

**CRISTINA CORSI & FRANK VERMEULEN (eds.)**

**AMMAIA I: THE SURVEY**  
**A Romano-Lusitanian Townscape Revealed**



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# I.3 THE TOWN OF AMMAIA IN ANCIENT SOURCES

V. G. Mantas

## Introduction

As with most Roman towns located within the territory of present day Portugal, there are only a few ancient literary sources available from which to derive knowledge about the history of the *municipium* of *Ammaia*. This unfortunate situation makes it necessary to resort, systematically, to archaeological and epigraphic testimony which, however, does not always prove to be sufficiently clear, even when the data provided are cross-referenced or compared with the evidence produced by archaeological excavations. The ruins of *Ammaia* were neglected until almost the end of the last century (Oliveira, Fernandes and Caeiro 1996: 15-22; Mantas 2000: 391-394), a fact which explains the loss of much valuable information, which was destroyed or dispersed without appropriate registration. A good example of this loss of important documentation is the epigraph of *duumvir* M. Iunius Gallus, which we came to know about through an English officer serving during the Peninsular War, but which was not followed up upon or referred to again and has remained missing ever since (Stylop 2009: 35-55).

Until 1935, the very identification of the *Ammaia* ruins was hindered by the lack of sources, a problem that was only solved when Leite de Vasconcelos recorded the honorific inscription with which the inhabitants of *Civitas Ammaiensis* engraved the annual vote in honour of the Emperor Claudius. This inscription was found in S. Salvador de Aramenha (Vasconcelos 1935: 5-9), thus confirming an alternative location for *Ammaia* to the one previously proposed by Hübner, that of present day Portalegre (Hübner 1869: 20-21). Indeed, as described in chapter I.2, the scholarly tradition had always identified the ruins of S. Salvador de Aramenha as being those of *Medobriga*.

Other inscriptions recorded and published in the nineteenth century, namely by the *Corpus Inscriptionum Latinarum*, also went missing but have been recovered in recent years, partly due to the restoration works carried out on the Quinta de Deão manor house for its later use as the small monographic museum of the *Ammaia* archaeological site. In some cases, it was possible to correct former readings, despite the fact that several epigraphs had been damaged through the reuse of their base, as happened with the marble plaque of the provincial Flamen G. Iulius Vegetus (*CIL II* 160 = IRCP 617). Although heavily worn on the right side of the area of

inscription (Fig. 6), it still allows the name of his wife, Propinia Severa, to be clearly identified (Mantas 2004: 100-104). In spite of the prolonged dilapidation of the ruins – which caused artefacts such as the epigraph in honour of Lucius Verus to be spread significant distances from their places of origin, including pieces of considerable size, as happened with the famous Arch of Aramenha (see *supra* chapter I.2 and Mantas 2010b: 321-336) – new epigraphical remains are expected to emerge that are sure to contribute to our knowledge of the town. Even if most of the registered epigraphs are of more interest to the field of social rather than administrative history, some of them, although irritatingly ambiguous, are of great benefit to this latter field too, as we shall see.



Fig. 6 Marble plaque dedicated to the *flamen* G. Iulius Vegetus (*Ammaia* Museum).

This preliminary introduction is justified for the reasons initially stated: our knowledge of *Ammaia*'s past is largely based on archaeological and epigraphical data due to the scarcity of other written sources, which amount to nothing more than clues from which little can be derived<sup>1</sup>. Some questions posed by the interpretation of these written sources can be answered or clarified by contrasting them with the archaeological evidence. In the same way, some literary references that do not allude directly to *Ammaia* should be taken into account, since they focus on aspects that are related to the town's history from a non-isolationist perspective.

## Latin historiography on *Ammaia*

Let us start by reviewing some of these references in Latin historiography. The first refers to the relationship between *Herminius Mons*, usually identified as roughly corresponding to the Serra da Estrela, and the campaign against the Lusitanians conducted in 48 BC by Q. Cassius Longinus, which led to the destruction of *Medobriga*, a town that humanist historians have placed at S. Salvador de Aramenha through an obscure line of toponymic reasoning that associates Aramenha with *Herminius* through the intermediate name *Herminia*. The reference in *De Bello Alexandrino*, possibly written by Aulus Hirtius, is laconic: "Thus, by assembling the whole army at one place and by promising one hundred sestertes to the soldiers, he shortly after took the fortified town of *Medobriga* and *Herminius Mons*, where he was acclaimed Imperator" (Hirtius, *Bell. Alex.*, 48, 2). From this, we can take the Serra de S. Mamede to be *Herminius Minor*, which immediately contradicts the absence of this orographic toponym in Pliny the Elder, who merely referred to the hilly region of *Ammaia* as *Ammaensibus iugis* (Pliny, *N.H.*, XXXVI, 24).

This fanciful connotation of Aramenha with *Herminius Mons*, without any support in classical sources, was widely accepted by researchers (Guerra 1996: 7-33) and can still occasionally be found in less informed publications. The influence of scholarly authority is also reflected in local legends, even of relatively recent creation, as in that of the Castelo de Marvão (Marques 1997: 159-168). Here, in line with the usual pattern of these narratives, a villain by the name of Cassius Longinus confronts a maiden appropriately named Amaia. The source of the toponym Monte Hermínio, designating a property in the vicinity of the ruins of *Ammaia*

and close to the confluence of two rivers, the Ribeira de Porto de Espada and the Sever, is probably the same, although the property appeared in the 1512 Manueline Charter of Marvão as Monte Arminho (Coelho 1988: 55-56, 99). In any case, there is nowadays no evidence that could possibly justify, or even allow for, the identification of the ruins of S. Salvador de Aramenha as being the *Medobriga* of ancient sources. Without wishing to interfere in ongoing language disputes, we do not exclude a relationship between Aramenha and Aramanha (*Ara Magna*), a toponym which can sometimes be found in areas where there was a heavy Roman presence, as for example on the outskirts of Santarém. The same could apply to S. Salvador de Aramenha, located at the northern corner of the urban ruins and eventually related to some large funerary monument of a type that we know to have existed in *Ammaia* (Mantas 2000: 408; Corsi and Vermeulen 2008: 167, 189-192). This hypothesis is reinforced by the fact that a necropolis was identified in the area in question.

Pliny the Elder's reference is laconic and indirect as it does not allude to the town but to the rock crystal existing in the elevated parts of the region and generally referred to as *Ammaensibus iugis*.<sup>2</sup> Despite the difficulties in situating the mines that supplied this important economic resource, which in Antiquity was regarded as a kind of perennial ice and very much appreciated for the making of jewellery, their location was confirmed, centuries later, through an Islamic source, incidentally no less imprecise than the description by Pliny: "*Cornelius Bocchus et in Lusitania perquam mirandi ponderis in Ammaensibus iugis, depressis ad libramentum aquae puteis*" (Pliny, *N.H.*, XXXVII, 127).

As a matter of fact, al-Himyari indicates the source of rock crystal as being some 40 miles north of Badajoz (Torres Balbás 1982: 770), which, although somewhat vague, still points to the region concerned, since the geodesic distance between Badajoz and S. Salvador de Aramenha is about 65km, not counting the Islamic villages of some importance that al-Himyari could have indicated as reference points in the intervening area (Sidarus 1991: 14-16). Given that al-Himyari also indicates a distance of 40 miles between Mértola and Beja, we can situate the rock crystal exploration in the Serra de S. Mamede area, without forgetting that the metrolology of Islamic geographers does not always use the exact same measure for a mile. In any case, these are certainly the same deposits indicated by Pliny, an author we would like to return to, this time with regard to an unusual gemstone and, once again, related to a text by Cornelius Boccus, a writer and eminent figure among the Lusitanian notables of the Julio-Claudian era: "*Bocchus auctor est et in Hispania repertas quo in*

1 We soon intend to publish the *corpus* of Roman inscriptions of the Municipality of Marvão, on which we have been working for some years by gathering all the presently known monuments, as well as completing and reviewing the data published by José d'Encarnação in his important work (IRCP 1984: 667-694, 777, 849).

2 For the identification of possible quarry areas, see chapter I.4 in this volume.

*loco crystallum dixit ad libramentum puteis defossis erui, chrysolithon XII pondo a se visam*" (Pliny, *N.H.*, XXXVII, 24).

The explicit statement that Bocchus actually saw the referred gemstone makes us question the origins of one of the more prominent figures of the early period of the urbanization of *Ammaia*, a certain Publius Cornelius Macer, who was granted Roman citizenship by Emperor Claudius and consequently registered with the Quirina tribe (IRCP 1984: 679-681; Encarnação 1986: 107; Mantas 2000: 410-411). This suggests strong patronage of Macer who we believe to have been a native elevated to the status of Roman citizen for reasons that naturally escape us, but which we can easily relate to a phase in the development of the town prior to it being granted Latin right – a subject we will return to later on (Fig. 7). We know today that several Cornelii Bocchi were active in the Julio-Claudian period, especially in *Salacia* (Alcácer do Sal) and Tróia, but also in other places where they left more or less obvious traces of their influence, such as *Olisipo* (Lisbon), *Scallabis* (Santarém), the Alentejo, near Arraiolos, and perhaps *Emerita* (Mérida) (Encarnação 2011: 189-201). Thus, it seems very likely that the promotion of Macer can be explained in light of the interests pursued by the Cornelii in the Alto Alentejo, which includes the writer referred to by Pliny. Given the fact that there are no known representatives of the *gens Cornelia* in the north-eastern Alentejo other than the one recorded in *Ammaia* (Encarnação 1987: 169), this hypothesis seems to be very plausible and worthy of further investigation.

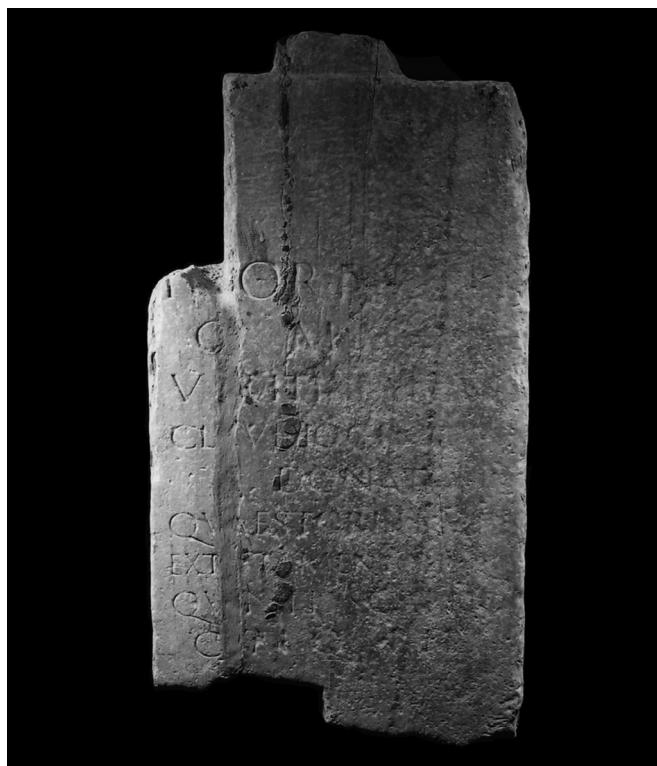


Fig. 7 Pedestal (?) of P. Cornelius Q. Macer (*Ammaia* Museum).

Another reference to the ancient city of *Ammaia* can be found in Claudius Ptolemy's *Geographia*, a work completed in the mid-second century in Alexandria (Ptolemy, *Geog.*, II, 5, 8). This author enumerated a long list of settlements and geographical features, located by means of a system of coordinates that at present is difficult – but not impossible – to use, and whose coordinates may have been partly derived from ancient road and port maps. Thus, the coordinates help to calculate the distances between different cartographical locations, providing interesting elements of comparison with the indications given by the *Antonini Itinerarium*. We consider that every minute of a Ptolemaic degree is equivalent to 1.05 Roman miles, a relation that can be used with reasonable confidence in the operations of triangulation that are needed to transform the differences between coordinates into linear values. With regard to *Ammaia* (*Αμμαία*), Ptolemy defined the following coordinates: 7° longitude, 39° 20' latitude. Now, these figures put *Ammaia* at a distance of 64 Roman miles from *Norba Caesarina* (Cáceres), equivalent to the 95km that separate them by road.

We believe that this coincidence proves the existence of a road going past Valência de Alcântara, which connected the two towns and continued in the direction of the River Tagus, despite the difficulties of its identification in the landscape. If we consider the distance to *Emerita Augusta* (Mérida), which in a straight line is about 102km, we encounter the equivalent of 96km, by default a negligible error, which is annulled if we consider the variant via Albuquerque. As for the town of *Olisipo*, the calculated distance seems to correspond to the length of the road which, via *Abelterium* (Alter do Chão), connected it with *Ammaia* (Fig. 8). Although much in the ancient sources needs to be treated with caution, we believe that *Geographia* can be used to situate *Ammaia*, even if the road maps that have come down to us through history do not corroborate the town's road connections (Roldán Hervás 1975: 212; gravures 3, 12). Finally, Ptolemy places the town in the territory inhabited by the Lusitanians, which in fact covers the whole of present day Alto Alentejo, a fact that cannot be explained by mere population transfer, as has been defended based on Strabo, and much less as a consequence of forced relocations ordered by Caesar and Augustus (Cassius Dio, XXXVII, 52, Floro, II, 33, 52). The obvious and widespread Lusitanian onomastics of the region does not allow for such an interpretation.

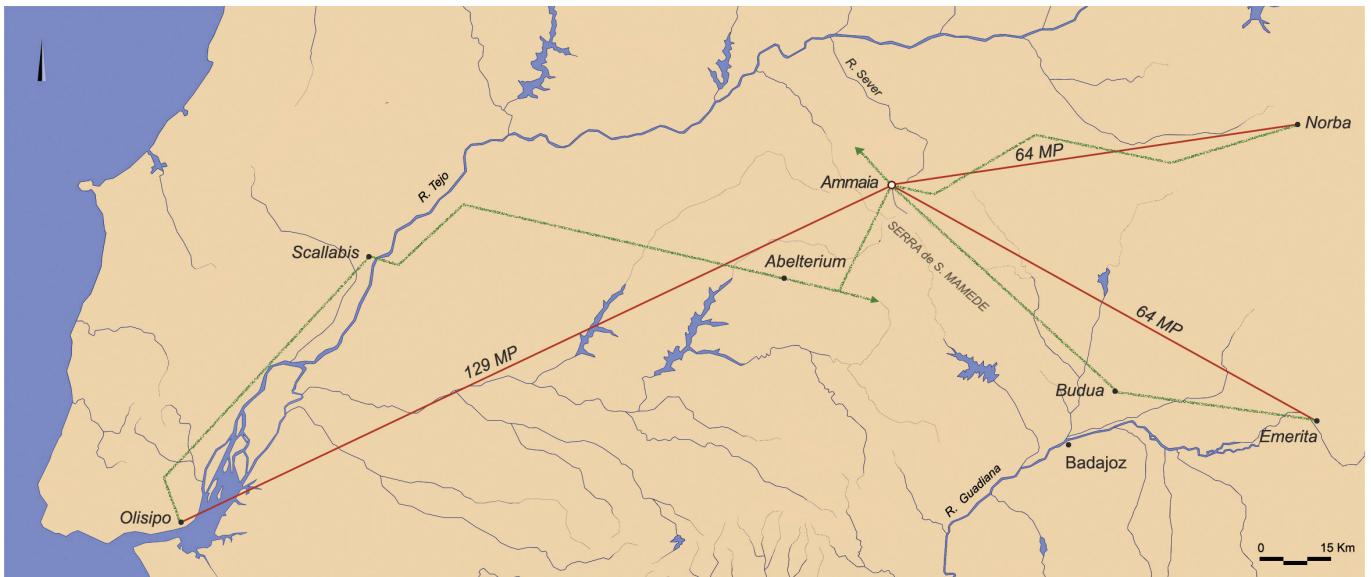


Fig. 8 Road network and Ptolemaic data. Approximate localizations of *Ammaia*, *Emerita*, *Norba* and *Olisipo*.

## Epigraphic sources

Let us now focus on the epigraphic sources from either the region or the ruins of the ancient town. As is well known, these sources represent only a fraction, no more than 5% on average, of the total that may have existed in the past. We are therefore limited by quantity as much as we are subject to the arbitrariness of the findings, a fact that demands caution when attempting to write history based on these – undeniably irreplaceable – documents. Another question that arises, and which is not unique to *Lusitania* or this specific area, is the chronology of the inscriptions, which overwhelmingly fall into the period of the height of the Roman Empire. The epigraphic *corpus ammaiensis* comprises a reasonable number of inscriptions, preserved or lost, but in any case transcribed, a part of which is presently exhibited at the *Ammaia* Museum under very good conditions (Fig. 9). The respective bibliography is also rather extensive, though

only a small portion is the result of recent epigraphic studies. These sources are particularly important when analysing the process of the town's legal and administrative development, as well as the composition of its population and its connections to the outside world.

We will start with the testimonies of the town's evolution and, above all, with its still much discussed status. Though the date of its elevation to *municipium* remains somewhat unclear, if we consider a possible gap between the concession of Latin right and the granting of municipal status (Gästerer 1988: 68-70; Le Roux 1995: 83-87), the question of the tribe is definitively resolved, leaving no reasonable doubt regarding its registration with the Quirina tribe, which, for many researchers, should be sufficient to consider *Ammaia* a Flavian municipality (Pintado 2004: 343-364). Unfortunately, the problem is not that simple. Everything indicates that the town was founded by Augustus in the context of a plan to reorganize *Lusitania* through the creation of *civitates* (Alarcão 1990c: 386-390). This programme, however, expanded over time, as proven by the chronology of the various *terminus Augustalis* found throughout the province (Bárcena 2002-2003: 107-125). We certainly do not follow the hypothesis, solely based on the reading of an inscription found in Albuquerque (*CIL* II 724), that *Ammaia* could have been one of the prefectures of *Emerita*, even if Albuquerque had belonged to the territory of *Ammaia* instead of that of the capital of *Lusitania*, which, for now, cannot be proven.

With regard to the essential question, the creation of the town and its development until the granting of municipal status, we now have five inscriptions that allow us to outline a general picture, but which fail to inform us on the precise dates of the change in status, except for the last one. The



Fig. 9 Detail of the epigraphy room at the *Ammaia* Museum.

first of these inscriptions dates from the year 44/45, during the time of Claudius' principate, and alludes to *Ammaia* as a peregrine settlement governed by native magistrates, like so many others: *Tib. Claudio / Caesari. Aug. / Germanico. imp. III / pont. max. trib. pot. / IIII. cos. III. desig. IIII / Civitas Ammaicensis / ex voto. annuo / L. Calventio. Vetere. / Carmini. leg. / Tib. Claudi. Caesaris. Aug / Proculo. Pisiri. f / Omuncione. Cilai. f* (IRCP 615). Thus, we know that in 44 or 45 the town was still restricted to a peregrine status, though we are not able to say since when, and marginal in the hierarchy of Roman urban centres. We would like to recall that, a little earlier, a similar vote had been expressed by the inhabitants of *Aritium Vetus* (Alvega?). This vote was addressed to the Emperor Caligula in the year of 37, also on the initiative of two native magistrates (*CIL II 172 = IRCP 647*), something that does not occur in the inscription dated 16 BC from the town of the *Igaeditani* (Idanha-a-Velha), where four magistrates are named (Mantas 2006: 61-65).

Around 44 AD, however, something was going to change in *Ammaia*, as is strongly suggested by the second inscription of the above mentioned group of five (*CIL II 159 = IRCP 618*), which was also found in S. Salvador Aramenha: *P [C]ornelio / Q Macro / viritim a Divo Claudio civit[ate] / donato / quæstori II viro / ex testamento ip[sius] / Quintius. Ca[p]jito / cum Q f h [p]*. This epigraph, possibly belonging to a monumental base, has a rather troubled history, causing repeated discussions among experts. Lost and truncated after its first registration (IRCP: 679-681; Encarnação 1986: 107; Stylop, Abascal and Cebrián 2009: 25, 28-29), debate has dragged on about its meaning, and even about the presence of the letter Q at the beginning of the second line of the epigraph. Once the missing fragment was recovered, the presence of the letter Q was confirmed, to which we cannot give any other interpretation than *Q(uirina)*, which is corroborated by both the epigraphs of G. Sentius Capito and M. Iunius Gallus – also found at the Quinta do Deão (Mantas 2004: 92-97; Stylop 2009: 33-46) – and the inscriptions of Monforte (IRCP 578, 595a), where the tribe is always identified as being that of Quirina. Since no urban centres are known to have been promoted in the Iberian Peninsula by Nero, the status of *municipium* must have been granted in Claudian times – or, alternatively, the concession of Latin right, considering the positions held by Cornelius Macro. Either that or an earlier date must be assigned to the inscription in order to maintain the thesis of a Flavian municipality (Stylop 1997: 105-123; Pintado 2004: 343-364). The well known inscription of *Sabora* in *Baetica* (*CIL II 1423*) forces us to question this thesis, since it is hardly acceptable in many situations. In fact, we can only be certain that a change of status took place between 44/45 and 74 AD, which we believe to have been the concession of Latin right, whereas we consider the Julio-Claudian period the most plausible for this to have taken place. One wonders if the status of *municipium* had been granted at the same time.

A third inscription sheds some light on this issue, although rather diffuse, probably reflecting the granting of Latin right to *Ammaia*: *Genio Oppid[i] Constitut[i] / sacrum // C. Annus / Valens / a l d* (IRCP 604). Again we have a kind of birth certificate of the town, devoid of chronology other than the one inferred by study of the monument (Fig. 10). Contrary to other opinions, we believe that this is not the physical birth of the town, but its constitution as an urban centre integrated into the Roman judicial order through the concession of Latin right, most probably under the Principate of Claudius. With regard to the monument, the difficulties associated with its dating match the prudence shown by Encarnação, who preferred to focus on the meaning of the expression *Oppidi Constituti*, to which he attributed a legal sense, though again with caution. This is also our opinion, shared by Arnílcar Guerra, who directly relates the votive stone to the concession of Latin right to *Ammaia* by the Emperor Claudius (Guerra 1996: 28-29). The opposite opinion, supported by arguments that do not differ significantly from those already presented, is maintained by Stylop, who suggests that the mentioned expression does not mean ‘legally constituted’, but rather ‘built’, though he accepts the dating of the monument to the Julio-Claudian period (Stylop 2009: 47-48).



Fig. 10 Altar dedicated to the Genius of the constituted oppidum (National Archaeological Museum).

The fourth monument worth considering with regard to the judicial history of the town, mentioned by Armin Stylop with reference to a document written by a British officer during the Peninsular War, does not help to solve this problem either. Here is the text: *M. Iunio / Quir. Gallo / II.vir. Turrania / Cilea. Genero* (Stylop 2009: 35-46). We thus have another Ammaian *duumvir*, whose *gentiliclus* is included in the name of the Eboran Senator Q. Iulius Cordus Iunius Mauricus (IRCP 414) and whose *cognomen* Gallus is of reasonable representation in *Lusitania*, one of them being the Olisiponian *duumvir* Q. Antonius Gallus, who lived at the time of Trajan (Mantas 2005: 30-31). As

usual in these municipalities, we are looking at notables belonging to or associated with native families, as is apparent from the *cognomen* of Turrania Cilea, whose *gentilicium* belongs to one of the most important families of *Conimbriga*, a town where, under Vespasian, the provincial *flamen* L. Iunius Latro resided (Etienne *et al.* 1976: 49-51, 91-93). This large monument, of which a drawing is preserved, is likely to have existed in the late first century or early second century, where it probably served as the base for one of the missing statues of the *Ammaia* forum.

Undisputed is the inscription detected on the pedestal of a statue or bust, where, for the first and only time, *Ammaia*'s status of *municipium* is referred to (*CIL* II 158 = IRCP 616). This monument dates from 166 AD and has been used in the past as grounds for the identification of the town as Portalegre: *Imp. Caes. L. Aurelio Vero Aug / divi. Antonini. f / pont. max. tri. pot / cos. II. p. p. Municip. Ammai.* (*CIL* II 158 = IRCP 616). Unfortunately, as has been stressed many times, the monument – from which, unusually, the magistrates in office are absent, strengthening the collective message of homage to Lucius Verus (Fig. 11) – only confirms that *Ammaia* was a Latin *municipium* in the early second half of the second century. In fact, and despite this important set of inscriptions, we are still in doubt about the date when *Ammaia* ceased to be a peregrine town and rose to Latin right status, consecrated or not with the title of *municipium*. Pliny's reference to the settlements (*oppida*) awarded with the *Latium Vetus*, before the *Latium minus* was globally assigned to *Hispania* by Vespasian, may be

better understood if we consider this possibility, placing the status change to *municipium* at the end of the first century, at a time when significant architectural interventions took place, as suggested by excavations in *Ammaia*, and particularly in the area of the so called south gate (Pereira 2009: 60-77, 174-175). Is it possible that the few pre-existing Latin towns opted for the title of *municipium* in order to distinguish themselves from newly promoted centres? In fact, we can only count on documentary evidence related to the *Civitas Ammaicensis* (in 44-45) and to the *Municipes Ammaienses* (166) that lacks associated dynastic references.

Epigraphy is also an essential source of information about *Ammaia* society and culture. The native anthroponomy, registered in a territory that is still vaguely defined, but covered, as we believe, much of the current District of Portalegre, does not give room for much doubt about the Lusitanian provenance of the majority of its population, clearly related to those of the Beira Interior and the region of Cáceres, and integrated into a wide, culturally well characterized area (Encarnação 1987: 167-170; Mantas 2000: 401). This circumstance is easily confirmed through the examination of surviving religious testimonies, since we have found evidence of local cults, such as the ones of *Ocrimira*, probably connected to the River Sever (IRCP 610), *Toga* (IRCP 611) and *Quanceius Tangus* (IRCP 641, *FE* 23 103, 106). Since indigenous cults are under-represented south of the River Tagus, this fact seems very significant to us.

Although, for now, only the urban temple of the forum is known as possibly being consecrated to Jupiter (Mantas 2010a: 170-181) given that S. Salvador de Aramenha has three epigraphs devoted to IOM (IRCP 605, 606, 608), this cult was widely practised by the more or less romanized native people of this region, as well as by former slaves (Mantas 2000: 405-406; Carneiro 2010 : 84-85). The epigraphy also testifies to the cult of Mars, in epigraphs from Monforte (IRCP 568) and the Tapada da Colegiada<sup>3</sup>, the cult of the Nymphs in Monforte (IRCP 569), or of Genius related to the *Ammaia* *oppidum* (IRCP: 668, 693; Mantas 2004: 89-92).<sup>4</sup> The religious landscape corresponds perfectly to that of a widely romanized region, but where pre-Roman traditions coexist in harmony with the classic cults, with or without *interpretatio*.



Fig. 11 Base of the monument dedicated to Lucius Verus by the *Municipes Ammaienses* (*Ammaia* Museum).

<sup>3</sup> According to the different interpretation proposed by Patrício Curado, to be published in *Açafa* online nº 4.

<sup>4</sup> The altar, consecrated to Genio Amaici, was found in Alvarroes, on the outskirts of the town.

An analysis of the Latin inscriptions also helps to detect changes in orthography, reproducing in certain circumstances the local pronunciation or a still imperfectly formed knowledge of the language, even when the supporting base is entirely classical. A survey of recorded *gentilicia* in the area that can roughly be considered dependent on *Ammaia* also offers some promising working hypotheses. Here is the current list: Aelia, Aquilia, Annia, Annonia, Carminia, Cateia, Coelia, Cornelia, Domitia, Iulia, Preccia, Propinia, Quintia, Sentia and Voconia. While some of these *gentilicia* only occur in rural settings, this does not necessarily point to a rural background, since there are several major landowners of the region among them.

The registered anthroponomical variety may indicate the relocation of families to the new urban centre, which, at the time, was built *ex-nihilo*. Some of these families belonged to a small group of notables, representing the elite that was needed to advance the programme of urbanization and to develop the political and economic dynamics that could ensure the success of the new town. These people were native peregrines, as is the case with the magistrates of the 44/45 AD epigraph, or with Publius Cornelius Macer. Some of them merely have urban representation, reflected in a limited number of inscriptions, since only Aelia, Annia and Iulia are, directly or indirectly, referred to in more than one epigraphic testimony. Without wishing to engage in a comprehensive analysis of the greater or lesser importance of these families, we must highlight Carminia, related, as has been maintained, to L. Calventius Carminius Vetus, legate of Claudius (Groag and Stein 1936: 103-104; IRCP: 677). Is this another coincidence?

The Iulia family appears in two inscriptions, suggesting a lower patronage at the beginning of the Empire when compared to other nearby urban centres, such as Évora, a fact we attribute in this area of *Lusitania* to the colonization strategy applied to the bordering stretches of the River

Tagus, although it may also reflect a later engagement in the region's urbanization. One of these epigraphs, probably dating from the second half or the end of the first century, and recovered from the Quinta do Deão, recalls the provincial Flamen G. *Iulius Vegetus* (*CIL II* 160 = IRCP 617), suggesting relations with Évora or Mérida and most likely with Lisbon, where we know about a female *flamen* called Iulia Vegeta (Silva 1944: 194-195; Mantas 2004: 100-104). The second inscription, devoted to the local deity Ocrimira, records a Iulia Saturisca of clearly indigenous origins (IRCP 610). The anthroponym Iulia still occurs in two other inscriptions: in the funerary inscription for the slave child of someone named Iulia (IRCP 622), and at a small altar devoted by a peregrine Iulia to a deity whose theonym has resisted all attempts at identification. Naturally, the first two testimonies are the most representatives in terms of *gentilicia*.

In addition to the naive citizens or peregrines, epigraphy also allows us to learn something about the freedmen and slaves (Mantas 2002: 49-68), which, at this location, seem to be of completely indigenous origin. Although the freedmen always had a rather numerous epigraphic representation, and *Ammaia* presents five inscriptions that refer to them, there is a lack of Greek or Grecized anthroponyms, so common in other areas. Is it possible that the Clunians, somehow over-represented in this area south of the River Tagus (Mantas 2000: 412, 415-416), replaced the technical staff employed at the agro-pastoral and mining explorations? As for the slaves, humble as they were even in death, they are only known through two inscriptions (IRCP 622, 639). We hope that further survey work, study and much required publication will allow us to extend our knowledge about this and other historical aspects of the town of *Ammaia*, and to definitively place it among the great Luso-Roman urban centres, notwithstanding the laconic style of the literary sources.

# BIBLIOGRAPHY

- Abascal, J. M. (1989) *La ciudad hispano-romana. Privilegio y poder.* Logroño, Colegio Oficial de Aparejadores y Arquitectos Técnicos de la Rioja.
- Alarcão, J. de (1983) *Portugal Romano.* Lisboa, Editorial Verbo.
- Alarcão, J. de (1988) *Roman Portugal I:* Warminster, Aris & Phillips Ltd.
- Alarcão, J. de (1990a) A urbanização de Portugal nas épocas de César e de Augusto. In Trillmich and Zanker 1990: 43-54.
- Alarcão, J. de (1990b) Identificação das cidades da Lusitânia Portuguesa e dos seus territórios. In *Les villes de Lusitanie romaine* 1990: 21-34.
- Alarcão, J. de (1990c) O estado e o governo local. In J. Serrão and A. H. de Oliveira Marques (eds), *Nova História de Portugal I:* 381-394. Lisboa, Editorial Presença.
- Alarcão, J. de (1998) A paisagem rural romana e alto-medieval em Portugal. *Conimbriga XXXVII:* 89-119.
- Alarcão, J. de, André, P., Barrelas, P., Carvalho, P. C., Silva, R. and Santos, F. (2009) *The Forum of Aeminium: The search for the original design.* Coimbra, IMC-Instituto dos Museus e da Conservação / Museu Nacional de Machado de Castro.
- Alarcão, J. de and Étienne, R. (1977) *Fouilles de Conimbriga I. L'Architecture M.A.F.P. / M.M.C.* Paris, De Boccard.
- Alba Calzado, M. (2001) Características del viario urbano de Emerita entre los siglos I y VIII. *Mérida: Excavaciones arqueológicas 1999, Memoria 5:* 397-424. Mérida: Consorcio Ciudad Monumental de Mérida 2001.
- Alba Calzado, M. (2002a) Datos para la reconstrucción diacrónica del paisaje urbano de Emerita: las calles porticadas desde la etapa romana a la visigoda. *Mérida: Excavaciones Arqueológicas 2000, Memoria 6:* 371-396. Mérida: Consorcio Ciudad Monumental de Mérida.
- Alba Calzado, M. (2002b) Revalorización de las vías urbanas de Emerita. *Mérida. Ciudad y Patrimonio 6:* 133-148.
- Alba Calzado, M. (2004a) Arquitectura doméstica de Emerita. In X. Dupré i Raventós (ed.), *Las capitales provinciales de Hispania 2. Mérida: Colonia Augusta Emerita:* 67-83. Roma, L'Erma di Bretscheider.
- Alba Calzado, M. (2004b) Evolución y final de los espacios romanos emeritenses a la luz de los datos arqueológicos (pautas de transformación de la ciudad tardoantigua y altomedieval). In T. Nogales Basarrate (ed.), *Augusta Emerita: territorios, espacios, imágenes y gentes en Lusitanía romana. (Monografías emeritenses 8):* 207-255. Mérida, Museo Nacional de Arte Romano.
- Albertini, E. (1923) *Les divisions administratives de l'Espagne Romaine.* París, De Boccard.
- Almagro Basch, M. (1976) La topografía de Augusta Emerita. In *Ciudades Augusteas de Hispania I, Simposio celebrado con ocasión del bimilenario de la colonia Caesaraugusta, Zaragoza 29 septiembre - 2 octubre 1976:* 189-212. Zaragoza, Universidad de Zaragoza.
- Almeida, M. J. (2000) *Occupação rural romana no actual concelho de Elvas.* Universidade de Coimbra. Master thesis.
- Almeida, M. J., Carneiro, A., Rodríguez Martín, F. G. and Morgado, P. (2011) De *Augusta Emerita a Olisipo:* proposta de traçado para o primeiro troço da via XII do Itinerário de Antonino. In A. Carneiro, J. de Oliveira, L. Rocha and P. Morgado (eds), *Arqueología do Norte Alentejano: Comunicações das 3as Jornadas.* Lisboa, Edições Colibri / Câmara Municipal de Fronteira.
- Álvarez Martínez, J. M. (1981) *El puente y el urbanismo de Augusta Emerita.* Madrid, Universidad Complutense de Madrid.
- Antico Gallina, M. (ed.) (2000) *Dal Suburbium al Faubourg: evoluzione di una realtà urbana. (Itinera 2-3).* Milano, Edizioni Et.
- Antrop, M. (2007) *Perspectieven op het landschap.* Gent, Academia Press.
- Arce, J. (1993) La ciudad en la España tardorromana: continuidad o discontinuidad. In *Ciudad y comunidad cívica en Hispania (siglos II y III después de J. C.). (Collection de la Casa de Velázquez 40):* 177-187. Madrid, Casa de Velásquez.
- Arce, J. (1995) El catastrofismo de Hidacio y los camellos de la Gallaecia. In A. Velazquez, E. Cerrillo and P. Mateos Edes (eds), *Los últimos romanos en Lusitania. (Cuadernos Emeritenses 10):* 219-228. Mérida, Museo Nacional de Arte Romano.
- Arce, J. (2002) *Merida Tardorromana (300-580 d.C.). (Cuadernos Emeritenses 22).* Mérida, Museo Nacional de Arte Romano.
- Arinó Gil, E., Gurt i Espaguerra, J. M. and Palet Martínez, J. M. (2004) *El pasado presente: arqueología de los paisajes en la Hispania Romana. (Acta Salamanticensi. Estudios Geográficos & Históricos 122).* Salamanca, Ediciones Universidad de Salamanca.
- Arrais, F. A. (1974) *Diálogos de D. Frei Amador Arrais,* [ed. lit.] M. Lopes de Almeida. Porto, Lello & Irmão Editores.
- Aspinall, A., Gaffney, C. and Schmidt, A. (2008) *Magnetometry for Archaeologists (Geophysical Methods for Archaeology Series 2).* Plymouth, AltaMira Press.
- Ayerbe Vélez, R., Barrinhos Vera, T. and Palma García, F. (eds) (2009) *El foro de Augusta Emerita. Génesis y evolución de sus recintos monumentales. (Anejos de Archivo Español de Arqueología LIII).* Mérida, CSIC.
- Balil, A. (1972) Casa y urbanismo en la España Antigua. Casa familiar y vivienda colectiva en la España Romana, Boletín de arte y arqueología, Universidad de Valladolid 37: 55-131.
- Bárcena, C. (2002-2003) Epigrafía y territorio en la Hispania romana: Los *termini* públicos. *Anas* 15-16:107-125.
- Barral i Altet, X. (1982) Transformacions de la topografia urbana a la Hispania cristiana durant l'Antiguitat tardana. In P. de Palol Salellas (ed.) *Actes de la II Reunió d'Arqueologia Paleocristiana Hispanica:* 105-132 Barcelona, Institut d'arqueologia i prehistòria.

- Barral i Altet, X. (1992) La cristianización de las ciudades romanas de *Hispania. Extremadura arqueológica* 3: 51-56.
- Baxter, M. J. (1994) *Exploratory multivariate analysis in archaeology*. Edinburgh, Edinburgh University Press.
- Bedon, R. (1998) Les faubourgs des villes gallo-romaines: perspective d'ensemble. *Caesarodunum* 32: 9-20.
- Bejor, G. (1999) *Vie colonnate. Paesaggi urbani del mondo antico. (Rivista di archeologia - Supplementi 22)*. Roma, Giorgio Bretschneider.
- Beltrán Lloris, M. (1985) *Celsa (Colección Guias arqueológicas de Aragón 2)*. Zaragoza, Diputación General de Aragón.
- Beltrán Lloris, M. (1991) La casa urbana hispanorromana. In *La casa urbana hispanorromana. Ponencias y comunicaciones. Congreso celebrado en Zaragoza del 16 al 18 de noviembre de 1988*: 7-10. Zaragoza, Institución Fernando el Católico.
- Bendala Galán, M. (ed.) (1993) *La ciutat hispano-romana. Presentació i catàleg de l'exposició del XIV Congrés Internacional d'Arqueologia Clàssica*. Barcelona, Ministerio de Cultura / Ambit Servicios Editoriales.
- Bendala Galán, M. (1994) La ciudad en la *Hispania Romana*. In X. Dupré i Raventós (ed.), *La ciudad en el mundo romano. Actas del XIV Congreso Internacional de Arqueología Clásica*: 115-123. Tarragona. Consejo Superior de Investigaciones Científicas.
- Benech, C. (2007) New approach to the study of city planning and domestic dwellings in the ancient Near East. *Archaeological Prospection* 14: 87-103.
- Bescoby, D. J., Cawlay, G. C. and Chroston, P. N. (2004) Enhanced Interpretation of Magnetic Survey Data using Artificial Neural Networks: a Case Study from Butrint, Southern Albania. *Archaeological Prospection* 11: 189-199.
- Biers, W. R. (ed.) (1988) *Mirobriga. Investigations at the Iron Age and Roman Site in Southern Portugal by the University of Missouri-Columbia, 1981-1986. (BAR International Series 451)*. Oxford. British Archaeological Reports.
- Bintliff, J. and Snodgrass, A. (1988) Mediterranean survey and the city. *Antiquity* 62: 57-71.
- Blagg, T. F.C. and Millett, M. (eds) (1990) *The Early Roman Empire in the West*. Oxford, Oxbow.
- Boaventura, R. and Langley, M. (2006) Apontamentos arqueológicos para história da região de Monforte: uma visão cartográfica. *Revista portuguesa de Arqueologia* 9 (2): 75-81.
- Boeniger, U. and Tronicke, J. (2010) On the potential of kinematic GPR surveying using a self-tracking total station: evaluating system crosstalk and latency. *IEEE Transactions on Geoscience and Remote Sensing* 48: 3792-3798.
- Borges, S. (2002) A cidade romana de Ammaia: as termas do forum (notícia preliminar). *Ibn Maruán. Revista Cultural do Concelho de Marvão* 12: 85-97.
- Borner, W., Uhlirz, S- and Dollhofer, L. (eds) (2012) Proceedings of the 16th International Conference on "Cultural Heritage and New Technologies" (Vienna, November 2011): 59-73. Vienna, Stadtarchäologie Wien.
- Bosque Sendra, J. (2000) *Sistemas de Información Geográfica*. Madrid, Rialph.
- Boucher, A. R. (1996) Archaeological Feedback in Geophysics. *Archaeological Prospection* 3: 129-140.
- Bowden, W. and Bescoby, D. (2008) The plan of *Venta Icenorum* (Caistor-by-Norwich): interpreting a new geophysical survey. *Journal of Roman Archaeology* 21: 325-334.
- Caballos, A., Marín Fatuarte, J. and Rodríguez Hidalgo, J.M. (1999) *Itálica arqueológica*. Sevilla, Universidad de Sevilla.
- Caetano, J. C. (2002) Necrópoles e ritos funerários no oeste da Lusitania romana. In D. Vaquerizo (ed.), *Espacio y usos funerarios en el Occidente Romano. (Actas del Congreso Internacional, Córdoba, 5-9 junio, 2001)*: 313-334. Córdoba, Universidad de Córdoba.
- Calderón Fraile, M. N., Cano Ortiz, A. I., Cerrillo Cuenca, E., Heras Mora, F. J., Mejías del Cosso, M. D., Sánchez Barba, M. E. and Silva Cordero, A. F. (2000) Sociedad y territorio: la evolución de los hábitats desde la Segunda Edad del Hierro a la romanización en la provincia de Cáceres. In J.-G. Gorges and T. Nogales Basarrate (eds), *Sociedad y Cultura en la Lusitania Romana. IV Mesa Redonda Internacional. (Serie Estudios Portugueses 13)*: 53-72. Mérida. Junta de Extremadura.
- Campana, S. and Piro, S. (2009) *Seeing the Unseen. Geophysics and Landscape Archaeology*. London, Taylor and Francis Group.
- Campanelli, A. (2000) Cinte murarie e fasce suburbane in alcune città romane d'Abruzzo: analisi preliminare. In *Antico Gallina 2000*: 81-93.
- Campbell, J. B. (2002) *Introduction to remote sensing* (3rd edition). London, Taylor and Francis.
- Cancela Ramírez, L. (2002) Aspectos monumentales del mundo funerario hispano. In D. Vaquerizo (ed.), *Espacio y usos funerarios en el Occidente Romano. (Actas del Congreso Internacional, Córdoba, 5-9 junio 2001)*: 163-180. Córdoba. Universidad de Córdoba.
- Carneiro, A. (2004) *Povoamento romano no actual concelho de Fronteira*. Lisboa, Edições Colibri.
- Carneiro, A. (2009) *Itinerários Romanos do Alentejo. Uma releitura de "As grandes vias da Lusitânia - O itinerário de Antonino Pio" de Mário de Saa, cinquenta anos depois*. Lisboa, Edições Colibri.
- Carneiro, A. (2010) Para uma cartografia dos cultos religiosos no Alto Alentejo em época romana. In F. Oliveira, J. Oliveira and M. Patrocínio (eds), *Espaços e Paisagens. Antiguidade Clássica e Heranças Contemporâneas* 3: 81-97. Coimbra. Centro de Estudos Clássicos e Humanísticos.
- Carvalho, J. (2002) Ammaia e a sua rede viária, algumas propostas de trabalho. *Ibn Maruán. Revista Cultural do Concelho de Marvão* 12: 69-83.
- Carvalho, P. C. (1998) *O forum de Aeminium*. Lisboa, Instituto Português de Museus.
- Castelo Ruano, R. (1994) Monumentos funerarios ibéricos. Interpretación de algunos de los restos arquitectónicos y escultóricos aparecidos en las necrópolis del Sureste peninsular. *Revista de Estudios Ibéricos* 1: 139-171.
- Castoldi, M. (2000) La fascia suburbana nelle città greche di Sicilia (VIII-V sec. a.C.). In *Antico Gallina 2000*: 25-37.
- Cepeda Ocampo J.J., Iglesias Gil, J.M. and Ruiz Gutiérrez, A. (2008) Territorio rural y espacio urbano en *Iuliobriga* (Cantabria). In: J. Mangas Manjarrés and M.A. Novillo (eds), *El territorio de las ciudades romanas*: 309-331. Madrid, Ediciones Sísifo.
- Ceraudo, G. (ed.) (2012) *100 anni di Archeologia Aerea in Italia. Atti del Convegno Internazionale, Roma 15/17 aprile 2009. (Archeologia Aerea, 4-5, 2010-2011. Studi di Aerotopografia Archeologica)*. Foggia, Claudio Grenzi Editore.

- Cerdeira, J. (2005) Aspectos físicos da Freguesia de S. Salvador da Aramenha. In J. de Oliveira (ed.), *São Salvador da Aramenha. História e Memórias da Freguesia. (Ibn Maruán. Revista Cultural do Concelho de Marvão 13)*: 19-24. Lisboa, Edições Colibri.
- Chazarra, A., Barceló, A., Pires, V., Cunha, S., Mendes, M. and Neto, J. (2011) *Atlas Climático Ibérico. Temperatura del Aire y Precipitación (1971-2000)*. Madrid, Agencia Estatal de Meteorología.
- Christie, N. and Augenti, A. (eds) (2012) *Urbes Extinctae. Archaeologies of Abandoned Classical Towns*. Farnham, Ashgate Publishing Group.
- Ciancio Rossetto, P. and Pisani Sartorio, G. (1997) Gli edifici per spettacolo. In J. Arce, S. Ensoli and E. La Rocca (eds), *Hispania Romana. Da terra di conquista a provincia dell'impero*: 188-196. Milano, Electa.
- CIL: Corpus Inscriptionum Latinarum, Consilio et auctoritate Academiae scientiarum germanicae editum.*
- Ciminale, M. and Gallo, D. (2004) *Non-destructive geophysical surveys: archaeological feedback*. [Paper presented at the CIPA XIXth International Symposium on "New Perspectives to Save Cultural Heritage", 30 September - 4 October 2003, Antalya, Turkey]. CIPA, ICOMOS.
- Cisneros Cunchillos, M. (1988) *Marmoles hispanos: su empleo en la España romana* (Monografías arqueológicas Universidad de Zaragoza 29). Zaragoza, Departamento de Ciencias de la Antigüedad.
- Clark, A. J. (1990) *Seeing Beneath the Soil: Prospecting Methods in Archaeology*. London, Batsford.
- Clark, A. J. (1996) *Seeing Beneath the Soil: Prospecting Methods in Archaeology*. London, Routledge.
- Clark, I. (1979) *Practical geostatistics*. London, Elsevier Applied Science.
- Coelho, P. M. L. (1988) *Terras de Odiana. Subsídios para a sua história documentada. Medobriga, Ammaia, Aramenha, Marvão*. Lisboa, Edições Colibri.
- Collins, R. (1994) *The Arab Conquest of Spain. 710-797*. Oxford, Blackwell Publishers Ltd.
- Conolly, J. and Lake, M. (2006) *Geographical Information Systems in Archaeology*. Cambridge, Cambridge University Press.
- Correia, M. (1999-2000) Contributos para o estudo do povoamento dos Vidais (Marvão) – II Idade do Ferro. *Ibn Maruán. Revista Cultural do Concelho de Marvão* 9/10: 117-144.
- Correira Perdigão, J. and Peinador Fernandes, A. (1976) *Carta geológica de Portugal na escala de 1/50.000. Notícia explicativa da folha 29-C Marvão*. Lisboa, Serviços Geológicos de Portugal.
- Corsi, C. (2012a) The Ammaia Project. Integrated approaches for studying Roman towns in Lusitania. In F. Vermeulen, G.J. Burgers, C. Corsi & S. Keay (Eds.). *Urban landscape Survey in Italy and the Mediterranean*: 160-169. Oxford, Oxbow.
- Corsi, C. (2012b) Integrating Aerial-Photography, Historical Cartography, Archaeological Excavations and Geophysics Survey on the Roman Colony of Marianna (Corsica, France). In Johnson and Millett 2012: 222-240.
- Corsi, C., Johnson, P. S. and Vermeulen, F. (2012) A Geomagnetic Survey of Ammaia: a contribution to understanding Roman urbanism in Lusitania. *Journal of Roman Archaeology* 25: 121-145.
- Corsi, C., Klein, M. and Weinlinger, G. (2012) The Roman town of Ammaia (Portugal): From total survey to 3D reconstruction. In W. Börner, S. Uhlirz and L. Dollhofer (eds), *Proceedings of the 16th International Conference on "Cultural Heritage and New Technologies"* (Vienna, November 2011): 59-73. Vienna, Stadtarchäologie Wien.
- Corsi, C. and Vermeulen, F. (2008) Elementi per la ricostruzione del paesaggio urbano e suburbano della città romana di Ammaia in Lusitania. *Archeologia Aerea* 3: 177-194.
- Corsi, C. and Vermeulen, F. (2009) Archaeology of a Roman landscape in Central Portugal. *Egyptian Journal of Environmental Change* 1 (1): 1-5. <http://www.envegypt.com/EJEC/uploads/26.pdf>
- Corsi, C. and Vermeulen, F. (eds) (2010) *Changing Landscapes. The impact of Roman towns in the Western Mediterranean. Proceedings of the International Colloquium, Castelo de Vide – Marvão, 15–17 May 2008*. (Ricerche, Series Maior 1). Bologna, AnteQuem.
- Corsi C. and Vermeulen, F. (2012) Water in Ammaia. Infrastructures and Leisure in a Roman Town of Lusitania. In R. Kreiner and W. Letzner (eds), SPA. *Sanitas Per Aquam. Tagungsband des Internationalen Frontinus-Symposiums zur Technik und Kulturgeschichte der antiken Thermen, Aachen, 18.-22. März 2009*. (BABesch Supplements 21): 183-190. Leuven, Peeters Publisher.
- Cortese, C. (2005) *Processi di trasformazione nel suburbio di Mediolanum tra tarda età repubblicana e media età imperiale. Il caso dell'area dell'Università Cattolica*. Università Cattolica del Sacro Cuore – Milano. Ph.D. thesis.
- Cortese, C. (2008) What can we learn about the archaeological record combining quantitative analysis and ethnoarchaeology: issues from a work in progress. In F. Lugli and A. A. Stoppiello (eds), *Atti del 3º Convegno Nazionale di Etnoarcheologia, Mondaino, 17-19 marzo 2004*. (BAR International Series 1841): 117-120.
- Cosentino, P. L., Capizzi, P., Fiandaca, G., Graziano, G., Martorana, R., Messina, P., Pellegrino, L., Razo Amoroz, I. and Scalone, E. (2006) The corridor of the great hunting scene, Villa del Casale (Piazza Armerina). In *Recent Work in Archaeological Geophysics, London, 19 December 2006*: 1-3. London, Environmental and Industrial Geophysics Group.
- Cunliffe, B. and Keay, S. (eds) (1995) *Social Complexity and the Development of Towns in Iberia. From the Copper Age to the Second Century A.D. Papers from the Symposium on "Urbanism in Iberia", London 24th and 25th February 1994*. (Proceedings of the British Academy 86). Oxford, Oxford University Press/British Academy.
- Daveau, S., Coelho, C., Costa, V. G. and Carvalho, L. (1977) *Répartition et rythme des précipitations au Portugal* (Mémorias do Centro de Estudos Geográficos 3). Lisbon, University of Lisbon/ Centre for Geographical Studies.
- David, A. (1995) *Geophysical Survey in Archaeological Field Evaluation. (Research and Professional Services Guideline 1)*. London, English Heritage.
- De Dapper, M. and Vermeulen, F. (eds) (2000) *Geo-archaeology of the Landscapes of Classical Antiquity. International Colloquium Ghent 23-24 October 1998*. (BABesch Supplement 5). Leuven, Peeters.
- De Dapper, M., Vermeulen, F., Deprez, S., and Taelman, D. (eds) (2009) *Ol'Man River. Geo-archaeological aspects of rivers and river plains*. (Archaeological Reports Ghent University 5). Gent, Academia Press.

- Dekkers, M. J., Vriend, S. P., van der Weijden, C. H. and van Gaans, P. F. M. (1989) Uranium anomaly evaluation in groundwaters: a hydrogeochemical study in the Nisa region, Portugal. *Applied Geochemistry* 4: 375-394.
- De Maeyer, P. and Antrop, M. (2005) *Theoretische basisconcepten van GIS*. Gent, Academia Press.
- De Man, A. (2011) *Defesas Urbanas Tardias da Lusitânia. (Studia Lusitana 6)*. Mérida, Museo Nacional de Arte Romano.
- Deprez, S. (2009) *Geoarchaeological Study of the Natural Resources in the Territory of the Roman Town of Ammaia (Northeastern Alentejo, Portugal). Case Studies on Water Supply, Granite Building Stone Quarrying and Opencast Gold Mining*. Ghent University, Ph.D. thesis.
- Deprez, S., De Dapper, M. and De Jaeger, C. (2006), The water supply of the Roman town of Ammaia (Northeastern Alentejo, Portugal): a geoarchaeological case study. *Publicações da Associação Portuguesa de Geomorfólogos* 3: 109-133.
- Deprez, S., De Dapper, M., Almeida, N., De Paepe, P. and Vermeulen, F. (2009) A geoarchaeological study of the historical placer gold exploitation of the Tagus River terrace of the Conhal. In M. De Dapper, F. Vermeulen, S. Deprez and D. Taelman (eds), *Ol'Man River. Geo-archaeological aspects of rivers and river plains. (Archaeological Reports Ghent University 5)*: 311-332. Gent, Academia Press.
- Doneus, M. and Neubauer, W. (1998) 2D combination of prospection data. *Archaeological Prospection* 5 (1): 29-56.
- Durán Cabello, R. M. (1991) La técnica constructiva de la llamada "Casa-Basílica" de Mérida. In *La casa urbana hispanorromana. Ponencias y comunicaciones. Congreso celebrado en Zaragoza del 16 al 18 de noviembre de 1988*: 359-369. Zaragoza, Institucion Fernando el Católico.
- Eastman, J. R. (2006) *IDRISI Andes. Guide to GIS and Image Processing*. Worcester, Clark University/Labs.
- Edmondson, J. C. (1987) *Two Industries in Roman Lusitania. (BAR International Series 362)*. Oxford, British Archaeological Reports.
- Edmondson, J. C. (1990) Romanization and Urban Development in Lusitania. In Blagg and Millett 1990: 151-178.
- Encarnação, J. d' (1986) Inscrições Romanas do *Conventus Pacensis*. Aditamento. *Trabalhos de Arqueologia do Sul* 1: 107.
- Encarnação, J. d' (1987) A população romana do nordeste alentejano. In *Actas 1<sup>as</sup> Jornadas de Arqueología do Nordeste Alentejano* 85: 167-170. Castelo de Vide.
- Encarnação, J. d' (2011) Cornelii Bocchi de Olisipo, *Scallabis e Salacia*. In J. L. Cardoso and M. Almagro-Gorbea (eds), *Lucius Cornelius Bocchus. Escritor lusitano da Idade da Prata da Literatura Latina*: 189-201. Lisboa-Madrid, Academia Portuguesa da História-Real Academia de la Historia.
- Ernenwein, E. G. and Kvamme, K. L. (2008) Data processing issues in large-area GPR surveys: correcting trace misalignments, edge discontinuities and striping. *Archaeological Prospection* 15: 133-149.
- Étienne, R., Fabre, G., Lévéque, P. and Lévéque, M. (1976) Épigraphie et Sculpture. In J. Alarcão and R. Étienne (eds), *Fouilles de Conimbriga II*. Paris, M.A.F.P. / M.M.C.
- Fabião, C. (2008) *Sit Tibi Terra Levis. Rituais Funerários Romanos e Paleocristãos em Portugal. Roteiro da Exposição*. Lisboa, Museu Nacional de Arqueologia.
- Fear, A.T. (1996) *Rome and Baetica. Urbanization in southern Spain c. 50 BC – AD 150*. Oxford, Clarendon Press.
- Feio, M. and Almeida, G. (1980) A Serra de S. Mamede. *Finisterra. Revista Portuguesa de Geografia* 25 (29): 30-52.
- Feio, M. and Daveau, S. (eds) (2004) *O relevo de Portugal. Grandes unidades regionais*. Coimbra, Associação Portuguesa de Geomorfólogos.
- Feio, M. and Martins, A. (1993) O Revelo do Alto Alentejo (traços essenciais). *Finisterra. Revista Portuguesa de Geografia* 28 (55-56): 149-199.
- Fernandes, A. P., Perdigão, J. C., de Carvalho, H. F. and Peres, A. M. (1973) *Carta geológica de Portugal na escala de 1/50.000. Notícia explicativa da folha 28-D (Castelo de Vide)*. Lisboa, Lisboa Serviços Geológicos de Portugal.
- Fernandes, A. P. and Perdigão, J. C. (1976) *Carta geológica de Portugal na escala de 1/50.000. Notícia explicativa da folha 29-C (Marvão)*. Lisboa, Serviços Geológicos de Portugal.
- Fernández Ochoa, C., Morillo Cerdan, A. and Zarzalejos Prieto, M. (2000) Grandes conjuntos publicos en Hispania. In C. Fernández Ochoa and V. García-Enterro (eds), *Termas romanas en el Occidente del Imperio. Colloquio Internacional de Arqueología en Gijón, diciembre de 1999*: 59-72. Gijón, VTP Editorial.
- Fernández Vega, P.A. (1999) *La casa romana (Serie interdisciplinar)*. Madrid, Ediciones Akal.
- F. E.: *Ficheiro Epigráfico*, Suplemento de *Conimbriga*. Universidade de Coimbra.
- Flannery, K. V. (ed.) (1976) *The Early Mesoamerican Village*. New York-London, Academic Press.
- Frakes, J.F.D. (2009), *Framing Public Life: The Portico in Roman Gaul*, Wien, Phobos Verlag.
- Francisco Pereira, M., Brandão Silva, J. and Ribeiro, C. (2010) The role of bedding in the formation of fault-fold structures, Portalegre-Esperança transpressional shear zone, SW Iberia. *Geological Journal* 45: 521-535.
- Gaffney, C. and Gater, J. (2003) *Revealing the Buried Past: Geophysics for Archaeologists*. Stroud, Tempus Publishing.
- Gaffney, C., Gater, J., Linford, P., Gaffney, V. and White, R. (2000) Large-scale Systematic Fluxgate Gradiometry at the Roman City of Wroxeter. *Archaeological Prospection* 7: 81-99.
- Gaffney, C., Gater, J. and Van Ovenden, S. (2002) *The Use of Geophysical Techniques in Archaeological Evaluations*. (Institute of Field Archaeologists Technical Paper 6). Reading, IFA.
- Galsterer, H. (1988) The *Tabula Siarense* and Augustan municipalization in Baetica. In J. González and J. Arce (eds), *Estudios sobre la Tabula Siarense. (Anejos de Archivo Español de Arqueología* 9): 61-74. Madrid, CSIC/Centro de Estudios Históricos.
- Garcías Marcos, V. and Vidal Encinas, J.M. (1995) Recent Archaeological Research at Asturica Augusta. In Cunliffe and Keay 1995: 371-394.
- Garland, G. D. (1971) *Introduction to Geophysics: Mantle, Core and Crust*. Philadelphia, W. B. Saunders.
- Gelichi, S. (2000) L'eliminazione dei rifiuti nelle città romane del nord Italia tra antichità ed alto medioevo. In X. Dupre i Raventos and J. A. Remola Valverdu (eds), *Sordes urbis: la eliminacion de residuos en la ciudad Romana (Biblioteca Italica* 24): 13-23. Rome, L'Erma di Bretschneider.

- Geoscan Research (2004) *Fluxgate Gradiometer FM256*. Instruction Manual Version 1.6.
- Goodman, G. (2009) GPR methods for archaeology. In Campana and Piro 2009: 229-244.
- Gorges, J.-G. (1979) *Les Villas Hispano-Romaines: inventaire et problématique archéologiques*. (Publications du Centre Pierre Paris 4). Paris, De Boccard.
- Grasmueck, M., Weger, R. and Horstmeyer, H. (2005) Full-resolution 3D GPR imaging. *Geophysics* 70: K12-K19.
- Grayson, D. K. (1984) *Quantitative zooarchaeology*. New York, Academic Press.
- Groag, E. and Stein, A. (1936) *Prosopographia Imperii Romani* II. Berlin, Lipsia.
- Gros, P. (1994) Comprendre la ville romaine? Perspectives et problèmes d'une approche structurelle. In X. Dupré i Raventós (ed.), *La ciudad en el mundo romano. Actas del XIV Congreso Internacional de Arqueología Clásica*: 45-55. Tarragona. Consejo Superior de Investigaciones Científicas.
- Gros, P. (1996) *L'architecture romaine: du début du IIIe siècle av. J.-C. à la fin du Haut-Empire. I Les monuments publics*. Paris, Picard.
- Gros, P. (2001) *L'architecture romaine du début du IIIe siècle av. J.-C. à la fin du Haut-Empire* II. Paris, Picard.
- Guerra, A. (1996) *Ammaia, Medobriga e as ruínas de S. Salvador da Aramenha. Dos antiquários à historiografia actual. A Cidade* 11: 7-33.
- Harris, T. M. and. Lock G. R. (1996) Multi-dimensional GIS: exploratory approaches to spatial and temporal relationships within archaeological stratigraphy. In H. Kamermans and K. Fennema (eds), *Interfacing the past. Computer applications and quantitative methods in Archaeology*. (*Analectia Praehistorica Leidensia* 28/II): 307-316. Leiden, Rijksuniversiteit Leiden.
- Hay, S., Johnson, P. S., Keay, S. J. and Millett, M. (2010) *Falerii Novi*: Further Survey of the Northern Extra-Mural Area. *Papers of the British School at Rome* LXXVII: 1-38.
- Heinzelmann, M., Jordan, D. and Murer, C. (2010) *Amiternum* and the Upper Aterno Valley. *Journal of Roman Archaeology* 23: 55-83.
- Hernández Ramírez, J. (1998), *Augusta Emerita. Estructura urbana*, Badajoz, Diputación Provincial de Badajoz, Departamento de Publicaciones.
- Hesse, A. (1999) Multi-parametric survey for archaeology: how and why, or how and why not? *Journal of Applied Geophysics* 41 (2-3): 157-168.
- Hillier, B. and Hanson, J. (1984) *The Social Logic of Space*. Cambridge, Cambridge University Press.
- Hounslow, M. W. and Chroston, P. N. (2002) Structural Layout of the Suburbs of Roman Butrint, Southern Albania: Results from a Gradiometer and Resistivity Survey. *Archaeological Prospection* 9: 229-242.
- Hübner, E. (1869) *Corpus Inscriptionum Latinarum* II, Berlin (= *CIL*).
- Humer, F., Gugl, C., Pregesbauer, M., Vermeulen, F., Corsi, C. and Klein, M. (2011) Current Productions: *Carnuntum*, German Limes and Radiopast. *Virtual Archaeology Review* 4: 131-137.  
[http://varjournal.es/doc/varj02\\_004\\_16.pdf](http://varjournal.es/doc/varj02_004_16.pdf)
- Humer, F., Pregesbauer, M., Vermeulen, F., Corsi, C. and Klein, M. (2010) 3D Culture Database *Carnuntum*. In M. Ioannides, D. Fellner, A. Georgopoulos and D. Hadjimitsis (eds), *Digital Heritage, Third International Conference, EuroMed 2010 (Lemessos, Cyprus November 2010). Proceedings. (Lecture Notes in Computer Science* 6436): 91-93. Berlin-Heidelberg, Springer.
- IRCP: Encarnação, J. d' (1984) *Inscrições Romanas do Conventus Pacensis I-II*. Coimbra, FLUC. Instituto de Arqueologia.
- Izenman, A. J. (2008) *Modern Multivariate Statistical Techniques: Regression, Classification and Manifold Learning*. New York, Springer.
- Jalhay, E. (1947) Epigrafia amaiense. Contribuição para o estudo da Aramenha romana (Concelho de Marvão). *Brotéria* 45 (6): 5-23.
- Jiménez Salvador, J. L. (2002) Últimas novedades en relación al mundo funerario romano en el este y sureste de Hispania (Siglos II a.C. – IV d.C.). In D. Vaquerizo (ed.), *Espacio y usos funerarios en el Occidente Romano. (Actas del Congreso Internacional, Córdoba, 5-9 junio, 2001)*: 181-201. Córdoba, Universidad de Córdoba.
- Johnson, P. S. (2010) *Cidade Romana de Ammaia: Geophysical Survey Report, Magnetic Gradiometry – June/July and September/October 2010*. Unpublished report, University of Évora.
- Johnson, P. S. (2012) Conceptualising Townscapes: Perceptions of Urbanism and their Influence on Archaeological Survey Strategies. In Johnson and Millett 2012: 8-23.
- Johnson, P. S., Keay, S. and Millett, M. (2004) Lesser Urban Sites in the Tiber Valley: *Baccanae, Forum Cassii and Castellum Amerinum. Papers of the British School at Rome* LXXII: 69-99.
- Johnson, P. S. and Millett, M. (eds) (2012) *Archaeological Survey and the City. (University of Cambridge Museum of Classical Archaeology Monographs* 2). Oxford, Oxbow.
- Jones, G. and Maki, D. L. (2005) Lightning-induced magnetic anomalies on archaeological sites. *Archaeological Prospection* 12 (3): 191-197.
- Kaiser, A. (2011) *Roman urban street networks*. London, Routledge.
- Keay, S. J. (1988) *Roman Spain. (Exploring the Roman World* 2). London, British Museum Publications.
- Keay, S. (1995) Innovation and Adaptation: The Contribution of Rome to Urbanism in Iberia. In Cunliffe and Keay 1995: 291-337.
- Keay, S. (1998) The development of towns in early Roman Baetica. In Keay, S. (ed.), *The Archaeology of Early Roman Baetica (JRA Supplementary Series* 29): 54-86. Portsmouth, Journal of Roman Archaeology.
- Keay, S., Millett, M., Robinson, J., Taylor, J. and Terrenato, N. (2000) *Falerii Novi: A New Survey of the Walled Area. Papers of the British School at Rome* LXVIII: 1-93.
- Keay, S. J., Millett, M., Paroli, L. and Strutt, K. (eds) (2005) *Portus. An Archaeological Survey of the Port of Imperial Rome (Archaeological Monograph* 15). London, The British School at Rome and Soprintendenza Archeologica di Ostia.
- Keay, S. and Rodríguez Hidalgo, J. M. (2009) Topografía y evolución urbana. In A. Caballos Rufino, A. (ed.), *Itálica-Santiponce. Municipium y Colonia Aelia Augusta Italicensium*. Rome, The British School at Rome.
- Kintigh, K. W. (1984) Measuring archaeological diversity by comparison with simulated assemblages. *American Antiquity* 49 (1): 44-54.

- Kvamme, K. L. (2006a) Data Processing and Presentation. In J. Johnson (ed.), *Remote sensing in archaeology: an explicitly North American perspective*. Tuscaloosa, The University of Alabama Press.
- Kvamme, K. L. (2006b) Integrating multidimensional geophysical data. *Archaeological Prospection* 13 (1): 57-72.
- Kvamme, K. L. (2007) Integrating Multiple Geophysical Datasets. In J. Wiseman and F. El-Baz (eds), *Remote Sensing in Archaeology*: 345-374. New York, Springer Science Business Media, LLC.
- Kvamme, K., Ernenwein, E. and Markussen, C. (2006) Robotic Total Station for Microtopographic Mapping: an Example from the Northern Great Plains. *Archaeological Prospection* 13: 91-102.
- Lafon, X. (2001) Le Suburbium. *Pallas* 55: 199- 214.
- La Motta, V. M. and Schiffer, M. B. (1997) Formation processes of house floor assemblages. In P. M. Allison (ed.) *The Archaeology of Household Activities*: 19-29. New York, Routledge.
- Laur-Belart, R. (1991) *Guide d'Augusta Raurica*. Basel, Historische und Antiquarische Gesellschaft.
- Leckebusch, J. (2007a) Verification and topographic correction of GPR data in three dimensions. *Near Surface Geophysics* 5: 395-403.
- Leckebusch, J. (2007b) Pull-up/pull-down corrections for ground-penetrating radar data. *Archaeological Prospection* 14: 142-145.
- Leckebusch, J. (2011) Problems and solutions with GPR data interpretation: depolarization and data continuity. *Archaeological Prospection* 18: 303-308.
- Leckebusch, J. and Sütterlin, H. (2007) Large scale GPR surveys in Augst. *Studijné Zvesti* 41: 210-212.
- Lehmann, F. (1999) *Automation in 3D Georadar Investigations: New acquisition and Processing Techniques*. Zurique, Swiss Federal Institute of Technology, Ph.D. thesis.
- Lehmann, F. and Green, A. (1999) Semiautomated georadar data acquisition in three dimensions. *Geophysics* 64: 719-731.
- Lehmann, F. and Green, A. (2000) Topographic migration of georadar data: implications for acquisition and processing. *Geophysics* 65: 836-848.
- Lehmann, F., Vonder Mühl, D., van der Veen, M., Wild, P. and Green, A. G. (1998) True topographic 2-D migration of georadar data. In *Symposium on the Application of Geophysics to Engineering and Environmental Problems*. (SAGEEP 11, 1): 107-114. Denver, Environmental and Engineering Geophysical Society.
- Le Roux, P. (1990) Les villes de statut municipal en Lusitanie Romaine. In *Les villes de Lusitanie romaine* 1990: 35-49.
- Le Roux, P. (1995) *Romains d'Espagne. Cités et politiques dans les provinces: IIe siècle av. J.-C. - IIIe siècle ap. J.-C.* Paris, Armand Colin.
- Les villes de Lusitanie romaine* (1990). *Hiérarchies et territoires. Table ronde internationale du Centre national de la recherche scientifique (Talence 8-9 décembre 1988)*: 35-49. Paris, Éditions du C.N.R.S.
- Lillesand, T. M., Kiefer, R. W. and Chipman, J. W. (2004) *Remote sensing and image interpretation* (5th edition). New York, Wiley.
- Linford, N., Linford, P., Martin, L. and Payne, A. (2007) Geophysical evidence for assessing plough damage. In *Studijné Zvesti* 41: 212-213.
- Linford, N., Linford, P., Martin, L. and Payne, A. (2010) Stepped frequency ground-penetrating radar survey with a multi-element array antenna: results from field application on archaeological sites. *Archaeological Prospection* 17: 187-198.
- Link, K. F. and Barba, L. A. (2001) Combined Visualisation of Electrical and Magnetic Surveys. In M. Cucarzi and P. Conti (eds), *Filtering, Optimisation and Modelling of Geophysical Data in Archaeological Prospecting. (Quaderni Prospettive Archeologiche, 50th Anniversary Issue)*. Rome, Fondazione Carlo Maurilio Lerici/ Politecnico di Milano.
- Lopéz-Moro, F. J., Murciego, A., and López-Plaza, M. (2007) Silurian/Ordovician asymmetrical sill-like bodies from La Codosera syncline, W Spain: A case of tholeiitic partial melts emplaced in a single magma pulse and derived from a metasomatized mantle source. *Lithos* 96 (3-4): 567-590.
- Luzon Nogué, J. M. (1975) *La Itálica de Adriano. (Arte hispalense 9)*. Sevilla, Diputacion Provincial de Sevilla.
- Luzon Nogué, J. M. (1982) Consideraciones sobre la urbanística de la ciudad nueva de Itálica. In *Actas de las primeras jornadas sobre excavaciones arqueológicas en Itálica (Santiponce, Sevilla). Excavaciones Arqueológicas en España* 121: 75-95. Madrid: Ministerio de Cultura – Subdir. Gral. de Arqueología y Etnología.
- Mackie, N. (1990) Urban munificence and the growth of urban consciousness in Roman Spain. In Blagg and Millett 1990: 179-192.
- Magdinier, A.-G. and Thollard, P. (1987) L'Enceinte Romaine d'Orange. In *Les enceintes augustéennes dans l'Occident romain (France, Italie, Espagne, Afrique du Nord). Actes du colloque international de Nîmes. IIIe Congrès archéologique de Gaule méridionale, 9-12 octobre 1985. (Bulletin annuel 18)*: 27-96. Nîmes, Ecole antique de Nîmes.
- Maillol, J., Ortega-Ramirez, J. and Berard, B. (2005) *Archaeological Feedback as a Research Methodology in Near-Surface Geophysics. (AGU Joint Assembly, New Orleans, 23-27 May 2005)*. Washington, American Geophysical Union.
- Maloney, S. J. and Hale, J. R. (1996) The villa of Torre de Palma (Alto Alentejo). *Journal of Roman Archaeology* 9: 275-294.
- Mansuelli, G. (1985) *Roma e le province 2: Topografia, urbanizzazione, cultura*. Bologna, Cappelli Editore.
- Mantas, V. G. (1990) As cidades marítimas da Lusitanía. In *Les villes de Lusitanie romaine* (1990): 149-205.
- Mantas, V. G. (1998) O espacio urbano nas cidades do norte da Lusitanía. In: A. Rodríguez Colmenero (ed) *Los orígenes de la ciudad en el Noroeste Hispánico*, (Actas del Congreso Internacional Lugo 1996): 355- 391. Lugo, Grafic-Lugo.
- Mantas, V. G. (2000) A sociedade luso-romana o município de Ammaia. In J. G. Gorges and T. Nogales Basarrate (eds), *Sociedad y Cultura en la Lusitanía Romana. IV Mesa Redonda Internacional (Serie Estudios Portugueses 13)*: 391-420. Mérida. Junta de Extremadura.
- Mantas, V. G. (2002) Libertos e escravos na cidade luso-romana de Ammaia. *Ibn Maruán. Revista Cultural do Concelho de Marvão* 12: 49-68.
- Mantas, V. G. (2004) Novidades epigráficas de Ammaia (S. Salvador de Aramenha, Marvão). In D. Auliard and L. Bodiou (eds), *Au Jardin des Hespérides. Mélanges Offerts à Alain Tranoy*: 87-105. Rennes. Presses Universitaires Rennes (PUR).

- Mantas, V. G. (2005) Os magistrados olisiponenses do período romano. In C. Silva (ed.), *História das Figuras do Poder. (Torres Veteras 7)*: 21-56. Torres Vedras. Câmara Municipal de Torres Vedras.
- Mantas, V. G. (2006) Cidadania e estatuto urbano na *Civitas Igaeditanorum* (Idanha-a-Velha). *Biblos* 4: 49-92.
- Mantas, V. G. (2010a) *Ammaia e Civitas Igaeditanorum*. Dois espaços forenses lusitanos. In T. Nogales Basarate (ed.), *Ciudad y Foro en Lusitania Romana (Studia Lusitana 4)*: 167-188. Merida. Museo Nacional de Arte Romano.
- Mantas, V. G. (2010b) O Arco da Aramenha em Castelo de Vide. *Humanitas* 62: 321-336.
- Mantas, V. G. (2012) *As Vias Romanas da Lusitânia (Studia Lusitana 7)*. Merida. Museo Nacional de Arte Romano.
- Mar, R. (1997) L'urbanistica romana nella penisola iberica. In J. Arce, S. Ensoli and E. La Rocca (eds), *Hispania Romana. Da terra di conquista a provincia dell'impero*: 142-148. Milano, Electa.
- Marques, G. (1997<sup>2</sup>) *Lendas de Portugal II*: 159-168. Lisboa, Círculo de Leitores.
- Martín Bueno, M. (1985) Los recintos augusteos en *Hispania*. In *Les enceintes augustéennes dans l'Occident romain (France, Italie, Espagne, Afrique du Nord). Actes du colloque international de Nîmes. IIIe Congrès archéologique de Gaule méridionale, 9-12 octobre 1985. (Bulletin annuel 18)*: 107-124. Nîmes, Ecole antique de Nîmes.
- Martins, M. and Carvalho, H. (2010) *Bracara Augusta* and the changing rural landscape. In Corsi and Vermeulen 2010: 281-298.
- Mataloto, R. (2010) Do Campo ao *Ager*: Povoamento e ocupação rural pré-romana do Alentejo central e a sua romanização. In V. Mayoral Herrera and S. Celestino Pérez (eds), *Los paisajes rurales de la romanización: arquitectura y explotación del territorio. Contribuciones presentadas en la Reunión Científica celebrada en el Museo Arqueológico Provincial de Badajoz, 27 y 28 de octubre de 2008*: 59-88. Madrid. Ediciones La Ergástula.
- Mayeas Cruz, P. (1994-95) Reflexiones sobre la trama urbana de Augusta Emerita, *ANAS. Museo Nacional de Arte Romano de Mérida* 7/8: 233-247.
- McCartney, P. H. and Glass, M. F. (1990) Simulation models and the interpretation of archaeological diversity. *American Antiquity* 55 (3): 521-536.
- Menéndez, L. G. and Azor, A. (2006) Estructura interna del batolito granítico de Nisa-Alburquerque. *Geogaceta* 40: 131-134.
- Menéndez, L. G., Azor, A., Ordóñez, A. and Sánchez-Almazo, I. (2011) The metamorphic aureole of the Nisa-Alburquerque batholith (SW Iberia): implications for deep structure and emplacement mode. *International Journal of Earth Sciences* 100: 1533-1550.
- Metcalf, D. and Barlow, K. R. (1992) A Model for Exploring the Optimal Trade-Off between Field-Processing and Transport. *American Anthropologist, New Series* 94 (2): 340-356.
- Meyer, K.E. (1999). Axial peristyle houses in the western empire, *Journal of Roman Archaeology* 12: 101-121.
- Mierse, W. E. (1999) *Temples and towns in Roman Iberia: the social and architectural dynamics of sanctuary designs from the third century B.C. to the third century A.D.* Berkeley/London, University of California Press.
- Millett, M. (2007) Experiments in the analysis of finds deposition at Shiptonthorpe: a retrospect. In R. Hingley and S. Willis (eds), *Roman finds: context and theory*: 100-105. Oxford, Oxbow.
- Mommesen, H. (1986) *Archäometrie. Neuere naturwissenschaftliche Methoden und Erfolge in der Archäologie*. Stuttgart, Teubner.
- Monteiro, M. (2011) A villa romana dos Mosteiros (Castelo de Vide). *Açafa on-line* 4. Ebook available at: <http://ebookbrowse.com/gdoc.php?id=306374930&url=5437824f024a02af0ac1baf75d1eac9a>.
- Neubauer, W. (2004) GIS in Archaeology – the Interface between Prospection and Excavation. *Archaeological Prospection* 11: 159-166.
- Neubauer, W. and Eder-Hinterleitner, A. (1997) Resistivity and magnetics of the Roman town *Carnuntum*, Austria: an example of combined interpretation of prospection data. *Archaeological Prospection* 4: 179-189.
- Neubauer, W., Eder-Hinterleitner, A. and Melichar, P. (2002) Georadar in the Roman civil town *Carnuntum*, Austria: an approach for archaeological interpretation of GPR data. *Archaeological Prospection* 9 (3): 135-156.
- Neubauer, W., Seren, S., Hinterleitner, A., Löcker, K. and Melichar, P. (2009) Archaeological interpretation of combined magnetic and GPR surveys of the Roman town *Flavia Solva*, Austria. In D. Marguerie and Ph. Lanos (eds), *Mémoire du sol, espace des hommes*: 225-228. Rennes, Presses Universitaires de Rennes.
- Nielsen, I. (1993) *Thermae et Balnea*. Aarhus, Aarhus University Press.
- Nogales Basarrate T. (ed.) (2010) *Ciudad y Foro en Lusitania Romana. (Studia Lusitana 4)*. Merida. Museo Nacional de Arte Romano.
- Nogales Basarrate, T. and Márquez Pérez, J. (2002) Espacios y tipos funerarios en *Augusta Emerita*. In D. Vaquerizo (ed.), *Espacio y usos funerarios en el Occidente Romano. (Actas del Congreso Internacional, Córdoba, 5-9 junio 2001)*: 113-144. Córdoba. Universidad de Córdoba.
- Novo, A., Lorenzo, H., Rial, F. I. and Solla, M. (2010) Three-dimensional ground-penetrating radar strategies over an indoor archaeological site: convent of Santo Domingo (Lugo, Spain). *Archaeological Prospection* 17: 213-222.
- Nuzzo, L., Leucci, G. and Negri, S. (2009) GPR, ERT and Magnetic Investigations inside the *Martyrium* of St Philip, Hierapolis, Turkey. *Archaeological Prospection* 16: 177-192.
- Oimoen, M. J. (2000) An effective filter for removal of production artefacts in U.S. Geological Survey 7.5-minute digital elevation models. In *Proceedings of the 14th International Conference on Applied Geologic Remote Sensing, Las Vegas, 6-8 November 2000*: 311-319. Ann Arbor, Environmental Research Institute of Michigan.
- Oliveira, J. de (ed.) (2005) *São Salvador da Aramenha. História e Memórias da Freguesia. (Ibn Maruán. Revista Cultural do Concelho de Marvão 13 N° especial)*. Lisboa, Edições Colibri.
- Oliveira, J. de (2010) A pulverização da *Ammaia* na Alta Idade Média. In F. de Oliveira, J. de Oliveira and M. Patrocínio (eds), *Espaços e Paisagens. Antiguidade Clássica e Heranças Contemporâneas* 3: 167-186. Coimbra. Centro de Estudos Clássicos e Humanísticos.

- Oliveira, J. de, Fernandes, I. C., and Caeiro, J. (1996) Cidade Romana de Ammaia. *Ibn Maruán. Revista Cultural do Concelho de Marvão* 6: 15-22.
- Oliveira, J. de, Pereira, S. and Parreira, J. (2007) Nova carta arqueológica do concelho de Marvão. (*Ibn Maruán. Revista Cultural do Concelho de Marvão* 14 – Nº. especial). Lisboa, Edições Colibri:
- Olmo, L. (1998) Nuevas perspectivas para el estudio de la ciudad en la época Visigoda. In *Actas de las Jornadas Internacionales "Los visigodos y su mundo"*, Ateneo de Madrid, Noviembre de 1990 (Arqueología, Paleontología y Etnografía 4): 259-269.
- Osland, D. (2006) *The Early Roman Cities of Lusitania (BAR International Series 1519)*. Oxford, Archaeopress.
- Padrós Martí, P. (1998) El suministro de agua y la red de colectores en la ciudad romana de Baetulo. In A. Rodríguez Colmenero (ed.), *Los orígenes de la ciudad en el Noroeste Hispánico (Actas del Congreso Internacional, Lugo 15-18 de Mayo 1996)*: 599-621. Lugo, Diputación Provincial.
- Paliou, E. and Corsi, C. (forthcoming) “The whole is more than the sum of its parts”– Geospatial data integration, visualisation and analysis at the Roman site of Ammaia (Marvão, Portugal). In *Proceedings of the CAA 2012 Conference, Southampton 26-30 March 2012*.
- Palma, F. (2003) Resultados de las intervenciones arqueológicas realizadas durante el 2001 en el Foro Municipal de la *Colonia Augusta Emerita*. In J. M. Álvarez Martínez and T. Nogales Basarate, *Forum Coloniae Augustae Emeritae. Templo de Diana*: 429-439. Mérida. Asamblea de Extremadura.
- Peinador Fernandes, A., Correira Perdigão, J., Figueiredo de Carvalho, H. and Martins Peres, A. (1973) *Carta geológica de Portugal na escala de 1/50.000. Notícia explicativa da folha 28-D Castelo de Vide*. Lisboa. Serviços Geológicos de Portugal.
- Peña, J. T. (2007) *Roman Pottery in the Archaeological Record*. New York, Cambridge University Press.
- Pereira, S. (2009) A cidade romana de Ammaia. Escavações arqueológicas 2000-2006 (*Ibn Maruán. Revista Cultural do Concelho de Marvão* 2 – Nº. especial). Lisboa, Edições Colibri.
- Pereira, S. (2010) Ammaia: transformação e mudança na paisagem urbana. In: F. de Oliveira, J. de Oliveira and M. Patrocínio (eds) *Espaços e Paisagens. Antiguidade Clássica e Heranças Contemporâneas, 3 História, Arqueologia e Arte*: 153-169. Coimbra. Centro de Estudos Clássicos e Humanísticos.
- Pereira, S. (2011) Intervenções preventivas na área dos Estacionamentos (Ammaia). In A. Carneiro, J. de Oliveira, L. Rocha and P. Morgado (eds), *Arqueologia do Norte Alentejano: Comunicações das 3as Jornadas*: 241. Lisboa, Edições Colibri / Câmara Municipal de Fronteira.
- Persichini, S. (2012) The tripartite fora of the Augustan age in Lusitania. In W. Börner, S. Uhlirz and L. Dollhofer (eds), *Proceedings of the 16th International Conference on Cultural Heritage and New Technologies, November 14-16, 2011*: 441-461. Wien, Stadtarchäologie Wien.
- Pestana, M. I. (1992) Registros mineiros na região de Portalegre no período Fontista. *Ibn Maruán. Revista Cultural do Concelho de Marvão* 2: 207-219.
- Piçarra, J. M., Romão, J. C., Gutiérrez-Marco, J. C. and Oliveira, J. T. (1999) Preliminary note on the Ordovician-Silurian stratigraphic sequence of the Serra de São Mamede region, southern border of the Central Iberian Zone, Portugal. *Journal of Conference Abstracts* 4 (3): 15.
- Pintado, J. A. (2004) Apuntes sobre la “Quirina tribus” y la municipalización flavia de “Hispania”. *Revista Portuguesa de Arqueología* 7 (1): 343-364.
- Piro S., Mauriello, P. and Cammarano F. (2000) Quantitative integration of geophysical methods for archaeological prospection. *Archaeological Prospection* 7 (4): 203-213.
- Pope, G. A. and Miranda V. C. (1999) A geomorphology of megaliths: neolithic landscapes in the Alto Alentejo, Portugal. *Middle States Geographer* 32: 110-124.
- Powlesland, D. (2006) Beneath the sand, remote sensing, archaeology, aggregates and sustainability: a case study from Heslerton, the Vale of Pickering, North Yorkshire, UK. *Archaeological Prospection* 13,4: 291-299.
- Quaresma, J.C. (2010-2011), *Ammaia* (S. Salvador de Aramenha, Marvão, Portugal) no âmbito dos intercâmbios de bens e de gentes com o Norte peninsular durante o Alto-Império, *Oppidum* 6-7: 85-102.
- Ramirez, J. A. and Menéndez, L. G. (1999) A geochemical study of two peraluminous granites from south-central Iberia; the Nisa-Albuquerque and Jalama batholiths. *Mineralogical Magazine* 63 (1): 85-104.
- Ratola Duarte, I. M. (2002) *Solos Residuais de Rochas Granítóides a Sul do Tejo. Características Geológicas e Geotécnicas*. Universidade de Évora. Ph.D. thesis.
- Rebecchi, F. (1987) Les Enceintes Augustéennes en Italie. In *Les enceintes augustéennes dans l'Occident romain (France, Italie, Espagne, Afrique du Nord). Actes du colloque international de Nîmes. IIIe Congrès archéologique de Gaule méridionale, 9-12 octobre 1985. (Bulletin annuel 18)*: 129-150. Nîmes, Ecole antique de Nîmes.
- Reis, M. P. (2004) *Las termas y balnea romanas de Lusitania. (Studia Lusitana 1)*. Merida. Museo Nacional de Arte Romano.
- Remolà Vallverdú, J. A. and Acero Pérez, J. (eds) (2011) *La gestión de los residuos urbanos en Hispania: Xavier Dupré Raventós (1956-2006), in memoriam*. Mérida, CSIC.
- Ribeiro, O., Teixeira, C., Carvalho, H. de, Peres, A., Fernandes, A. P., Torre de Assunção, C. and Lapuente, P. (1965) *Carta geológica de Portugal na escala de 1/50.000. Notícia explicativa da folha 28-B Nisa*. Lisboa. Serviços Geológicos de Portugal.
- Richards, J. A. (1993) *Remote sensing digital image analysis: an introduction* (second edition). Berlin/London, Springer-Verlag.
- Richardson, J. S. (1995) *Neque elegantem, ut arbitror, neque urbanum: Reflections on Iberian Urbanism*. In Cunliffe and Keay 1995: 339-354.
- Rodríguez Alonso, M. D., Diez Balda, M. A., Perejón, A., Pieren, A., Liñán, E., López Diez, F., Moreno, F., Gámez Vintaned, J. A., González Lodeiro, F., Martínez Poyatos, D. and Vegas, R. (2004) Dominio del Complejo Esquisto Grauváquico: Estratigrafía. La secuencia litoestratigráfica del Neoproterozoico-Cámbrico Inferior. In J. A. Vera (ed.), *Geología de España*: 78-81. Madrid, Sociedad Geológica de España/Instituto Geológico y Minero de España.
- Rodríguez Hidalgo, J. M. and Keay, S. (1995) Recent Work at *Italica*. In Cunliffe and Keay 1995: 395-420.
- Rodríguez Temiño, I. (1991) La casa urbana hispanorromana en la *Colonia Augusta Firma Astigi* (Ecija, Sevilla). In *La casa urbana*

- hispanorromana. *Ponencias y comunicaciones. Congreso celebrado en Zaragoza del 16 al 18 de noviembre de 1988*: 345-353. Zaragoza, Institucion Fernando el Católico.
- Roldán Hervás, J. M. (1975) *Itineraria Hispana. Fuentes antiguas para el estudio de las vías romanas en la Península Ibérica*. Anejo de Hispania Antiqua. Universidades de Valladolid y Granada.
- Rosada G. (2001), "Locantur tabernae pergulis cum suis". The Cisalpine tabernae in urban topography. In *Carinthia romana und die römische Welt: Festschrift für Gernot Piccottini zum 60. Geburtstag: 171-192*. Klagenfurt, Verlag des Geschichtsvereines für Kärnten.
- Ruggiu, A. (1995) *Spazio privato e spazio pubblico nella città romana. (Collection de l'École Française de Rome 210)*. Roma, École Française de Rome.
- Ruiz Valderas, E. (ed.) (2001). *La casa romana en Carthago Nova. Arquitectura privada y programas decorativos*. Murcia, Murcia Tabularium.
- Saa, de M. (1956) *As Grandes Vias da Lusitânia. O Itinerário de Antonino Pio I*. Lisboa, Sociedade Astória Lda.
- Sanderson, D. J., Roberts, S. and McGowan, J. A. (1991) Hercynian transpressional tectonics at the southern margin of the Central Iberian Zone, west Spain. *Journal of the Geological Society* 148: 893-898.
- Santos Retolaza, M. (1991) Distribución y evolución de la vivienda urbana tardorrepublicana y altoimperial en Ampurias. In *La casa urbana hispanorromana. Ponencias y comunicaciones. Congreso celebrado en Zaragoza del 16 al 18 de noviembre de 1988*: 19-34. Zaragoza, Institucion Fernando el Católico.
- Schiffer, M. B. (1987) *Formation processes of the archaeological record*. Salt Lake City, University of Utah Press.
- Schmidt, A. (2001a) *Geophysical Data in Archaeology: A Guide to Good Practice*. Oxford, Oxbow.
- Schmidt, A. (2001b) Visualisation of multi-source archaeological geophysics data. In M. Cucarzi and P. Conti (eds), *Filtering, Optimisation and Modelling of Geophysical Data in Archaeological Prospecting. (Quaderni Prospettive Archeologiche, 50th Anniversary Issue)*: 149-160. Rome, Fondazione Ing. Carlo Maurilio Lerici/Politecnico di Milano.
- Schmidt, A. (2009). Electrical and magnetic methods in archaeological prospection. In Campana and Piro 2009: 67-82.
- Scollar, I., Tabbagh, A., Hesse, H. and Herzog, I. (1990) *Archaeological Prospecting and Remote Sensing*. Cambridge, Cambridge University Press.
- Shennan, S. (1988) *Quantifying archaeology*. Edinburgh, Edinburg University Press.
- Sidarus, A. (1991) *Ammaia de Ibn Maruán: Marvão*. *Ibn Maruán. Revista Cultural do Concelho de Marvão* 1: 13-26.
- Sillières, P. (1997) *Baelo Claudia*. Una ciudad romana de la Bética. (*Collection de la Casa de Velázquez* 61). Madrid, Casa de Velázquez.
- Silva, A. V. (1944) *Epigrafia de Olisipo. Subsídios para o estudo da Lisboa romana*. Lisboa, Câmara Municipal.
- Solá, A. R., Williams, I. S., Neiva, A. M. R. and Ribeiro, M. L. (2009) U-Th-Pb SHRIMP ages and oxygen isotope composition of zircon from two contrasting late Variscan granitoids, Nisa-Albuquerque batholith, SW Iberian Massif: Petrologic and regional implications. *Lithos* 111 (3-4): 156-167.
- Sommella, P. (1985-87) Modelli urbani in età repubblicana. *Quaderni del Centro Studi Lunensi* 10-12: 97-122.
- Sommella, P. (1998) Schemi programmatici e pianificazione edilizia nell'urbanistica romana in Italia. In A. Rodríguez Colmenero (ed.), *Los orígenes de la ciudad en el Noroeste Hispánico (Actas del Congreso Internacional, Lugo 15-18 de Mayo 1996)*: 209-218. Lugo, Diputación Provincial.
- Stempfhuber, W., Schnaedelbach, K. and Maurer, W. (2000) Genaue Positionierung von bewegten Objekten mit zielverfolgenden Tachymetern. In K. Schnädelbach and M. Schilcher (eds), *Ingenieurvermessung 2000, XIII. International Course on Engineering Surveying*: 144-154. Stuttgart, Wittwer Verlag.
- Streich, R. and van der Kruk, J. (2006) Three-dimensional multicomponent georadar imaging of sedimentary structures. *Near Surface Geophysics* 4: 39-48.
- Strutt, K. (2007) *Report on the Geophysical Survey at Dura Europos, Syria, April 2007 (SREP 5/2007)*. Southampton, Archaeological Prospection Survey Service.
- Strutt, K. (2009) *Report on the Geophysical Survey at Ammaia, Portugal, July 2009 (SREP 6/2009)*. Southampton, Archaeological Prospection Survey Service.
- Stylow, A. (1997) Apuntes sobre las tribus romanas en *Hispania. Veleia* 12: 105-123.
- Stylow, A. (2009) O estatuto jurídico de Ammaia: a propósito de uma inscrição copiada em 1810. In Stylow, A., Abascal, J. M. and Cebrián, R. (eds.) *Marvão e Ammaia ao tempo das Guerras Peninsulares. Ibn Maruán. Revista Cultural do Concelho de Marvão* 16 (Nº. especial): 35-55.
- Stylow, A., Abascal, J. M. and Cebrián, R. (2009) Marvao e Ammaia ao tempo das Guerras Peninsulares. *Ibn Maruán. Revista Cultural do Concelho de Marvao* 16 (No. especial). Lisbon, Edições Colibri.
- Taelman, D. (2012) *The Provenance, Supply and Use of Stone Material at the Roman Town of Ammaia*. Ghent University, Ph.D. dissertation.
- Taelman, D., Corsi, C., De Dapper, M., Deprez, S., Verdonck, L. and Vermeulen, F. (2011) Geoarchaeological research in the Roman town of Ammaia (Alentejo, Portugal). In *Multidisciplinary Approaches to Classical Archaeology – Multidisciplinari per l'Archeologia Classica. Proceedings of the 17th International Congress of Classical Archaeology, Rome 22-26 September 2008. (Bollettino Archeologia Online)*: 58-70 [http://151.12.58.75/archeologia/bao\\_document/poster/7\\_Corsi\\_2\\_e\\_altri.pdf](http://151.12.58.75/archeologia/bao_document/poster/7_Corsi_2_e_altri.pdf).
- Taelman, D., Deprez, S., Vermeulen, F. and De Dapper, M. (2009) Granite and rock crystal quarrying in the *Civitas Ammaiensis* (north-eastern Alentejo, Portugal): a geoarchaeological study. *BABesch* 84: 177-188.
- Taelman, D., Deprez, S., Vermeulen, F., De Dapper, M. and De Paepé, P. (forthcoming a) Pitaraña, a Granite Quarryscape in the Hinterland of Roman Ammaia (Alentejo, Portugal). In Y. Tristant and M. Ghilardi (eds), *Archéologie du paysage. L'Égypte et le monde méditerranéen*, BiEtud. Cairo, IFAO.
- Taelman, D., Elburg, M. A., Smet, I., De Paepé, P., Luis, L., Vanhaecke, F. and Vermeulen, F. (forthcoming b) Roman Marble from Lusitania: Petrographical and Geochemical Characterisation. *Journal of Archaeological Science*.

- Taelman, D., Elburg, M. A., Smet, I., De Paepe, P., Vanhaecke, F. and Vermeulen, F. (2012a) White, veined marble in Roman Ammaia (Portugal): provenance and use. *Archaeometry*: DOI: 10.1111/j.1475-4754.2012.00691.x.
- Taelman, D., Vermeulen, F., De Dapper, M. and De Paepe, P. (2012b) The Stones of Ammaia: Use and Provenance. In A. Gutiérrez García-Morena, M. P. Lapuente Mercadal and I. Rodà de Llanza (eds), *Interdisciplinary Studies on Ancient Stone. Proceedings of the IX Association for the Study of Marbles and Other Stones in Antiquity (ASMOSEA) Conference (Tarragona 2009)*: 117-126. Tarragona, Institut Català d'Arqueologia Clàssica.
- Teichner, F. (2007). Romanisierung und Keltische Resistenz: Die "kleinen" Städte im Nordwesten Hispaniens. In: *Die Selbstdarstellung der römischen Gesellschaft in den Provinzen im Spiegel der Steindenkmäler*. Akten des IX Internationalen Kolloquiums über provinzialrömisches Kunstschaaffen (Innsbruck, 2005): 202-216. Innsbruck, University Press.
- Thadeu, D. (1977) Hercynian paragenetic units of the Portuguese part of the Hesperic Massif. *Boletim da Sociedade Geológica de Portugal*, 20 (3): 247-276.
- Tobler, W. (1993) *Non-Isotropic Geographic Modeling. Technical Report 93-1*. Santa Barbara, National Center for Geographic Information and Analysis.
- Torres Balbás, L. (1982) Arte hispanomusulmán hasta la caída del califato de Córdoba. In R. Menéndez Pidal (ed.), *Historia de España* (second edition): 331-788. Madrid, Espasa-Calpe.
- Tranoy, A. (1990) L'organisation urbaine dans le *Conventus Scallabitanus*. In *Les villes de Lusitanie romaine. Hiérarchies et territoires*: 11-20. Paris, C.N.R.S.
- Trillmich, W. and Zanker, P. (eds) (1990) *Stadtbild und Ideologie. Die Monumentalisierung hispanischer Städte zwischen Republik und Kaiserzeit*. Kolloquium in Madrid vom 19.-23. Oktober 1987 (Verlag der Bayerischen Akademie der Wissenschaften, Heft 103): 43-54. München, C. H. Beck.
- Tsirkin, J. B. (1987) The Crisis of Antique Society in Spain in the Third Century. *Gerión* 5: 253-270.
- Tsirkin, J.B. (1994) Romanization of Spain. Socio-political aspect, Part III. Romanization during the Early Empire. *Gerión* 12: 217-253.
- Tsirkin, J.B. (1996) Romanization of Spain. Socio-political aspect (IV). Romanization during the Early Empire. Conclusion, 1. Espacio, tiempo y forma. *Historia antigua* 9: 265-280.
- Uribe Agudo, P. (2008) *La edilicia doméstica urbana romana en el Nordeste de la Península Ibérica (séc. I a.C - III d.C)*, Universidad de Zaragoza, PhD thesis.
- Valladares, M. I., Barba, P. and Ugidos, J. M. (2002) Precambrian. In W. Gibbons and T. Moreno (eds), *The Geology of Spain*: 7-16. London, The Geological Society.
- Van Roode, S., Corsi, C., Klein, M., Vermeulen, F. and Weinlinger, G. (2012) *Radiography of a townscape. Understanding, visualising and managing a Roman townscape*. In S. J. Kluiving and E. Gutmann-Bond (eds), *Landscape Archaeology Between Art and Science: From a Multi- to an Interdisciplinary Approach (Landscape & Heritage Proceedings)*, Proceedings of the 1st Landscape Archaeology Conference: LAC2010 (Amsterdam 26th – 28th January 2010): 429-441. Amsterdam, Amsterdam university press.
- Varene, P. (1987) L'Enceinte Augustéenne de Nîmes. In *Les enceintes augustéennes dans l'Occident romain (France, Italie, Espagne, Afrique du Nord). Actes du colloque international de Nîmes. IIIe Congrès archéologique de Gaule méridionale, 9-12 octobre 1985 (Bulletin annuel 18)*: 17-23. Nîmes, Ecole antique de Nîmes.
- Vasconcelos, J. L. (1935) Localização da cidade de Ammaia. *Ethnos* 1: 5-9.
- Verdonck, L. (2012a) Fluxgate Gradiometer and GPR Survey to Locate and Characterize the Perimeter, Early Imperial Centre and Street Network of the Roman Town Mariana (Corsica). In Johnson and Millett 2012: 241-260.
- Verdonck, L. (2012b). *High-resolution ground-penetrating radar prospection with a modular configuration*, Ghent University, PhD dissertation.
- Verdonck, L., Taelman, D. and Vermeulen, F. (2008) Ground-penetrating radar survey at the Roman town of Ammaia (Portugal). In *Geological Society of London EIGG meeting on "Recent work in archaeological geophysics"*, London, 16-17 December 2008: 35-36. London, Geological Society.
- Verdonck, L. and Vermeulen, F. (2011) 3-D GPR survey with a modular system: reducing position inaccuracies and linear noise. In M. G. Drahor and M. A. Berge (eds) *Extended abstracts of the 9th International Conference on Archaeological Prospection, Izmir, 19-24 September 2011*: 204-212. Istanbul, Archaeology and Art Publications.
- Verhegge, J. (2010) *Enhancing magnetic survey interpretation of Roman cities: geophysical data combination and archaeological feedback on Ammaia*. University of Bradford, unpublished MSc thesis.
- Verhegge, J., Schmidt, A., Gaffney, C., Vermeulen, F. and Verdonck, L. (2010) Enhancing magnetic survey interpretation of Roman cities: geophysical data combination and archaeological feedback on Ammaia. In *Recent work in archaeological geophysics. Abstracts. NSGG Day Meeting, London 15th December 2010*: 45-48. London.
- Verhoeven, G., Smet, P., Poelman, D. and Vermeulen, F. (2009) Spectral Characterisation of a Digital Still Camera's NIR-Modification to Enhance Archaeological Observation. *IEEE Transactions on Geoscience and Remote Sensing* 47 (10): 3456-3468.
- Verhoeven, G., Taelman, D. and Vermeulen, F. (2012) Computer vision-based orthophoto mapping of complex archaeological sites: the ancient quarry of Pitaraña (Portugal-Spain). *Archaeometry* 54 (6): 1114-1129.
- Vermeulen, F. (2011) Reviewing 10 years of aerial photography in the valley of the River Potenza (Le Marche). In Ceraudo 2012: 259-264.
- Vermeulen, F., Burgers, G. J., Corsi, C. and Keay, S. (eds) (2012) *Urban Landscape Survey in Italy and the Mediterranean*. Oxford, Oxbow.
- Vermeulen, F., Corsi, C. and De Dapper, M. (2012) Surveying the townscape of Roman Ammaia (Alentejo, Portugal): a geoarchaeological approach of the forum area. *Geoarchaeology* 27 (2): 105-187.
- Vermeulen, F., De Dapper, M., Corsi, C. and Deprez, S. (2005) Geoarchaeological observations on the Roman town of Ammaia. *Internet Archaeology* 19: [http://intarch.ac.uk/journal/issue19/corsi\\_index.html](http://intarch.ac.uk/journal/issue19/corsi_index.html).

- Vermeulen, F. and Taelman, D. (2010) From cityscape to landscape in Roman *Lusitania*: the Municipium of *Ammaia*. In Corsi and Vermeulen 2010: 311-324.
- Vermeulen, F. and Themudo Barata, F. (2010) Hidden landscapes and ancient landmarks: some theoretical and methodological issues of studying early historical landscapes in SW-Iberia. In A. Orejas, D. Mattingly and M. Clavel-Leveque (eds), *From Present to Past through Landscape*: 69 – 84. Madrid, COST.
- Villatoro, M., Henríquez, C. and Sancho, F. (2008) Comparación de los interpoladores IDW y Kriging en la variación espacial de PH, CA, CICE y P del suelo. *Agronomía Costarricense* 32 (1): 95-105.
- Vita-Finzi, C. and Higgs, E. S. (1970) Prehistoric economy in the Mount Carmel area of Palestine: site catchment analysis. *Proceedings of the Prehistoric Society* 36: 1-37.
- Viú, J. de (1852) *Estremadura. Colección de sus inscripciones y monumentos* I. Madrid, Montero.
- Vriend, S. P., Dekkers, M. J., Janssen, M. A. and Commandeur, J. (1991) Well sediments: a medium for geochemical prospecting, an example from the Nisa region, Portugal. *Journal of Geochemical Exploration* 41: 151-167.
- Ward-Perkins, J.B. (1970) From Republic to Empire. Reflections on the early provincial architecture of the Roman West. *The Journal of Roman Studies* 60: 1-19.
- Watters, M. (2009) The complementary nature of geophysical survey methods. In Campana and Piro 2009: 183-200.
- Wheatley, D. and Gillings, M. (2002) *Spatial technology and archaeology. The archaeological applications of GIS*. London, Taylor and Francis.
- Wood, J. (1996) *The geomorphological characterisation of digital elevation models*. Leicester, University of Leicester.