Conferências da Ammaia

Professor José Mattoso

nº 1

SIX YEARS OF RESEARCH IN *AMMAIA*
BUILDING A EUROPEAN FIELD LABORATORY FOR NON-DESTRUCTIVE ARCHAEOLOGICAL SURVEY

Cristina Corsi

Frank Vermeulen

Fundação Cidade de Ammaia

Conferências da Ammaia

Professor José Mattoso

SIX YEARS OF RESEARCH IN *AMMAIA*

BUILDING A EUROPEAN FIELD LABORATORY FOR NON-DESTRUCTIVE ARCHAEOLOGICAL SURVEY

Cristina Corsi and Frank Vermeulen

FICHA TÉCNICA

Editor (989-97643): Fundação Cidade de Ammaia

Autor: Cristina Corsi e Frank Vermeulen

Título da coleção: Conferências da Ammaia, Professor José Mattoso

Subtítulo: Six years of research in *Ammaia* - Building a European field laboratory for non-destructive archaeological survey.

Tiragem: 250

ISBN: 978-989-97644-2-2

Nota Prévia

Através da conferência proferida pelos Professores Cristina Corsi e Frank Vermeulen, damos continuidade às "Conferências da Ammaia – Professor José Mattoso" que a Fundação instituiu envolvendo no seu título o nome do ilustríssimo historiador que tanto tem apoiado os trabalhos científicos em curso na Ammaia desde há alguns anos. A presente conferência constituiu em certa medida a derradeira apresentação pública em Portugal dos resultados científicos obtidos no âmbito do projeto Radio-Past que decorreu na Ammaia e que se concluiu recentemente, o qual teve a Universidade de Évora como a entidade líder de um vasto consórcio internacional financiado pelas Ações Marie Curie da União Europeia.

Os dois oradores de hoje são de facto os responsáveis científicos por aquele projeto atribuído ao centro de Investigação da Universidade de Évora, CIDHEUS, Centro Interdisciplinar de História, Cultura e Sociedades que para o efeito mobilizou esses investigadores oriundos da Universidade de Cassino e da Universidade de Gent.

Este projeto além da importância científica de que se reveste envolve uma tecnologia não invasiva e não destrutiva na identificação das estruturas arqueológicas enterradas, tecnologia ainda pouco utilizada em Portugal, mas dirigidas neste caso à investigação das ruinas da cidade romana da Ammaia.

Os resultados obtidos genericamente permitem conhecer uma área estrutural da cidade com cerca de 25 ha, o que só seria possível vir a conhecer com o recurso ou método corrente de escavações intrusivas diretas nunca antes de cinquenta anos.

Para além do mais este projeto que resulta portanto do apoio direto da Universidade de Évora, constituí a primeira fase de internacionalização da atividade da Fundação em prol da divulgação científica no país e no estrangeiro das ruinas desta cidade romana, classificadas como Monumento Nacional desde 1949, mas totalmente abandonadas e ignoradas pelos poderes públicos.

Queríamos para terminar agradecer publicamente à Universidade de Évora na pessoa do seu antigo reitor Prof. Jorge Araújo, além do mais pela importância que atribuiu ao projeto designadamente quanto ao impacto na valorização do património arqueológico nacional assim como à Prof.ª Cristina Corsi e ao Prof. Frank Vermeulen o excecional trabalho realizado com impacto indiscutível na projeção internacional desta cidade romana localizada no norte alentejano.

Marvão, 29 de Novembro de 2013

Eng.º Carlos Melancia

Presidente do Conselho de Curadores

Fundação Cidade de Ammaia

Six years of research in *Ammaia*

Building a European field laboratory for non-destructive archaeological survey*

Cristina Corsi and Frank Vermeulen

In the autumn of 2007, on invitation of prof. Jorge Araujo, former rector of the Universidade de Évora, and with the support of our friend prof. Filipe Themudo Barata, we took over the scientific direction of the archaeological site of *Ammaia*, a deserted Roman town in Alto Alentejo.

The first steps taken following the "master plan" which we elaborated were the re-activation of the research and laboratory activities on the site, and the elaboration of several proposals for national and international calls.

Both these targets implied the setting-up of important international partnerships and the establishment of strong collaboration with other teams of specialists in different fields, with the ambitious goal of making *Ammaia* an international pole for research and innovation in archaeological survey.

The first objective, framed into the scientific activities of the *Centro Interdisciplinar de Historia, Culturas e Sociedades* (CIDEHUS) of the Universidade de Évora, has been achieved mainly in collaboration with the *Fundação Cidade de Ammaia*, and with the needful and strong support of the FCT.

Starting in 2008, several fellowships for technicians of the on-site laboratory of analysis and restoration and for young scholars for the study of the huge quantity of archaeological finds stored in the depot of *Ammaia* have been awarded, under our tutorship, by the FCT. At the same time a number of other specialists, Portuguese and foreign, have been involved in the material processing. At this stage, we can proudly say that most categories of old and new finds have been treated for conservation and studied, and analysis has been done on several categories of materials, like stone, ceramics and glass[1].

New campaigns of archaeological excavations were planned for the following summers, and students from many institutions in Portugal, Spain, Belgium, Italy and other countries came to *Ammaia* to be trained in the methodology of excavation in this very "international" context.

Simultaneously, research was restarted in the field of archaeological survey and landscape archaeology[2]; already in

[1] The catalogue of the several categories of finds which were studied in the course of these last 5 years will be published together with the excavation contexts in the volume *Ammaia II*. *The excavations 1994-2011*, edited by C. Corsi.

[2] In this sense, the project entitled 'Geo-archaeological research of Roman landscapes in Alentejo' [http://www.cidehus.uevora.pt/index_investiga.ht] is to be considered as the link between the activities which we carried out in *Ammaia* in the years 2001-2006, as "external" researchers and our new role of *investigadores visitantes* at UEvora. In this context, CIDEHUS collaborated with the Belgian University of Ghent and the Italian University of Cassino in developing a geo-archaeological approach to the region.

the summer of 2008, some tests were carried out with geophysical prospections[3].

The very good results achieved during this fieldwork pushed us to focus our "fund raising" activity in the field of "non-destructive" archaeology and **archaeological diagnostics**. By the term 'archaeological diagnostics' we mean a whole array of methodologies and approaches to the survey of archaeological sites, mainly referring to those that do not imply excavations, or at least only very limited ones. As in medicine, in fact, we can make a diagnosis assessing the state of the art (medical history), analysing the phenomena and evidence visible from outside (symptomatology), applying instrumental diagnostics and finally resolving to excavation (surgery) only when and where really needed, with the least "invasive" approach possible[4]. This very peculiar approach to archaeological research can be also described as "archaeology without excavations". In fact, it is not correct to think that archaeology is equal to "excavations" and that everything in archaeology is about "finding": instead, archaeology is all about understanding. In

[3] For brief history of these first years of activity in *Ammaia* under our direction see: C. Corsi, The *Ammaia* Project. Integrated approaches for studying Roman towns in *Lusitania*, in F. Vermeulen, G.J. Burgers, S. Keay, C. Corsi eds., *Urban Landscape Survey in Italy and the Mediterranean*, Oxford: Oxbow, 2012, pp. 160-169.

[4] The newest guidelines for good practice in archaeological diagnostics will be published very soon in the framework of the activities of hte EU funded project radio-past (infra), in the book edited by C. Corsi, B. Slapsak and F. Vermeulen for the series 'Natural Science in Archaeology' of Springer Publishing.

addition to, and sometimes instead of, excavation many other instruments and approaches are available to researchers for the reconstruction of ancient landscapes and townscapes. Aerial photography, for instance, has been used by archaeologists since the origin of photography itself, to "spot" from the air traces of buried archaeological features. Equally, survey and surface artefact collection are applied mainly to detect the presence of human settlement, mostly in the countryside and in green-field areas. Relatively more recently (the first experiments were performed in the 1940's) different geophysical survey techniques have been applied to detect subsoil archaeological features. A lot of information can traditionally also be found in historical documents and archives, in ancient sources and historical cartography.

In this way, we can collect a lot of information about what is still buried under the ground, and in the best cases, once all these data are pieced together, we have something comparable to a "radiography" of the subsoil features.

The integration of all these techniques has brought archaeology in the third millennium toward a restraint from excavations, as excavations are not only costly and time-consuming but – most problematically – each monument that is brought to light requires specialized, costly and often environmentally unsustainable restoration interventions.

Therefore, the second main objective of our master plan was pursued writing proposals inspired by this aim of experimenting in these fields.

The successful applications allowed us to start in *Ammaia* an advanced "open-laboratory" for innovation and experimentation, not only in fieldwork but also in aspects of interpretation, visualisation and valorization of these very peculiar types of datasets.
The most important projects which were, or still are, "based" in *Ammaia* are:

1) The EU funded FP7 project *"Radiography of the Past*[5]*,* short-named *"Radio-Past".* In this project four academic partners (the Universities of Évora, Ghent and Ljubljana and the British School at Rome) and three SMEs (7Reasons – Austria, Past2Present – the Netherlands and Eastern Atlas – Germany) have pooled their resources in order to develop integrated approaches to studying different urban sites (mostly Roman) and searching for effective ways in which to present their results to a wider public[6].
In other words, the Radio-Past project has first sought to integrate different methodologies in the widely developed field of non-destructive survey technologies as applied to

[5] This project is part of the Marie Curie/People IAPP 2008 GA 230679 program (see the project website: www.radiopast.eu).
[6] S. van Roode, C. Corsi, M. Klein, F. Vermeulen, G. Weinlinger, Radiography of a townscape. Understanding, visualising and managing a Roman townsite, in S.J. Kluiving e E. Guttmann-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), Amsterdam: Amsterdam university press, 2012: 429-441.

archaeology. But it has also pursued the validation of the results through innovative methods of visualisation and the development of strategies for the efficient management of the cultural heritage sites studied. The idea was to develop a standard set of survey approaches, based on a series of already widely used methods as well as more innovative methods such as active low-altitude aerial photography, geophysical prospection, light detection and ranging (LiDAR) surveys and geomorphological observations, which can in the future be efficiently used in a comparable and integrated way on a wide range of complex sites in Europe.

Furthermore, the project also targeted the development of effective scientific systems for the dissemination of survey results. In particular, the combination of high-resolution fieldwork with computer-based means of mapping and data visualisation allows the virtual reconstruction of buried towns or large settlements within a relatively short space of time. This is opposed to the more traditional excavation-centred approach where it can take generations before a broader view of the site becomes available. It is essential, in fact, that specialists can disseminate this knowledge to the wider public by means of efficient and imaginative communication systems and that they find ways to make visitors experience the “invisible” ancient settlements still hidden under their feet.

The partners have selected several “test sites” where they have gathered to cooperate in fieldwork, experimentation

and training activities. *Ammaia* has been chosen in the framework of this project as the main 'open-lab' of the consortium. The project Radio-Past was launched in April 2009 and terminated on March 31st 2013.

2) The second project is entitled: *"The Ammaia project. A concerted action of archaeology, natural sciences and applied technologies to place a Roman town in context",* financed by the Portuguese National Fund for Research (FCT)[7]. In this enterprise, UEvora (here represented by the research centres CIDEHUS and HERCULES) its main partners are the Department of Electrical Engineering and the Institute for Systems and Robotics (ISR) of the Instituto Superior Técnico (IST) in Lisbon. The foremost objective of this project is the creation of opportunities to transfer knowledge and to validate developments and innovation in the methodology of archaeological surveys. One of the priorities of this project is the development of a new 'low budget' system for high-resolution low altitude LiDAR scanning. Another priority is to investigate further possibilities in the automation of certain types of field survey, such as geophysics. This project, which will last for three years, was launched in 2010.

3) Another very important collaboration has been established in the framework of the *Projectos transfronteiriços bilaterais*

[7] Official denomination of this FCT project is: FCOMP-01-0124-FEDER-010492 (PTDC/HIS-ARQ/103227/2008)

of the *Rede de Investigação Transfronteiriça Extremadura-Centro Alentejo* (RITECA), with the Instituto de Arquelogia de Mérida. The project entitled “Revalorizaçaõ do património arqueológicos: a aplicação de técnicas de análise não destructivas” intends to extend the acquisitions and the experimentations done during these last years by our team to other “neighboring” geographical contexts and to broaden the approaches applied to this specific field of research, experimenting new techniques, exchanging experience and expertise.

* * *

The data captured during these last 6 years of intensive fieldwork have brought to the understanding of many aspects of the ancient town of *Ammaia* and to a preliminary reconstruction of its townscape during the heydays. These newest results have been integrated with what was already known thanks to traditional excavations and former research. On these results we will focus our attention here.

The site of the former Roman town of *Ammaia*, located in the municipality of Marvão, in the district of Portalegre in Alto Alentejo, is a quite interesting one. The archaeological evidence of this now-abandoned town-site is mostly hidden on the hillside immediately south of the small ‘street-village’ of São Salvador de Aramenha, in the beautiful Rio Sever valley.

The few standing ruins, still visible above-ground, had already attracted the attention of Portuguese and Spanish historians in the sixteenth century, when many monuments of ancient towns were despoiled to procure readily available building stones.

Progressively, the ruins have been recognized as relevant to the site of this abandoned Roman town and finally in 1994 regular archaeological excavations started under the responsibility of the *Fundação Cidade de Ammaia*, in partnership with the universities of Évora and later Coimbra. These excavations were almost all centred on places where some visible ruins indicated the underground presence of Roman structures. They were focussed on the parts of the city wall with towers and a gate (Porta Sul) on the southern side, with the remains of housing and a monumental paved square and a road in the same sector[8]. In addition, there were the remains of a town house in Quinta do Deão, parts of public baths, and the remains of the centrally located forum with the *opus caementicium* nucleus of the podium of a temple.

The other types of investigation, which we mentioned earlier, paralleled the traditional excavations, and an extensive program of geo-archaeological research started already in 2001. This interdisciplinary survey lead to the discovery and mapping of the Roman aqueducts, the hypothetical

[8] S. Pereira, *A cidade romana de Ammaia. Escavações arqueológicas 2000-2006* (*Ibn Maruán. Revista Cultural do Concelho de Marvão* 2 – Nº. especial). Lisboa, Edições Colibri, 2009.

delineation of the wall circuit, a better comprehension of the relationship between town and countryside, and to the identification of primary resources for the economy of the town, such as stones, minerals and metals[9].

The town surface of some 20 hectare enclosed in the wall-circuit of our proposal was surely not fully urbanised: the slope of Malhadais hill, in the western part of the site, is too steep to allow building. However, we think that, as in several other Roman towns located in undulating landscapes, that the small hilltop was included for strategic and functional reasons.

As we saw, in 2009, with the launch of the project Radio-Past which selected *Ammaia* as one of the main open-labs for testing the integration of non-destructive approaches, a new program of field research was started. The close integration of fieldwork, targeted excavations, remote sensing, topographic survey and geophysical prospection results has allowed the reconstruction of the full town layout, with the delineation of the very regular street-grid and the definition of the characteristics of its main monuments and housing sectors. This intensive survey work has produced a truly remarkable plan of the ancient city and some urban details come out in a spectacular way (**fig. 1**)[10].

[9] F. Vermeulen, M. De Dapper, C. Corsi and S. Deprez, Geoarchaeological observations on the Roman town of Ammaia. *Internet Archaeology* 19, 2005.

[10] The final results and their interpretation have been presented in the book edited by C. Corsi and f. Vermeulen, *Ammaia I: The Survey A Roman Lusitanian townscape revealed* (ARGU 8), Ghent: Academia Press, 2012.

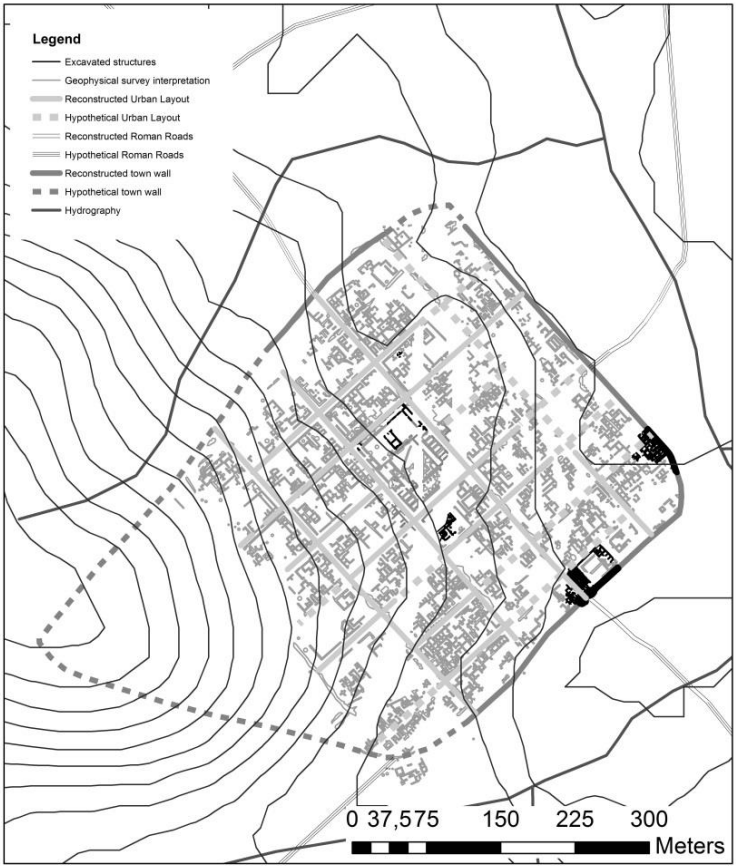

Fig. 1: *Ammaia*, S. Salvador de Aramenha (Marvão). Archaeological map of the town, integrating data from excavations and geophysical survey (elaboration C. Corsi).

We know that some of the main streets of the town were flanked by porticoes. On the basis of comparative research and of the architectural pieces found on the site, we can reconstruct them as segments of arcades lining the sides of a number of housing blocks. These arrangements are partially decorative and partially functional and they were meant to add "decor" to urban road axes and at the same time to offer comfort to passers-by and shelter for pedestrians. These arcades, in fact, elevate the urban axes to the level of "showpiece streets" and they are a very clear example of how, in ancient towns, streets were not simply regarded as pathways connecting one place to another. Rather, the function of these covered passageways is to create public space for business and social activities in whatever weather condition. In *Ammaia*, rows of shops (*tabernae)* are often present along the inner sides of these porticoes.

Even if with some uncertainty, we can propose for these porticoes a reconstruction of the first phase with a one-storey single pitched roof, with tiles and roof tiles, supported by rows of granite columns composed of several drums, up to a height of around 3m (circa 10 Roman feet)[11] (**fig. 2**).

In the following phases, we can expect these arcades to be affected by transformations, implying also enlargements of the portico's width and often conversion into enclosed spaces, with the construction of walls between the columns or pillars and the infilling of the bays.

[11] An earlier phase with wooden installations can also be conceived.

Fig. 2: *Ammaia*. 3D reconstruction of a streetview of the *cardo maximus* bordered by porticoes (elaboration M. Klein, 7Reasons).

Most blocks of the urban grid seem to be partly or sometimes fully occupied by housing complexes, even if commercial and artisanal functions (*tabernae*, workshops, etc.) are also present in many *insulae* where some are no doubt directly associated with the domestic life[12].

In different sectors we have been able not only to distinguish easily all essential walls, floors and even columns, but also other meaningful linear structures, such as local aqueducts or drainage systems, and the associated basins, fountains, *impluvia* or cisterns, and sometimes even ovens, cooking installations and hypocausts, the "heating systems" of antiquity.

[12] Corsi C., Johnson P.S., Vermeulen F., A Geomagnetic Survey of Ammaia: a contribution to understanding Roman Urbanism in Lusitania. *Journal of Roman Archaeology* 25, 2012, pp. 121-145.

What we can see through the “radiography of the subsoil” is a town carefully planned, according to a quite regular grid, well connected with a number of gates. Not all the blocks have the same dimensions though. The two central rows of blocks are bigger, as in the very centre of this grid the big complex of the forum, the monumental centre of the town, was located.

The forum of *Ammaia*

In Roman towns, the forum is the central place of urban life, normally a square where all prominent buildings for civic life are positioned. The square is the busiest meeting point, where business and political affairs are negotiated, the place where the orators harangue the crowds, where all notices and decrees are posted, where the notables of the city and the heroes of the Roman world are celebrated with honorary inscriptions and monuments. The most important temples and sacred buildings for the protection of the town are placed in the forum. Here justice is administered and the civil and political life of the city is discussed in monumental buildings or covered halls which border the open square.

For this reason, in the urban plan, the forum of *Ammaia* occupies the two central blocks of the street grid, raised to a very pivotal position. It is connected to the main gates by the principal urban axes, the so called *cardo maximus* (oriented from north-west to south-east, connecting the southern gate

with a possible gate on the northern side of the city walls) and the so called *decumanus maximus*, perpendicular to the *cardo*, passing the complex on its southern side, exiting the town from the eastern gate. As the terrain is gently sloping from north-west to south-east, the forum complex is built on a huge wedge-shaped platform. On the south-eastern side, to compensate the height difference, a *cryptoporticus* was built.
A *cryptoporticus* is a semi-subterranean gallery or vaulted corridor, on top of which is usually a real portico[13].
Until recent years, very little was known of the *Ammaia* forum: only the almost shapeless concrete nucleus of the high podium that supported the central temple is preserved, and very limited excavations have brought to light segments of the portico and cryptoportico which surrounded the square.
The "radiography" of the subsoil taken by the Radio-Past team by means of geophysical survey, paralleled with some limited archaeological excavations intended as a field-check (what is called "ground-truthing"), allowed us to fully reconstruct the plan of the complex, which we can establish measured 88 by 65m. It can easily be ascribed to the well-spread type named "tripartite forum" or "forum block". It is in fact characterized by the combination of three sectors with different functions: a temple or an *aedes*, often raised on a platform; a central courtyard; and a basilica hall (**fig. 3**).

[13] F. Vermeulen, C. Corsi, M. De Dapper, Surveying the Townscape of Roman Ammaia in Portugal: An Integrated Geoarchaeological Investigation of the Forum Area, *Geoarchaeology* 27, 2, 2012: pp. 123-139.

Fig. 3: *Ammaia*. Archaeological plan of the forum area integrating data from excavations and geophysical survey (elaboration C. Corsi, and the basis of the interpretation by L. Verdonck).

The sacred part of the *Ammaia* forum was dominated by what could probably be interpreted as a *capitolium*-type temple. The latter was erected on a podium, measuring some 9 by 17m. The temple was equipped with a monumental

staircase on its short south-eastern side, directed towards the square. Its entrance way was probably flanked by symmetrically placed water basins (**fig. 4**).

Fig. 4: *Ammaia*. 3D reconstruction of the northern part of the forum, where the main temple hypothetically flanked by two water basins is located (elaboration M. Klein, 7Reasons).

The very symmetrical central square of the forum measures some 53 by 31m. It is surrounded by a 6m wide portico fronting on either side 7 rows of rectangular “rooms” with dimensions around 9 by 5m. The latter are probably predominantly *tabernae*.

The geophysical surveys indicated the presence of a whole series of mostly rectangular structures positioned on this forum square. They could possibly indicate different podia, statue bases and even cisterns. One linear diagonal feature is

most probably the aqueduct leading to one of the water basins.

On the opposite site of the square from the temple was the basilica, an elongated rectangular hall (circa 46 by 17m), internally supported by two rows of columns or pillars, spaced at about every 4m. The naves were perhaps unequal in width and the central aisle was around 7m wide. Its entrance is probably located centrally in its northern long side.

On the short south-western side the three-aisled building was flanked by three elongated rooms, whose function is still unknown, but it is believed that they were linked with the administrative functions of the building. There is also comparative evidence to possibly interpret some of these rooms as devoted to the imperial cult.

The preliminary study of the archaeological finds points to the mid-first century AD (possibly the reign of Claudius) for the beginning of the construction of the monumental complex, with an early phase of renovation probably undertaken in Flavian times (the last quarter of the first century AD). Comparanda of plan and chronology can be found in *Lusitania (Augusta Emerita, Ebora Liberalitas Iulia, Pax Iulia, Sellium* and *Bobadela)* and in the wider context of the other Hispanic provinces[14].

[14] S. Persichini, 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, 2012.

The bath complex

The excavations at the bath complex, situated immediately south of the forum, were started in 1996, along with several other irregularly spaced campaigns until 2003, while a new program of stratigraphic investigations started in the summer of 2008. Excavation campaigns have continued in the following summers in order to thoroughly investigate this important urban building, which was partly destroyed by the modern road crossing the site[15].

What had been brought to light are parts of a vast complex, containing one room which was clearly identified as a bath facility, probably heated, and the corner of a well-built *natatio*. In between them, there seems to occur a large space whose floor was probably originally laid on *suspensurae*, which however have been devastated by spoliation activities. Even considering the fact that only a very small portion of the original floor above the hypocaust is preserved, it seems that it was cut in a later phase by a stone built sewer, whose western side was constructed with some reused materials (e.g. column drums), while the more original eastern side was linked to the foundation of the massive wall delimiting the *natatio*.

[15] C. Corsi and F. Vermeulen, 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 antike Thermen*. Aachen, 18.-22. März 2009, (Babesch Supplements, 21), 2012, Leuven, Peeters Publishers, pp. 183-190.

The bath (ambiente A), plastered with marble slabs laid on thick layers of pinkish mortar, was made accessible by a short flight of 3 steps, and went through several structural transformations, meant to reduce the capacity. A lead fistula conducted water out to a channel covered with schist slabs.

The structures of this bath are partially reused existing walls, with the same orientation. The *natatio* (or *piscina*) was built with big, well squared blocks of granite, inserted into the huge *caementicium* nucleus that delimits the two walls. The interior of the pool had been plastered with carefully smoothed mortar, and was probably originally covered with marble slabs.

In order to better comprehend the planning of the complex and to have a careful understanding of the kind and disposition of the heated rooms, we undertook several campaigns of topographic and geophysical survey of the whole area of the bathhouse and the surrounding blocks. The use of a specially developed Ground Penetrating Radar system to make the “x ray” of structures still buried under the pavement of the road connecting Marvão to Portalegre, which cuts though the Roman town, allowed for excellent additional data. Furthermore, by careful analysis and positioning of several still-standing or detectable wall structures on the edge of the street and by linking them up with the results of detailed GPR and magnetic surveys of the remaining agricultural space in this area of *Ammaia* along with the results of the new digs, we are now able to obtain a

much better understanding of this monumental complex and even to propose a detailed reconstruction of the whole plan. We can now propose a reconstruction of the pool in 15 by 12m, with an original depth close to 1,70m.

The new excavations clearly confirmed that the bathhouse was not the first building in this part of the city. It was preceded by a possible rectangular building structure with portico (?), whose function is still unclear, but which cannot at the moment be connected with a thermal use. According to wider geophysics results pertaining to the original insula south of the forum, and to the dating of the very few finds connected with this first occupation phase, it might be part of pre-Flavian town structures, possibly with residential function (*domus*?). Some destroyed flooring in *opus spicatum* is associated with this earlier phase.

According to the preliminary analysis of associated pottery, somewhere in later Flavian times or the early second century AD a bathhouse was constructed here. Taking all data into consideration this was probably a rectangular structure of min. 40 by 40m. The occupation of the complex lasted fully into the third century, but it is possible that in the course of the fourth century AD the complex lost the use as thermal bath to be converted in something else.

Porta Sul

Without doubt the best-preserved monument of Roman *Ammaia* is the town's southern gate or the so-called Porta Sul. In the earlier years of the existence of *Ammaia*, this area was used as living quarters. Underneath the remains of the western half of the paved square, the remains of early houses and of a related dirt street are still visible. The original entrance to the town and these earlier structures were completely dismantled for the construction of the monumental gate complex during the Flavian–Trajanic period, at the end of the first century AD or the beginning of the second century AD.

The new architecture was dominated by an arched gate-building flanked by two massive circular towers and a monumental square. The towers measured more than 6m wide and were separated by the gate entrance and a small courtyard. Until 1891, the original arched gate was preserved and reused in the nearby village of Castelo de Vide. Of the original decoration of the towers, nothing has preserved. Nevertheless, few fragments of marble illustrate that the tower walls were decorated with white marble or pink limestone tiles coming from Estremoz (Portugal) (white marble) and Alconera (Spain) (pink limestone)[16].

Between the towers, the remains of the gate system are still visible. The well-developed cart ruts in the granite blocks of

[16] D. Taelman, S. Deprez, F. Vermeulen and M- De Dapper, Granite and rock crystal quarrying in the *Civitas Ammaiensis* (north-eastern Alentejo, Portugal): a geoarchaeological study. *BABesch* 84, 2009: pp. 177-188.

the gate threshold are interesting features. These deep cart ruts prove that Porta Sul was one of the town's main entrances through which heavily loaded carts entered or left the town.

The gate building opens onto a large rectangular square of some 21 by 24m paved with large granite blocks. It is symmetrically arranged on either side of the 4 m wide *cardo maximus*, the main North-South Street of *Ammaia* that passed alongside the town's major buildings such as the bathhouse and the forum (**fig. 5**).

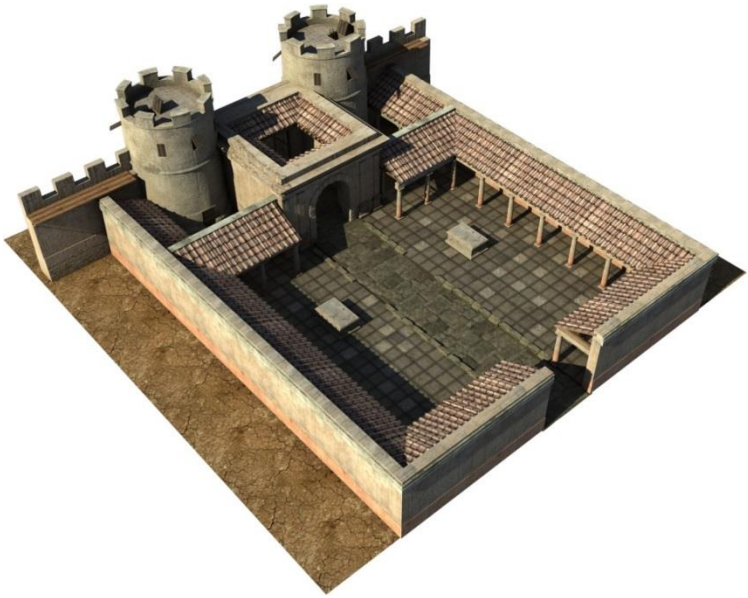

Fig. 5: *Ammaia*. 3D reconstruction of the southern gate and of the square which was opened in its inner side, where one of the main streets of the town, the *cardo maximus*, departed (elaboration M. Klein, 7Reasons).

Three columns found during the excavation of the *cardo maximus* illustrate the architectural decoration of the square. In the middle of both sides of the square, a statue on a small podium originally decorated the complex. We assume that along the sides of the square, a canvas provided the necessary shade during the hot summer for the visitors of the Porta Sul. A small doorway in the eastern part of the square opens onto a large building, hypothetically identified with a *macellum* or food market.

Several elements of the monumental gate building illustrate that the architects of the *Ammaia* monument had good contacts with architects in other important towns in Roman *Lusitania*. For example, the construction technique of the towers and the inner courtyard is similar to that used for the temple of Diana at the colonial forum and for the Portico del Foro, both in *Emerita Augusta*, modern Mérida in Spain. Similarly, the paved square resembles the paved square of the colonial forum in *Emerita Augusta*.

In the second half of the second century AD, a fire destroyed a large part of the complex and several changes were made to the architecture of the monumental gate building. Near the town wall, *tabernae* or small shops were created where hot drinks and food were sold. The general view and layout of the town entrance with its gate building, towers and monumental square, however, remained the same until the town was abandoned from the late 4th or early fifth century AD onwards.

The "*suburbium*"

Ancient towns have to be considered as nodes in a flexible and constantly changing grid. Their impact on the surrounding landscape was often impressive and the tight nexus of town and countryside was essentially a relationship of interdependency. Archaeological research of recent decades has now developed a set of tools which help to demonstrate more vividly this urban impact on the countryside. In the territory of *Ammaia*, the most fruitful approaches for the investigation of the *suburbium* (the closest outskirts of an urban centre) proved to be geo-archaeological and geophysical survey (**fig. 6**).

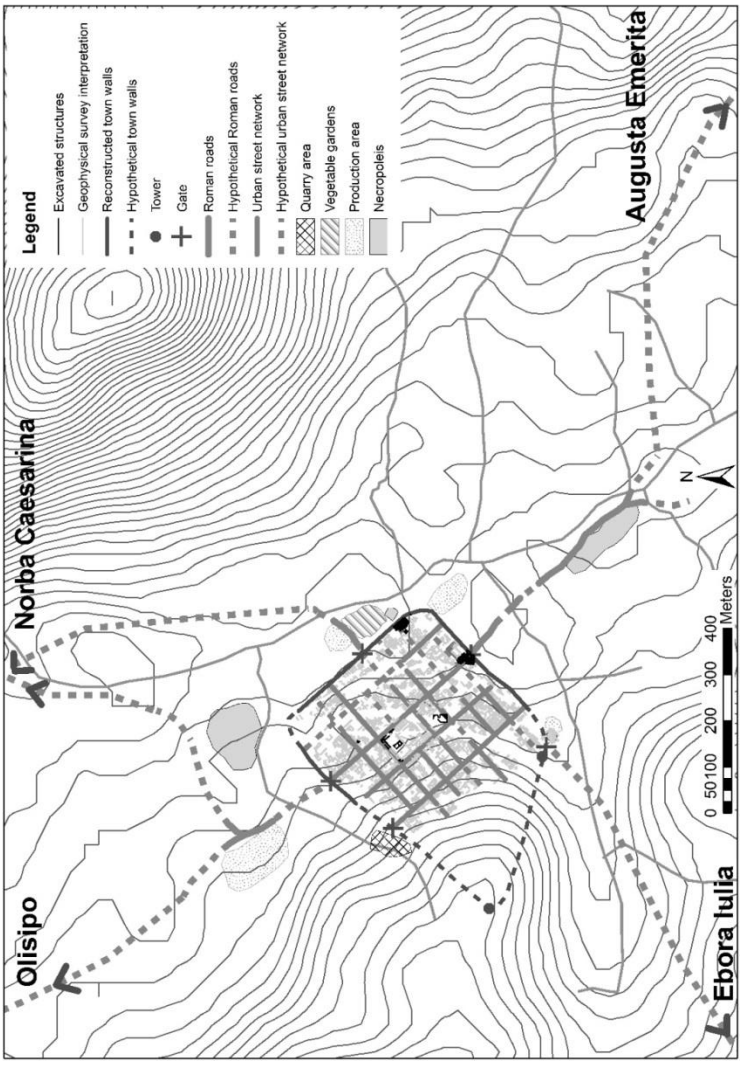

Fig. 6: *Ammaia*. Archaeological map of the town and its suburbium, integrating data from excavations, geophysical and topographical survey (elaboration C. Corsi).

The most prominent characteristic is the road network, in most cases linked to the intra-mural street grid. The most important road for *Ammaia* was evidently the one leading to the provincial capital *Emerita Augusta*. It leaves the town at its monumental south-gate, to head in a straight line in a southeastern direction. A second road exits the town at the south gate, but switches immediately in a southwestern direction. Maybe also a road for smaller traffic, leaving from a secondary gate whose location at the southern corner of the wall circuit is proposed by the intra-mural geomagnetic prospection, joins up with this road. This road formed a direct connection with the Roman town of *Ebora* and the important marble quarries of the Estremoz area.

A third road leaves the town from the presumed gate located near the midpoint of the NE side of the walled enclosure. Its trace is picked up by the extra-mural magnetic survey and it leaves this gate first in a north-eastern and then, near the River Sever, in a northern direction. At Ponte Velha, the road divides into a northern and an eastern trajectory. The northern trajectory passes through a zone of intensive rural exploitation with many Roman *villae* and smaller farms. Further to the north, the road might connect with the road going to the River Tagus in the direction of *Aegitania* (Idanha-a-Velha). The eastern trajectory probably continues to the town of *Valentia* (Valencia da Alcântara?) and *Norba Caesarina* (Caceres), the neighbouring *civitas* capital,

following more or less the same course as the modern road from Marvão.

Finally, a fourth road leaves town from the presumed gate in its northwestern walled side, with the same orientation (45° NW) as the intramural *cardo maximus*. It seems to connect *Ammaia* with *Aritium Vetus* (Alvega?) where an important crossing of the River Tagus River is proposed, passing on its way Castelo de Vide and an area with several Roman *villae* and farms. It is also seems to connect *Ammaia* to the main central Lusitanian road system and eventually to *Olisipo* (Lisbon) in the West[17].

Along these roads, the main *necropoleis* (the funerary areas) were located: geophysical survey and legacy data identify some of them along the southern and the northwestern roads, and in front of the museum, where the modern car-park is located. Here the base of a monumental tomb made out of large granite blocks, found during recent excavations, is still visible.

"Industrial" (quarrying of building stones and workshops for metals) and agricultural (mainly vegetable gardens) activities can also be located respectively on the northwestern side, near the steeper part of the slope of Malhadais hill, where earlier research had wrongly presumed the presence of a Roman theatre, and in the eastern area toward the Sever river. Here the magnetic survey also revealed building

[17] V. G. Mantas, *As Vias Romanas da Lusitania*, (Studia Lusitana 7), Merida: Museo nacional de Arte Romano, 2012.

structures, on both sides of the main road leaving the town as a prolongation of the *decumanus maximus*. The intensive surveys revealed here the presence of many metal artefacts and slag, indicating a function at some moment in time connected with metal works and small suburban industry.

The 3D reconstructions

A most interesting facet of the interdisciplinary work achieved in *Ammaia* these past six years was the development, from detailed archaeological fieldwork to a full 3D reconstruction of the site during the period of its greatest expansion and glory, the second century AD.

As we have seen, *Ammaia* served as an ideal test site to apply state-of-the-art technology for non-destructive surveys uncovering the remains of a complete Roman urban settlement, partly due to its exceptional condition of preservation. The resulting data, mostly in the shape of geophysical images and their archaeological interpretations, have now been used to approach a complete virtual reconstruction of the town and its surrounding landscape.

The visualisation of these geophysical results was approached by referencing the *Ammaia* data with better preserved and excavated sites of the ancient regions of *Lusitania* and *Hispania*, comparing similar structures and dimensions, in order to visualise local architectural features and details of decoration. Digital Elevation Models, geophysical results and 3D Laser scans are taken into account

to build the ancient terrain, where the results of the architectural 3D reconstruction reside. Special programs were used to achieve realistic results and breathe life into the scenes. Sophisticated hard- and software were introduced to drive the animation of computer generated people to ensure correct movements while keeping the production costs feasible. Specialised render algorithms enabled the creation of terrain features, like plants, stones and boulders as well as populating the scenes with (simplified) animated characters.

The intricate methods involved in such virtual reconstructions are multifarious and have to be adapted to the special characteristics of this site. Procedures which had been developed and tested over the past years in some other parts of Europe, were applied and refined, while other new techniques had to be developed to suit the necessity of this specific project. The workflow as well as the different fields of activities involved in the process of the 3D reconstruction of *Ammaia*'s cityscape is mostly innovative and a nice example of good practice for further work of this kind in Europe.

We can visualise now the main public monuments in their coherent setting: the forum, the public baths, the square at the southern gate, and understand the plan of most of the blocks with houses of different types, workshops and shops. Of course, the image we have thanks to our research is a "synchronic" one, meaning that different phases, related to

transformations and changes which have affected these buildings, sometimes during several centuries of occupation, are all “squashed” into one plan and one reconstruction. In most cases we cannot understand the real evolutions of these buildings, but in some examples, mostly the 3-dimensional information collected by means of GPR survey, integrated with some focused stratigraphic ground-truthing excavation and higher resolution earth-resistance survey, the definition of a certain phasing in the transformation of urban houses is possible.

Conclusions

The analysis of the archaeological record collected so far allows us to propose for *Ammaia* a foundation during the Principate of Augustus, possibly in the last years of the first century BC or the very beginning of the new Era. The foundation is clearly framed in a well-defined project, intended to create a settlement that could serve as “central place” for the exploitation of the land and its natural resources and as junction along the road-network connecting inner and coastal Lusitania, which helped to design the layout of the town in detail.

At this stage we cannot establish the original political status of this settlement. However, an inscription of 44/45 AD qualifies *Ammaia* as a “*civitas*” (IRCP, 615: *civitas Ammaiensis*), and one of 166 AD defines it “*municipium*”

(IRCP, 616: *municipes Ammaienses*). Therefore, we are sure that the town achieved first the "*civitas*" status and later the municipal one. The elevation to the status of Latin *municipium* would have happened during the period between the second half of the first and the first half of the second century AD, possibly already during the Flavian era.

The study of finds seems to prove that the town flourished during the second and third centuries. In the course of the fourth century, a few monuments were renovated and even if some sectors do not appear to be very "lively", the Late Imperial phase is still very perceptible. After the fifth century, the city seems to have gradually fallen into abandonment, as the inhabited areas shrank: recent excavations have shown that some parts were already covered by floods and slope deposits during Late Antiquity, and that some constructions, presumably private buildings, invaded the public spaces. Ancient sources inform us that when the Arabs conquered the region in the last quarter of the ninth century, the Muladi chieftain Ibn Marwân settled on the nearby and strategically well-situated stronghold which was named Marvão after him, and boasted that he was Lord of the 'Fortaleza de Amaia'. At that time, the Roman site was presumably totally abandoned.

It is now time to revive the place again and researchers from many European countries have worked hard these past years to bring *Ammaia* a bit back to life. This can be a new start for a Lusitano-Roman site with great potential to understand the

Past and create a new future for the region. As part of the project Radio Past also a first base has been lead for a fully integrated management plan of the site. This takes care of the presentation and divulgation of the site, its museum and wider environment, to different groups of the general public. The elaboration of targeted management plans for sites where most of the archaeological evidence is 'invisible' is a first step toward the sustainable integration of archaeology into the social and economic texture of smaller and wider regions. We hope that this can be moved further now by the local and regional community in close association with national and international entities. To our opinion the musealization of the site and further use as a scientific laboratory can now be brought to full synergy.

***** *The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) and from the Portuguese National Fund for Research (FCT - Fundação para Ciência e Tecnologia), under the Fundo Europeu de Desenvolvimento Regional (FEDER), in the framework of the Quadro de Referência Estratégico Nacional.*

These results were achieved thanks to the collaboration of many colleagues, collaborators and friends that is impossible to mention individually here. Still, we wish to express our gratitude to each one of them for the great privilege we were offered to direct this challenging enterprise.

A Fundação Cidade da Ammaia, pessoa colectiva de direito privado, foi constituída por escritura pública em 27 de Novembro de 1997, tendo por objecto social a prossecução de acções de ordem cultural, educativa e filantrópica, podendo também actuar na área da ciência, e nas áreas social e do desporto. Mercê da sua actividade no estudo e preservação do património arqueológico nas ruínas da cidade romana de Ammaia, classificadas como Monumento Nacional desde 1949, obteve o Prémio Vasco Vilalva da Fundação Calouste Gulbenkian em 2009. Foi considerada Instituição de Utilidade Pública pelo Despacho n.º 15694/2010, publicado no D.R., 2º Série, nº 203, de 19 de Outubro.

Quinta do Deão, Estrada da Calçadinha n.º 4, São Salvador de Aramenha, 7330-318 Marvão, Portugal.

Telefone: 00351 245 919 089 Website: www.ammaia.pt
Fax: 00351 245 909 001 E-mail: fundacao@ammaia.pt