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## **BEST PRACTICES IN HERITAGE CONSERVATION AND MANAGEMENT. FROM THE WORLD TO POMPEII**

Le vie dei Mercanti \_ XII Forum Internazionale di Studi

**Carmine GAMBARDELLA**

La scuola di Pitagora editrice

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## **Best practices in heritage conservation and management. From the world to Pompeii**

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Aversa | Capri

June 12th- 14th, 2014

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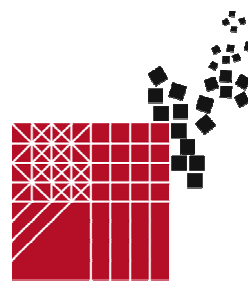




XII International Forum

Le Vie dei  
Mercanti

BEST PRACTICE IN  
**HERITAGE**  
CONSERVATION  
MANAGEMENT



FROM THE WORLD TO POMPEII

Aversa / Capri, 12,13,14 June 2014

## Redrawing Tarraco

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### Abstract

The city of Tarragona houses an important architectural heritage mainly from its past as 'Tarraco', capital of the Roman province of *Hispania Citerior*, but also from its medieval and late 19<sup>th</sup> century history. The archaeological ensemble of Tarraco was inscribed as a UNESCO World Heritage Site in 2000, but although many efforts have been devoted by archaeologists and historians to unveil and understand the history and aspect of the Roman city, many aspects remain unknown.

This is largely caused by the absence of a coherent body of historiographical material, which is today scattered across several institutions and, specially, the lack of precise and useful graphical representations of the remains and of the existing city that allows in-depth analysis and interpretations of future findings.

In recent years, researchers from the Catalan Institute of Classical Archaeology (ICAC) and the Architecture School of the URV (ETSA) have teamed up to produce comprehensive, detailed graphic materials, including a new set of plans and sections of the old city, of the grandiose areas of representation of the Provincial capital, and of the hidden structures beneath the city's surface. These have been executed with the latest technologies (fotogrammetry, laser scanning) but also with traditional methods (measurement, topography), on top of a mixture of existing materials (hand-drafted cartography from municipal master plans) and of historical and archaeological documentation.

**Keywords:** Tarragona, Architectural heritage. Representation. Education. Archaeology.

## 1 Introduction

### 1.1 Archaeology and Architecture: a long history together

Architecture and archaeology are two disciplines that have had a long history together and a close relationship that dates, at least, from the late Middle Ages. In the past, the solidity of structures that were "made to last" (castles and fortresses, churches and cathedrals, and so on), built mostly in stone and with durable materials, has made architectural remains an important part of archaeological sites.

The first intellectuals that took a decided look backward at history, and regarded it as an "open book for architectural and historic reference were the humanists in the Renaissance. For most of them, such as Alberti, Vignola [12; 13] or Palladio [9], to name a few, the study of the Roman remains became a sort of "ritual", and they all traveled to Rome to copy, survey, redraw and interpret the remains of the old roman buildings that still were visible in the metropolis of the Roman Empire. This was an "educational primer" in architecture, history and humanism, and this pedagogical scheme became a

standard in architectural education until well into the 20th century<sup>1</sup> (maybe one of the last examples, now under debate, was probably Le Corbusier himself [1]).

The major written source of scholarship on architecture during the renaissance was the study of Roman building treatises, of which only Vitruvius' *De Architectura* has survived. Vitruvius' book includes the term in its title, and this term was adopted fully by the Renaissance intellectuals as the name for the discipline that was taking shape with them: "architecture"<sup>2</sup>.

Archaeology, on its part, also has its origins in a few early Renaissance authors who not only took an interest in ruins (i.e. "architectural" remains) but also in ancient remains<sup>3</sup>. The first excavations with a proto-scientific method were carried out by John Aubrey, in Stonehenge and other megalithic monuments in England [2], and also in Pompeii and Herculaneum in the late 18<sup>th</sup> century<sup>4</sup>.

Hence, architecture and archaeology have had a very close relationship until the end of the 19<sup>th</sup> century, and probably part of the 20<sup>th</sup> [11]. For some reason, the education of architecture professionals progressively abandoned the study of history and archaeology. The reasons are many, and it is not in the scope of this paper to analyze them in depth. But we could mention, in favor of the argument, a few of these reasons. First of all, the so called Modern Movement and the architectural avantgardes approached a "new architecture" with a rupturist approach and a radical rejection of historical architecture of all kinds, be it classical, historicist or eclectic [5]. Second, a modern approach to architecture, also favored by the Moderns, substituted the study of history and traditional construction methods with the more modern building technology of concrete, steel and glass. And, last but not least, the deeper specialization trend of most disciplines, that made them abandon lesser interesting paths, like it is the case with the study of history for architects.

## 1.2 Tarraco, UNESCO World Heritage Site since 2000

Tarraco was the entrance port of Rome in the Iberian Peninsula. It was an ancient Iberian settlement that, due to its historical role, reached the capitality of the *Prouincia Hispana Citerior*, the largest in the Empire during the flowering times of the *Pax Augusta*. Its close relationship with the Emperor Augustus, and his exemplary role in the acceptance of the imperial cult, were the basis for the construction of the large monumental headquarters of the *Prouinciae Concilium*, the public office of half of the Peninsula. This area of 19Ha was articulated by a center of worship to the emperor, currently occupied by the medieval Cathedral, the great administrative square of the provincial forum – probably the second largest square in the entire Empire– and the Circus, defining the limit between the Municipal city and the provincial capital spaces (Figure 1). This arrangement pre-determines the medieval urbanism, and constantly reemerges in the current historical center. Besides, the Roman city of some 90Ha had a theater, an amphitheater, fifteen public or private baths and many economic urban facilities and services. This urban reality would only be surpassed after the second half of the 19<sup>th</sup> century [8].

After the decline of the Visigothic period, the city and the territory of *Tarracona* were occupied by the arab-berber invasion and, thanks to its geopolitical character, it remained institutionally abandoned for four centuries –i.e. no political or religious establishment–, as the boundary between Al-Andalus and the Catalan counties. After the Catalan reoccupation, the city recovered its urban condition, under the tutelage of the Count of Barcelona and the metropolitan Archbishop. But it never reached the vitality of other periods. Only after the debacle of the Napoleonic wars, the city gets back a socioeconomic vitality thanks to a growing port activity.

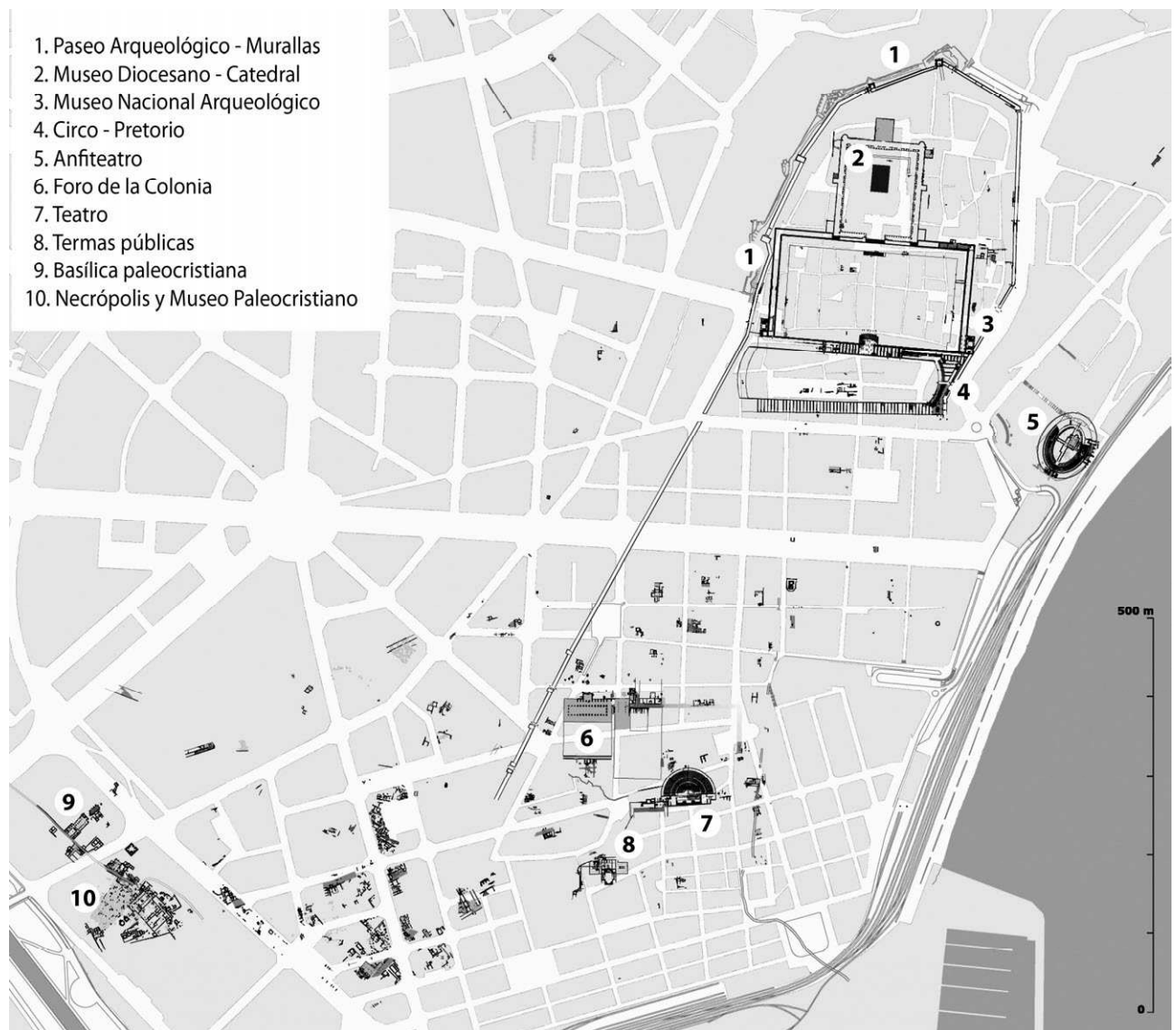
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<sup>1</sup> It is remarkable how classical architectural education, for centuries, included a trip to Rome. For example, the *École des Beaux Arts* in Paris awarded since 1663 the prestigious *Prix de Rome*, which included a stipend and a stay in the French academy in Rome for two to four years of study, to get acquainted with the models of antiquity.

<sup>2</sup> However, Alberti's book on architecture, the first renaissance treatise on architecture, is named "*De re aedificatoria*".

<sup>3</sup> Flavio Biondo (1392-1463) is dubbed as the first "archeologist". Humanist and historian, he published several works on the remains and the topology of ancient Rome, at the crossroads of archaeology and architecture: *De Roma instaurata* ("Roma restored"), 1446; *De Roma triumphante* ("The triumph of Rome"), 1459; *Italia illustrata*, 1474; and *Historiarum ab inclinatione Romanorum imperii decades* ("The historical decades of the decline of the Roman Empire"), 1483.

<sup>4</sup> Karl Jakob Weber, engineer and architect was in charge of the first methodic excavations of these towns by commission of king Carlo III of Naples [10].



**Figure 1:** The scheme of the provincial forum in the Upper part of Tarraco

The first known early writings and compilations on the rich historical heritage of the city are dated from the Renaissance. The studies of Lluís Ponç d' Icart and the collection directed by Archbishop Antoni Agustí define the beginning of the interest on the local past, although the absence of stable institutions gave a central role to the concerns of local historians. The 19<sup>th</sup> century marks a definitive turning point in relation to the protection of heritage and the emergence of local institutions, such as the first Diocesan Museum, the Antiquities Museum, and other initiatives in the realm of local collectors. When Tarragona loses the status of military plaza the first great conservationist debate occurs, in relation to the destruction of the walls of the city, that constrained so far the new urban developments. A similar situation also occurred in the first quarter of the 20<sup>th</sup> century, with the discovery of the local forum and the great Christian necropolis. Finally, the debate on the conservation and restoration of architectural heritage is set in the mid- 20<sup>th</sup> century, with the rehabilitation actions undertaken by the Brigades of National Heritage (Pretori Tower, amphitheater, colonial forum, etc.). The return of democracy and economic development of the city leads to a new stage in the restoration of heritage, sometimes as an empowerment of museological enclosures, or as a dignifying of institutional spaces housed in historic buildings [7].

In the late 1990s the city felt that the maintenance of such a heritage deserved some important institutional support, and filed an application to the UNESCO. The “archaeological ensemble of Tarraco” was inscribed as a UNESCO World Heritage Site in 2000”, recognizing that “the Roman remains of Tarraco are of exceptional importance in the development of Roman urban planning and design and served as the model for provincial capitals elsewhere in the Roman world. Tarraco provides eloquent testimony to a significant stage in the history of the Mediterranean lands in antiquity”.

With or without the endorsement of the UNESCO nomination, many efforts have been devoted by archaeologists and historians to unveil and understand the history and aspect of the Roman city, but many aspects still remain unknown to date. This is caused by a number of different reasons, some of which are detailed here.

First of all, the remains are today very fragmentary and many are preserved under the present city and beneath more recent buildings. The medieval city was slowly built occupying the inside of the courts of the representation squares of the Upper part, and later the arena of the circus (Figure 1). Much of the material for the new city was scavenged from the old Roman monuments, mainly in the form of raw material to create lime mortars for construction (see also note 5). Then, the built structures such as walls, terraces and stands were used as supporting elements for new structures, and were left inside new constructions where they were modified, altered and, most of the times, damaged. Thus the original form of the city is difficult to understand and requires a very thorough understanding of the different existing structures, which are sometimes not visible.

Besides the diacronical evolution of the architecture of the city, the research efforts and archaeological tasks have been scattered across several institutions. Indeed, the agents involved in the study and preservation of Tarraco are, at least, five: the city hall of Tarragona, through its History Museum; The National Archaeological Museum of Tarragona, part of the state cultural institutions and administration; The Royal Archaeological Society of Tarragona, a non-for-profit organization established in 1844; The Catalan Institute of Classical Archaeology, a Catalan independent research center created a decade ago; and the University Rovira i Virgili, mainly (but not only) through its History and Archaeology department. The effect of so many agents has been the dilution of the efforts devoted to the study of the city. Sometimes, the differences in the respective policial agendas, diverging research interests (and, sometimes, personal confrontations) have affected the necessary collaboration relegating it to a very small thread –if any, altogether.

Finally, as a result of all these contingencies, there is an absence of a coherent body of historiographical material. In particular, there is a lack of precise and useful graphical representations of the remains and of the existing city that allows in-depth analysis and interpretations of future findings. A city like Tarraco, with so many hidden structures, built by the addition of several layers of history, and several waves of alterations and modifications, needs a solid set of drawings to be able to interpret and understand the relative positions of the concurring elements, the disposition in three dimensions of existing and disappeared structures, and to allow the crystallization of old structures into present forms to emerge.

To date, one of the best and more comprehensive record of the final state of archaeological documentation is the publication "Planimetria Arqueològica de Tarraco" [6], a systematic collection of documents and drawings, and a thorough index of bibliographical materials, known in 2004. Although this work has provided the basis for the development of a three-dimensional model with *Sketchup*, a graphic *corpus* of all the preserved Roman architecture does not exist, a visual archive that allows the realization of reliable architectural studies or, simply, the management, monitoring and control of the conservation of a heritage which is 2000 years old.

## **2 Redrawing Tarraco**

### **2.1 The ETSA – ICAC Collaboration**

Since its creation in 2005, the School of Architecture of the Universitat Rovira I Virgili, with its headquarters in the nearby city of Reus, has had a strategic planning that focuses on three interrelated lines: the study of the architectural heritage; the study of the local territory; and the advancement in modern construction technologies. These strategic lines inform the research lines of its professors and research groups, and therefore affect also the teaching at the school, which, besides the traditional and mandatory subjects, has a slant in these directions.

According to the school, the study of the architectural heritage has been a way to introduce interdisciplinarity into the sometimes closed world of architecture. The interaction with specialists from other areas, like art historians, and archaeologists. It is a way of bridging the traditional barriers of the architecture discipline, and reach out as architects to other areas of inquiry and offer their skills. This reinforces their disciplinary values, and puts them in contact with other valuable knowledge. On the other hand, the study of the territory connects the research to the needs of the peoples that live closer, while at the same time generating a universal knowledge that can be transferred to other areas of the world.

During the third year of the school, professors from the area of graphical representation, with an interest in architectural heritage, teamed with researchers at ICAC in order to collaborate and share skills and experiences. The architecture professionals were skilled digital draughtsmans, with

experience in research and teaching in architectural drawing, traditional C.A.D., 3D modeling and rendering, and digital imagery. They did not shy away, therefore, from all forms of new technology and its application to architectural representation. Alternatively, the professionals from ICAC were trained archaeologists, with an in-depth knowledge of historical sites and excavations, stratigraphy techniques and a background in history. Most of them came from the Graphical Documentation Unit at ICAC, and were also well trained in the use of CAD programs and digital representation technology. Besides, the team was completed with history specialists in Tarraco and its Roman and medieval past.

The first activity together was the proposal of an elective course on architectural heritage and architectural representation, which began during the academic year 2007-08 (see below for the description). The objectives of the course are threefold:

a) Use the most accurate and most modern technologies available to them in order to make detailed surveys of existing monuments and architectural structures. The limit for the use of technology was only the available budget. Furthermore, as is usual among technology lovers, the challenge to test and try out new possibilities was almost a necessity.

b) Redraw the surveyed elements, with the help of advanced architecture students, in order to reinterpret the data with architectural drawing. Redrawing architectural structures in plan and section, in 3D, and in different scales can put in context a lot of information, and allow for the comparison of elements. The reconstruction in drawing (manual or digital) or in three dimensional models of the existing (and the non existing) structures is a cheap way of testing hypothesis and combining and controlling insights. Finally, the rendition in a set of accurate drawings of the status of the present city allows the emergence of invisible and hidden structures, by inspection of the crystallized forms of the ancient remains in more modern structures.

c) Finally, putting in a historical context this graphical information, with the help of historians and academics with a good knowledge of the remains.

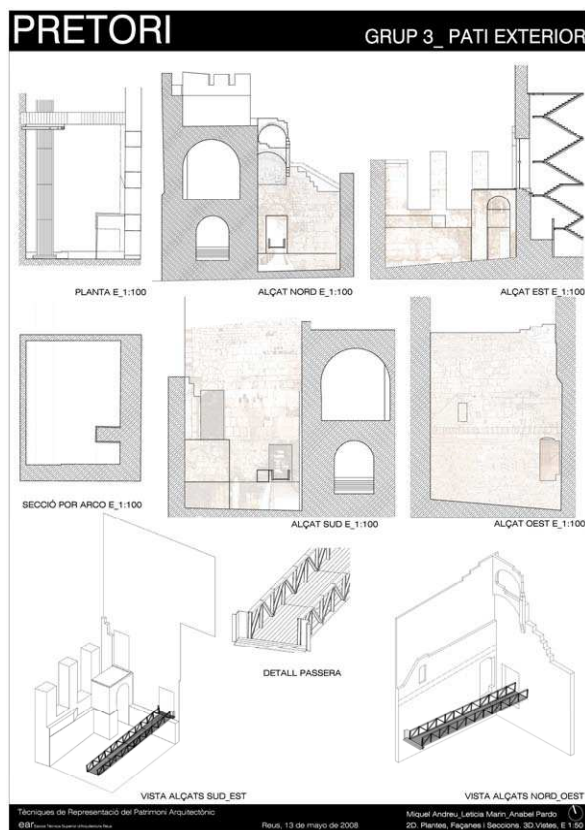


Figure 2: Architectural drawing of the Pretori Tower

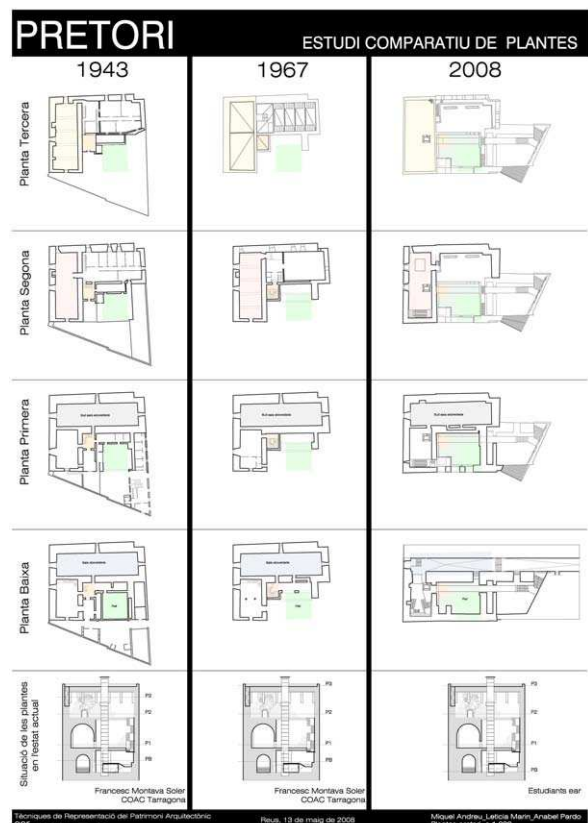


Figure 3: A historical comparative of the evolution of the plans of Pretori Tower

It is very important to stress that this elective course is not a simple "lecture course" but, on the contrary, intends to go far beyond mere teaching. While it is based on a sound pedagogical and academic basis (nothing else could be acceptable, of course), the course is, in fact, a platform that reaches into research areas, digs and experiments in real archaeological problems, and to tries out real surveying techniques. Every year, the teaching staff proposes to solve a particular representation problem, which is not naïvely selected (see below, section 2.3). Then, with the help of a group of



experts in the different areas involved, the students discover the surveying methodologies, the representation techniques and the solutions to the usual pitfalls in and around tangible surveying exercises of rather large proportions: “learn-by-doing”. For this reason, it is organized as a rather free-form atelier that knows the starting point, but ignores the end results altogether.

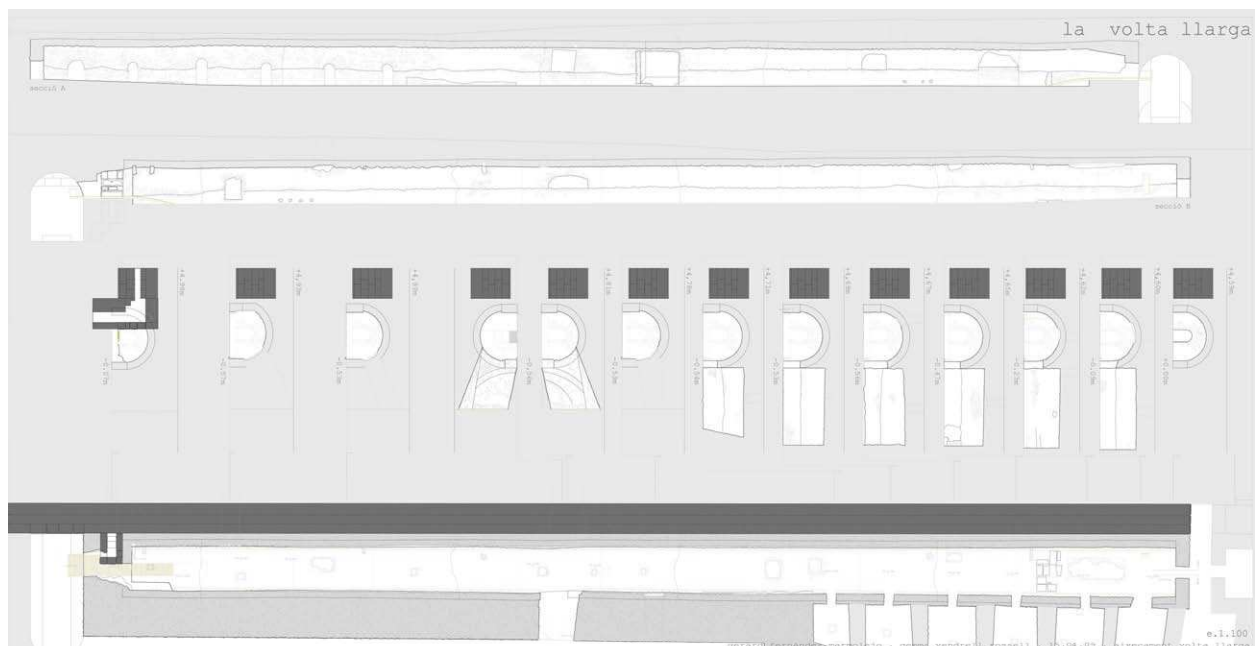
## 2.2 The area of study

By the name of “Pretori Tower”, “Castell del Rei” or “Tower of Pilates” we identify a solid building, which after 2000 years of history, and the architectural restoration works of the 1960s, is currently about 26.40m wide and a maximum height of 23 m. This is a tower-shaped body raised in the 1<sup>st</sup> century aD and performed in stonework as part of the monumental complex that housed the Concilium Prouincia Hispaniae Citerioris (commonly known by the neologism of “Provincial Forum” of Tarraco). This vast urban complex, which occupied about 12 Ha, was the result of the sum of a *temenos*, a large square of representation and, on a lower platform, the circus, the latter constituting the element of separation from the residential town. This is a scheme evolved from the Hellenistic model composed of sequence “temple” > “public area” > “recreational area” extended from the time of emperor Augustus [4], where what is now known as the “Pretori Tower” is just the southern end of the eastern cryptoporticus of the representation square, as extended stairwell and whose main function was part of the communication backbone between Circus and the perimeter of the square. This urban scheme motivated the existence of another almost twin structure at the opposite angle : the tower of the former Audiència [3] (see Figure 1, Figure 2).

Other fragments of this scheme are today either hidden beneath the city, or fossilized in newer structures. The difficulty is not so much to discover and know about their existence, but to be able to compare new and old, side by side, to ascertain their correspondence. Hence the importance of accurate drawings.

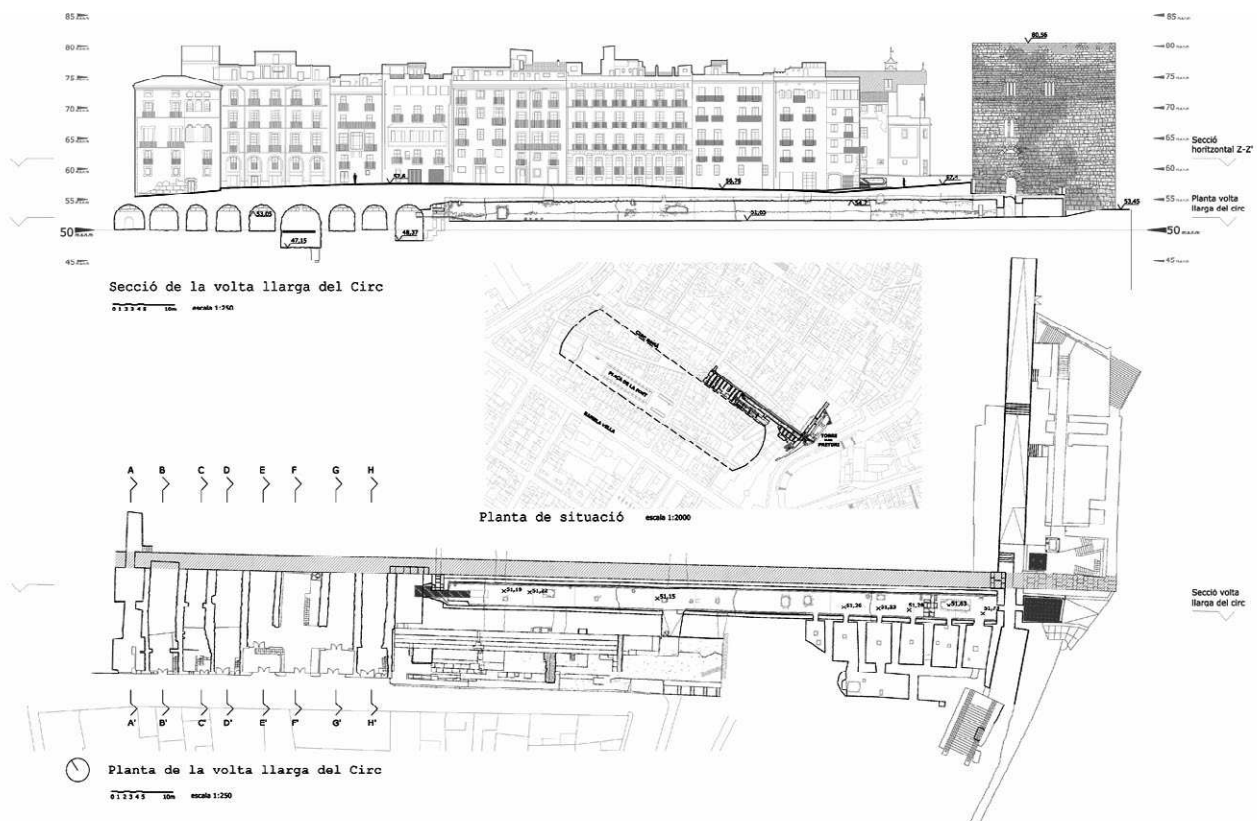
## 2.3 The objects of study

The course co-organized by ICAC and ETSA, named “Heritage representation Techniques”, is celebrating in 2013-14 its seventh edition, and in the last six years a great deal of information has been generated:



**Figure 4:** One of the drawings of the survey of the *Volta Llarga*, from which its main sections are cut .

**2007-08:** For the first edition of the course (only with a handful of students) a simple object was selected. The students surveyed in 2D and 3D the building of the tower of Pretori. The techniques were, this first time, rather conventional: topography, measuring tape, photography, etc. The resulting documents were a set of plans, sections and elevations of the building that yield an interesting representation of its complexity (Figure 2). Then, with the help of a great amount of historical documentation, in the form of plans and photographs, a historical analysis of the transformation of the building was prepared (Figure 3). Several interesting conclusions came out, like the definitive orientation of the stairs inside the building, which have been troubling researchers for a long time (not shown).

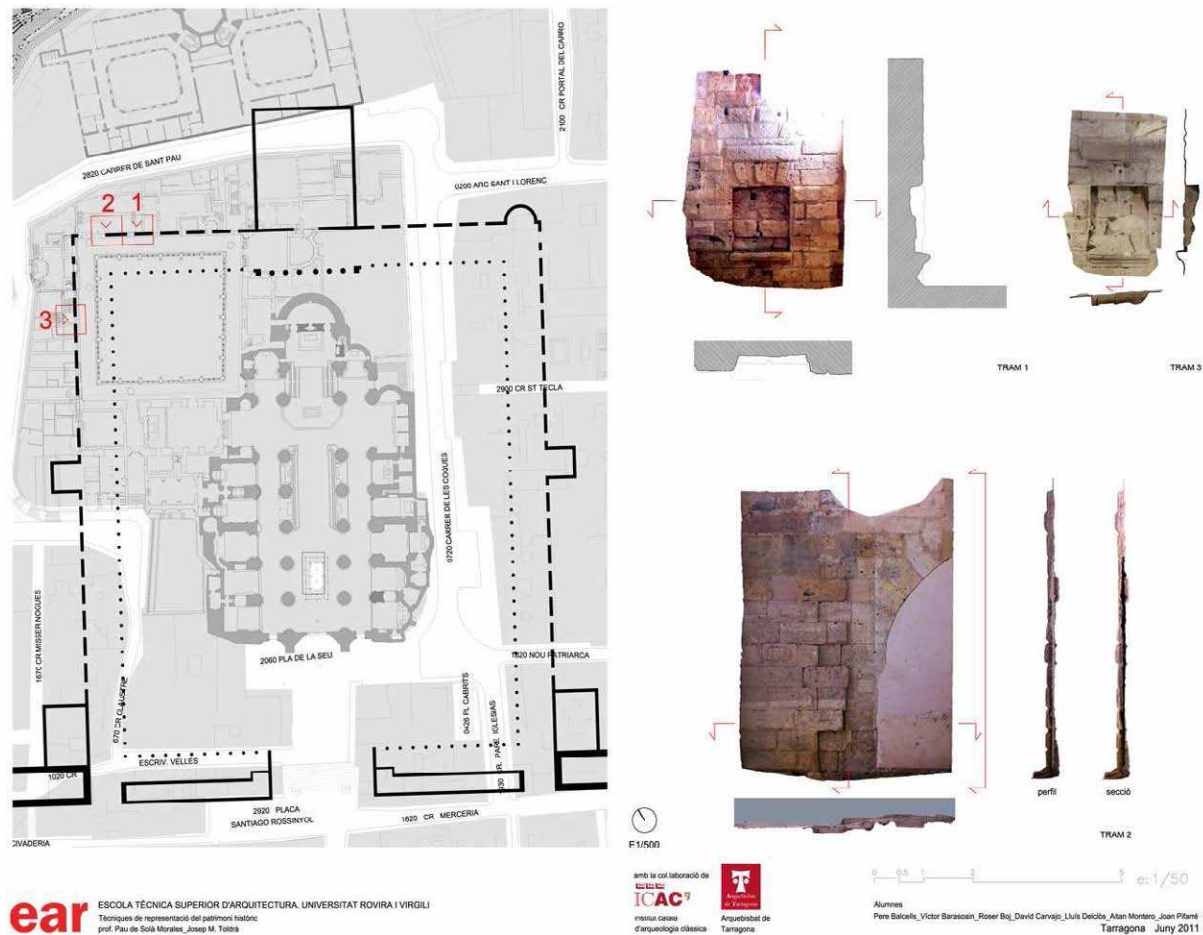


## PLANTA I SECCIÓ PRINCIPALS

Làmina 1 de 3    dimarts 26 maig 2010    Entrega Final    Tècniques de Representació del Patrimoni Arquitectònic    Grup 4    Belén Garrido    Marta Navarro    Josep Piñuan    Javier Sesé

**Figure 5:** Underground plan and section/elevation of a fragment (about half of the distance) of the connection line between the representation square and the circus [from Pretori tower to the Antiga Audiencia tower]

**Figure 6:** Surveying of the Roman wall behind Tarragona's Cathedral cloister.



**2008-09** The survey continued on the vaults beneath the Pretori tower and the circus (“volta llarga”), both on the exterior and the interior. The result is the first elevation of this space and its accurate relationship with the city above (Figure 4). Although traditional topographic techniques were mostly used, we began experimenting with 3D scanning and photogrammetry, thanks to the acquisition of a robotized total station. To complete the drawing, existing materials of the city above, we reused: old plans (hand drawn in the 1980’s, and part of the municipal documentation) and more accurate topographic materials (dating from the 1990’s) were available. These had to be redrawn, corrected, and merged into the existing information.

**2009-10:** Continuing with the previous experiences, the following year the survey of the “hinge” between representation square and circus was continued. Thus, the complete elevation from Pretori Tower to Antiga Audiencia Tower was completed at several levels (plan of the upper screen, plan of the hidden structures, longitudinal sections at different points, transversal sections, elevations, etc. This time, a closer study of the relationship of the hidden structures (beneath the ground) and the existing city was carried out. In particular, the position of the façades (corresponding to the medieval city wall) was accurately measured to align them with the huge stone block wall known to exist below it (Figure 5).

**2010-11:** Encouraged by the success of the three elevation campaigns, the team decided to move to another location and try out new surveying techniques, always in an experimental manner. The object this time were two sections of the enclosing wall of the cloister of the city’s cathedral, that have a fragment of some 30-40m of the original Roman enclosing wall of the sacred precinct (see areas 1, 2 and 3 in Figure 6, left). These techniques, coupled with topographic and traditional measurement, allowed us to survey these wall fragments, and also to locate them with great precision in Tarragona’s plan. An impressive section of the city and the hill on which the old Tarragona was built was also drawn (Figure 7).



**Figure 7:** Section of the hill of Tarragona (“Part alta”) through the cloister and the nave of the Cathedral.

#### **2011-12 and 2012-13:**

To continue with the works in the sacred precinct (also known as the “worship square”, or the higher square of the provincial area), the team went with a group of students to the National Archaeological Museum of Tarragona, that holds an important collection of marble and limestone fragments from several monumental zones of Tarraco<sup>5</sup> (Augustus temple, worship and representation squares, forum, etc.). Most of these pieces were photographed all around and were modeled using photogrammetry techniques. During 2011-12 several pieces from the museum’s warehouse were scanned; during 2012-13, pieces from the museum’s permanent exhibition and pieces hung up on the museum’s walls were photographed and modeled with photogrammetry. The resulting 3D models were then measured, analyzed, and checked against some of the most widely known treatises of antiquity: Palladio’s *Four Books* [9], Serlio’s *Seven Books* [12] and Vignola’s *Book of five Orders* [13].

The result (Figure 8) was a thorough study of the pieces and the classical orders (in this case, a composite order), with which we attempted to make a full 3D representation of the whole decoration program of the sacred square. This attempt to a complete redrawing of the façades, plans and

<sup>5</sup> It is important to remember that marble (of which all the monumental areas of Tarraco were made), and also limestone, are a mineral compound of calcium carbonate ( $\text{CaCO}_3$ ). This material is one of the main sources of lime mortar. Unfortunately, most of Roman ancient and other ancient remains were ravaged to produce this construction material, and Tarragona is no exception. For this reason, very few remains of Tarraco’s monuments have arrived to our days.

**Figure 8:** Two samples of photogrammetry 3D modeling of pieces from the MNAT, and an interpretation (together with hypothesis and conjectures) of the possible size and features of the resulting decorative program

With the help of fourth year architecture students, who are well versed in representation techniques, and utilizing modern and traditional surveying techniques the authors have been able to redraw different heritage remains in the city of Tarragona, the old Roman Tarraco. Learning and teaching these techniques has been fairly easy, and obtaining 2-dimensional and 3-dimensional, data-rich and accurate representations of Tarraco's remains fairly simple. Thus, from a pedagogical point of view, the courses have been useful and sound, more if we understand that we have also taught the students new ways of interacting, analyzing and understanding the history of their territory. .

In any of these cases, accurate and precise architectural representation is used as a support for archaeological and historical analysis of the past, establishing a useful interdisciplinary relationship that we hope will yield many results in the near future.



## Bibliographical References

- [1] L'Italia di Le Corbusier 18/10/2012 - 17/02/2103. Rome: MAXXI, Museo nazionale delle arti del XXI secolo, 2013.
- [2] AUBREY, J. AND J. FOWLES *Monumenta Britannica: or, a miscellany of British antiquities*. Sherborne, England: Dorset Pub. Co., 1980.
- [3] DUPRÉ, X. AND J. M. CARRETÉ *La "Antiga Audiència". Un acceso al foro provincial de Tarraco*. Madrid: Excavaciones Arqueológicas en España, 1993.
- [4] GROS, P. Le modèle du forum d'Auguste et ses applications italiques ou provinciales. État de la questions après les dernières découvertes. In M. NAVARRO AND J.M. RODDAZ eds. *La transmission de l'ideologie impériale dans l'Occident romain. Colloque Bastia 2003*. Bordeaux-París: CTHS, 2006, p. 115-128.
- [5] LOOS, A. Ornament and Crime. Cahiers d'aujourd'hui, 1913, (5).
- [6] MACIAS, J. M., I. F. FERNÁNDEZ, L. P. MASGORET, et al. *Planimetria Arqueològica de Tàrraco*. Tarragona: ICAC, 2007. ISBN 978-84-934698-4-9.
- [7] MACIAS SOLÉ, J. M. The Integrated Management of Archaeological Heritage in Tarragona (ancient Tarraco, Hispania Tarraconensis). In S. SANTORO ed. *Skills and tools to the cultural Heritage and cultural tourism management (TEMPUS IV-CHTMBAL)*. Teramo, IT: D'Errico, 2013, p. 215-236.
- [8] MAR, R., J. RUIZ DE ARBULO, D. VIVÓ AND J. A. BELTRÁN *Tarraco. Arquitectura y urbanismo de una capital provincial romana*. Tarragona: DAC 5, 2012.
- [9] PALLADIO, A. I Quattro Libri dell'architettura. Venetia, 1570.
- [10] PARSLOW, C. C. *Rediscovering antiquity : Karl Weber and the excavation of Herculaneum, Pompeii, and Stabiae*. Cambridge: Cambridge University Press, 1995. ISBN 0521471508.
- [11] RUBIÓ, J. *Visions del Taber Mons Barcinonensis*. Barcelona, 1927.
- [12] SERLIO, S. Regoli generali di architettura sopra le cinque maniere degli edifici, cioe, thoscano, dorico, ionico, corinthio, et composito con gli essempli dell'antiquita, che per la maggior parte concordano con la dottrina di Vitrubio. MDXXVII. Venetia: Francesco M da Forli, 1537, vol. 1.
- [13] VIGNOLA, J. B. D. Regola delli cinque ordini d'Architettura di M. Iacomo Barozzo da Vignola. Roma, 1562.