONES, G.D.B. 1960: «Veii: The Valchetta baths ('Bagno della Regina')». *Pap. Br. Sch. Rome* Vol 28, 54-69.
- JACKSON, R. 1990: *Doctors and diseases in the Roman Empire*. London.
- JOUFFROY, H. 1992: «Les aquae Africanae». In A. Chevallier (ed.): *Les eaux thermales et les cultes des eaux, Actes du Colloque d'Aix-les-Bains*. Caesarodunum 26 : 87-99.
- JUTIER, P. and LEFORT, J. 1862: *Études sur les eaux minérales et thermales de Plombières... Bureau de la Compagnie concessionnaire*. Paris, Plombières.
- KÖHLER, J. 1999 : *Die Terme Taurine bei Civitavecchia (Publikationsstand - Chronologie - Bibliothek, Rome)*.
- KÖHLER, J. 2002: «Research on Roman Thermo-Mineral Baths from Italy to Israel». In C. Ohlig, Y. Peleg and T. Tsuk (eds.): *Cura Aquarum in Israel, Congress Jerusalem 2001, Schriften der DWhG* 1: 295-305.
- KÖHLER, J. 2003: «Römische Thermalbäder: Badekultur durch Natur und Technik» in P.J. Ohlig (ed.), *Wasserhistorische Forschungen: Schwerpunkt Antike*, 161-181.
- KÖHLER, J. 2006: «Forschungen zu römischen Thermalbädern / Research on Roman Thermo-Mineral Baths». In G. Wiplinger (ed.). *Cura Aquarum in Ephesus, Congress Ephesus. Selçuk 2004*. BABesch suppl. 12. Roma: 447-52.

- KÖHLER, J. 2007: «Termalismo antico e tardoantico a Civitavecchia». In M. Guérin-Beauvois and J.-M. Martin (eds.): *Bains curatifs et bains hygiéniques en Italie de l'Antiquité au Moyen Âge*. École Française de Rome 383. Rome : 115-126.
- KÖHLER, J. 2011: «Tradition und Fortschritt in Römischen Thermalbädern». In R. Kreiner and W. Letzner (eds.): *Spa, sanitas per aquam. Tagungsband des Internationalen Frontinus-Symposiums Zur Technik- Und Kultureschichte Der Antiken Thermen*. Aachen, 18.-22. März 2009. Aachen: 57-64.
- KÖHLER, J. 2016: «Death in the Bath: From Therapeutic Hazard to a Reconstruction of Ancient Roman Bathing». In G. Wiplinger (ed.): *De aquaeductu atque aqua urbium Lyciae Pamphylicae Pisidiae. The legacy of Sextus Julius Frontinus (Tagungsband des internationalen Frontinus-Symposiums Antalya, 31. Oktober - 9. November 2014)* (Babesch Supplement 27): 191-202.
- KÖHLER, J. 2018: «Before the Hammam: The ancient spas of the Roman Africa». In M. Bassani, M. Bolder-Boos and Ul. Fusco (eds.): *Rethinking the concept of healing settlements: water, cults, constructions and contexts in the Ancient world*. Archaeopress Roman Archaeology 52. Oxford: 99-111.
- KREINER, R. and W. LETZNER (eds.) 2012: *SPA, SANITAS PER AQUAM Tagungsband des Internationalen Frontinus-Symposiums zur Technik- und Kultureschichte der antiken Thermen* (Aachen, 18.-22. März 2009). Babesch Suppl. 21, Leuven-Paris-Walpole.
- KOTARBA, J., CASTELVI, G. AND MAZIÈRE, F. 2007 : *Carte Archéologique de la Gaule, 66: Les Pyrénées-Orientales*. Paris.
- LAMBRON, E. 1860 : *Les Pyrénées et les eaux thermales sulfurées de Bagnères-de-Luchon*. 2Vol (Paris).
- LAPORTE, J.-P. 2006 : «Henchir el-Hammam (antique Aquae Flavianae)». *Auras. Societé d'études et de recherches sur l'Aures antique* 3 : 285-321.
- LAUNAY, L. DE 1899 : *Recherches, captage et aménagement des sources thermominérales*. Cours professé à l'Ecole des mines. ed. Paris.
- LAVENDHOMME, M.-O. 1997 : *Carte Archéologique de la Gaule 42: La Loire*. Paris.
- LAZZARO, L. 1981: *Fons Aponi. Abano e Montegrotto nell'antichità*. Roma.
- LEVEAU, P. 2007 : «Aix-les-Bains et son tombeau-temple: ruralité et urbanité d'un vicus allobroge». *Gallia* 64 -Titre à part-: 279-287.
- LLINÀS I POL, J., MERINO I SERRA, J. and MONTALBÁN I MARTÍNEZ, C. 2004: «Les termes romanes de Sant Grau (Caldes de Malavella). Novetats arran de les excavacions de 2002». *Quaderns de la Selva* 16: 69-89.
- LLINÀS I POL, J. and NOLLA I BRUFAU, J.M. 2011: «Aigua sagrada: El balneari del Puig de Sant Grau a Aquae Calidae (Caldes de Malavella, la Selva)». In A. Costa, Ll. Palahí and D. Vivó (coord.): *Aquae Sacrae: Agua y sacralidad en la Antigüedad*. Girona: 103-114.
- LUGAND, M. AND BERMOND, L. 2001: *Carte Archeologique de la Gaule 34/2: Agde et la Bassin de Thau*. Paris.
- LUSSAULT, A. 1997 : *Carte Archéologique de la Gaule, 65: Les Hautes-Pyrénées*. Paris.
- MACCHIORO, V. 1912 : «Le terme romane di Agnano», *Monum. Antichi* 21: 225-284.
- MANDERSCHIED, H. 1988: *Bibliographie zum römischen Badewesen: unter besonderer Berücksichtigung der öffentlichen thermen*. Druck und Eiband. München.
- MANDERSCHIED, H. 2000: «The water management of Greek and Roman baths». In O. Wikander (ed.): *Handbook of Ancient Water Technology*. Oxford: 467-535.
- MANIQUET, C. 2014 : «Evaux-les-Bains (Creuse): agglomération secondaire à caractère cultuel ou sanctuaire rural? Nouvelle intervention archéologique sur la galerie couverte menant aux thermes». *Trav. Archéologie Limousine* 34 : 27-41.

- MARCATO, M. 2017 : *Il termalismo nelle province romane occidentali: Gallia Narbonense, Gallia Lugdunense, Aquitania, Alpi Marittime, Cozie, Graie e Pennine*. Ph. D. Diss Università di Padua. Padua.
- MARTY, J. and ROUYER, L. 1892: «Notes archéologiques sur Hammam Meskoutine et ses environs», *Recl. Not. Memóries Societé Archéologique Hist. Geogr. Département Constantine 1890-1891*, 26 : 203–275.
- MATILLA SÉIQUER, G. 2003 : «Fortuna del bajo imperio a época visigoda: problemas y perspectivas de la continuidad histórica». *Antigüedad Crist. Monogr. Históricas Sobre Antigüedad Tardía*. Murcia: 597–606.
- MATILLA SÉIQUER, G. 2007: «El balneario romano de Archena». In M^a.C. Gómez Molina y J. Carrasco Molina (coord.): *40 Congreso Internacional Valle de Ricote: «Despierta Tus Sentidos»*. Centro Cultural de Ricote. 8-11 de noviembre de 2007. Murcia: 217–230.
- MATILLA SÉIQUER, G. 2017. «El balneario romano de Fortuna. Visión de conjunto tras la última campaña de excavaciones». In G. Matilla Séiquer and S. González Soutelo (eds.): *Termalismo Antiguo en Hispania: Un análisis del tejido balneario en época romana y tardorromana en la Península Ibérica*. Anejos de Archivo Español de Arqueología 78. CSIC; Madrid: 131–170.
- MATILLA SÉIQUER, G. and OVEJERO, L. 2017: «Archena: el balneario de Carthago Nova», in G. Matilla Séiquer and S. González Soutelo (eds.): *Termalismo Antiguo en Hispania: Un análisis del tejido balneario en época romana y tardorromana en la Península Ibérica*. Anejos de Archivo Español de Arqueología 78. CSIC. Madrid: 221–258.
- MATILLA SÉIQUER, G., GALLARDO CARRILLO, J., ARIAS FERRER, L. and EGEA VIVANCOS, A. 2004: «La planificación arquitectónica en el balneario romano de Fortuna». In S. Ramallo Asensio (coord.): *Decoración arquitectónica en las ciudades romanas de Occidente*. Cartagena 8-10 octubre 2003. Murcia: 543–552.
- MAIURI, A. 1958. *The phlegraeen field. From Virgil's tomb to the grotto of the Cumaeen Sibyl*. Guide-books to Museums and monuments in Italy. Ministero per i Beni culturali e ambientali. 5th ed. Naples.
- MARCATO, M. 2018. «Cult and healing water in Roman Gaul». In: M. Bassani, M. Bolder-Boos and U. Fusco (eds.), *Rethinking the concept of healing settlements: water, cults, constructions and contexts in the Ancient world*. Archaeopress Roman Archaeology 52. Oxford: 37–48.
- MEDRANO MARQUES, M.M. 2004: *Fitero en la Historia. Desde el neolítico a la llegada del Islam*. Fitero.
- MEDRI, M. 2013: «In Baiano sinu: il vapor, le aquae e le piccole terme di Baia». In M. Bassani, M. Bressan and F. Ghedini (eds.): *Aquae Salutiferae. Il Termalismo Tra Antico e Contemporaneo. Atti Del Convegno Internazionale (Montegrotto Terme, 6-8 Settembre 2012)*. Antenore Quaderni 29. Padova: 119–144.
- MEIJIDE CAMESELLE, G. and HERVÉS RAIGOSO, F. 2000: «Un nuevo espacio en las termas de Lugo». In M^a.C. Fernández Ochoa and V. García-Entero (eds.): *Termas Romanas en el Occidente del Imperio. II Coloquio Internacional de Arqueología en Gijón, Gijón 1999*. Gijón: 215–220.
- MERINO, J., NOLLA, J.M. and SANTOS, M. 1994: *Aquae Calidae. Presencia romana a la Selva*. Centre d'Estudis Selvatans, Santa Coloma de Farners. La Selva.
- MICHLER, M. 2004. *Carte Archéologique de la Gaule, 88: Les Vosges*. Paris.
- MIRÓ I ALAIX, C. 1992. «Les termes romanes de Caldes de Montbui». *Arraona: Revista d'Història*, 10: 11–29.

- MIRÓ I ALAIX, C. 1997. «La arquitectura termal medicinal de época romana: morfología y funcionalidad». In M^a.J. Peréx Agorreta (ed.): *Termalismo Antiguo, I Congreso Peninsular. Arnedillo (La Rioja), 3-5 octubre 1996*. Madrid: 369-376.
- MOCCI, F. and NIN, N. 2006: *Carte Archéologique de la Gaule, 13/4: Aix-en-Provence, Pays d'Aix, Val de Durance*. Paris.
- MOLLIÈRE, D.H. 1893 : *Archéologie médicale. Mémoire sur le mode de captage et l'aménagement des sources thermales de la Gaule romaine, par le Dr Humbert Mollière,...* A. Côte. Paris.
- MORA RODRÍGUEZ, G. 1981: «Las termas romanas en Hispania». *Archivo Español de Arqueología* 54: 37-90.
- MORA RODRÍGUEZ, G. 1992: «La literatura médica clásica y la arquitectura de las termas medicinales», *Espacio, Tiempo y Forma, Ser. II Hist. Antig.*: 121-132.
- NIEBERLE, M. 2016: «The Archaeological Park of Baiae: New hydrological findings and considerations». In G. Wiplinger (ed.): *De aquaeductu atque aqua urbium Lyciae Pamphyliae Pisidiae. The legacy of Sextus Julius Frontinus (Tagungsband des internationalen Frontinus-Symposiums Antalya, 31. Oktober - 9. November 2014)*. Babesch Supplement 27: 203-214.
- NIELSEN, I. 1990: *Thermae et balnea: the architecture and cultural history of roman public baths*. 1^a. ed. Aarhus University Press. Aarhus.
- NIKOLOV, D. 1968 : «Stroitelen nadpis ot rimska bania kraj Stara Zagora». *Archeologija Sofia* 10, 1 : 43-48.
- NUBER, H.U. 2011: «Die römischen Schwefelwasserthermen von Aquae-Bad Gögging, Stadt Neustadt an der Donau, Lkr. Kelheim». In R. Kreiner and W. Letzner (eds.): *SPA, Sanitas per Aquam. Tagungsband Des Internationalen Frontinus-Symposiums Zur Technik- Und Kultureschichte Der Antiken Thermen. Aachen, 18.-22. März 2009*. Aachen: 65-70.
- OLCOZ YANGUAS, S. 2017. *Los baños romanos de Fitero. Apuntes para el estudio de la historia de los Baños de Fitero*. Fitero.
- ORÓ FERNÁNDEZ, M.E. 1995. *Aguas mineromedicinales y balnearios de la Hispania romana. Aspectos médicos, funcionales y religiosos (Microfichas)*. PhD. Universidad de Valencia. Valencia.
- ORÓ FERNÁNDEZ, E. 1996: «El balneario romano: Aspectos médicos, funcionales y religiosos». In *El balneario romano y la cueva negra de Fortuna (Murcia). Homenaje al profesor PH. Rahtz. Antigüedad y Cristianismo* 13. Murcia: 23-152.
- ORTALLI, J. 2004: *Bagno di Romagna nell'antichità: le terme, l'insediamento, il territorio*. All'Insegna del giglio. Firenze.
- OURNAC, P., PASSELAC, M. and RANCOULE, G. 2009: *Carte Archéologique de la Gaule, 11/2: L'Aude*. Paris.
- PAUNIER, D. 1992 : «Eaux thermales et culte des eaux en Suisse à l'époque romaine». In R. Chevallier (ed.) : *Les eaux thermales et les cultes des eaux en Gaule et dans les provinces voisines*. Caesarodunum 26. Tours-Turin: 385-401.
- PAUNOV, E.I. 2013: *From koine to romanitas: the numismatic evidence for Roman expansion and settlement in Bulgaria in Antiquity (Moesia and Thrace, ca. 146 BC – AD 98/117)*. PhD Cardiff University. Cardiff.
- PELLETIER, A. (ed.) 1985 : *La Médecine en Gaule: villes d'eaux, sanctuaires des eaux*. Revue archéologique du Centre de la France, 21-22. Picard. Paris.
- PERAZZA, F. 1992. *Les thermes gallo-romains d'Uriage. Les résultats des dernières fouilles archéologiques*. Pierre Ecriv. Patrim. Isère: 73-88.
- PERÉX AGORRETA, M.J. (ED.) 1997: *Termalismo Antiguo, I Congreso Peninsular. Arnedillo, 3-5 octubre 1996*. UNED-Casa de Velázquez. Madrid.

- PERÉX AGORRETA, M. and RODRÍGUEZ MORALES, J. 2011: «Las stationes con aquae en la Tabula de Peutinger». *Espacio, Tiempo y Forma. Serie I, Prehistoria y Arqueología* 4: 153-170. <<https://doi.org/10.5944/etfi.4.2011.10750>>.
- PERÉX AGORRETA, M.J. and BAZZANA, A. (eds.) 1992: *Termalismo antiguo. Actas de la mesa redonda Aguas mineromedicinales, termas curativas y culto a las aguas en la península ibérica* (Madrid, 28-30 de noviembre de 1991). UNED. Madrid.
- PERÉX AGORRETA, M.J. and C. MIRÓ I ALAIX (EDS.) 2017: *Vbi aquae ibi salvs. Aguas mineromedicinales, termas curativas y culto a las aguas en la Península Ibérica (desde la Protohistoria a la Tardoantigüedad)*. UNED. Madrid.
- PETTENO, E. 1998: «Le aquae e le terme curative dell'Africa romana», *Antiquités africaines* 34 : 133-148. <<https://doi.org/10.3406/antaf.1998.1291>>.
- PEZIN, A. and BOUET, A. 2002: «Aquae Calidae, Amélie-les-Bains-Palalda (Pyrénées-Orientales)» in J.L. Fiches (dir.), *Agglomérations gallo-romaines en Languedoc-Rousillon*, I. Lattes : 120-124.
- PRESS, L. 1984 : «Łaźnie rzymskie w Bulgarii». *Balc. Posnaniensia* 1 (Poznań). Acta et studia: 175-190.
- PREVOST-BOURE, P. and GEROLD, J.-C. 2007: *Une ville thermale gallo-romaine. L'antique Niederbronn*. <<https://archeographe.net/Une-ville-thermale-gallo-romaine-L>>.
- PROVOST, M. 1988 : *Carte Archéologique de la Gaule, 45: Le Loiret*. Paris.
- PROVOST, M. AND MENNESSIER-JOUANNET, C. 1994 : *Carte Archéologique de la Gaule, 63/2: Le Puy-de-Dôme*. Paris.
- QUEIROGA, F.M.V.R. 2006. «Algumas notas sobre a arqueologia da área urbana de Vizela», In *ias Jornadas de património local. Vizela, Março de 2006*. Actas (Câmara Municipal de Vizela, Caldas de Vizela) 7-28.
- QUEIROGA, F.M.V.R. 2013. «Algumas notas sobre a arqueologia da área urbana de Vizela», *Rev. Fac. Let. Ciênc. E Téc., Património XII*, 181-201.
- RAMEAU, J.-C. 1978 : «Les thermes gallo-romains de Bourbonne-les-Bains». *Bull. Société Hist. Archéologique Langres* 1: 61-100.
- RAMÓN SÁNCHEZ, L. DE and S. GONZÁLEZ SOUTELO (forthcoming): «Apuntes sobre los condicionantes hidrogeológicos y las soluciones de captación de las aguas minerales-termales en los balnearios romanos». In S. Reboreda Morillo *et alii* (eds.): *Perspectivas del agua: Modelos de captación de la Prehistoria al Medioevo*. Ed. Dyckinson. Madrid.
- REGIONAL HISTORICAL MUSEUM OF BURGAS (ed.) 2018: *Aquae Calidae. The favourite baths of Emperors, Tsars and Sultans*. Burgas.
- REGIONE LAZIO 2007: *Termalismo antico e moderno nel Lazio*, 2a Edición. ed. Quasar. Roma.
- RENDIĆ-MIOČEVIĆ, A. 2015: «A reconstruction of the central part of the Nymphaeum (fountain) at Varaždinske Toplice (Aquae lasae) with a relief depiction of Nymphs». In C-G. Alexandrescu (ed.): *Proceedings of the 13th International Colloquium on Roman Provincial Art (Bucharest-Alba Iulia-Constanta, 27th May-3rd June 2013)*. Cluj-Napoca. Mega: 43-54.
- RENE, L. 1943. «Les fouilles des Fontaines-Salées en 1942». *Gallia* 1 : 27-70.
- RODRÍGUEZ CAO, C. and EGUILITA FRANCO, J.M. 2017: «El balneario romano de la ciudad de Ourense: primer balance de las excavaciones». In G. Matilla Séiquer and S. González Soutelo (eds.): *Termalismo Antiguo en Hispania: Un análisis del tejido balneario en época romana y tardorromana en la Península Ibérica*. Anejos de Archivo Español de Arqueología 78. CSIC, Madrid: 95-116.
- RODRÍGUEZ COLMENERO, A., FERRER SIERRA, S. and ÁLVAREZ ASOREY, R.D. 2004: *Miliarios e outras inscricións viarias romanas do noroeste hispánico (conventos bracarense, lucense e asturicense)*. Lugo.

- ROLDÁN HERVÁS, J.M. 1965: «Las lápidas votivas de Baños de Montemayor», *Zephyrus. Revista de Prehistoria y Arqueología* 16: 5-38.
- SABLAYROLLES, R. and BEYRE, A. 2006: *Carte Archéologique de la Gaule, 31/2: Le Comminges (Haute-Garonne)*. Paris.
- SAMAMA, É. 2015: «Sources chaudes et eau médicale : un 'thermalisme' grec ?». In J. Scheid et al. (eds.): *Le Thermalisme. Approches historiques et archéologiques d'un phénomène culturel et médical*. CNRS Editions. Paris: 13-30.
- SAUER, E. 2005: *Coins, cult and cultural identity: Augustan coins, hot springs and the early Roman baths at Bourbonne-les-Bains*. Leicester.
- SAUGET, B. and SAUGET, J.-M. 1980: «Les thermes gallo-romains de Bourbonne-les-Bains (Haute-Marne). Remarques préliminaires (fouilles de la Direction Régionale des Antiquités Historiques de Champagne Ardenne)». *Bull. Société Hist. Archéologique Langres* 2: 55-60.
- SCHAEER, A. 2015: *Die Bäder: 2000 Jahre europäische Badekultur. Stadtgeschichte Baden. Hier und jetzt*. Baden: 9-91.
- SCHALLMAYER, E. 1989: *Aquae, das römische Baden-Baden*. Baden-Baden.
- SCHAUB, A. 2011: «Aachen als römische Bäderstadt». In R. Kreiner and W. Letzner (eds.): *SPA, Sanitas per Aquam. Tagungsband Des Internationalen Frontinus-Symposiums Zur Technik- Und Kultureschichte Der Antiken Thermen*. Aachen, 18.-22. März 2009. Aachen: 11-20.
- SCHAUB, A. (ed.) 2018: *Gläserne Grabungen: 10 Jahre neue Stadtarchäologie Aachen 2006-2016, Aachener Beiträge zur Baugeschichte und Heimatkunst*, 9. Aachen.
- SCHEID, J. 2015 : «Lieux de culte et pratique salutaires dans l'Antiquité romaine». In J. Scheid, M. Nicoud, D. Boisseuil, J. Coste (eds.): *Le Thermalisme. Approches historiques et archéologiques d'un phénomène culturel et médical*. Paris : 31-44.
- SCHNEIDER, A. 1974 : «Des origines de Plombières. Quelques étapes de son histoire». *Bull. Académie Société Lorraines Sci. XIII* : 197-202.
- SCHOPPA, H. 1974 : *Aquae Mattiacae: Wiesbadens römische und alamannisch-merowingische Vergangenheit*. Wiesbaden.
- SEKULOV, V.P. 2009: «The bath in the Late Roman Thermal Spa in the village of Bansko, Strumica (through space and time)». In S. Taseva (ed.): *Water, Life and Pleasures. Collection of Works. Institute for Protection of the Monuments of Culture and Museum*. Strumica (Strumica): 21-34.
- ŞENYURT, H.K. 2016: «Sarıkaya roma hamami tarihçesi ve 2010-2015 yili kazı çalışmaları sonuçları». *Uluslararası Bozok Sempozyumu*, 05 - 07 Mayıs 2016. Yozgat: 110-121.
- SERRA, P.B. and BACCO, G. 1996: «Forum Traiani: il contesto termale e l'indagine archeologica di scavo». In P. Ruggeri and C. Vismara (eds.), *L'Africa romana. Atti del XII convegno di studio* (Olbia, 12-15 dicembre 1996): 1213-1255.
- SERRA, P.B. and BACCO, G. 2014: *Aquae Ypsitanae - Forum Traiani*. Mostra archeologica grafico-fotografica. Fordongianus.
- SOUCHON, F. (ED.) 2006: *Uriage-les-Bains. Station thermale d'hier et d'aujourd'hui*. Grenoble.
- STRACCI, G. AND TOTI, O. 2017: *Aquae Tauri. Da sogno a progetto*, Società Storica Civitavecchiese. Civitavecchia.
- TARAMELLI, A. 1903 : «Fordongianus. Antiche terme di Forum Traiani». *Scavi e scoperte I* : 469-490.
- TASEVA, S. AND SEKULOV, V. 2017: *The Great bath of the Late Roman thermal spa in the village of Bansko*. Skopje.
- THERBERT, Y. 2003 : *Thermes romains d'Afrique du Nord et leur contexte méditerranéen*. Publications de l'École française de Rome 315. Rome.
- THEVENARD, J.-J. 1996 : *Carte archéologique de la Gaule, 52/1: La Haute-Marne*. Paris.

- VALLET, A. 1925 : «Découverte d'un établissement thermal à Fedj-M'Zala». *Recueil des notices et mémoires de la société archéologique, historique et géographique du Département de Constantine 1923-1924*, 55 : 92-97.
- VURPILLOT, D. 2013. «Saint-Honoré (Nièvre)». In St. Venault and P. Nouvel (dir.) : *Projet Collectif de Recherche. Agglomérations Antiques de Bourgogne, Franche-Comte et Champagne Meridionale. Inventaire Archéologique, Cartographie et Analyses Spatiales. Rapport d'Activité 2013*. Besançon: 137-156.
- VURPILLOT, D. 2014a : «Bourbon-Lancy, Saône-et-Loire». In St. Venault and P. Nouvel (dir.) : *Projet Collectif de Recherche. Agglomérations Antiques de Bourgogne, Franche-Comte et Champagne Meridionale. Inventaire Archéologique, Cartographie et Analyses Spatiales. Rapport d'Activité 2013*. Besançon : 120-136.
- VURPILLOT, D. 2014b : «Bourbonne-les-Bains, Haute-Marne». In St. Venault and P. Nouvel (dir.) : *Projet Collectif de Recherche. Agglomérations Antiques de Bourgogne, Franche-Comte et Champagne Meridionale. Inventaire Archéologique, Cartographie et Analyses Spatiales. Rapport d'Activité 2013*. Besançon : 137-156.
- VURPILLOT, D. 2014c : «Luxeuil-les-Bains, Haute-Saône». In St. Venault and P. Nouvel (dir.) : *Projet Collectif de Recherche. Agglomérations Antiques de Bourgogne, Franche-Comte et Champagne Meridionale. Inventaire Archéologique, Cartographie et Analyses Spatiales. Rapport d'Activité 2013*. Besançon, I: 199-221.
- WIEDEMER, H.R. 1969: «Die römischen Heilthermen von Baden: Aquae Helveticae. Baden». *Neujahrsblätter* 44: 45-59.
- WILSON, A. 1997: *Water management and usage in Roman North Africa: a social and technological study*. D. Phil. Thesis. University of Oxford. Oxford.
- YARAŞ, A. 2004: «Wasser in der Heiltherme von Allianoi». In G. Wiplinger (ed.): *Cura Aquarum in Ephesos Proceedings of the Twelfth International Congress on the History of Water Managment and Hydraulic Engineering in the Mediterranean Region (Ephesus / Selçuk, Turkey, Oktober 2-10, 2004)*. Babesch Suppl. 12: 443-452.
- YARAŞ, A. 2011. «Antik Sağlık Merkezi Allianoi ve Hastanesi». In *Uluslararası Bergama Sempozyumu. International Bergama Symposium (07 – 09 Nisan 2011)*. Bergama: 372-387.
- YEGÜL, F. 1992. *Baths and bathing in classical antiquity*. Architectural History Foundation. New York.
- ZANDA, E. (ed.) 2002 : *Museo Archeologico di Acqui Terme. La città. Acqui Terme*.
- ZANDA, E. and BACHETTA, A. 2005: *La piscina romana, Aquae Statiellae, Percorsi di archeologia*. Genova.
- ZANETTI, C. 2017 : *Il termalismo nelle province romane centrali. Rezia, Germania superiore e inferiore*. Ph. D. Diss. Università di Padova. Padova.
- ZANETTI, C. 2018: «Places of worship and healing water in Roman Germaniae and Raetia». In M. Bassani, M. Bolder-Boos and U. Fusco (eds.): *Rethinking the concept of healing settlements: water, cults, constructions and contexts in the Ancient world*. Archaeopress Roman Archaeology 52. Oxford: 49-60.
- ZUCCA, R. 1013: «Il progetto di ricerca sulle Aquae Calidae della Sardinia». In M. Bassani, M. Bressan and F. Ghedini (eds.): *Aquae Salutiferae. Il termalismo tra antico e contemporaneo. Atti Del Convegno Internazionale (Montegrotto Terme, 6-8 Settembre 2012)*. Antenore Quaderni 29. Università degli Studi di Padova. Padova: 145-172.