

## 5.9 Radiography of a townscape.

### Understanding, visualising and managing a Roman townsite

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#### **INTRODUCTION**

In spring 2009, a European project, short-named ‘Radio-Past’, was launched within the FP7 Marie Curie framework ‘Industry-Academia Partnerships and Pathways’. The project, fully titled ‘Radiography of the past, integrated non-destructive approaches to understand and valorise complex archaeological sites’, aims to join different resources and skills to improve, refine and validate intensive archaeological surveys on complex sites, with a special focus on abandoned ancient urban sites in the Mediterranean. A consortium of seven partners merges academic institutions – University of Évora (P), Ghent University (B), University of Ljubljana (SI) and the British School at Rome (UK), with private companies: 7Reasons Media Agency (A), Past2Present (NL) and Eastern Atlas (D) – to fulfil the objectives of the programme. Its general European-scale aims can be summarised as follows: ‘to open and foster dynamic pathways between public research organisations and commercial enterprises’ and ‘to stimulate inter-sector mobility and increase knowledge sharing through joint research partnerships in longer term co-operation programmes between organisations from Academia and Industry’.

The Radio-Past project seeks to integrate different methodologies in the widely developed field of non-destructive survey technologies as applied to archaeology, and also to pursue validation of the results through innovative methods of visualisation and the development of strategies for efficient management of the cultural heritage sites studied. It is a main target of this project to allow multiplication of methods and research approaches, and to generate methodological guidelines for archaeological diagnostics. The idea is to develop a standard set of survey approaches, based on a series of already widely used as well as more innovative methods, such as active low-altitude aerial photography, geophysical prospection, Li-DAR survey 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. Practically, this work should result in

a guide of good practice for many researchers in survey archaeology, which considers with care the suite of survey approaches that are most appropriate for the nature of each site in question.

Furthermore, the project also concurrently targets 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, should allow virtual reconstructions of a buried town or large settlement within a relatively short space of time, as opposed to the more traditional excavation-centred approach that could take generations before a broader view of the site becomes available.

With these aims, the project seeks to link up with the EU policies of cultural heritage and landscape management. The core of field research done in the framework of Radio-Past complies fully with art. 3.Ib of the European Convention on the Protection of Archaeological Heritage, better known as the Treaty of La Valletta 1992, where it is stated that ‘to preserve the archaeological heritage and guarantee the scientific significance of archaeological research work, each Party undertakes: ... to ensure ... that non-destructive methods of investigation are applied wherever possible’. Cultural heritage management authorities will benefit widely from this approach, as such integrated surveys of complex sites provide them with a very effective tool for gauging the degree of archaeological survival on such sites in their care and choosing appropriate conservation strategies.

Previous initiatives by some of the authors have brought the ancient townsite of *Ammaia* to the centre of the debate about the impact of urbanisation on the Romanisation process and on transformations of ancient landscapes in Southern Europe (Corsi & Vermeulen 2010). We have chosen the abandoned Roman site of *Ammaia* in central Portugal as the ‘open laboratory for research and experimentation’ within the Radio-Past project, but some research activities by the partner institutions are also carried out in other areas of the Mediterranean (Italy: *Portus* and the *Potenza Valley*, Greece: *Boeotia*. See below Web References). In *Ammaia*, the University of Évora (coordinator of the Radio-Past project) is also piloting other projects in partnership with the Portuguese National Research Fund (FCT) and several universities (Casino, Ghent and Lisbon). The excellent conditions for research, including good site preservation, access and logistics, will help us to develop a research strategy with possible implications for future directions in this field.

## **A TOOLBOX FOR FIELD SURVEY AND REMOTE SENSING**

During the last decade there has been an upsurge in the non-destructive survey of complex, often abandoned urban sites in the Mediterranean area (Vermeulen et al. 2012). More and more archaeologists have started to realise the potential offered by the techniques of wide-scale, intensive survey to map and understand their sites. Large and complex urban sites that had hitherto been studied in a piecemeal approach, which was largely predicated upon the monument-based interests of earlier scholars, are now being subjected to a range of survey techniques to rapidly generate plans of partial, or in some cases, complete townscapes. Although much relevant fieldwork has been generated in recent years, there is need for a more careful strategy in such approaches and for efficient choices of technique, during the process of data gathering in the field as well as in post-field processing and presentation. The Radio-Past team is developing an integrated methodology which firstly involves a wide range of field survey techniques. They are

all essentially of a non-invasive nature and particularly adapted to study large and complex sites, such as abandoned towns or villages where most of the present-day use of the terrain is agricultural. These field-oriented techniques include: geomorphological and topographical survey (Vermeulen et al. 2005; Deprez, De Dapper & De Jaeger 2006), intensive and extensive surface artefact collection, vertical and low altitude aerial photography (Corsi & Vermeulen 2008) and a wide range of geophysical prospection techniques.

### ***Topographical, geomatic and geomorphological surveys***

The study of large and complex sites and the relationship with the natural components of their setting, is more and more influenced by a true geo-archaeological and geomatic approach, using techniques that combine both methods of the geosciences and of archaeological survey. The integration of a question-driven archaeological approach with the use of a wide array of GIS-based analyses and visualisation tools, the application of intensive geomatic research (GPS-mapping, 3D-scanning and photogrammetry) and geomorphological survey, create a framework which is ideally suited for characterising the location, extent, environmental embedding and erosion history of ancient settlements and towns.

A crucial base for such approaches is the production of a fine Digital Elevation Model (DEM) based on remote sensing, existing (digital) maps and ground geomatics. The latter involve acquiring fine resolution data about the micro topography of the site based on a survey with total station instruments or GPS. Through a set of field observations and activities, such as systematic coring and sampling over the site surface, the geomorphological study of intra-site erosion and palaeo-soil formation can be undertaken.

Innovation can be searched here not only through new integrations of approaches but also by testing the limits and possibilities of the recent developed topographic technique of LiDAR (Light Detection And Ranging) or ALA (Airborne Laser Altimetry). This is a relatively new technique in the toolbox of landscape archaeology. It is a different way of looking at the earth's surface and can produce a high resolution, highly accurate set of surface relief data. The ability to detect height differences of a few centimetres can reveal features on the surface – natural or artificial – which were previously invisible. Its capacity to see below the vegetation enables archaeologists to identify features hidden beneath woodland cover. Moreover, LiDAR can cover large areas of landscape with a resolution and accuracy previously unavailable. A particular challenge is to mount the LiDAR equipment on low altitude, unmanned platforms, which would allow a widespread use of this technique at the highest resolution and in low cost conditions.

### ***Artefact surveys***

Of particular importance for the study and evaluation of large and complex sites is the use of an intensive artefact survey approach, characterised by high-resolution fieldwalking, where archaeological material at the surface is collected within grid squares. Intensive artefact surveys are more costly and take more time than extensive surveys, but can provide more comprehensive information on the nature of human activities on the site. In this way activity areas within the site itself can be determined and located. The analysis includes the mapping of the densities of different types of archaeological material. Although material is usually highly fragmented due to ploughing, careful examination of diagnostic pieces can provide chronological information. Statistical analysis of different types of material and different size classes may reveal patterns of past human activities, but also post-depositional disturbance or modern interference with the visibility of the archaeological material on the surface. To understand the pattern of visibility of complex archaeological sites, the analytical field survey is often combined with geomor-

phological mapping and possibly geophysical prospection (see further). Detailed and intensive artefact surveys can answer questions on the chronology of landscape use, on functional zoning within ancient cityscapes, the distribution of certain classes of material and instruments, palaeo-demography etc. It also provides key information which can guide decisions on further archaeological research on the site, such as excavation.

### ***Aerial photography***

Developments in the fields of aerial photography and other types of non-ground-based remote sensing have a serious impact on the potential to study large and complex sites with a non-invasive approach. Detailed investigation of available aerial images combined with intensive monitoring of such sites with the help of low-altitude digital aerial photography can be very productive for the study of ancient urbanisation, site size, site limits, suburban activities, etc. Together with studies where predominant use is made of the more static evidence of existing vertical photography or nowadays also very high-resolution imagery obtained from satellites or airborne radar flights, an ever increasing array of active remote sensing techniques is available for archaeological research or can be further developed. Since the beginning of aerial photography, researchers have used all kinds of devices ranging from pigeons, kites, poles and balloons, to rockets in order to take cameras aloft and remotely gather the aerial data needed for a combination of research goals. To date, many of these unmanned devices are still used, mainly to gather archaeologically relevant information from relatively low altitudes, enabling so-called low-altitude aerial photography (LAAP).

### ***Geophysical prospection***

It has been shown on different classical sites in the Mediterranean and beyond that a systematic and integrated wide-scale application of geophysical survey techniques can contribute in a dramatic way to our understanding of ancient urban topography. Geophysical techniques are non-destructive, since all the necessary information is obtained above the ground, which allows research of buried remains without damaging them. Moreover, some of the applications are quite fast and can cover extended plots of land in just a few weeks of fieldwork, sometimes delivering very detailed plans of the archaeological presence in the soil. Common geophysical research designs include the following methods: magnetometer survey, earth resistance measurements, ground penetrating radar and electromagnetic induction survey. As some methods can be slower (e.g. georadar survey vs. magnetic survey), it is more appropriate to apply some instruments to target particular areas of interest or where there is a potential for deeper archaeological deposits. Archaeological features such as brick and stone walls or floors, hearths, kilns and disturbed building material will be represented in the results, as well as more ephemeral changes in soil, allowing the location of foundation trenches, pits and ditches. Results are, however, extremely dependent on the geology of the particular area, and whether the archaeological remains are derived from the same materials, which stresses the need of integration with geological and geomorphological approaches.

### ***The visualisation approach***

The reconstruction of ancient landscapes for 3D-visualisation depends on the integration of all available information as well as correct interpretation. Communication between the scientific teams involved in the fieldwork and visualisation technicians is crucial in order to discuss different possible interpretations

of the data. This applies to the larger-scale vision of the surrounding landscape, as well as the finer resolution approach towards the reconstruction of a townscape with all its architectural detail.

Available topographic information and environmental studies represent the base for the landscape reconstruction. Digital Terrain Models (DTM) derived from existing topographic or geomorphological maps and/or from ALS (Airborne Laser Scan Data) and DGPS (Differential Global Positioning System) can be used to simulate flow-morphology and erosion, which is then subtracted from the present state DTM in order to assume the ancient landscape topography. Existing information on hydrography and water supply, botanical coverage, land-use, suburban settlement and road systems can then be added to this 'Raw Terrain Model' to arrive at a simulation of the former terrain. The challenging visualisation of such landscapes is done by using special programmes which are capable of displaying millions of parts in the scene with a photo-realistic output using fractal algorithms based on the input of the operator.

The process of the architectural modelling for ancient urban sites includes the generation of building modules in order to create differentiated, large-scale urban structures within an acceptable time-labour frame. Typical local architectural details and styles are integrated in these modules by the use of all existing information from local archaeological research (survey, excavation and material studies), as well as from reference to better preserved sites of the same period and region. These building blocks can be laid out on the digital topographic maps in order to visualise the desired urban structures. As a result, a building typology is generated which will serve as 'filling blocks' for the layout of the whole urban site, maintaining the possibility to make changes and update these models if needed. The reconstruction of prominent, singular buildings, which are better known via stratigraphic excavations or can be considered landmarks of the townscape (e.g. a *forum*, gate or temple), cannot be processed through modulation, although certain parts of their decoration, such as columns, will be reused elsewhere and can be altered if needed.

The visualisation of architecture and landscapes should also be enriched with animated figures to produce a believable image for the viewer. Human motion can be produced by animating virtual characters manually or by recording real actors through a kinematic system called 'Motioncapture'. Poorly animated or ill-conceived characters are immediately recognised by the human eye and can downgrade the quality of the virtual media, even with a surrounding cityscape of outstanding quality. Through instancing, thousands of figures can be implemented into a virtual environment, producing realistic and lively scenery around the reconstructed archaeology. These scenes can then be used to tell a story about the ancient town, allowing the viewer to step into this past world and feed his/her interest in this topic. The attention of the viewer can only be assured with an outstanding quality of form and content. Certain media can be used to catch the attention of the different types of audience. Linear storytelling through books, pictures and films ensures high-quality, interactive worlds, such as 'realtime 3d environments' which often attracts the younger generations.

## **A CASE STUDY: THE 'OPEN LAB' AMMAIA (PORTUGAL)**

*Ammaia* is a Roman town whose foundation must surely predate the inscription mentioning the *Civitas Ammaiensis* during the reign of Claudius (44/45 AD; *IRPC*, 615; Mantas 2000, 392-393.). It was conferred the status of *municipium* by the time of Lucius Verus, as indicated by another inscription conserved in the

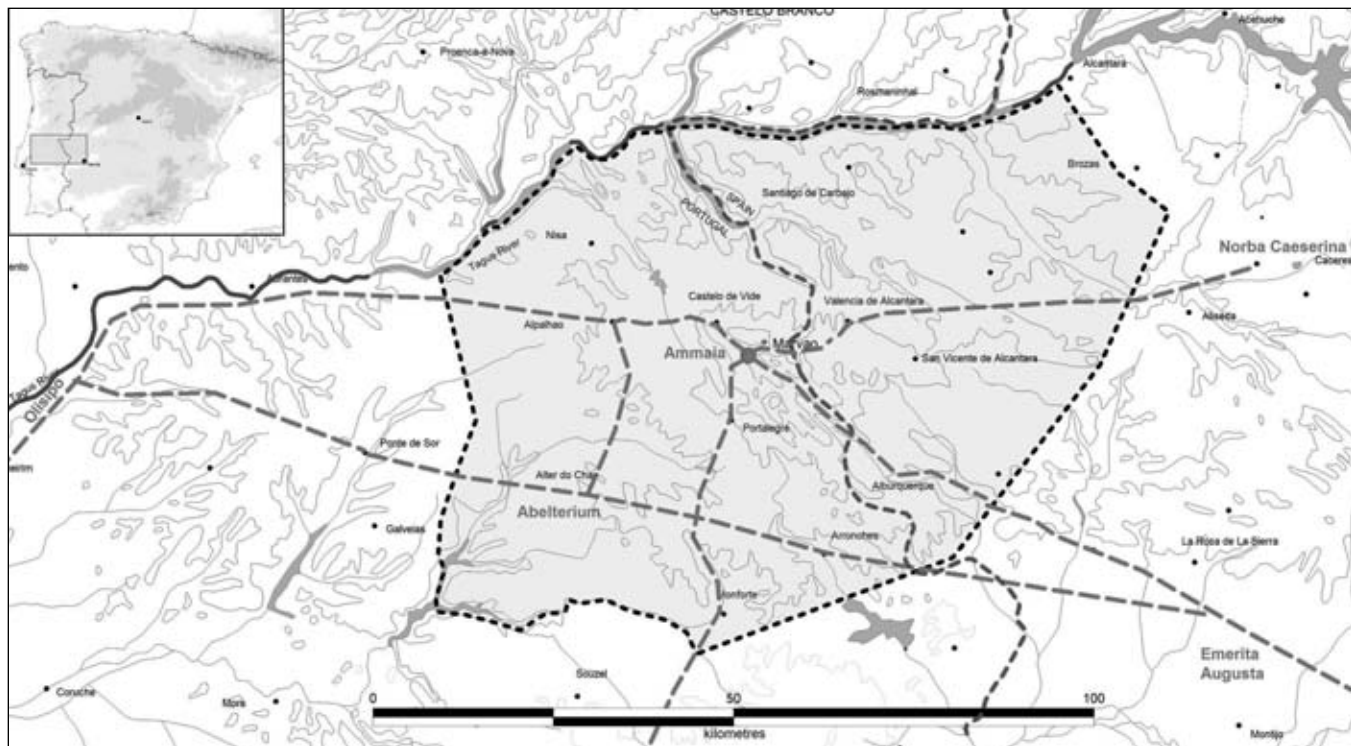
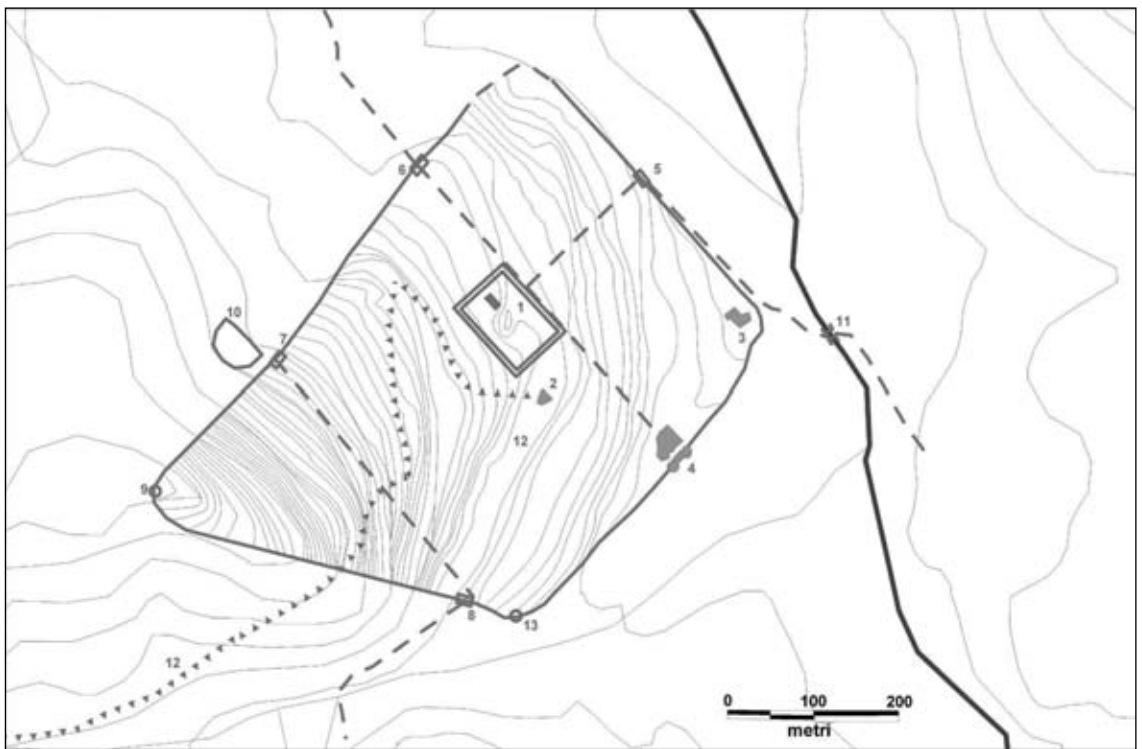


Figure 1. *Ammaia* and its territory at the centre of the road-network in Lusitania (authors).

nearby town of Portalegre (CIL, II, 158 = IRCP, 616). The ruins of *Ammaia* are located in the heart of the Natural Park of the Serra de São Mamede, a mountainous area of east-central Portugal extending into Spanish territory (fig. 1). The site is part of the fertile valley of the river Sever (Marvão). At this stage of our research, no settlement traces preceding its Roman foundation have been detected.

Archaeological research started at the site in 1995 with some excavations under the responsibility of the Fundação Cidade de *Ammaia*, a private foundation combining public and private institutions. This institution is now the owner of the site, and they are responsible for managing the archaeological park and its infrastructure. Archaeological excavations have been concentrated so far on areas where ruins are still visible above ground. This is clearly the case in the area of the main town gate, *Porta Sul* (fig. 2, n. 4; fig. 3), where the city street now interpreted as the so-called *cardo maximus* widened into a paved square after passing through an arched double chamber gate fortified by two circular towers. The second main zone of excavation is the *forum* area (fig. 2, n. 1), where the concrete nucleus of the main temple's podium is still visible and where excavation trenches brought to light segments of a *cryptoporticus* and remains of the main bath complex of the town (fig. 2, n. 2). Excavations have also been carried out in zones where some restoration work has been carried out, such as in the area around the building that houses the archaeological museum, the 17th-century farm called *Quinta do Deão* (fig. 2, n. 3), or where facilities for the archaeological park were planned, such as the visitors car park in front of the museum.

A new programme of excavation was started in 2008, concentrating on the first two campaigns on the bath complex (2008-2009), with the aim of adding to our knowledge of the monument, of the phases preceding the baths and of the transformation and abandonment of the sector. Part of the aim of the new excavation programme is also to do some ground truthing.



Top

Figure 2. *Ammaia* and the surroundings: archaeological mapping. In grey: archaeological monuments partially preserved and hypothetical monuments; full line: sure topographical elements of the Roman town, dashed line: hypothetical elements. 1. forum 2. baths 3. house complex 4.-8. gates 9. tower 10. theatre 11. bridge 12. Aqueduct 13: tower?

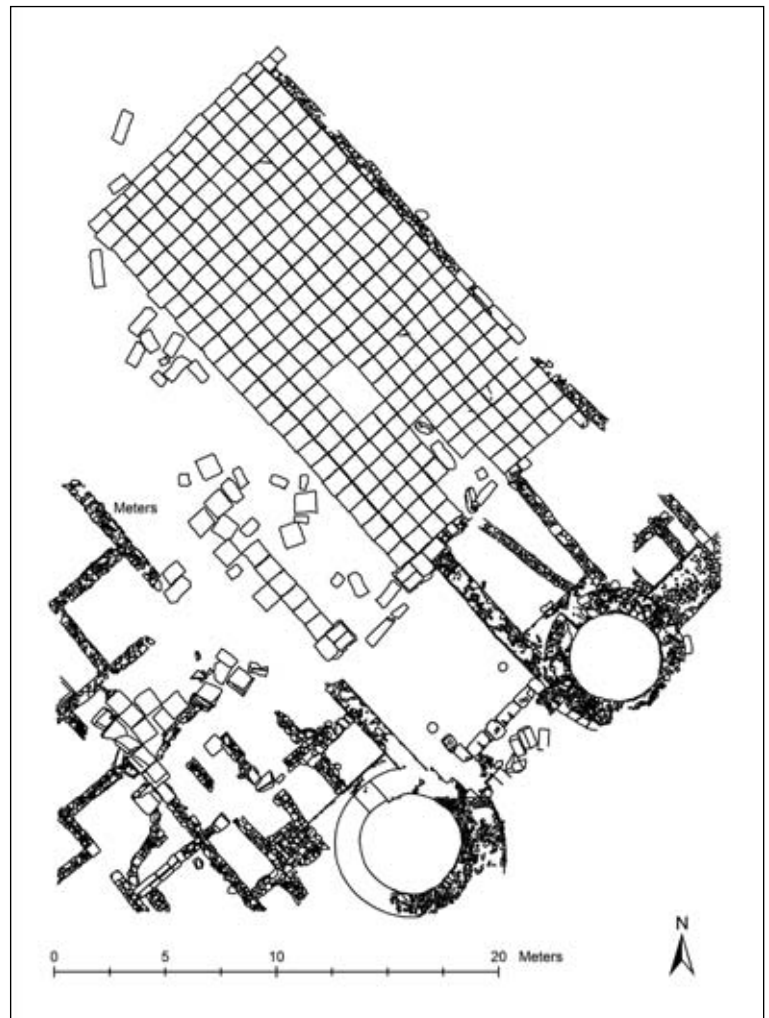


Figure 3. *Ammaia*. Synchronic plan of excavated area of the southern gate (Porta Sul). Fundação Cidade de Ammaia.

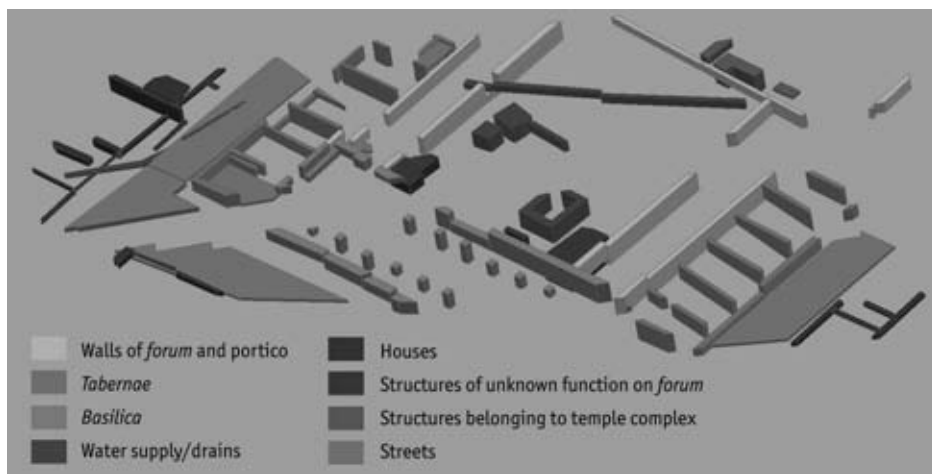


Figure 4. *Ammaia*. 3D reconstruction of the 'buried' structures of the forum detected with the GPR survey (elaboration by L. Verdonck). See also the full colour section in this book

During the course of the same summer campaigns, some initial geophysical surveys were carried out as preparation for the larger scale, non-destructive survey operations within Radio-Past. In 2008, geophysical prospection was mainly undertaken with GPR by a team from Ghent University, and in 2009, already within the framework of the Radio-Past project, a field collaboration with the University of Southampton (APSS-team) focused on magnetometry. Together, these first campaigns of geophysical survey covered an area of almost 5 hectares.

The results of the 'time slicing' of the processed GPR data (fig. 4) provided the basis for a digital reconstruction of the forum. All visible elements of the survey results, such as the large basilica, the 20 symmetrically positioned shops, the axial temple and a series of monumental structures on the central square can be well reconstructed, by combining the survey data with relevant information from the site and examples from elsewhere. Here, during a small-scale excavation campaign in the summer of 2010, some ground truthing of these results was done, which supplied additional information for the structural and chronological definition of the main architectural phases. New intensive geophysics during the summer campaign of 2010, with magnetometry and electrical resistivity, produced additional high-resolution imagery of this forum area, which at the moment is being processed. This is also the case for the area near the Porta Sul, where in the near future these additional geophysics data could enhance the proposed reconstruction of the excavated gate and its immediate surroundings (fig. 6).

The still ongoing magnetometer survey, intended to fully cover the intramural areas of the city, has already produced a fine map of town structures in some of the central and northern areas of the former town (fig. 5). Clearly visible are the regular grid of city streets, delimiting housing blocks, public spaces (such as the bath complex and a market), workshops and water infrastructures. The results obtained so far give reason to believe that the full intramural town plan can indeed be revealed, limiting the necessity for grand-scale and costly excavation procedures, but at the same time allowing a 3D view of the townscape and opening perspectives on a sustainable touristic exploitation and cultural value of the site.

In parallel with the geophysical investigations and necessary ground truthing operations, which are focused on the reconstruction of the cityscape, many other field operations have been initialised by the Radio-Past team or are being prepared. We can mention here the still embryonic development of robotics to perform high resolution LiDAR coverage of the site, in collaboration with the Instituto Superior Técnico in Lisbon, and terrestrial scanning operations of some of the still standing ruins by an Irish team



Figure 5. *Ammaia*. Interpretation of geophysics survey and excavated areas with reconstruction of the street network: 1. forum, 2. baths, 4. area of the southern gate. See also the full colour section in this book

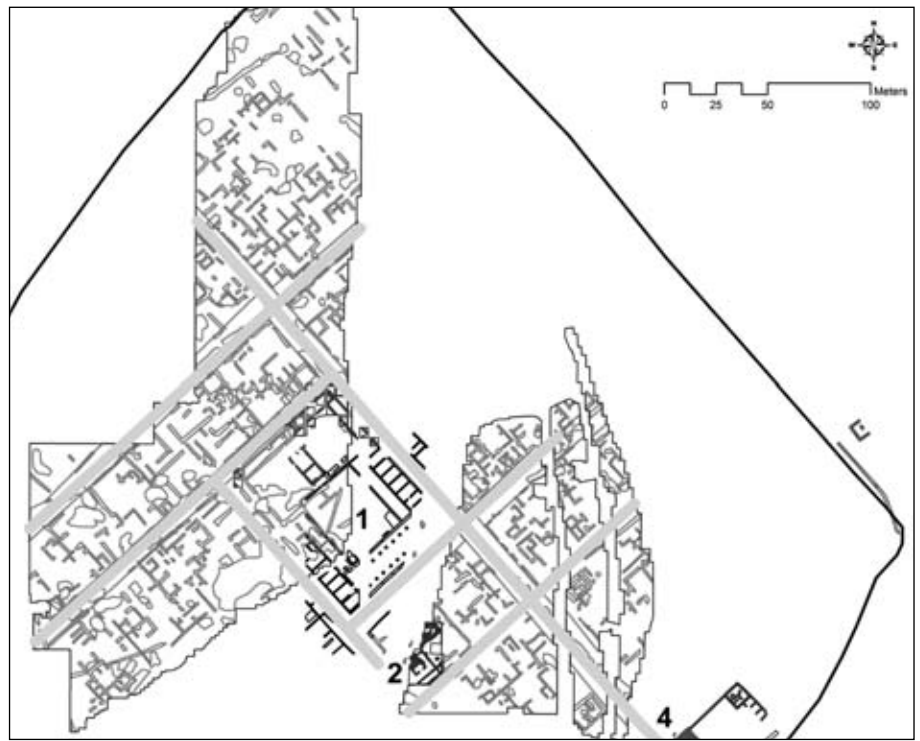
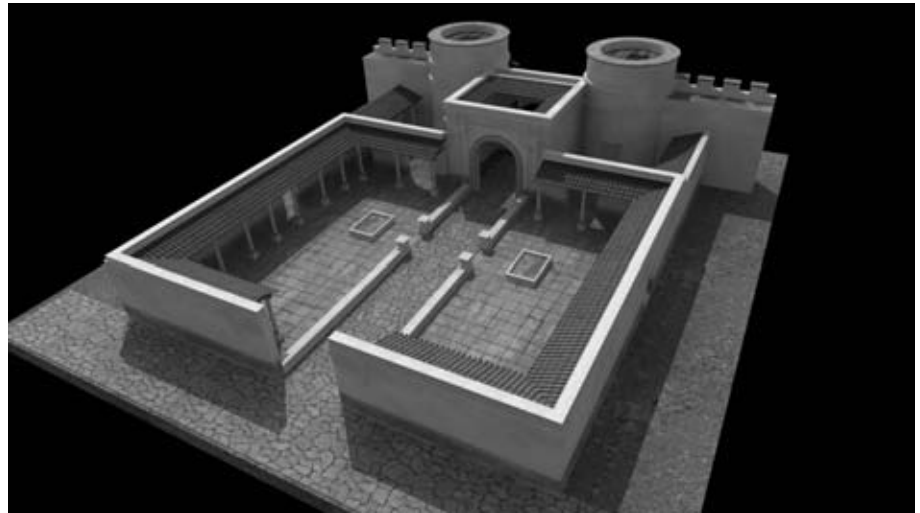


Figure 6. *Ammaia*. Preliminary 3D reconstruction of the southern gate (Porta Sul) by M. Klein.



from The Discovery Programme. In addition, tests were done with low-altitude aerial photography, using a blimp and a helikite. The helikite is a hybrid between a balloon and a kite. By combining a helium balloon with kite wings, this lighter-than-air device combines the best properties of both platforms without incurring too much of their disadvantages. The helium-filled balloon allows the helikite to take off in windless weather conditions, whereas the kite components become important in case there is wind, as they counteract any unstable behaviour that is characteristic of traditional balloons and blimps flown in windy conditions. Moreover, the construction supports more payload for its size when compared with ordinary aerostats. A Microdrone, which has been recently purchased, could even provide more stabil-

ity for such low-altitude aerial photography. Initially developed for purely military applications, drones or Unmanned Aerial Vehicles (UAVs) are powered aerial vehicles that do not take a human operator aloft but fly and manoeuvre in the air autonomously or by remote control. Using a drone with four rotors, it is normally possible to lift a digital reflex camera, while a GPS mounted on the instrument provides autonomous waypoint navigation and position hold to take an excellent aerial photograph. Underneath these airborne platforms a construction is mounted that can hold not only normal digital cameras, but also Near Infrared (NIR) or Near-Ultraviolet (NUV) enabled digital reflex cameras, allowing the operators to test a wider range than the visible field and therefore obtaining a maximum of relevant information concerning subsoil features which have an impact on the surface and its vegetation.

Important ongoing or planned work are also a set of geoarchaeological operations. In 2001, a joint team from Universities of Ghent and Cassino started this interdisciplinary fieldwork, mainly meant to understand the general landscape setting of the town, its water supply, the town/country relationship and the wider settlement dynamics. Preliminary results of this work in progress have been published elsewhere (Vermeulen et al. 2005; Taelman et al. 2009; Vermeulen & Taelman 2010). An essential aspect of the research is the reconstruction of the taphonomy of the urban site and its immediate surroundings, including the study of historical erosion and degradation processes and the elaboration of a fine DEM. To obtain this, a campaign of systematic and high density coring in the intra-mural part of the suburban areas is planned for 2011, as well as a continuation of ongoing tests with surface and near-surface artefact collection.

## THE ARCHAEOLOGICAL RECONSTRUCTIONS

To apply and refine the visualisation of data sets collected with non-destructive approaches in *Ammaia*, a close collaboration between the scientific researchers who conducted the prospection in the field and the ICT specialists has been set up. A particular challenge for the 3D visualisation work in test-case *Ammaia*, which aims at a 'total' digital reconstruction of the Roman town and its immediate hinterland, is that most of the data sets available will be derived from intensive geophysics surveys. These total-coverage prospection data, essentially geomagnetic measurements, georadar imaging and electrical resistivity mapping, will however be fully integrated with the focused excavation effort. To proceed in relevant phases, the Radio-Past team will first produce detailed digital reconstructions of several specific monuments of the Roman town, e.g. the southern gate (Porta Sul), the *forum* and the baths, while the second phase will reconstruct the total town area.

For the first attempt to produce a 3D reconstruction we chose the well-preserved Porta Sul (fig. 5). Preparation for this work included foreseeing the use of modular structures taken from nearby reference sites, offering more information through standing structures, publications and reconstructions. These were then combined with the archaeological excavation plans and some additional geophysical prospection results. The process of reconstruction started with the gathering of information about the topography of the terrain, observing the standing remains and transforming all existing data into a suitable format. The main application we use to model and animate 3D data is Autodesk 3ds Max, in conjunction with various specialised software applications. Reconstructing the arch was much helped by an old photograph taken before its 19th-century destruction and relocation into a secondary location in the nearby

town of Castelo de Vide, where it was brought and integrated into the post-medieval city walls. From the measurements of its proportions we adapted other heights such as those of the city wall and towers. The open space, *intra muros* from the gate, still preserves its layout with massive, well cut (approx. 1 x 1m) granite blocks forming a rectangular square of approximately 23 x 12m on each side of the main road through the gate. The main use of this square is still unclear, but it is assumed that a market (*macellum*) was possibly connected to the north of the square. Thanks to clearly visible rounded marks in the granite flooring of the square, a portico could be suggested. Although there is no indication whether these holes were used for posts, pillars or columns, their placements shows that some shelter structure such as tents or roofing could be supposed. Some of the large granite blocks of the square, facing the street, showed marks of a possible basement. This basement could have been used to separate the street and the square place in order to keep dirt and water off its pavement. Finally, less problematic is the reconstruction of the city wall and its towers, as remains of the towers are still standing up to 2,5m and also the city wall is quite well preserved near the gate. As the Romans were very systematic in their elaboration of city walls and gate systems, this model will allow a full digital reconstruction of the town enclosure system.

## THE MANAGEMENT PLAN

In order to ensure the sustainability of the project both on a scientific and socio-economic level, a management plan is being developed for the site. The site management plan will be a heritage policy with instruments to ensure the future of *Ammaia*. The heritage policy serves the following objectives:

- outline the roles and responsibilities related to the management of the site;
- create a clear set of guidelines by which to manage the site;
- ensure the physical protection of this heritage site;
- create a sustainable environment to vitalise responsible tourism to *Ammaia*.

Ideally, a heritage policy should search, find and solidify the link between the past and the present. The site itself forms an integral part of contemporary spatial planning as well as the current economic and social landscape. It will therefore not only need to incorporate scientific information, but information on legal aspects as well. As a result, the management plan will be value-based: the various management aspects will be approached from the valorisation of the site.

Several management aspects need to be addressed and researched for the heritage management policy. These will be the building blocks of the heritage policy; together they will form a policy that can be evaluated, adapted and implemented. The various management aspects have been defined in the position paper that has been drawn for this project (van Roode 2008), and include:

- analysis and evaluation of comparable management plans;
- archaeological risk analysis and risk map;
- evaluation system;
- area specific management plan;
- research plan;

- capacity and implementation plan;
- marketing plan;
- integration of website and heritage policy.

## CONCLUSIONS

This paper was concerned most of all with presenting the aims and methodology of ongoing concerted research in order to adequately survey, map, interpret, visualise and manage large complex sites, such as abandoned ancient cities, in particular in Mediterranean Europe. Even if more substantial results are still awaited, we were also able to present some preliminary data on the ongoing operations in field lab *Ammaia*. Archaeological data collected there prove that most urban structures of *Ammaia* were developed during the 1st century AD, but that town life lasted until the early Middle Ages. The urban centre of *Ammaia* was delimited by a wall circuit, possibly enclosing some 22 ha, and the town had a regular layout, with main axes connecting the circuit gates (fig. 2). Detailed plans of some of the major monumental areas in the city (the southern gate, forum and bath complex) are now available, and thanks to an integration of data from excavations, multilayered geophysics, micro-topographical measurements, geomorphological fieldwork and some remote sensing, it is now possible to propose the first reconstructions of these crucial urban areas.

From the methodological point of view, the approach of the 'Radio-Past team' aims to be exemplary and wishes to draft guidelines for good practice in the field of landscape archaeology and especially urban survey. Progress in the discipline of landscape archaeology is sought by testing new survey applications and by the holistic integration of a wide set of approaches and multidisciplinary survey techniques. A crucial aspect is the philosophy of merging mostly non-destructive scientific research and heritage-management of buried archaeological sites and their surroundings, while at the same time limiting destructive intervention, such as excavation, to the absolute minimum. The partnership among specialists in different fields and the synergy of resources and competences allows the team to work on a 'total project' based on looking through the surface, as in radiography. But, as in medical diagnostics, this 'scanning' is considered to be only the first step in understanding research on historical landscapes. Scientific research has to face the demands from public and stakeholders and the dissemination of results via effective but still scientifically based multimedia has to be part of the research agenda. The landscape archaeology of the third millennium can in this way play a key role in the protection and valorisation of cultural landscapes, improving the way they are presented to the public and enhancing their sustainable and responsible development.

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