

# TOWARDS A THEORY OF RECONSTRUCTING ANCIENT LIBRARIES

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# TOWARDS A THEORY OF RECONSTRUCTING ANCIENT LIBRARIES

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I dedicate this dissertation to my parents and grandparents, whose constant encouragement helped me become a first generation PhD holder in my family.

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## LIST OF ABBREVIATIONS

<i>AA</i>	<i>Archäologischer Anzeiger</i>
<i>AC</i>	<i>L'Antiquité Classique</i>
<i>ABI</i>	<i>Accademie e Biblioteche d' Italia</i>
<i>AvP</i>	<i>Altertümer von Pergamon</i>
<i>AJA</i>	<i>American Journal of Archaeology</i>
<i>AD</i>	<i>Ἀρχαιολογικόν Δελτίον</i>
<i>APAWPH</i>	<i>Abhandlungen der preussischen Akademie der Wissenschaften, Philosophisch-Historische Klasse</i>
<i>AAL</i>	<i>Acta archaeologica Lovaniensia</i>
<i>Boreas</i>	<i>Boreas Münstersche Beiträge zur Archäologie</i>
<i>BA</i>	<i>Bollettino d' Arte</i>
<i>BCH</i>	<i>Bulletin de Correspondance Hellénique</i>
<i>BCAR</i>	<i>Bullettino della Commissione Archaeologica Comunale di Roma</i>
<i>CIL</i>	<i>Corpus Inscriptionum Latinarum</i>
<i>FiE</i>	<i>Forschungen in Ephesos</i>
<i>FUR</i>	<i>Forma Urbis Romae</i>
<i>JDAI</i>	<i>Jahrbuch des Deutschen Archaeologischen Instituts</i>
<i>JHS</i>	<i>Journal of Hellenic Studies</i>
<i>JKDAI</i>	<i>Jahrbuch des Kaiserlich Deutschen Archaeologischen Instituts</i>
<i>JÖAI</i>	<i>Jahreshefte des Osterreichischen Archaeologischen Institutes in Wien</i>

<i>JAS</i>	<i>Journal of Archaeological Science</i>
<i>JRA</i>	<i>Journal of Roman Archaeology</i>
<i>JRS</i>	<i>Journal of Roman Studies</i>
<i>Ergon</i>	<i>Έργον τῆς ἐν Ἀθήναις Ἀρχαιολογικῆς Ἐταιρείας</i>
<i>MAAR</i>	<i>Memoirs of the American Academy in Rome</i>
<i>MEFRA</i>	<i>Melanges de l'Ecole francaise de Rome. Antiquity</i>
<i>MINF</i>	<i>Mèmoires de l'Institut national de France, Acadèmie des inscriptions et belles-lettres</i>
<i>AM</i>	<i>Mitteilungen des Deutschen Archaeologischen Instituts. Athenische Abteilung</i>
<i>RM</i>	<i>Mitteilungen des deutschen archaeologischen instituts. Römische Abteilung</i>
<i>NSA</i>	<i>Notizie degli Scavi di Antichita</i>
<i>OpA</i>	<i>Opuscula archaeologica</i>
<i>PBSR</i>	<i>Papers of the British School at Rome.</i>
<i>Praktika</i>	<i>Πρακτικά τῆς ἐν Ἀθήναις Ἀρχαιολογικῆς Ἐταιρείας</i>
<i>SAB</i>	<i>Sitzungsberichte der Koeniglichen Preussischen Akademie der Wissenschaften zu Berlin, II,</i>
<i>SHA</i>	<i>Studies in the History of Arts</i>
<i>S.H.A.</i>	<i>Scriptores Historiae Augustae</i>
<i>TAPA</i>	<i>Transactions of the American Philological Association</i>
<i>ZB</i>	<i>Zentralblatt für Bibliothekswesen</i>

## SUMMARY

The library was one of the most important institutions in the Hellenistic and Roman city, as evidenced in the writings of ancient authors, and the building remains of libraries found throughout the Greco-Roman world, from Asia Minor to France and from Africa to Northern Greece. Yet, the library remains one of the least easily identifiable building forms and one of the most difficult to reconstruct, because unlike architectural types such as the temple, stoa, or theater, the library exhibits significant variety in design, scale and monumentality and the use of different component elements.

In reconstructing libraries, scholars often rely on a prescribed set of assumptions about components and their arrangement that limit our ability to identify libraries and understand their diversity of arrangement. This dissertation proposes shape grammars as an effective computational methodology to identify, understand, and reconstruct ancient libraries of diverse and variant scale, design and monumentality. The work presents a comprehensive documentation of known and identified libraries, reviews the design principles of the architectural form of ancient libraries, and on the basis of this historical analysis proposes a shape grammar for the formal specification of ancient Greek and Roman libraries.

The library grammar encodes the design principles of ancient libraries in ninety-one rules that are grouped in two major parts: the first generates the main hall of the library and its interior design, and the second generates the complete layout of the library including additional porticoes, peristyles, exedras, gardens and propylon. The application of the

rules generates libraries of diverse scales and monumentality: libraries known in the corpus and as well as hypothetical libraries.

The dissertation presents grammatical derivations for the seventeen known and identified libraries. These derivations, depending on the degree of preservation of the building remains of libraries, function as an evaluative tool for the validity of the grammar or for the reconstructions proposed by traditional research. In many cases, they point to different possibilities in the identification of the building remains related to libraries among remains of different phases or remains belonging to neighboring buildings, and suggest variant scenarios of reconstruction that might not stand out using traditional techniques of reconstruction.

The metadata of the rules in the grammar and the derivations are used in a frequency analysis that provides a probabilistic model as an effective and systematic guide in identifying, evaluating and predicting the architectural form of libraries: the main hall and the threshold are identified as mandatory architectural components, the niches and focal point as most likely, and the podium with a colonnade as less likely to occur in a library. Less frequently, the library is a whole complex with exedras, a monumental entry and additional rooms that function as auditoria, banquet halls or offices.

Moreover, the work presents the derivations of possible libraries and evaluates the rules applied to generate them based on the frequency analysis. In the end, the work concludes whether these buildings are libraries, non-libraries or exceptional libraries.

Lastly, this dissertation assesses the opportunities and challenges that emerge in using shape grammars to identify and reconstruct libraries and also the value and impact of



using formal computational methods in the systematic exploration of variations in reconstruction of the archaeological record.

# CHAPTER 1

## INTRODUCTION

The architectural form of ancient libraries is introduced, and a brief description of the methodology for its formal analysis is discussed. The contributions of the dissertation to the formal analysis, evaluation and reconstruction of surviving archaeological remains are discussed and contextualized within a wider discourse on the usage of formal methods in the systematic exploration of variation in the reconstruction of archaeological records. An outline of the work with a summary of each chapter is offered in the end.

### **1.1. Prelude**

The history of the architectural form of the ancient library remains a puzzle. This history is typically confined to a small corpus of ancient writings and an equally small corpus of surviving monuments. Yet we know that libraries in the Roman high imperial period were an indispensable part of both urban structures and civic life. Ancient literary sources indicate a rich bibliography on the art of collecting, organizing and using books and libraries. Built with the patronage of emperors and prominent citizens, both in major urban centers and lesser cities and towns, as part of private residences, royal palace complexes, civic complexes, or as independent buildings, there were likely as many libraries in antiquity as there were major Greek and Roman cities, which are estimated in the hundreds. Today we can only account for sixty-six public libraries through reference in either written sources or building remains. This loss, part of the vast shipwreck of

antiquity, as Alberti<sup>1</sup> has poignantly characterized it, and the elusive form of the building type still continue to captivate our collective imagination of the ancient world's libraries, education and knowledge.

At the core of our projection towards the past of these buildings is the book itself. The book, one of the most persistent human inventions was in its western form invented in the form of the papyrus roll in the Old Kingdom in Egypt and remained unchanged for more than three and a half millennia, when in the medieval times it was finally replaced by the codex, the book in the form we know it today. The architectural form of libraries changed to accommodate the new type of book.

Today the introduction of the internet and digital media has revolutionized the way we think about storing and retrieving textual information and has redirected our interest in virtual worlds and words versus physical ones. Libraries and educational institutions are facing the dilemma of either converting to new media or sticking to the traditional forms of textual information. The understanding of the history and logic of the traditional textual medium, the book, and its physical space, the library, have become critical in our understanding of the opportunities and limitations of the new media and their impact on the physical space of the library as a public space.

The subject matter of this dissertation is the architectural form of ancient Greek and Roman libraries. The analysis starts from the critical examination of evidence – the fragments of the ancient libraries preserved in the archaeological record – and envisions the original state of the buildings that housed the book collections. A synthesis of

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<sup>1</sup> Alberti [and Bartoli, and Rykwert] (1965).

historical analysis and formal analysis deploying formal (computational) approaches is proposed as a way to tackle the gap between surviving evidence and original design. The motivation is to address one of the most difficult problems in formal analysis in archaeological research – the conjectural representation of a proposed initial state of an artifact from its current fragmented state. The case of the ancient libraries is one of the most difficult and interesting problems precisely because of the scarcity of the building remains and because, unlike architectural types such as the temple, stoa, or theater, the library exhibits significant variety in design, scale and monumentality and the use of different component elements. This dissertation proposes shape grammars as an effective computational methodology to identify, understand, and reconstruct ancient libraries of diverse and variant scale, design and monumentality.

## **1.2. Corpus of ancient libraries**

It is difficult to estimate the number of ancient libraries. The increase of literacy and broader reach of knowledge in ancient Greece gave birth to the proto-public libraries for the storage and reading of texts in combination with museums and galleries for the exhibition of works of art of sculpture and painting. Over the next centuries, in the Hellenistic and Roman periods, libraries became public institutions as part of temples and educational institutions including gymnasia and philosophical schools, and were part of every important city or town. In addition, libraries began to be perceived as symbols of intellectual and political power and were quite often planted in the heart of cities by wealthy citizens and emperors as instruments of political propaganda. In the second

century C.E., libraries often combined the function of a library with a funerary monument, as evidenced in Rome and the provincial libraries in Asia Minor.

This diversity of symbolism, function and circumstances under which libraries were designed resulted in a significant diversity in their architectural form, in terms of scale, configuration of spaces and monumentality of the interiors. Libraries were built as independent buildings, as complexes, and as part of other complexes. Despite this diversity, specific underlying characteristics in the architectural form of libraries can be identified. This work summarizes the current state of our knowledge on ancient libraries, based on ancient testimonia and the archaeological record of the past one hundred years including recent findings. Problems relevant to the origins, the use, and the design are discussed.

The number of ancient libraries must have been almost equivalent to the number of important cities and towns and is calculated into hundreds. Among them, only 54 libraries are known through ancient testimonia, ancient authors and epigraphic sources. Among them 17 libraries are also identified with building remains. In addition to them, another 12 have been identified based on their architectural form but without any reference in ancient testimonia to verify their identification.

The corpus of libraries chosen for architectural analysis herein consists of the seventeen buildings that have been identified both through building remains<sup>2</sup> and also references in ancient testimonia. In this work I use the actual state plans of the buildings, in order to

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<sup>2</sup> Remains for two of the libraries, the library in the Portico of Octavia and the library at the Temple of Peace do not come only from building remains on site, but also from the Forma Urbis Romae, the 3rd century marble map of Rome, which today survives partially and fills in our knowledge on the urban form of Rome in the 3rd century.

base the analysis on the evidence. These libraries were built over a period of four hundred years, starting from the early Hellenistic libraries and continuing to the imperial libraries in Rome and the provinces of the Roman Empire, from North Africa to Northern Greece, and from Asia Minor to North Italy (table 1.1 and figure 1.1).

**Table 1.1** The corpus of identified libraries.

	<i>Library</i>	<i>Location</i>	<i>Date</i>
a	Library at the Serapeum	Alexandria	300 – 250 BCE
b	Library of Pergamon	Pergamon	200 – 175 BCE
c	Library of Rhodes	Rhodes	Hellenistic times
d	Academy of Plato	Athens	Hellenistic times
e	Augustan Palatine Library	Rome	28 BCE
f	Library at the Portico of Octavia	Rome	23 BCE
g	Library at the Temple of Peace	Rome	75 CE
h	Domitianic Palatine Library	Rome	80 CE
i	Pantainos Library	Athens	102 CE
j	Celsus Library	Ephesus	After 117 CE
n	Ulpian Library	Rome	114 - 128 CE
k	Neon Library	Sagalassos	After 120 CE
l	Library of Nysa	Nysa	2nd century CE
m	Melitine Library	Pergamon	After 123 CE
o	Hadrian's Library	Athens	131 CE
p	Library at the Forum of Philippi	Philippi	2nd century CE
q	Rogatinus Library	Timgad	2nd half 2nd century CE



**Figure 1.1** Map showing the geographical distribution of libraries. Letters refer to the entries of each library in Table 1.1.

### **1.3. Formal methods in archaeological reconstruction**

The reconstruction of archaeological fragments includes a high degree of uncertainty. Typically this task is undertaken by archaeologists who interpret available data and propose an initial state of the artifacts based upon their expertise on the type of artifacts in question, which includes aspects of its structure, materiality, function, ornament, and process of production. Given the variables, experts often disagree on the interpretation of available evidence and the conjectural model of an artifact's original state. A substantial gap remains between the representation of the evidence produced through fieldwork and the conjectural representation of a proposed initial state of the artifact.

The conflicting reconstructions in the field and the debated accounts that support them, readily verify that the possibilities of interpretations between these two states – the evidence and the conjecture – vary to great degree. Each interpretation offers a different realization of the initial state of the artifact. But, if these proposed realizations (and more) are all possible how can one begin to reason about these possible interpretations? Upon which premises can one solution be better than the others? What are the steps, if any, for the modeling of such reconstructions? Is it possible to formalize and agree upon such assertions?

Formal (mathematical and computational) approaches have been playing an increasingly significant role in this debate. Mathematical approaches including graph theory, lattice theory, proportional analysis, symmetry analysis, statistical analysis, space syntax theories, and generative grammars, increasingly participate in the formal description, interpretation and evaluation of the evidence recovered in fieldwork (see chapter 4).

The emphasis in the present work is centered on generative grammars as an effective way of classifying, analyzing and reconstructing artifacts based on a finite vocabulary of components and rules that describe an infinite set of organizations of these components. More specifically, the work uses shape grammars that directly use shapes in the computation that are more intuitive and more visual. Applications like the generative specification of the tombs in the Orkney Islands, Scotland, or the generative specification of Greek geometric battlement and running meanders, and the generative specification of Makowiecka's schemas for Roman libraries, point to a very different kind of theory to test the premises of a reconstruction.



The work presented here is positioned within this wider field and uses shape grammars to explore the formal specification of the ancient Greek and Roman libraries, the subject of the inquiry of this work.

The grammar itself consists of ninety-one rules that split in two major sections: the first generates the main hall of the library and its interior design, and the second the general layout of the library including any additional spaces. In each section the rules are organized in stages that address specific characteristics within the design of libraries, such as the design of the podium, the colonnade, the niches, the stoas, and the exedras. The sequential application of the rules from one stage to the other generates a range of possible plans of ancient libraries with a diversity of both scale and monumentality.

The library grammar can generate plans of the seventeen libraries in the corpus by applying the rules juxtaposed on the actual state plan of the building remains, and can also generate plans of hypothetical libraries by applying and computing the rules on a white canvas, with no restrictions in terms of site and program. This formalism is used for the evaluation and the reconstruction of fragmentarily surviving archaeological remains by proposing variant possible reconstructions. The range of hypothetical library plans gives the range of variation within the type of ancient libraries and suggests possible plans that might be identified in the future (see chapter 5.5).

#### **1.4. Contributions of the dissertation**

The main goal of this dissertation is to integrate historical research with computation (representation and reasoning) so that computation can inform historical research and

interpretation. The methodology has been designed as a feedback loop upon these premises and it is hoped that the contributions of the work will affect both domains.

The work revisits the issues of origins, use and design of the ancient library that have been discussed repeatedly in modern scholarship and clarifies them in the light of recent findings. The work discusses a variety of building precedents including the gymnasium, prytaneum, and metroon, and mostly the mouseion – an institution under the auspices of the Muses, that housed manuscripts and works of art and combined the functions of a contemporary library, museum, and gallery. The thesis concludes that underlying characteristic of all of them, and central design feature is the stoa, a porticoed building type central in Greek and Hellenistic urbanism.

Also, the work discusses issues of use and maintenance including the alleged existence of a *peristasis*, an exterior double wall for the better insulation of the main hall and the protection of the papyrus rolls, and the alleged usage of stairs to give access to the second level of niches. The work suggests that the upper niches were intended to host statuary of poets, orators, and other authors, which are frequently referenced in ancient testimonia, and that there was therefore no need for circulation through stairways. Also the work rejects the double exterior walls as a programmatic feature of the library.

Based upon these conclusions, the shape grammar clarifies the design of libraries that have been identified and reconstructed with a great degree of certainty based on available evidence. Significantly, in these cases the formalism functions primarily in a self-evaluating mode as a valid descriptive and analytical tool of building remains. If the grammar is able to generate the forms of libraries that are well documented and

reconstructed with a high degree of certainty, the grammar is evaluated as a trustworthy tool for the description, analysis and reconstruction of other libraries with similar features. In addition, the frequency analysis of the rules used to generate the known and identified libraries provides a quantitative analysis of the building type of the library, by defining the probability with which different architectural features occur.

The grammar also works as an evaluative tool of possible libraries, i.e. buildings that have been suggested as libraries, but for which no reference in ancient testimonia can verify their existence as such. The grammar provides a systematic tool for their evaluation. If the rules can generate them, then they are admitted to the corpus of possible libraries, if not, then they could not have been libraries in the same style as the known ancient libraries. If the grammar can generate part of their architecture, the metadata of the grammar evaluates the derivations and determines whether they are libraries or not based on the rules used to generate them: if the rules belong to the rules with high frequency of occurrence in the corpus of known libraries, then the buildings are evaluated as exceptional libraries. If the rules have low frequency of occurrence in the known libraries, then buildings are evaluated as non-libraries.

The grammar also functions as a predictive tool in the cases in which a library is not preserved but ancient testimonia point to its existence. In such cases the grammar points to possibilities and offers guidance for the possible identification of the spaces of the library among the building remains. If the shapes used by the grammar can be identified in part or all of the building remains, then this is a valid hypothesis for the identification of the library.

Similarly the grammar works as an evaluative tool when remains and material record point stylistically to features of libraries but the evidence may be incomplete. In these cases the grammar may also suggest that an existing remain is a part of a library.

## **1.5. Outline of the dissertation**

The outline of the dissertation is given below along with a summary of each chapter.

Chapter 1 introduces the problem of the architectural form of the ancient libraries. A brief description of the methodology adopted for the formal analysis of the architectural form of the ancient libraries is discussed. The contributions of the dissertation to formal analysis, evaluation and reconstruction of surviving archaeological remains is discussed and contextualized within a wider discourse on the usage of formal methods in the systematic exploration of variation in the reconstruction of the archaeological record. An outline of the work with a summary of each chapter is offered at the end.

Chapter 2 provides a summary of the current state of knowledge on ancient libraries and focuses on problems relevant to their origins, use, and design. The summary includes ancient testimonia on libraries as book collections, ancient testimonia on libraries as buildings or parts of buildings, as well as modern scholarship discussing the findings of archaeological excavations from the 19th century onwards and the birth and evolution of contemporary theory on ancient libraries. The problem of origins of the building form is discussed and accounts of the relationship of the building form of the library to building precedents such as mouseia, gymnasia, prytaneia and metroa is given as well. A reconstruction of the building program of the ancient library is given, including the

management of the book collections, the technology of the rolls and the codices and their spatial requirements, and other technical specifications required to protect such material. An account is given of the current distinction between Greek and Roman libraries and the assumptions and conventions governing such classifications along with a detailed account of the spatial and functional characteristics of the building form.

Chapter 3 systematically presents the corpus of the ancient libraries in four different categories: a) Libraries that are known from ancient testimonia and have been identified by building remains; b) Libraries that are not known from ancient testimonia but are possible based on archaeological evidence, reasoning and correlation with building remains that exemplify compositional and structural aspects of library forms; and c) Libraries that are known through testimonia but have not yet been identified with any building remains. All case studies are presented in a chronological order and in an identical format in order to draw attention to their similarities and differences. This format includes general historical and geographical data and an up-to-date account of the archaeological research and findings pertaining to the alleged spatial characteristics of the libraries, namely, the main hall, podium, niches, focal point colonnade, stairs, roof, floor, apertures, and walls. Actual dimensions of archaeological record are given when available and all literary and epigraphic material when known is presented in both its original text format and its English translation.

Chapter 4 lists a series of theoretical approaches to the formal analysis of archaeological fragments including proportional and symmetry analysis, statistical analysis, space syntax theories, and generative grammars. The emphasis is given to generative grammars and the formal representation of the archaeological artifacts and more specifically to the

shape grammar formalism. The formalism is presented and illustrated by three shape grammars applications all founded within the archaeological discourse: one on the generative specification of the tombs in the Orkney Islands, Scotland; a second on the generative specification of the Greek geometric battlement and running meanders; and a third on the generative specification of Makowiecka's schemas for Roman libraries. A brief synthesis of the findings provides a pretext and a frame of reference for the formal specification of the ancient Greek and Roman libraries, the subject of the inquiry of this work.

Chapter 5 presents a shape grammar of ancient libraries. The corpus of the seventeen libraries that have been unambiguously identified by ancient testimonia and building remains is represented in an identical scale, manner and set of graphical conventions to foreground the similarities and differences between the archaeological remains of the libraries. The pictorial representation of the state-of-preservation plans foregrounds only the elements of the buildings that are of interest to this research and to produce the initial analysis set of the seventeen libraries. A shape grammar for the ancient libraries is postulated upon these drawings and is given in two series: one for the design and arrangement of the central core of the library, the *oikos*; and a second for the arrangement of the whole building complex of which the library is a part, including auxiliary rooms, porticos, stoas, *exedras*, and *prostyla*. A series of derivations is given for the generation of all known libraries that are juxtaposed to the state-of-preservation plans that comprise the corpus of the grammar. A series of alternative derivations of some of the libraries in the corpus is presented in order to critically discuss the conventions and the merits of other reconstructions of the libraries proposed by different scholars and by the grammar.

Secondly, the rules used to generate the derivations of the known are analyzed in a frequency analysis, which informs the definition of the building type of the library as a set of mandatory, most probable and less probable architectural features. This probability model is later used to confirm or refute the interpretation of buildings as possible libraries.

Chapter 6 provides a critical summary of the formal analysis of the architectural form of the ancient libraries. The summary discusses both the two inquiries, one in the history and one in the logic of the design of the form of the ancient libraries, and reflects upon how these two inquiries are attempted to be seamlessly intertwined. Within this context a critical assessment of the role and usage of shape grammars in archaeological research is offered along with the opportunities and challenges that emerge within this framework. A summary of future directions includes extensions of the formalism to include proportional and transformational grammars in two and three dimensions as well as the encoding of the grammar in a digital software application. The chapter concludes with some final reflections on the impact and value of formal methods in the systematic exploration of variation in the reconstruction of the archaeological record.

## **CHAPTER 2**

### **HELLENISTIC AND ROMAN LIBRARIES**

A summary on the current state of our knowledge on ancient libraries is given with a special emphasis in problems relevant to their origins, use, and design. The summary includes ancient testimonia on libraries as book collections, ancient testimonia on libraries as buildings or parts of buildings, as well as modern scholarship discussing the findings of archaeological excavations from the 19<sup>th</sup> century onwards and the evolution of the design of ancient libraries. The problem of origins of the building form is discussed and accounts of the relation of the building form of the library to building precedents such as the museum, the gymnasium, the prytaneum and the metroon are given. A reconstruction of the building program of the ancient library is given too, including aspects of the management of the book collections, the technology of the rolls and the codices and their spatial requirements, and other technical specifications required to protect such material. An account is given of the current distinction between Greek and Roman libraries and the assumptions and conventions governing such classification along with a detailed account of the spatial and functional characteristics of the building form.

#### **2.1. Introduction**

The literature review of libraries consists of primary sources – ancient testimonia referring to ancient libraries and actual buildings that shelter book collections, as well as



secondary sources that include books, papers, publications, and dissertations from the 19<sup>th</sup> century onwards.

### 2.1.1. *Ancient testimonia on libraries*<sup>3</sup>

The word library, in Greek *βιβλιοθήκη* and in Latin *bibliotheca*, appears in Greek and Latin literature in several forms and contexts, signifying flexibility in the conception of a library. According to the 2<sup>nd</sup> century CE dictionary of Festus the word *bibliotheca*<sup>4</sup> meant for the Greeks and the Latins, both the collection of a large number of books and the space in which the books were kept.<sup>5</sup>

In ancient testimonia, there are eighty-five references to libraries. In two, there is an explicit reference to the public character of the library with the adjective *δημοσία* (*public*) modifying the noun *βιβλιοθήκη* (library). Only two references do not include the stem –βιβλίο / -βυβλίο (references in Greek) or –biblio / –byblio (references in Latin). They both refer to the Augustan Palatine Library as curia. It is known that Augustus held the meetings of the senate in the Palatine Library, so the reference to the library as curia can be explained by the function of the library as a meeting place for the senate. Among the eighty-three references that include the stem –βιβλίο/ -βυβλίο (references in Greek) or –biblio/–byblio (references in Latin), twenty-one references use the stem with –υ or –y (-βυβλίο in Greek, -byblio in Latin) and sixty-two references use the stem with –ι or -i (-βιβλίο in Greek, –biblio in Latin). Biblio- and byblio- are both derived from the Greek

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<sup>3</sup> All references in ancient testimonia are given in Appendix B.

<sup>4</sup> “Bibliothecae et apud Graecos et apud nos tam librorum magnus per se numerus, quam locus ipse, in quo libri collocatae sunt, appellantur” Festus, “De verborum significatu.”

<sup>5</sup> Blanck (1992, 178).

βύβλος, literally, the Egyptian papyrus. The term βύβλος itself could either be a Greek rendition of an older Egyptian origin or alternatively a rendition of the Phoenician port Byblos from which Egyptian papyrus was exported to Greece. Nine references are composite words or phrases (βιβλιοφυλάκιον, αποθήκας τῶν βιβλίων, οικήματα μετὰ τῶν βιβλίων, ταμεῖα ταῖς βίβλοις, opus bybliothecae) and seventy-four references are the Greek word βιβλιοθήκη/ βυβλιοθήκη or the Latin word *bibliotheca/ bybliothecca* in different cases, according to their use in function in the text.

Among the eighty-three references, fifty-six are in singular form, and twenty-seven are in plural form. The references in singular form use the terms βιβλιοθήκη, βιβλιοφυλάκιον, and *bibliotheca*. The references in plural form use the terms βιβλιοθήκαι, *bibliothecae*, αποθήκας τῶν βιβλίων (book warehouses), οικήματα μετὰ τῶν βιβλίων (houses with books), and ταμεῖα ταῖς βίβλοις (book treasuries), and *opus bibliothecae*. In all cases it is unclear whether these terms refer to the book collection, the institution of the library or to the actual building.

It has been argued for example, that the word *bibliothecae* refers to two libraries, one for the Greek and one for the Latin book collections, as one would expect Roman libraries to have both Greek and Latin collections.<sup>6</sup> However, this interpretation does not take into account that plural was also used in cases where the strong assumption is that there was only Greek literature. For example Strabo refers at the Library of Attalids in Pergamon in plural,<sup>7</sup> and Ammianus Marcellinus refers at the Library at the Serapeum in plural.<sup>8</sup> So,

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<sup>6</sup> Callmer (1944, 159); Gregori (1937, 14); Casson (2001, 85).

<sup>7</sup> Strabo, *Geography*, 8.4.2.

the reference to the library in plural does not necessarily imply bilingual collections or two different libraries.

Additional evidence comes from the fact that on many occasions authors use the term both in singular and in plural while referring to the same library. For example, Galen refers to the Palatine Library in the same text using the term twice in plural and once in singular.<sup>9</sup> Moreover, the term has been used in plural for libraries whose building remains testify only one hall, as for example the Augustan Palatine Library. Clearly, the use of the term *bibliothecae* in these cases does not infer the actual division of the library in two sections or two identical halls, but to multiple book depositories, a fact that is also indicated by the composite phrases *αποθήκας, οικήματα, ταμεία*. An additional element that might support this interpretation is that the word *βιβλιοθήκαι* is used in reference to the description of archival material as in the case, for example, of the costs undertaken for the archive of Aphrodisias.<sup>10</sup> It is safer to infer that the term *bibliothecae* refers to multiple bookcases or multiple storage rooms associated with the library, rather than a symbolic division based on bilingual collections.

Lastly, the interpretation of the term *bibliothecae* as a pair of Greek and Latin book collections is further weakened by the consistent and explicit reference to the language of the book collections. For example Suetonius refers to the Augustan Palatine Library as *bibliotheca Latina Graecaquae*,<sup>11</sup> and Isidor, who recycles Suetonius' writings, refers to

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<sup>8</sup> Ammianus *Marcellinus*, 22.16.12-13.

<sup>9</sup> Galen, *On the avoidance of grief*, 12 -17.

<sup>10</sup> MAMA 8, 498, 2.8-31.

<sup>11</sup> Suetonius, *Lives of the Caesars*, Augustus, 29. 3.

the library at the Atrium Libertatis as *bibliothecas Graecas atque Latinas*.<sup>12</sup> Moreover, there are two inscriptions that mention each of the sections of Domitian's Library in the Palatine i.e. *bibliotheca Latina* and *bybliothece Graece*. These two inscriptions are the only references to two different book collections for each of which the archaeological record verifies a separate hall. Finally, there is an inscription referring to the Bibliotheca Latina at the Porticus Octaviae, but the lack of any further evidence and material record regarding this building does not allow for any conclusions as to its significance.

In conclusion, the two most frequent terms in Greek and Latin that are used to refer to libraries, *βιβλιοθήκη* and *bibliotheca* respectively, appear both in singular and plural form and neither makes a clear distinction whether any of these terms refers to a building, to a room, to a collection of bookcases, or to a book collection. Depending on the context, authors alternated between using the term to refer to the building or the hall where the book collection is stored and accessed, the bookcases where the books were stored, or the collection of the books itself. The use of singular form typically implies the library as an organized book collection for public usage sheltered within a building or a part of a building complex as for example, the Library of Alexandria, the Library of Pergamon, and others. The singular form is used as well for library buildings that consist of a single hall, for example the library of Celsus,<sup>13</sup> but also library buildings that consist of a complex of more spaces, as for example, the library of Pantainos.<sup>14</sup> The use of plural typically refers to the multiple spaces and furniture for the storage of books. The

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<sup>12</sup> Isidor, *Etymologie*. 6.5.2.

<sup>13</sup> Praschniker et al. (1953, 61-62).

<sup>14</sup> Meritt (1946, 330-331).

reference to a section of a library, the Latin or the Greek library, does not necessarily signify the separation of these collections in different halls, but instead to different bookcases within the same hall. The possibility that it refers to different rooms can only be confirmed in the case of Domitian's library on the Palatine hill, where building remains have revealed two identical apsidal halls, and two inscriptions mention the two sections of the library separately.<sup>15</sup> So, the interpretation of the terminology must be considered within the context of the text and must not lead to assumptions about the typology of the building.

### 2.1.2. *Ancient testimonia on libraries as book collections*

The first surviving reference to the earliest book collections in antiquity comes from Athenaeus<sup>16</sup> in the 2<sup>nd</sup> century CE who named Polycrates, the tyrant of Samos, and Peisistratus, the tyrant of Athens, as the first owners of marvelous books. The information that Polycrates and Peisistratus founded libraries in the 6<sup>th</sup> century B.C.E. is later restated by Suetonius and Isidor.<sup>17</sup> As literacy increased in Athens of the 5<sup>th</sup> century B.C.E., the industry of book production became more developed and more individuals owned and had access to books. Among the early zealous book collectors, Xenophon<sup>18</sup> names

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<sup>15</sup> CIL VI 5188; CIL VI 5884.

<sup>16</sup> Athenaeus, *The Learned Banqueters*, 1.3. α «ἦν δὲ, φησί, καὶ βιβλίων κτήσις αὐτῷ ἀρχαίων Ἑλληνικῶν τοσαύτη ὡς ὑπερβάλλειν πάντας τοὺς ἐπὶ συναγωγῇ θεταυμασμένους, Πολυκράτην τε τὸν Σάμιον καὶ Πεισίστρατον τὸν Ἀθηναίων τυραννήσαντα Εὐκλείδην τε τὸν καὶ αὐτὸν Ἀθηναίων καὶ Νικοκράτην τὸν Κύπριον ἔτι τε τοὺς Περγάμου βασιλέας Εὐριπίδην τε τὸν ποιητὴν Ἀριστοτέλην τε τὸν φιλόσοφον καὶ τὸν τὰ τούτων διατηρήσαντα βιβλία Νηλέα.»

<sup>17</sup> Isidor, *Etymologie*, 6.2.3.

<sup>18</sup> Xenophon, *Memorabilia*, 4.2.8 «Εἰπέ μοι», ἔφη, «ὦ Εὐθύδημε, τῷ ὄντι, ὥσπερ ἐγὼ ἀκούω, πολλὰ γράμματα συνήχας τῶν λεγομένων σοφῶν ἀνδρῶν γεγονέναι;»  
Καὶ ὁ Εὐθύδημος, «Νῆ τὸν Δί',» ἔφη, «ὦ Σώκρατες' καὶ ἔτι γε συνάγω, ἕως ἄ κτήσωμαι ὡς ἂν δύναμαι πλεῖστα.»

Euthedemos, a student of Socrates, and Aristophanes<sup>19</sup> cites Euripides. Athenaeus<sup>20</sup> mentions these as well in addition to Euclid of Athens, Nicocrates of Cyprus, Aristotle, Neleus, and the kings of Pergamon. Significantly though, it is Strabo<sup>21</sup> who credits Aristotle as the first collector of books to systematize teaching and research.

Isidor of Seville wrote in the 6th century C.E. and is an indirect source on the history of book collections. Isidor, in the sixth book of his encyclopedia, the *Etymologies*, and in the historical context of ecclesiastical books, authors, libraries, and offices, gives a short background on the history of Greek and Roman libraries, recycling information from Suetonius.<sup>22</sup> In his account, he includes the etymology of the word bibliotheca, a short account of the history of Greek and Roman libraries, and an extensive account of the types of literary works, the different writing materials and utensils, the different types of books – the codex and the scroll – and the copyists and their tools. In his account, Isidor credits Peisistratos as the first to establish a library. He describes the fate of this library and its transfer by Xerxes to Persia, and its later return to Greece by Seleucus Nikanor. He also credits Ptolemy Philadelphus as the most zealous collector not only of Greek books, but also as translator of books from other languages to Greek. Isidor describes in detail the translation of the Torah by seventy scholars that were hosted in the Library of Alexandria. Lastly, Isidor discusses the book collections transferred to Rome as spoils of

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<sup>19</sup> Aristophanes, *Frogs*, 943 ἄλλ' ὡς παρέλαβον τὴν τέχνην παρὰ σοῦ τὸ πρῶτον εὐθὺς οἰδοῦσαν ὑπὸ κομπασμάτων καὶ ῥημάτων ἐπαχθῶν, ἴσχανα μὲν πρῶτιστον αὐτὴν καὶ τὸ βᾶρος ἀφειλον ἐπυλλίοις καὶ περιπάτοις καὶ τευτλίοισι λευκοῖς, χυλὸν διδοὺς στωμυλμάτων ἀπὸ βιβλίων ἀπηθῶν.

<sup>20</sup> Athenaeus, *The Learned Banqueters*, 1.3. a. (supra n.14).

<sup>21</sup> Strabo, *Geography*, 13.1.54 «ὁ γοῦν Ἀριστοτέλης τὴν ἑαυτοῦ Θεοφράστῳ παρέδωκεν, ᾧ περ καὶ τὴν σχολὴν ἀπέλιπε, πρῶτος ὧν ἴσμεν συναγαγὼν βιβλία καὶ διδάξας τοὺς ἐν Αἰγύπτῳ βασιλέας βιβλιοθήκης σύνταξι.»

<sup>22</sup> Callmer (1944, 145).

war from Macedonia and Pontos by Aemilius Paulus and Lucullus respectively, the commission of Varro by Caesar to construct “the largest library possible”<sup>23</sup> and the establishment of the first public library in Rome by Asinius Polius.

Private book collections also became very popular in Rome, as books were brought from the Hellenistic kingdoms as spoils of war. Cicero<sup>24</sup> and Plutarch<sup>25</sup> mention Atticus, Faustus Sulla, Lucullus and many poets and philologists as passionate book collectors. It seems that book collectors granted access to the collections in their villas, and as such borrowing books was also quite popular. Cicero in a letter to his friend Atticus<sup>26</sup> mentions that he enjoys being in the library of Faustus Sulla, and in his book *De finibus*<sup>27</sup> mentions that he went to Lucullus’ library in his villa in Tusculum to borrow some books of Aristotle. Also, Plutarch<sup>28</sup> credits Lucullus not only for collecting, but more importantly, for allowing free access to important books and for letting people use the stoas and the surrounding spaces as a temple of the Muses. Similarly, an inscription<sup>29</sup>

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<sup>23</sup> Isidor, *Etymologie*. 6.5.1.

<sup>24</sup> Cicero, *Ad Atticus*, 4.10 (Letter 84); Cicero, *On Ends*, 3.2.7.

<sup>25</sup> Plutarch, *Lives, Lucullus*, 41.1-2.

<sup>26</sup> Cicero, *Ad Attic*, 4.10 (Letter 84) “Cum audissem Antiochum, Brute, ut solebam, cum M. Pisone in eo gymnasio quod Ptolemaeum vocatur.”

<sup>27</sup> Cicero, *On Ends*, 3.2.7 “Nam in Tisculano cum essem vellemque e bibliotheca pueri Luculli quibusdam libris uti, veni in eius villam ut eos ipse ut solebam depromarem. Quo cum venissem, M. Catonem quem ibi esse nescieram vidi in bibliotheca sedentem, multis circumfusum stoicorum libris.”

<sup>28</sup> Plutarch, *Lives, Lucullus*, 41.1-2, «Σπουδῆς δ’ ἄξια καὶ λόγου τὰ περὶ τὴν τῶν βιβλίων κατασκευὴν. καὶ γὰρ πολλὰ καὶ γεγραμμένα καλῶς συνῆγεν, ἧ τε χρήσις ἦν φιλοτιμοτέρα τῆς κτήσεως, ἀνεμιμένων πᾶσι τῶν βιβλιοθηκῶν, καὶ τῶν περὶ αὐτὰς περιπάτων καὶ σχολαστηρίων ἀκωλύτως ὑποδεχομένων τοὺς Ἕλληνας ὥσπερ εἰς Μουσῶν τι καταγῶγιον ἐκείσε φοιτῶντας καὶ συνδιημερεύοντας ἀλλήλοις, ἀπὸ τῶν ἄλλων χρειῶν ἀσμένως ἀποτρέχοντας. πολλάκις δὲ καὶ συνεσχόλαζεν αὐτὸς ἐμβάλλων εἰς τοὺς περιπάτους τοῖς φιλολόγοις καὶ τοῖς πολιτικοῖς συνέπραττεν ὅτου δέοιτο· καὶ ὄλωσ ἔστια καὶ πρυτανεῖον ἑλληνικὸν ὁ οἶκος ἦν αὐτοῦ τοῖς ἀφικνουμένοις εἰς Ῥώμην.»

<sup>29</sup> *CIL X 6638*.

mentions a book collection in the imperial library in Antium, in which were placed dedicated imperial slaves, who helped the patrons.<sup>30</sup>

Book collections were so popular in this time that several treatises were written on the use and collection of books.<sup>31</sup> Though these treatises are now lost, their names survive through indirect sources. Suda, the encyclopedia written in the 10<sup>th</sup> century C.E., gives the names of three authors and the titles of their treatises on libraries, from the 1<sup>st</sup> century and the 2<sup>nd</sup> centuries C.E. that we would not know otherwise. In the 1<sup>st</sup> century B.C.E., Telephos from Pergamon wrote the work *Βιβλιακὴ Ἐμπειρία*; in the 1<sup>st</sup> century C.E., Herrennios Philon from Byblos wrote a twelve-volume work with the title *Περὶ κτήσεως καὶ εκλογῆς βιβλίων βιβλία*; and in the 2<sup>nd</sup> century C.E. Damophilos wrote the work *Φιλόβιβλος*. Athenaeus gives the name of another author of the 1<sup>st</sup> century B.C.E., Artemon from Pergamon, who wrote the works *Περὶ συναγωγῆς βιβλίων*, and *Περὶ βιβλίων χρήσεως*. Another indirect source of treatises on libraries in antiquity is Suetonius and his work *De Vita Caesarum*. Suetonius wrote in the 2<sup>nd</sup> century C.E. about the lives of the Roman rulers from Caesar to Domitian, and included information about the libraries that were founded under them. In his work, he mentions that Marcus Terrentius Varro, the great intellectual of the 1<sup>st</sup> century B.C.E., wrote the three-volume work *De Bibliothecis*, while he was commissioned by Caesar to organize the first public library in Rome. Varro's work survives today only in fragments, but a significant portion of its material is later recycled by Suetonius and Isidor.

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<sup>30</sup> Blanck (1992, 216).

<sup>31</sup> Callmer (1944, 145).



In summary, ancient literary sources show a rich interest in book collecting and in the art of organizing and indexing book collections by individuals, kings, and emperors. The number of treatises written on the art of book collecting clearly supports this fact. Dedicatory inscriptions of libraries also show a special interest in the dedication of libraries by emperors, officials and wealthy citizens. Moreover, literary sources prove the extent to which books were appreciated as spoils of war from archaic times to the Roman times, and the ways in which the first libraries in Rome and Italy were private, but to some extent open to a circle of intellectuals and the public.

While the significance of books and libraries was certainly intellectual, it was also political. Books represent knowledge and by collecting universal knowledge and dedicating a library, one asserted his possession of it. It is not a coincidence that libraries in Roman times were dedicated by the emperor, members of the imperial house or officials, and often displayed the statue of the emperor, for example the statue of Trajan was displayed in the Pantainos Library, the Neon Library and in the Library of Prusa, and the statue of Hadrian in the Melitine Library. Also, it seems that portraits of emperor in libraries have received cult.<sup>32</sup> The statue of Hadrian in the Melitine Library depicted him in the nude, which was an iconographic characteristic of heroes and gods.<sup>33</sup> Ultimately the role of the book, the book collection and the association with could be used as an instrument of power.

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<sup>32</sup> Petsalis-Diomidis (2010, 211).

<sup>33</sup> Petsalis-Diomidis (2010, 171).

### 2.1.3. *Ancient testimonia on the design of libraries*

Several ancient references indicate the importance of book collections, and several treatises were written on the collection, use, and maintenance of books. While we might expect some interest in the design of libraries, no treatise on the architectural form of libraries survives today. The only explicit reference to the design of libraries comes from Vitruvius. In the sixth book (6.4) of *De Architectura*, the only treatise on architecture that survives from antiquity, he included a section on the orientation of private libraries when addressing the proper exposure for rooms in domestic architecture. He says that libraries should have an eastern exposure, so that the predawn breeze dispels the damp and allows the right amount of light into the library for morning activities. Later, describing the Greek house (6.7), he says that the rooms attached to the peristyle facing east are libraries. It should be considered that the morning light was necessary for activities like writing letters for politics, logistics and commerce that must have taken place in the private libraries. It can therefore be inferred that private book collections were located in rooms in direct connection to the peristyle, facing east. However, this should not be taken as a general guideline to the design of public libraries, as Vitruvius refers to private libraries in private residences, not to public institutions. It is surprising that Vitruvius does not mention anything about libraries in his fifth book, where he discusses the types of public buildings within the city walls. This is even more surprising if we consider that he devotes six chapters to theaters, one to colonnades and one to palaestras. In the chapter on palaestras, Vitruvius mentions the exedras for philosophical and rhetoric recitations attached to the stoas of the palaestra, but he does not refer to the libraries and book collections related to those exedras. Lastly, in the seventh book (7. Preface 4), Vitruvius

mentions the big libraries of Alexandria and Pergamon but his description reveals his confusion about them. He says that the Library of Alexandria was built after the Library of Pergamon, when the opposite is in fact true. In all, it seems that Vitruvius is not convinced or simply not aware of the importance of libraries in Hellenistic cities and the role they could play in the newly founded Roman Empire.

Other references to the design of libraries come from authors who describe known libraries. Diogenes Laertius is the only source of information for the design of the Lyceum, the philosophical school of Aristotle.<sup>34</sup> The Lyceum has the form of a gymnasium, with a garden and a peripatos, around which are arranged the different spaces; the *Μουσεῖον*, the sanctuary of the Muses with their statues and other votive gifts, the *στωῖδιον*, a small stoa, and the *κάτω στοὰ*, the lower stoa. A similar design must have been implemented in the design of the Library at the Museum in Alexandria, which was organized by Demetrius Phalereus, a student of Aristotle and member of the Lyceum in Athens. The only information about its design comes from Strabo,<sup>35</sup> who describes the Museum as part of the palaces that include a *peripatos*, an *exedra* and a grandiose *οἶκος*, a banquet hall for the members of the Museum. Much later, in Roman times, Cicero names the peristyle of his villa “Lyceum” or “Gymnaseum,”<sup>36</sup> a fact that shows the importance of a peristyle in the design of the ancient library, and the importance of Aristotle in the history of book collections and the design of libraries.

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<sup>34</sup> Callmer (1944, 147).

<sup>35</sup> Strabo, *Geography*, 17.1.8, τῶν δὲ βασιλείων μέρος ἐστὶ καὶ τὸ Μουσεῖον, ἔχον περίπατον καὶ ἐξέδραν καὶ οἶκον μέγαν ἐν ᾧ τὸ συσσίτιον τῶν μετεχόντων τοῦ Μουσείου φιλολόγων ἀνδρῶν.

<sup>36</sup> Strocka (1981, 307).

The relationship of the library to a stoa has been established by numerous other references in literary sources that describe known libraries. Isidor mentions that Asinius Pollius likely founded the Greek and the Latin Library in the Atrium Libertatis as a peristyle complex.<sup>37</sup> Pausanias says that the peristyle building of Hadrian in Athens contains books in rooms attached to the stoas with gilded ceilings and alabaster and embellished with statues and paintings.<sup>38</sup> Aphthonius says that in the library of Alexandria there is a central peristyle with double stoas and attached rooms, some of them repositories of books and some spaces for the cult of the gods.<sup>39</sup> Ammianus Marcellinus mentions that the library at the Temple of Serapis was in a temenos with an extended colonnaded courtyard and magnificent temples and breathing statues, and works of art.<sup>40</sup> Suetonius says that Augustus' library on the Palatine Hill was attached to colonnaded stoas that surrounded the Temple of Apollo.<sup>41</sup>

Also, there are numerous references to the embellishment of libraries with works of art, painting and sculpture. Josephus says that Vespasian dedicated the Temple of Peace, which he embellished with ancient masterpieces of painting and sculpture.<sup>42</sup> Pliny describes in the library at the Temple of Apollo at the Palatine Hill a 50 ft tall bronze statue of Apollo.<sup>43</sup> Specific mention is made to the embellishment of libraries with portraits of authors and orators, sometimes of still living ones who received this as the

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<sup>37</sup> Isidor, *Etymologie*. 6.5.2 “primum autem Romae bibliothecas publicativ Pollio Graecas simul atque Latinas addit auctorum imaginibus in atrio, quod de manubiis magnificentissimum instruxerat.”

<sup>38</sup> Pausanias, *Description of Greece*, 1.18.9 “πεποιήνται δὲ καὶ ταῖς στοαῖς κατὰ τὰ αὐτὰ οἱ τοῖχοι. καὶ οἰκήματα ἐνταῦθά ἐστιν ὀρόφω τε ἐπιχρῦσφ καὶ ἀλαβάστρω λίθω, πρὸς δὲ ἀγάλμασι κεκοσμημένα καὶ γραφαῖς: κατὰκειται δὲ ἐξ αὐτὰ βιβλία.”

<sup>39</sup> Aphthonius, *Progymnasmata* 12.

<sup>40</sup> Ammianus *Marcellinus*, 22.16.12-13.

<sup>41</sup> Suetonius, *Lives*, Augustus, 29.3.

<sup>42</sup> Josephus, *The Jewish War*, 7.158.

<sup>43</sup> Pliny, *Natural History*, 34.8.43.

biggest honor. Isidor in his account of the library in the Atrium Libertatis says that Asinius Pollius decorated the atrium with portraits of authors.<sup>44</sup> Pliny also mentions that among the portraits was the portrait of the still living Varro, to honor a leading orator and citizen.<sup>45</sup> The author of *Scriptores Historiae Augustae* says that a portrait of the still living Numerian was put in the Ulpian Library to honor him as a powerful orator.<sup>46</sup> Sidonius Apollinaris writes in a letter to Firminus that his portrait with all his honors inscribed was put in the Ulpian libraries among the portraits of authors.<sup>47</sup> Tacitus mentions that the Palatine Library displayed the portraits of Hortensius and other orators, and the portrait of Augustus.<sup>48</sup>

Lastly, fragments of two inscriptions, one from the gymnasium in Rhodes and one from Piraeus give the names of the authors and the titles of books in two columns, which have been interpreted either as a formal catalogue of the books held in the library, or as a dedicatory inscription of books donated to the library.<sup>49</sup>

In conclusion, literary sources referring to libraries as buildings range from the 1<sup>st</sup> century CE to the 6<sup>th</sup> century C.E. and focus on the sculptural and painting program of a library rather than its architecture, emphasizing the close connection between books and works of sculpture and painting. The architecture of the library repeated across many sources centers on its relationship to colonnaded courtyards, and rooms attached to colonnaded stoas and peristyles, contributing to the overall character of the library as a space of

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<sup>44</sup> Isidor, *Etymologie*. 6.5.2.

<sup>45</sup> Pliny, *Natural History*, 7.30.115.

<sup>46</sup> SHA, *Numerian*, 11.3.

<sup>47</sup> Sidonius, *Letters*, 9.16.25.

<sup>48</sup> Tacitus, *Annals*, 2.37.

<sup>49</sup> Maiuri, 1925, Nr. 11; IG II<sup>2</sup> 2362.

pleasure and intellectual pursuit. The reference in ancient testimonia to libraries in plural form should not be taken as evidence of separate halls classifying literary works based on the language in they were written, because on many occasions the reference is clearly to the actual bookcases, the placement of scrolls or the halls, and not the space containing the bookcases. Only Vitruvius addresses the importance of the orientation of the library to the courtyard in order to optimize ventilation and morning light. However, it seems that Vitruvius did not have a significant understanding of public libraries, which had just been introduced to Rome toward the end of the 1<sup>st</sup> century B.C.E., and the beginning of the 1<sup>st</sup> century C.E. It is for this reason that Vitruvius most likely discussed only private libraries, as for example that of Lucullus, which were located in the peristyles of private villas in Rome, and were open to a circle of intellectuals, and the public, who could borrow books with the help of slaves that maintained the collections.<sup>50</sup>

#### *2.1.4. Modern scholarship*

Several archaeological and historical studies have explored the history of ancient libraries and the problem of their use and design. The literature on ancient libraries begins with the archaeological excavations of the Library of Pergamon in 1884, the Celsus Library in Ephesus in 1904, and the Rogatinus Library in Timgad in 1909, the latter two both excavated and identified according to their dedicatory inscriptions. The good condition of the latter two libraries drew a lot of attention to the architecture of Roman libraries and fixed a convention for interpreting the Roman library, namely the niches on the walls, the podium supporting an interior colonnade and galleries, the focal point with a central apse

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<sup>50</sup> Blanck (1992, 209-211).

or aedicula, and the peristasis. Subsequent discoveries have been understood in the context of these two libraries.

The first study of ancient libraries in Rome was made by Max Ihm.<sup>51</sup> He bases his analysis on literary sources and inscriptions and discusses issues of library use, organization and personnel. Ihm notes that according to the description of the region in the Constantinian times, there were 28 public libraries in Rome; he deduces that their locations are in big public complexes, like theaters, baths and porticoes.

The first doctoral dissertation on libraries was written by Andrè Langie.<sup>52</sup> His dissertation covers the history of libraries in the Near East and Egypt, classical Greece, Hellenistic Greece including the libraries of Alexandria and Pergamon, and Rome and the Roman world, giving a complete account of literary and epigraphic evidence, and sketches or drawings for identified buildings. Langie also gives an extensive analysis of the function of libraries, the furniture, the administration, the management, the staff, the budget, and other issues pertaining to the problem of use.

A first compilation of references in ancient testimonia on libraries in the provinces of the Roman Empire, and a first comprehensive list of known libraries in Italy, Africa and Asia Minor were given by René Cagnat.<sup>53</sup> Cagnat also gives extensive descriptions of the libraries of Celsus and Rogatinus. He discusses their similarities and differences and he attempts to extract the characteristics of Roman libraries: niches, where the armaria with

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<sup>51</sup> Ihm (1893).

<sup>52</sup> Langie (1908).

<sup>53</sup> Cagnat (1909).

the books are located; central apse with statue; galleries giving access to the niches of the upper rows; and peristalsis for the protection of books. Significantly, Cagnat identifies the peristyle and the lateral rooms flanking the main hall in the Rogatinus Library as attributes of Greek prototypes that were copied by the Romans. Cagnat suggests the lack of the typical double rows of niches as the deficit of the design and the combination of multiple rooms as the compensation. Based on his characteristics of a Roman library, Cagnat identifies the so-called Lararium in Pompeii as a library because it featured a portico, a main rectangular hall, niches and a central semicircular apse. His effort to establish a type for a Roman library is significant, but his analysis of the characteristics of the Rogatinus Library shows the determining role that the Celsus Library played in leading and even limiting subsequent scholarship to a very specific path.

The first English language book on libraries was written by Clarence Eugene Boyd<sup>54</sup> with conclusions largely following the same lines as Ihm and Langie. Boyd lists the libraries in Rome known by name and the libraries known by location, and summarizes knowledge from literary sources about the architecture of libraries, the content of their book collections, their management and staff, and storing units of rolls. A similar account was given by Carl Wendel<sup>55</sup> with his effort collecting all the references in literary sources about private book collections and libraries from the 5<sup>th</sup> century B.C.E. to the Roman times.

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<sup>54</sup> Boyd (1915).

<sup>55</sup> Wendel (1949).



A more precise view of the architecture of the libraries was given by Giorgio de Gregori<sup>56</sup> in his analysis on the Celsus Library, the Rogatinus Library, and the Ulpian and Palatine Libraries in Rome, which had been recently excavated at the time. Gregori identifies more buildings with similar characteristics that could have been libraries – the exedra in the Baths of Caracalla, Trajan, Diocletian and Nero, the Atrium Library and the Philosophers’ Hall in Hadrian’s Villa in Tivoli, and the library in the Domus Aurea. Gregori does not make any reference to earlier libraries and focuses only on Roman libraries. His work was significant in that it further refined and set the conventions and the features taken as characteristic of a Roman library: one large main hall attached to a portico, typically rectangular in plan with niches on the walls for the armaria of books; a podium with three steps that supported colonnades and galleries that give access to the upper rows of niches either through movable ladders or permanent stairs in the backbone of the main hall; a central semicircular or rectangular recess on the back wall reserved for a statue patron of the library, typically of Minerva; standard guidelines of lighting of the main hall through one, two or three door openings and corresponding windows on top and often a skylight; identical symmetrically arranged halls for the two sections of a library, the Greek and the Latin; additional rooms associated for offices or extra stacks were possible; and lastly, sculptural decoration with architectural reliefs and portraits of authors in busts or medallions.

The argument about Greek libraries evolved in parallel. Building remains came firstly from the Library of Pergamon but these findings did not fit easily the theories that were

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<sup>56</sup> Gregori (1937).

developed for the Roman libraries. Until that point, Roman libraries had been extensively discussed and debated but there was little analysis of Greek libraries and no serious effort was taken to contextualize them as part of a larger paradigm or to identify continuity or commonalities between Greek and the Roman libraries. The discovery of the Hellenistic Library of Pergamon foregrounded these discrepancies. For example, the offset podium of the Library of Pergamon - set at a distance of about 50 cm from the three walls of the hall - could not be explained in terms of what was known and new theories were needed. One theory purported by Karl Dziatzko<sup>57</sup> identifies the offset podium as a support for statues, while another theory by Richard Bohn<sup>58</sup> identifies it as a support for bookcases – claiming as well that this might be considered as a possible precedent for the development of the niches later on the Roman libraries.

The first attempt to establish a connection between Greek and Roman libraries is given by Bernt Götze.<sup>59</sup> He looked for the principles of library design not in the preceding Hellenistic examples – which were not properly identified and excavated yet, but in the later Roman libraries, and tried to prove how the principles of interior design, as seen in the libraries of Celsus, Rogatinus and Hadrian, could have appeared in Hellenistic libraries in more primitive forms of construction using wood rather than recesses in the walls.<sup>60</sup> He also produced various reconstruction drawings representing how the bookcases in the Library of Pergamon could have been supported in the podium as Bohn had first suggested. Götze did not focus on identifying the Greek characteristics and how

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<sup>57</sup> Dziatzko (1896).

<sup>58</sup> Bohn and Droysen (1885).

<sup>59</sup> Götze (1937).

<sup>60</sup> Götze (1937, 225-232).

they were transferred in the Roman libraries, but rather the opposite: how characteristics that are clear in Roman libraries can be identified in the Greek as well.

The first treatise on the history and evolution of the library design throughout the Greek and Roman period was by Christian Callmer.<sup>61</sup> By the time of Callmer's publication in 1944, many more libraries had been identified and their plans published. The Library of Pergamon was excavated in the end of the 19<sup>th</sup> century and published in 1896, the library of Nysa was identified in 1913, the library of Hadrian was published in 1929, the Melitine Library was identified by inscriptions and published in 1932, the library of Pantainos was identified by the dedicatory inscription in 1933 and by the building remains in 1939, the library in the Forum of Philippi was published in 1937, and the libraries in Rome were systematized by Gregori in 1937.

Callmer attempts to explain the origins of building type and classify the libraries according to categories, including private and public libraries such as libraries in gymnasia, temeni, baths, set them in a chronological order, and show the evolution of the design of libraries, and primarily the Roman libraries, with respect to the relationship of the main halls to the courtyard and the axis of symmetry. Callmer did not explain how or why one type evolved from the other, and his theory on the origins of libraries from gymnasia might be overemphasized. Still, his work was very significant in placing all libraries in one long tradition and also identifying cases that were exceptional or did not fit in the exact scheme of the architecture of Roman libraries, as Gregori had axiomatically established it. Subsequent researchers followed most of his ideas about the

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<sup>61</sup> Callmer (1944).

identification of the origins of libraries in the Hellenistic gymnasia and the distinction of Greek and Roman libraries based on the arrangement of rooms and interior design.

A further elaboration of the origins of Roman libraries was attempted by Carl Wendel<sup>62</sup> along the ideas of Callmer putting more emphasis in the design of interiors as originating in the libraries of Egypt and more specifically the Library at the Serapeum, which Augustus had visited prior to building the Palatine Library.

A more controversial position along these same ideas was given by Elżbieta Makowiecka<sup>63</sup> on the origins and the evolution of libraries. She postulates the distinction of the Greek from the Roman library set upon the axis of symmetry along the short or the long side of the main hall, but her theory is based primarily on examples that today are disputed as libraries. Moreover, her theory cannot explain why both Greek and Roman types appeared in eastern and western territories in Roman times. Still, her main contribution is to visualize her findings about the types of libraries with a catalogue of schemata, which account for the known libraries, as well as for hypothetical ones that would be consistent with the types she defined.

A work following the same guidelines and focusing in the precise cataloguing and measuring of salient spatial characteristics of the Roman libraries has been given by Lora Lee Johnson.<sup>64</sup> Similarly to previous authors, Johnson bypasses the Hellenistic libraries by accepting Callmer's idea that they do not have any specific characteristics and focuses

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<sup>62</sup> Wendel (1949).

<sup>63</sup> Makowiecka (1978).

<sup>64</sup> Johnson (1984).

on the morphological characteristics that are typically attributed to Roman libraries – the niches, the peristasis, the colonnades, the podium and the stairs. She catalogues their dimensions. Her thesis is that these characteristics appear both in library and non-library buildings, and that their association with a library does not relate to functions associated with books, but rather with stylistic trends of the monumental Roman architecture. Thus, she concludes that they cannot lead to the a priori identification of a particular building as a library. She does not determine what does lead to the explicit identification of a building as a library, but her doctoral dissertation remains the most complete account of the architectural form of ancient libraries.

A recent thesis by Volker Michael Strocka<sup>65</sup> gives the history of the Roman libraries along the lines of his predecessors, beginning with the private collections and the ways in which public libraries were developed to accommodate the similar needs on a bigger scale. Significantly, he revisits several stereotypes about the Celsus Library that until then had governed the interpretation of many other Roman libraries; firstly, the misinterpretation of the gap between the exterior wall of libraries and other buildings as a peristasis, and not as a simple gap for draining purposes, and second the fact that the traces of stairs in the gap of the Celsus Library did not lead to an upper floor and had nothing to do with giving access to the interior of the library. Strocka's radical claim is that the main evidence for the peristasis and exterior stairs, on which scholars had based the interpretation and reconstruction of several other buildings, either does not exist or that it has been misunderstood.

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<sup>65</sup> Strocka (2003, 2000, 1981).

Finally, Wolfram Hoepfner<sup>66</sup> approaches the Greek libraries as a predecessor of Roman libraries, not only in room arrangement but also in interior design. With a series of reconstruction drawings he illustrates how both the Academy of Plato in Athens and the Library of Pergamon, the earliest libraries with building remains, could have had niches in the main hall, in a similar way to the Roman libraries. Though his theory is visually appealing, it is more speculative, not fully supported by archaeological evidence, and appears to be driven by the morphological characteristics. Moreover, his interpretation does not give justice to the Greek library as an autonomous building type in the architectural history. Rather he like others sees it through the prism of the much later Roman libraries.

Most recently, a careful work by George Houston and Keith Dix<sup>67</sup> looks at the corpus of libraries in Rome afresh and proposes that the references in epigraphic sources to twenty-eight public Roman libraries in the 4<sup>th</sup> century C.E. might be overestimated. They look at the actual evidence and challenge the idea that imperial bath complexes possessed libraries, asserting that many of the buildings or institutions attributed to libraries might actually refer to archives.

Scholars have summarized the cultural role of the library, and its use, management and administration. They have also emphasized the occurrence of libraries of different scales: private libraries, libraries in imperial villas, major public libraries in the capital, and libraries in important cities and towns all over the empire. Several treatises have also

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<sup>66</sup> Hoepfner (1996); Hoepfner (2002).

<sup>67</sup> Dix and Houston (1995, 2006).

dealt with the architectural form of the Greek and the Roman library and have summarized its basic characteristics, as well as its typical forms and categories. In their effort to classify libraries in different temporal and geographic categories, these treatises tend to underestimate the mobility of patrons and types in such a globalized society, as the Hellenistic World and Roman Empire. Evolutionary theories that present the evolution of the Hellenistic library in the republican and later in the imperial Roman libraries with the symmetrical arrangement of halls around a peristyle do not explain how the later type with the halls arranged one across to the other evolved from the earlier type with one hall next to the other, or what was the need for this development.

## **2.2. The problem of origins**

The origins of the library as distinct building structure with a program dedicated to the acquisition, cataloguing, and storing of books as well as spaces for their study and usage including lecture halls, auditoria, meeting rooms and other support spaces may be traced to a variety of building precedents that exemplify these structural and functional components.

The clearest precedent is the museum, a building complex consisting of covered and hypaethral spaces containing works of art and book collections. An early example is the Museum associated with the Lyceum in Athens and the best example is the Museum in Alexandria. More distant functional precedents include gymnasia and prytaneia, spaces for education and public administrative and archival purposes respectively, and all following and conditioned by the architectural model of the stoa and courtyard.

Clearly libraries first appeared in philosophical schools, which were associated with gymnasia, the quintessential vessel of education. It is typically suggested that because libraries were subspaces of gymnasia, their origins must therefore be found in gymnasia.<sup>68</sup> However, gymnasia as monumental building complexes and libraries appeared almost at the same time, in the 4<sup>th</sup> and 3<sup>rd</sup> centuries B.C.E. The origins of one cannot be identified in the other. Moreover, while Aristotle's philosophical school, which was the first to contain a library as an indexed set of books, was associated with the gymnasium at the Lyceum, that does not necessarily indicate that the building that was sheltering the collection, the Museum or any of the adjoining spaces<sup>69</sup> were part of the gymnasium. The assumption is that the library would have been a building complex, separate from the athletic facilities of the gymnasium, and it has to be considered as such.

Another building type, in which the origins of the library can be found, is the prytaneion, a building that was associated with multiple functions. The prytaneum served as both the meeting space for the prytaneis and as the state archive, and thus supported diverse functions, meetings, discussions, and the storage and retrieval of text.

Lastly, when considering the origins of the library, one cannot underestimate the importance of the Museum in Alexandria, the archetype of a library and an exhibition space together. The idea that the library is part of the Museum has prevailed. But it may be more accurate to consider the library not as a secondary part of the museum, but as

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<sup>68</sup> Callmer (1944, 154); Makowiecka (1978, 8-9); Strocka (1981, 304); Wendel (1949, 410).

<sup>69</sup> Diogenes Laertius, *Lives of Eminent Philosophers; Theophrastus* 5. 51-52 “πρῶτον μὲν τὰ περὶ τὸ μουσεῖον καὶ τὰς θεὰς συντελεσθῆναι κἄν τι ἄλλο ἰσχὺν περὶ αὐτὰς ἐπικοσμηθῆναι πρὸς τὸ κάλλιον: ἔπειτα τὴν Ἀριστοτέλους εἰκόνα τεθῆναι εἰς τὸ ἱερὸν καὶ τὰ λοιπὰ ἀναθήματα ὅσα πρότερον ὑπῆρχεν ἐν τῷ ἱερῷ: εἶτα τὸ στωϊκὸν οἰκοδομηθῆναι τὸ πρὸς τῷ μουσεῖῳ μὴ χειρὸν ἢ πρότερον: ἀναθεῖναι δὲ καὶ τοὺς πίνακας, ἐν οἷς αἱ τῆς γῆς περίοδοι εἰσιν, εἰς τὴν κάτω στοάν.”



integral to it. In the ancient mindset, the concept of a museum is different than contemporary notions and contains a wide array of artifacts of varying aesthetic and intellectual value. With this understanding, the book is a work of art similar to a statue or a painting. The origins of the museum and the library can therefore be found in the same institution, the Museum, the temenos of the Muses.

The underlying architectural characteristic of all the above-mentioned building types that accommodate storage of text media, and meeting/lecture spaces is the existence of a stoa and a courtyard. Thus, the origins of the library can be identified in the urban developments of the 4<sup>th</sup> and 3<sup>rd</sup> centuries B.C.E. with the stoa as the basic instrument of delineation of space and urban planning. A brief account of all each of the parallels or precedents is given below with the aim of elucidating the origins of different aspects of the library.

### *2.2.1. The mouseion*

The mouseion or museum was a temenos for the Muses, deities that protected the arts and sciences, history, astronomy, tragedy, comedy, dance, and poetry. The Museum in the Lyceum in Athens was closely associated with the library and the philosophical school of Aristotle. Literary sources credit Aristotle as the father of libraries, not because he was the first to possess a private book collection, but because he was the first to come up with an organizational system for book collections<sup>70</sup> in his educational institute, the peripatic

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<sup>70</sup> Strabo, *Geography*, 13. 1. 54 «Ἀριστοτέλης...πρῶτος ὃν ἴσμεν συναγωγῶν βιβλία καὶ διδάξας τοὺς ἐν Αἰγύπτῳ βασιλέας βιβλιοθήκης σύνταξιν.»

school in the Lyceum in Athens. Aristotle took an unordered set of books and categorized them into an indexed set.<sup>71</sup>

The architectural form of the Museum as conjectured from Diogenes Laertius' writings,<sup>72</sup> was a complex that included a garden, an altar, a promenade (peripatos), stoas and rooms attached to them, and included the statues to the seven Muses. So, the Museum was a space of leisure and engagement combining landscaped spaces, works of art (the statues) and an ordered book collection (library). It was also where lectures and discussions took place.

This concept of a sacred space dedicated to the cultivation of the arts and sciences, an educational research institution that included art and book collections, was repeated in Antiochia<sup>73</sup> and in a monumental scale in Alexandria. The Ptolemies commissioned Demetrios Phalereus, Aristotle's student and successor in the direction of the Museum in Athens, to organize the library in the Museum in Alexandria.

The Library of Alexandria, founded by the Ptolemy I Soter and further developed by Ptolemy II Philadelphos, was a more complex institution than the one in Athens, and incorporated Macedonian, Egyptian and Eastern traditions.<sup>74</sup> From the Macedonian tradition, it adopted the concept of the king as a patron of intellectual activities, and sponsor of scholars, who would be his advisors and his children's tutors. From the Egyptian and Eastern tradition, it adopted the concept of collecting universal knowledge

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<sup>71</sup> Casson (2001, 28-29); Callmer (1944, 146-147).

<sup>72</sup> *supra* n.65.

<sup>73</sup> Malalas, a 6<sup>th</sup> century CE chronicler references Maron of Antioch, who had emigrated to Athens, bequeathed in his will that a museum and a library are built with his money in Antiochia. See appendix B.

<sup>74</sup> Savvopoulos (2011, 106-107).

and creating an extensive data bank in the “House of Life,” the library, located in temples, like the library at the Rameseum, or in independent buildings, adjacent to temples and the king’s residence, like the library in Amarna.

The architectural form of the Library of Alexandria is not known through building remains<sup>75</sup> and literary sources tell us little about its different spaces and their arrangement. According to Strabo,<sup>76</sup> the library was part of the Museum, located next to the palace, and was a sequence of colonnaded courtyards and spaces with a promenade, exedra and rooms. Had the Library of Alexandria been known through building remains, scholars would have a clear image of the architectural form of the first monumental library, and we would have been able to reflect upon its origins. In the absence of such remains, we must turn our focus on the Library of Pergamon, a nearly contemporary building that has been identified with building remains that provide interesting clues regarding the possible architectural origins of monumental Greek library. The library consisted of a sequence of four rooms, one larger monumental room, and three smaller rooms that were located on the second level of the L-shaped stoa in the temenos of Athena Nikephoros Polias on the Acropolis of Pergamon. The library remains include a statue of Athena, a copy of the Athena Parthenos of Pheidias, and busts with inscriptions of poets. Also, several masterpieces of Greek sculpture were exhibited in the space of the temenos, including the statue group including the Wounded Gaul, now in the Capitoline Museums in Rome.

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<sup>75</sup> McKenzie (2007, 50).

<sup>76</sup> Strabo, *Geography*, 17. 1. 8. «τῶν δὲ βασιλείων μέρος ἐστὶ καὶ τὸ Μουσεῖον, ἔχον περίπατον καὶ ἐξέδραν καὶ οἶκον μέγαν ἐν ᾧ τὸ συσσίτιον τῶν μετεχόντων τοῦ Μουσείου φιλολόγων ἀνδρῶν. »

The architectural form of the Library of Pergamon is consistent with descriptions of the Museum in Athens and the Museum in Alexandria, which each included rooms and stoas. Most importantly, in addition to manuscripts, the library was associated with a garden and exhibition space of works of art, sculpture and likely painting as well.

These descriptions are consistent with the notion of the library as a space dedicated to the arts. The book in antiquity was hand-written and it was identified by its content, its author and the identity of its scribe. Its price and value depended upon who had copied it, and it constituted a collectible artifact. Libraries boasted about having original books of famous authors. For example, the Ptolemies tricked the Athenians into lending them the originals of the tragic poets, Aeschylus, Euripides and Sophocles, returning copies rather than originals.<sup>77</sup> In Imperial Rome, Galen not only mourns the loss of the Palatine Library by fire, but the loss of original books that were in the possession of famous authors, like Theophrastus.<sup>78</sup>

It is tempting to contemplate that the library was an integral component of the museum, rather than a secondary part of it. In this view the concept of the museum in antiquity differs from the modern museum. Contemporary scholarship has always seen the library as a part of the museum, and this notion has undermined the integrity of the library as an institution in antiquity. By identifying the library as an integral part of the museum, and appropriating ancient authors' descriptions of the museum, we gain a better

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<sup>77</sup> Casson (2001, 34-35).

<sup>78</sup> Galen, *On the avoidance of grief*, 12 -17.

understanding of the architectural form of the archetypical monumental library in antiquity.

### 2.2.2. *The gymnasium*

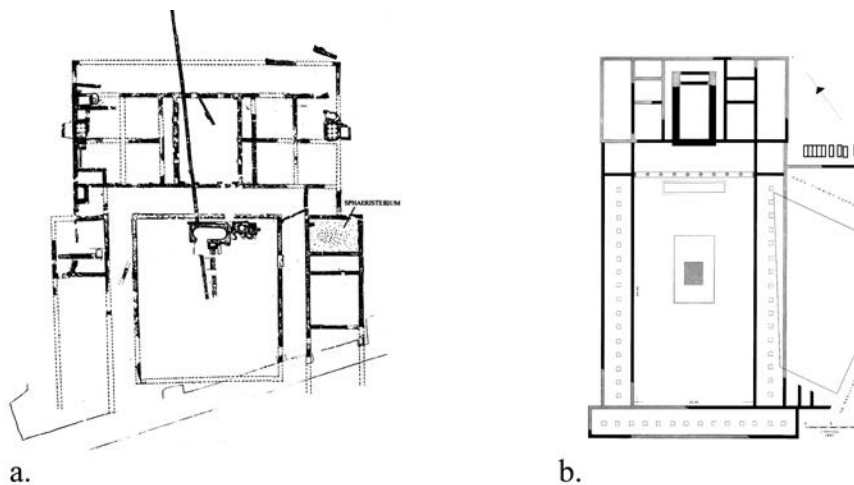
Almost contemporary to the royal libraries in temeni were the libraries of gymnasia. Such libraries include the gymnasia in Pergamon, Delphi, Mylasa, the Ptolemaion in Athens, the Homereion in Smyrna, and others known through epigraphic and literary sources. With the exception of the library in the gymnasium of Rhodes and the Academy, none has been identified with building remains. This situation has contributed to the assumption that libraries lacked specific form, and that they were adapted within the architectural form of the gymnasia in an ad hoc manner. However, the great Hellenistic gymnasia do not precede the great Hellenistic libraries, and it might be in fact more fruitful or accurate to identify a common origin for both libraries and gymnasia.

Initially, the gymnasium consisted primarily of athletic infrastructures and was not necessarily identified by a clearly bounded built space. The activities of the gymnasium took place in a designated area of parks, groves, shaded walks, and gardens.<sup>79</sup> Such phases can be traced in the gymnasia of Olympia, Delphi, Academy and Lyceum in Athens. In the classical period, it acquired more intellectual functions and from the 4<sup>th</sup> and 3<sup>rd</sup> centuries B.C.E., the gymnasium acquired the first built space, the palaestra, an orthogonal courtyard surrounded by rooms and named metaphorically after the wrestling

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<sup>79</sup> Wacker (2007, 349-350).

ring for the philosophical debates that happened there.<sup>80</sup> It was not until the Hellenistic period, in the 2<sup>nd</sup> and 1<sup>st</sup> centuries B.C.E. that the function of athletic training was limited to give more space for intellectual training and social activities. The gymnasium was monumentalized into a unified architectural complex that included a colonnaded courtyard, exedras, a central elaborate room and more rooms attached to its stoas, including the *acroaterion*, the *exedra*, the *ephebeion*, the *paidagogeion*, the courtyard and garden and *bibliotheca*.<sup>81</sup> Examples of such gymnasia are the gymnasium in the Lyceum founded by Lykourgos in the second half of the 4<sup>th</sup> century B.C.E.<sup>82</sup> and the gymnasium in the Academy in Athens (figure 2.1).



**Figure 2.1:** Gymnasia in Athens in the same scale. a) The Gymnasium at the Lyceum (Lygouri-Tolia 2002, fig.2); b) The Gymnasium at the Academy (Travlos 1971, fig. 59).

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<sup>80</sup> Wacker (2007, 352-354).

<sup>81</sup> Delorme (1960, 316-336).

<sup>82</sup> Lygouri-Tolia (2002, 211).

Libraries are associated with gymnasia formally, functionally and symbolically. Hellenistic gymnasia, as well as Roman libraries, were complex institutions, funded by Hellenistic kings and wealthy citizens as gifts to the community. The gymnasium in Athens by Ptolemy the III, the gymnasium of Olympia by Ptolemy II, the renovation of the gymnasium of Larisa by Philip V and Perseus are examples of gymnasia dedicated by kings.<sup>83</sup> Also, dedicators were wealthy citizens, relatives or friends of the king, and gymnasiarchs, the directors of gymnasia. A dedicatory inscription on a fragment on an architrave from Aigai in Mysia records the dedication of an auditorium by a gymnasiarch.<sup>84</sup> In return for the dedications, the community honored the benefactors and their families with honorary inscriptions in stelai, statues, rituals with coronations, honoring the statues with wreaths during banquets, celebration days, and even granted them priesthood through association with the gymnasium, promising sacrifices and libations after their death. The Gymnasium in Psenamosis in West Delta in Egypt is an example of a dedication by a relative to the king, who was granted great honors as an act of gratitude for funding a gymnasium.<sup>85</sup> The same model of fundraising was applied in Roman libraries, as in the Celsus Library, whose dedicatory inscription mentions the institutionalization of annual rituals commemorating the birthday of its founder. Honors in gymnasia were not limited to the founder, but also honored the top official, the gymnasiarch, and other donors and benefactors. Clearly, the foundation and the maintenance of a gymnasium and the sponsoring of related events, activities and sacrifices was an act of euergetism, i.e. making a benefaction, integral to social and

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<sup>83</sup> Bringmann et al. (1995, K Nr. 17; 390; 106).

<sup>84</sup> Bringmann et al. (1995, K Nr. 357).

<sup>85</sup> Paganini (2009, 38-40).

political life and capable of retaining or improving one's social status, a symbolism also adopted by the library. Wealthy citizens, officers and emperors dedicated spaces of education and public events, to appropriate for themselves what these spaces represented: knowledge and intellectual power, which ultimately translated into political power. The understanding of the patronage of a library has a value in our understanding of the architecture of a library, since in many occasions it affected the program and the form of the library. Libraries in the eastern part of the Roman Empire, where there was a strong tradition of *euergetism* in educational institutions, were dedicated by individuals: Pantainos in Athens, Celsus in Ephesus, Neon in Sagalassos, Melitine in Pergamon, Dion in Prusa. These libraries often combined the functions of a library and a funerary monument and included the tomb of the patron, and sometimes of his family.

### 2.2.3. *The prytaneion and metroon*

Associations between the library and civic buildings are not limited to gymnasia; the library was also functionally related to the prytaneion, the building for state archives (metroa). These buildings supported safe storage of text media. In both the library and the metroon text was under the protection of a god, the Mother in the case of archives - thus the name metroon - Athena in the case of libraries. All texts were kept in papyrus copies. More important texts were also inscribed into stone. In archives, decrees were inscribed into stone and erected in the city through the process of *publication formula*.<sup>86</sup> In libraries, abstracts of authors were inscribed in stone as shown by epigraphic evidence

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<sup>86</sup>Boegehold (1972, 24); Sickinger (1994, 286); West (1989, 531-532).



from the Gymnasium in Rhodes<sup>87</sup> and from Piraeus.<sup>88</sup> Both archives and libraries had well-structured personnel that was involved in several tasks - copying, reading, recording, correcting, registering, stamping, etc.- and required working spaces. Lastly, in metroa the indexing of text was very precise, following a pattern from bigger categories to subcategories. The archives were categorized in chronological order; the archon indicating the year, the ordinal number of the tribe in prytany, and the day of the prytany.<sup>89</sup> In libraries, the rolls were categorized according to topic and alphabetical order of authors; Aristotle, as Strabo informs us, developed this system. Aristotle lived in Athens in the 4<sup>th</sup> century B.C.E. and it is logical to assume that he came up with it under the preexisting knowledge of categorizing archives.

Architecturally, the archive was either part of the prytaneion, a very important civic building and seat of the executive power, like the archives in the prytaneia in Lato and Delos, or more rarely it was an independent building, as in the Metroon in Athens (figure 2.2). The Hellenistic Metroon in Athens consisted of a deep stoa with three rooms and a square peristyle courtyard attached to its west side.<sup>90</sup> The old Metroon<sup>91</sup> in Athens has been identified and reconstructed as a stoa with three rooms attached to it.

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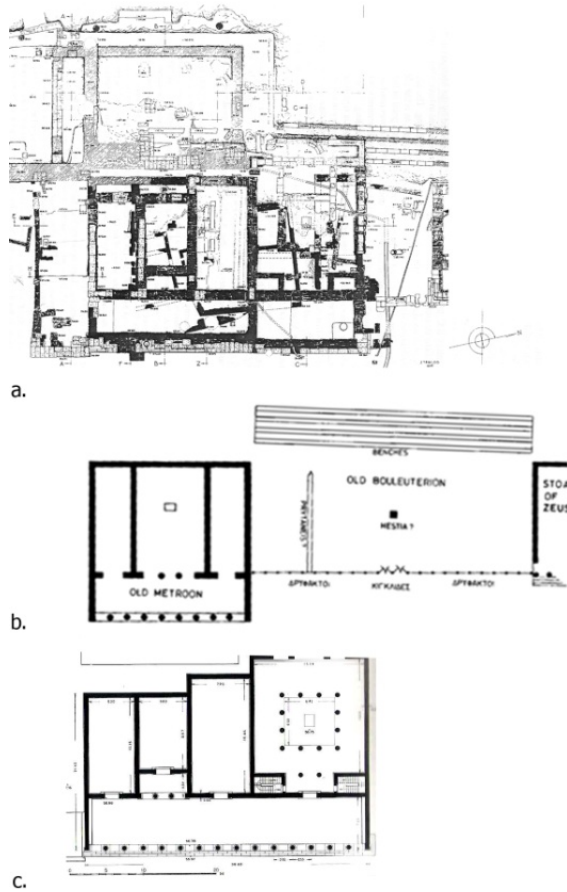
<sup>87</sup> Maiuri (1925, 14-15).

<sup>88</sup> IG II2 2362.

<sup>89</sup> West (1989, 533-534).

<sup>90</sup> West (1989, 529); Thompson (1937, 172-212); Valavanis (2002, 221-223).

<sup>91</sup> The Old Metroon in Athens has been identified by Miller (1995, 133-143) with the building remains that are traditionally interpreted as the Old Bouleuterion. He proposed that the identification of the Old Bouleuterion by Thompson (1937, 127-135) should be rejected and that a Metroon, built in the 6th century should be identified instead. Miller based his proposal on Thompson's (1937, pp. 134) statement that his interpretation of the Old Bouleuterion is based on little evidence, and definitely no evidence about the interior design with amphitheatrically arranged wooden seats, and also on the incongruence of the ancient sources and the building remains. Aristophanes, *Knights* 675, and Xenophon, *Hellenika* 2.3.51, talk about metal railings, behind which the people could watch what was going on in the Boule. This could not have



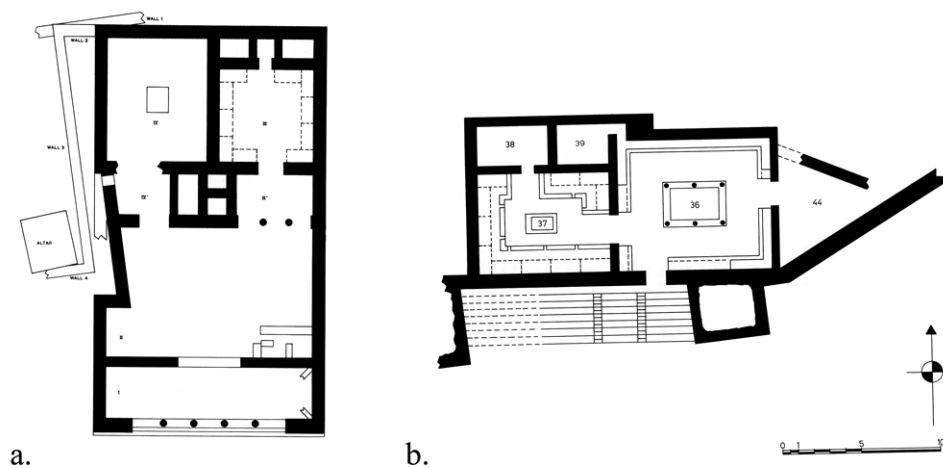
**Figure 2.2** Metroon (State Archive) in the Athenian Agora. a) State of preservation plan (Thompson, 1937, pl. 6); b) Reconstruction of the building in Classical period (Miller 1995, fig. 5); c) Reconstruction of the building in Hellenistic period (Thompson, 1937, pl. 8). All three are aligned in order for the reader to make the association between the state of preservation of the archaeological remains and the reconstruction of the different phases.

In both the Classical and Hellenistic phase, the statue of the goddess was located in a central, formal room, while the storage of the actual texts was in other smaller nondescript room. In other Greek cities and sanctuaries, like Delos and Lato, archives

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happened at the Old Bouleuterion, the way Thompson has reconstructed it, because of lack of space. According to Miller's theory, the Boule met in open space, in what Thompson has identified as multi-purpose benches, on the east slope of Kolonos Agoraios. Miller considers the four rows of stone slabs, longer than 37 m, as a primitive form of a meeting place, a primitive form of the New Bouleuterion, adequate to host the 500 members of the Boule.

have been identified based on testimonia and building remains as part of the prytaneion.<sup>92</sup> In these cases, too, where archives were part of another institution and building complex, archives were located in small storage rooms lacking specific characteristics (figure 2.3). Still, they were associated with the more elaborate spaces of the prytaneion: the dining room with banqueting couches, the meeting room with a seating bench in the perimeter and the hearth of the city in the center, and a courtyard.



**Figure 2.3** Prytaneia in Greece with identified archives, in the same scale and orientation; a) Delos; b) Lato (Miller 1978, fig. 4 and 5).

In conclusion, the prytaneion and the library, as text related spaces and spaces to accommodate meetings, discussions, and also banquets had common elements in their

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<sup>92</sup> The existence of an archeion in the prytaneion of Delos is attested epigraphically and has been identified with the northeastern part of the prytaneion, consisting of a prodomos, a large almost square room about 6 m wide, and three small storage spaces in the back. Due to the lack of a room to be identified with the hestiatorion Miller (1978, 77-78) suggested that the hestiatoreion, must have been the square room, and the archeion the series of smaller storage rooms attached to it to the north, or to the southwest. The existence of the archeion in the prytaneion of Lato is not testified epigraphically, but based on the parallel of the prytaneion of Delos is identified with the smaller room to the northwest of the larger room in the east side of the building Miller (1978, 84-85).

architectural form deriving from their function: multiple smaller spaces for the storage of text, and larger spaces for banqueting and open spaces in courtyards for discussions.

#### 2.2.4. *The stoa*

The library as a building related to education is associated with the gymnasium, and as a building related to the storage and retrieval of text the library is associated with an archive. More strikingly however, the underlying formal characteristic of all three buildings is the stoa. The stoa in its simplest form was a freestanding portico with a long back wall with a row of columns in the front, and a roof and walls in the short ends connecting them.<sup>93</sup> Starting at the end of the 5<sup>th</sup> century in Athens, a new type of stoa was developed, with rooms attached to its back wall<sup>94</sup> and a rich typology emerges to comprise all sorts of stoas including one-story and two-story stoas, one-aisle and two aisle stoas, linear, L-shape, U-shape and complete courtyard shape. As an urban element, the stoa developed soon into a module that played a crucial role in Hellenistic city planning<sup>95</sup> and the delineation of open civic and religious spaces, the monumentalization of building types and their adaptation to the predefined city block of the city, and the creation of shaded spaces, walkways and architectural thresholds.

Within this context it can be argued that the stoa is the par excellence formal architectural tool for Hellenistic architecture and urban planning and for the emergent library form as well. For example, the gymnasium, when it became a critically important civic space in

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<sup>93</sup> Coulton (1976, 1).

<sup>94</sup> Coulton (1976, 86).

<sup>95</sup> Wycherley (1951, 178).

Hellenistic cities evolved from its archaic and early classical forms of a loosely bounded area to a well-defined building complex conditioned by stoas and integrated in the urban fabric. Stoas and peristyles allowed the gymnasium to fit in the city block, acquire sharp boundaries, and assume a monumental building impact near the city center, while still enclosing its open spaces, as for example in Miletus. The gymnasium was developed into an enclosed and symmetrical space, with stoas, peristyles, and rooms. Thus, I argue that the similarity between the form of the gymnasium and the form of the library should therefore not be considered as a causal relationship, but rather two effects of the same cause; the development of urban planning and the role stoa played in adapting building types to it. The stoa is an inseparable element of the library throughout its history, whether the library is part of a temenos or a gymnasium, or an independent building or a complex itself. It is the relationship to the stoa that associates the library with the museum, a building complex with similar functions, in which the stoas are the formal elements that organize the different spaces.

### **2.3. The problem of program**

The design of the library addressed two functions: It served as a storage and preservation space for organic materials, papyrus and parchment, and it functioned as a public institution making knowledge accessible to its users. The design of the library therefore needed to conform to specific technical characteristics that would protect the building from dampness and rapid changes in temperature and humidity, while at the same time providing sufficient light for public functions. A brief description of both sets of functions served by the emerging building type in the Hellenistic period follows below.

### 2.3.1. *Managing the collection*

The dominant writing material in antiquity was the papyrus sheet, named in Greek *χάρτης* and in Latin *charta*. Papyrus (*Cyperus papyrus*) grows primarily along the Nile in Egypt. A papyrus roll was manufactured by laying and gluing together twenty or more sheets, creating a total length of about 6 m comprising a roll about 6 cm thick, easy to hold in one hand, while unrolling with the other. Each papyrus sheet was fabricated with thin sliced papyrus strips that were cut longitudinally from the core of the papyrus plant and were placed side-by-side. A second layer, running in the opposite direction, was placed on top of the first, and by beating with a stone, the two layers glued together with a naturally occurring adhesive property of the plant.<sup>96</sup>

The commercial papyrus roll had a total length of about 20 sheets. The width of the papyrus roll varied according to the quality of the papyrus. Pliny<sup>97</sup> gives a list of names for six different qualities, ranging from 13 inches to 7 inches (24.3 – 14.8 cm), according to the quality. An author wrote his script in columns, one next to the other, with margins, from left to right, leaving the first page empty. Each column was named *σελίς* in Greek or *pagina* in Latin (page) and the numbering in the upper middle made browsing for a specific line easier. If the manuscript took less space, the writer could cut the excess sheets, and if more space was needed, the writer could glue more papyrus sheets in the end, so that a papyrus roll was as big as the work written on it. At the end, the writer attached the last sheet in a wooden stick, named *ὄμφαλός* in Greek and *umbilicus* in

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<sup>96</sup> Blanck (1992, 76-82) gives extensive information on the production process of the papyrus roll, and on the different qualities available in the ancient market.

<sup>97</sup> Pliny, *Naturalis Historia* 13.74.

Latin, to facilitate rolling. The writer attached a small tag, named *σίλλυβος* in Greek, with the title of the work at the end of the wooden stick, which made browsing for the specific work easier. As one read the manuscript, he would unroll it with his right hand while rolling it back with his left. Once finished, the reader would have to roll the papyrus back on its original wooden stick.



**Figure 2.4** One of the oldest depiction of a roll in Greek Art. Drawing of a vase-painting by the painter of Onesimos (around 490 B.C.E.) depicting a youth reading a roll. In front of him, there is a box hosting other rolls (Berlin, Staatliche Museen, No. 3139).

The papyrus roll in Greek was named *βιβλίον*. Each author would decide how to subdivide his work and write each section in a separate roll accordingly. For example, Thucydides subdivided his work into 21 βιβλία (books), which would correspond to 21 rolls. Libius wrote his work *Ab urbe condita* in 142 books, which would correspond to 142 papyrus rolls.<sup>98</sup> A book collection of a public library consisting of 400,000 books, would therefore not correspond to a catalogue of 400,000 titles, but rather to 400,000 physical rolls.

Another material used in scrolls was leather or membrane. Leather was used as a writing material in Greece as early as the time of Herodotus in the 5<sup>th</sup> century B.C.E. Its use

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<sup>98</sup> Blanck (1992, 86).

however was not widespread. It is possible that during the years 170-168 B.C.E. when Alexandria was under siege by Antiochus Epiphanes, the export of papyrus might have stopped, so Pergamon would have returned to the use of the old known material and further refined its manufacturing. The membrane was finally named pergamene, after the city of Pergamon, but the use of this name appears only after the 4<sup>th</sup> century C.E.<sup>99</sup>

A different form of a book in antiquity was the codex (σωμάτιον in Greek), which is the form of book that we have today. It was likely introduced as early as the first century C.E., but the earliest remains we have come across are from the 2<sup>nd</sup> and 3<sup>rd</sup> centuries and its use is shown to be widespread only after the 4<sup>th</sup> century C.E. The codex was also made of papyrus or pergamene sheets, and the cover was made of leather. Its advantages included low cost, durability and ease of browsing and reading. It was cheaper, as it could fit more text since there was no limit to the number of pages; it was more durable, because the pages were protected by the hard cover; and browsing for a line and reading was easier because the reader did not have to roll it back again. The only disadvantage was that the manuscript had to be completed prior to its binding, and one had to calculate in advance how many pages would be needed. Such codices were not widespread in classical antiquity, but they must have existed in small numbers in Roman libraries. References in literary sources to *libri lintei* and *libri elephantini* must refer to codices made of papyrus or pergamene sheets and bound with high quality linen covers or ivory plates.<sup>100</sup>

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<sup>99</sup> Blanck (1992, 114).

<sup>100</sup> Blanck (1992, 86).



### 2.3.2. *Storage of books*

One way of protecting papyrus rolls from the changing conditions of the environment was the thoughtful treatment of the boundaries between the rolls and the rest of the library. The rolls were stored in wooden cabinets with horizontal or vertical orientation.

In the classical period, wooden boxes, with horizontal orientation and wooden lids, like the one shown in front of the reader on figure 2.4 were widely used.<sup>101</sup> Such storage equipment was so common that Greeks had a variety of terms to denote them; *κοιτίδια*, *κοιτίδες*, *φοριαμός*, *κιβωτός*, *θήκη*, *φόριον*, *φορίς*, *φυλάκιον*. Vertical cabinets with doors appear sporadically by the end of the fifth century B.C.E., with the same terminology as used for the horizontal ones. The earliest evidence of vertical cabinets with doors comes from 415 B.C.E., from an inscription on stone that refers to the bid of the furniture of Alcibiades, among which are mentioned one *κιβωτός* with two doors and one *κιβωτός* with four doors.<sup>102</sup>

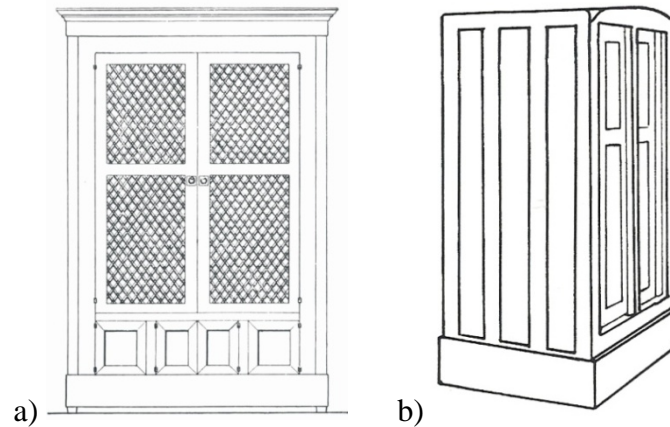
In the Roman period, vertical bookcases became common; they are named *armaria*, i.e. containers of arma (all the equipment). Other terms for *armarium* are *loculamentum*, *forulus*, or *nidus*. Boxes for transferring rolls and not for permanent storage were cylindrical with removable tops; *capsa* for one roll, and *scrinium*, for a couple of rolls.<sup>103</sup> Figure 2.5 shows two *armaria*, one from Pompeii and one from the Villa at Boscoreale.

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<sup>101</sup> Blanck (1992, 75-76).

<sup>102</sup> Budde (1939, 5-6).

<sup>103</sup> Budde (1939, 6-7).

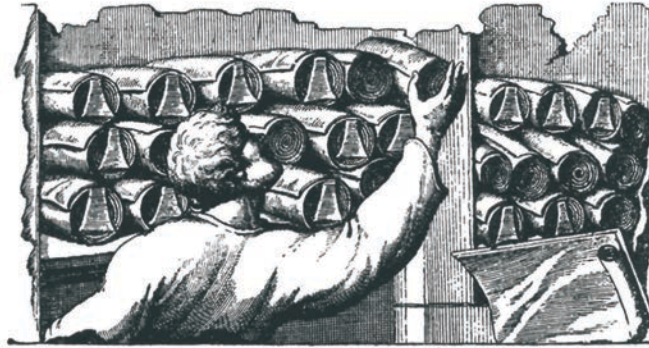


**Figure 2.5** Storage of rolls. a) Armarium from Pompeii; b) Armarium from Boscoreale (Budde 1939, fig. 5 and 6).

Other evidence regarding the use and storage of rolls comes from two Roman reliefs from the imperial period, as shown in figures 2.6 and 2.7. The first relief shows a doctor reading a roll in front of his private library; the second shows a library of a bigger scale. Several rolls are stored in shelves. Most of them have labels hanging that indicate the author of the roll. A servant is maintaining them. The relief might depict a scene from a library.



**Figure 2.6** A relief from the sarcophagus of a doctor from Ostia depicting a doctor reading a roll in front of an open armarium with the rolls horizontally laid on three shelves. Medical instruments are hanging on the wall (Metropolitan Museum of Art, 48.76.1).



**Figure 2.7** Line drawing of a Roman relief from Neumages, now lost, depicting rolls with identifying tags stacked in three levels on shelves (Casson 2001, fig.3.1).

In Roman public libraries the armaria were located in niches recessed in the wall (figures 2.13 and 2.15).<sup>104</sup> One might worry about their proximity to walls that could transfer humidity from the floor to the rolls. However, the niches were insulated by layers of plaster and marble that gave a protective layer of at least 2 cm. Niches in known libraries have a depth of 50-75 cm (See Table C.2). Each roll had a width of maximum 25-30 cm, and thus we can assume that in cases of niches 75 cm deep, two rolls could fit in the depth of the niche, leaving 15 cm for the thickness of the marble plate, the thickness of the wooden armarium, and probably some empty space between the two. In cases of niches 50 cm deep, only one roll could fit, leaving a space of 20 cm.

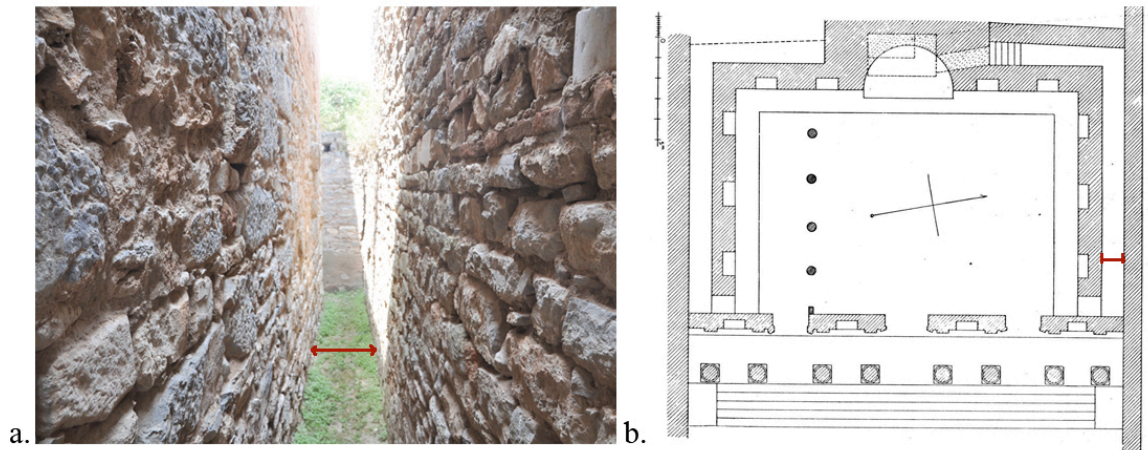
### 2.3.3. *Protection from dampness*

A major concern in the design of the library was the physical protection of the rolls and the codices stored within from dampness and the natural elements. In the cases where libraries were part of complexes and other rooms surrounded them, the construction of

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<sup>104</sup> Boyd (1915, 27).

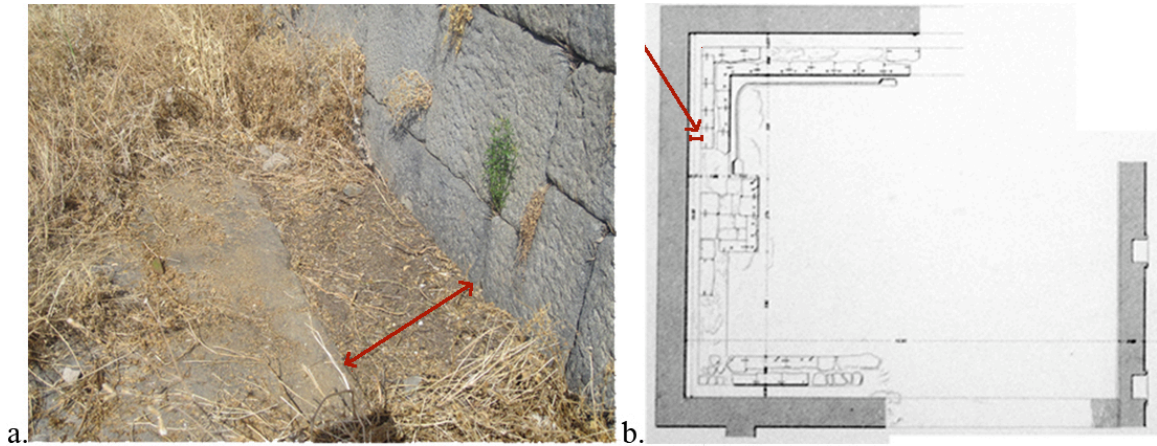
the roof could have been continuous, thus avoiding problems of leaks of rainwater between the library and the other rooms. In the cases in which libraries were built next to pre-existing buildings however, a gap was left between the two buildings and a drain was placed for the removal of the rainwater (figure 2.8).<sup>105</sup> The role of the gap between buildings was very crucial primarily in Roman architecture, not only for drainage reasons but also for religious reasons. Boundaries were sacred and guaranteed the right of property.<sup>106</sup> Such gaps appear in all kinds of buildings, like the Lararum in Pompeii and the Building of Eumachia to its southern side, between the Temple of Apollo in Pompeii and the houses to its western side, between the Celsus Library and the shops in Ephesus.



**Figure 2.8** The gap between the Celsus Library and the shops of the agora to the north. a) Photograph by the author; b) Plan of the building after Heberday (1905).

<sup>105</sup> In the library of Celsus, the gaps between the library and neighboring buildings slope to the west, where the water flows into two canals that lead under the library hall and drain in front of the façade Stročka (2003, 39).

<sup>106</sup> Coulanges (1956, 60-72).



**Figure 2.9** The gap between the podium and the wall of the Library of Pergamon. a) Photograph by the author, b) Plan after Bohn (1885, pl. 33).

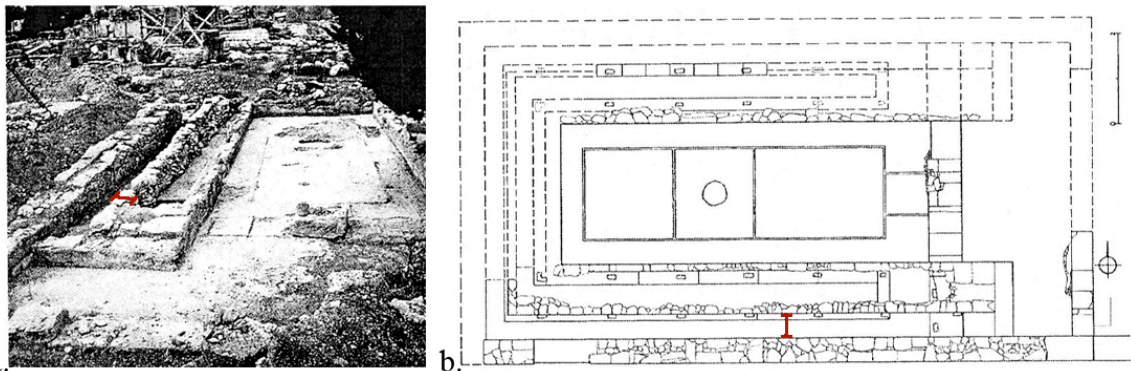
In libraries this gap has often been interpreted as a peristasis, a roofed corridor surrounding the main hall of the library resulting from the construction of double exterior walls.<sup>107</sup> This idea of the peristasis was based on the early interpretations of the building remains of the Celsus Library and the Library of Pergamon. In the Celsus Library (figure 2.8) there is a gap between the wall of the main hall and a second wall at a distance of about 1 meter, and in the Library of Pergamon, there is a footprint of a podium at a distance of 50 cm from the exterior wall of the main hall (figure 2.9). In both libraries, the building remains have been interpreted as having double walls. Johnson was the first one to draw attention to the use of insulation corridors and peristasis, suggesting that they had different functions and that they should not be considered a standard feature of libraries.<sup>108</sup> More recently, Stročka suggested that these building remains have been misunderstood.<sup>109</sup> For the Celsus Library, he claims that the gap was open to the sky, and

<sup>107</sup> Cagnat (1909, 9-10); Callmer (1944, 170-171); Gregori (1937, 11); Makowiecka (1978, 64).

<sup>108</sup> Johnson (1984, 126-133).

<sup>109</sup> Stročka (2003, 38-39); 2000, 155-165); 1981, 332-333).

it was there that the rainwaters from the roof of the library and from the neighboring buildings were collected and drained through a drain that ran under the library and ended close to the Gate of Mithridates. Strocka thus suggested that the second set of walls were the actual exterior walls of the surrounding buildings, and as such did not belong to the Celsus Library and had nothing to do with the insulation of the library hall. For the Library of Pergamon he suggested that the podium was not a carrier of a second wall, or roll cabinets, but of statuary and banqueting klinai, mattresses on which men could banquet in a reclined posture. To support his view, Strocka gave the parallel from a hestiatorion (banquet room) in Kyrene with a similar podium, at a distance from the exterior walls (figure 2.10).

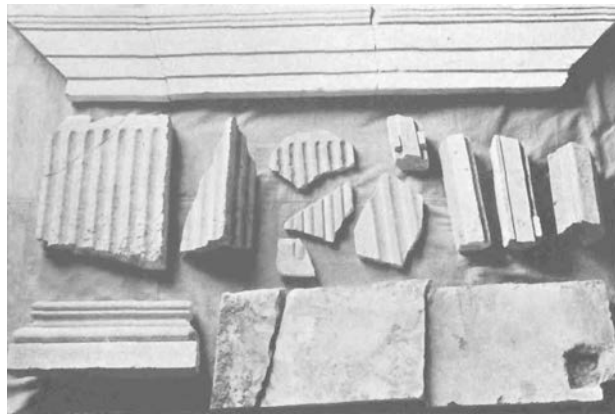


**Figure 2.10** Photograph and Plan of the Northern Hestiatorion in the Sanctuary of Zeus in Kyrene (Strocka 2001, fig. 2 and 4).

While there are good parallels to support the interpretation of the podium of the Pergamene Library as a carrier for banquet klinai, there is no parallel to support the view of it as a carrier of bookcases, an interpretation that would also raise structural problems. The interpretation of Strocka seems is convincing and I argue that there is enough evidence to disregard the notion of a peristasis as a technical characteristic for libraries.

#### 2.3.4. *Natural lighting*

In addition to providing protection from dampness, the library had to be sufficiently well lit. In the classical and Hellenistic periods, the lighting of rooms was only through the openings in the front wall. In the rooms for the storage of books, there were no windows on the back and sidewalls, because glass panels were not yet used for windows. Windows closed only with wooden doors and could therefore not sufficiently protect rolls from rain and dampness. Thus, only the front wall had doorways and windows, which were protected by peristyles or stoas. In the first century C.E., the use of glass panels in windows became widespread, and thus a row of windows appeared along the sidewalls, above the row of niches containing the books.<sup>110</sup> Evidence of such windows comes from the Melitine Library in the Asklepeion in Pergamon, as shown in figure 2.11.



**Figure 2.11** Window evidence from the Melitine Library in the Asklepeion in Pergamon (Deubner 1908, fig. 35).

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<sup>110</sup> Staikos (2004); Staikos (2005).

The orientation of the building was critical to protect from dampness and provide sufficient lighting. Vitruvius gave the guidelines for the orientation of private libraries, asserting that they should have an eastern exposure to get the morning light that dispels dampness, meaning that their entrance, the main source of light, had to be facing to the east. One would expect more consistency in the orientation of public libraries, but among the seventeen cases in the corpus of the known libraries, only two, the Celsus Library, and the Library in Philippi had eastern orientation. One, the Library of Pergamon, had southeastern orientation, while all the others had different orientations. Public libraries were embedded either in bigger complexes or a dense urban fabric, and as such there was not always much flexibility in orientation. Roman libraries could use windows and glass so the problem of orientations was somewhat less critical. The optimal Vitruvian orientation clearly was not a strict guideline in the construction of libraries.

#### *2.3.5. Staff of the library*

The maintenance of the collection of the books in the library by specially trained staff had an impact on the design of the building. The first account we have about the maintenance of a library comes from the library of Alexandria and the explicit list of all directors appointed by the court. Depending on the scale of the library, personnel consisted of sorters, copyists, clerks, and repairers, all typically slaves. However, no specific information about such staff exists until the imperial period in Rome. At that point, the emperor owned public libraries and assigned his staff from the palace to



different tasks in the libraries, according to needs.<sup>111</sup> The foundation, organization and maintenance of a library involved different officials, responsible for different aspects of the function of the library.<sup>112</sup> Firstly, there was a scholar or intellectual, who was responsible for the content of the library. He was the library commissioner and the scholarly advisor both of the library and the emperor. His duties were to advise the emperor on policy and questions that could be answered in books. This position was offered only for large libraries, like the Ulpian Library, or in special cases, when a new library was being organized. In the first century Greek scholars, with experience in the Library of Alexandria, took this position in Rome. In the second century with the increase of Latin literature, Latin scholars had the title *procurator bibliothecarum*.<sup>113</sup> In addition to and independent of the scholar was the administrator, who managed the funds of the private property of the emperor, and thus the branch of the libraries as well. The *curator operum publicorum* was responsible for the management of the facilities of the libraries, along with the other public buildings. Lastly, there was the *vilicus*,<sup>114</sup> who was a slave and worked as the supervisor dealing with daily issues. He was the supervisor either of a building or of the slaves working in a library. It is attested epigraphically that there was a different *vilicus* for the Latin and for the Greek section of the library in the Porticus of Octavia, assigned according to language skills. In the last rank of personnel were the

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<sup>111</sup> Boyd (1915, 43-46) gives the additional titles of personnel: *magister a bibliotheca*, who was the librarian; *librarius*, a well educated official being a bookseller, a copyist or transcriber *librarius a manu*, the secretary.

<sup>112</sup> Houston (2002) gives an in depth analysis of the hierarchy of personnel working at the public libraries in Rome, based on epigraphic evidence.

<sup>113</sup> Houston (2002, 160-161).

<sup>114</sup> Houston (2002, 155-156).

*slaves a bibliotheca*,<sup>115</sup> domestic slaves of the emperor and in some cases public slaves, who performed simple and necessary tasks in the library, such as adding labels to the volumes, mending and strengthening papyrus rolls, copying, and assisting patrons in locating books.

Apart from the personnel of the libraries, there were also renowned scholars, who spent their time studying, copying and correcting the manuscripts in the libraries. The well-known doctor of imperial times, Galen, states in a letter that he found the books of Aristotle, Theophrastus, Eudemus, Cleitus, Phainias and Chryssipus, as well as the books of all the ancient doctors in the Palatine Library, and he corrected and copied these books, in order to use them as error-free models in his own publications.<sup>116</sup> Presumably, a copy of Galen's corrected books would have been deposited in the Palatine Library, as well as in the Asklepeion of Pergamon, his home city.

Lastly, the personnel in a library must have supervised the library and ensured that the regulations of the library were followed. A regulatory inscription has been found in the library of Pantainos in Athens that forbids any book to be taken out of the library, and states that the library shall remain open from the first to the sixth hour.<sup>117</sup> The personnel of the library would open and close the library and ensure that the regulations about library loans were followed.

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<sup>115</sup> Houston (2002, 149-154).

<sup>116</sup> Galen, *On the avoidance of grief*, 12 -14.

<sup>117</sup> It must be noted in accordance with the Roman calendar, the day was subdivided into twelve nocturnae horae (night hours) and twelve diurnae horae (day hours), counting from the dawn to the dusk Salzman (1990, 31). So, the period between the first and the sixth hour, in which the library of Pantainos was open to the public would be from early in the morning till noon.

The amount and hierarchy of personnel working in a library, and the activities of copying performed indicates that the library must have had more than one space to accommodate these people and these functions.

#### 2.3.6. *Users*

The diversity of the scale and character of libraries indicates a significant diversity in the function, the goals and target groups. The first Hellenistic Royal libraries that were located in the proximity of palaces are considered to have been open to a small circle of intellectuals surrounding the king. The libraries that were associated with Hellenistic gymnasia would have been accessible to all those who were spending their time at the gymnasia, educators and students alike. In a similar manner, in the libraries in Rome, one would expect the library on the Palatine Hill to be less visited than the libraries in the fora. The Library on the Palatine Hill would have been open to the Emperor, his circle, the senators who met there and some invited intellectuals and scientists. The libraries located in the heart of Rome and the other cities in the provinces of the Roman Empire, in fora, agoras and important streets, would have functioned largely as libraries accessible to the public.

Given that literacy rates were not as high as today, we must assume that the users of the library were few. The assumption is that they would have been limited to a small circle of intellectuals and wealthy persons, for whom books were important. The design of monumental libraries such as Hadrian's Library in Athens suggests a small user group. Hadrian's Library is a monumental complex 122 m long by 80 m wide, located at the core of the ancient city of Athens, in a symmetrical arrangement to the Roman Agora,

and next to the Greek Agora. Yet the building has only one entrance, with only one door, indicating that even though the design and the dimensions of the building could have accommodated many persons, not everybody could flow in and out freely.

### *2.3.7. Conclusions*

In conclusion, through time, with the multiplication of texts, and the increase in the literacy of the Greco-Roman society, libraries became important institutions. They stored and preserved organic and delicate rolls, while making them accessible to an increasingly literate society. Librarians developed an efficient classification system for the easy retrieval of each roll in addition to a hierarchy of personnel for the maintenance and management of the rolls.

For the major problem of the protection of the book collections, libraries included drainage and dehumidifying techniques, a sophisticated system of multiple layers of protection of the rolls with armaria, wall veneer with plaster and marble plates, and controlled windows protected by stoas early on, or closed with glass panels in the Roman period. The suggestion that a peristasis or exterior double walls were constructed for better insulation however has been largely overestimated.

## **2.4. The problem of design**

The degree of programmatic flexibility and the diversity in the scale of the library make the range of libraries forms quite diverse and, as result, hard to generalize. Libraries were built in different urban contexts and locations. They varied considerably in scale, ranging from single hall structures to monumental complexes of multiple spaces including

exhibition spaces, gardens, semi-open shaded exedras for discussions, auditoria, offices for copyists and other personnel. It is difficult to derive a consistent set of criteria and conventions governing the design all these diverse components. Still an underlying design principle across all cases is the existence of a stoa, functioning as a threshold between the main hall and the open space, and also an architectural element that organized the library hall and the other spaces around an open space.

More specific design principles varied analogously to the context, the period or the geographic location of the library. For example, in Pergamon, where the overall design scheme promotes the relationship of architecture to the landscape, the library is carefully planned on the second floor of a two-story stoa that provides an impeccable vista to the landscape.<sup>118</sup> In imperial Rome, where visibility, monumentality and grandiose interior spaces are important to the goals of imperial imagery,<sup>119</sup> libraries have monumental interior designs emphasized with interior colonnades, podia and focal points that establish the axis of symmetry and lead the viewer to the center, often occupied by the statue of the emperor, the patron of the library and the one who appropriates the power of knowledge a library symbolizes.

Formal analysis of architectural characteristics foregrounds the similarities and differences of the Greek/Hellenistic libraries with their Roman counterparts. It also allows us to a) identify the spatial characteristics of a library form that are consistent across all times and geographies; b) identify additional spatial characteristics of libraries

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<sup>118</sup> Winter (2006, 212-218).

<sup>119</sup> MacDonald (1986, 183-203).

that are developed in Roman times; and 3) decide which characteristics of libraries are mandatory and which are optional.

#### *2.4.1. The formal components of the Greek and the Hellenistic library*

Greek and Hellenistic libraries were not built as freestanding buildings. Early Greek libraries were nondescript rooms hosting book collections and typically attached to stoas of larger complexes, e.g. gymnasia or temeni. An example is the additional spaces and rooms attached to the museum at the Lyceum of Aristotle, as described by Diogenes Laertius.

Hellenistic libraries were a formalized version of the Greek libraries. They consisted of a sum of different rooms and spaces with different functions, oriented towards a stoa or peristyle, which was at the core of the library and functioned as a reading space. A series of rooms attached to a stoa functioned as storage space for the book collection and an *oikos*, a more formal room, functioned as an exhibition space and a banquet hall. In most cases, formality was an important characteristic, but bilateral symmetry was not yet as important as it became in Roman period. Examples of Hellenistic libraries are the Library of Alexandria, as described by Strabo, and the library at the Serapeum in Alexandria, and the Library of Pergamon, as shown in the building remains.

The interior design of the main hall had no specific spatial characteristics and consisted of movable statuary of historians, philosophers, poets and other important authors, dedicatory inscriptions showcasing the contents of the book collections, and movable wooden furniture, cabinets for the storage of books, and banquet klinai for the symposia and philosophical discussions that took place there. Fragments of statuary and

inscriptions of book catalogues survive today from the libraries of Rhodes (see chapter 3.1.4) and Piraeus. No traces of furniture have survived due to the perishable nature of the material. Lastly, we should not exclude the possibility that libraries also included paintings on wooden boards, hanging on the walls, though no evidence survives today for the same reasons as the furniture. There is a reference in Josephus that the Temple of Peace in Rome, which included libraries, included also artworks of sculpture and painting,<sup>120</sup> and the same assumption must be made for the other libraries too.

#### 2.4.2. *The Roman library*

Roman libraries featured a combination of inherited Greek characteristics and Roman innovations. The overall plan of the Roman library inherited the Greek relationship of the main hall of the library to a stoa or a peristyle in the same way that Roman urbanism adopted the stoa as a building type from Hellenistic urbanism and elevated it into a linking element between different programmed spaces.<sup>121</sup> Roman libraries also continued as part of larger complexes, temples, fora, portica, and bath complexes, and in these complexes it was the stoa that mediated the relationship between the library and the other building components of the complex. The main hall of the library was typically centered against the back wall of a stoa or peristyle, for example as in the case of the Palatine Library or Hadrian's Library in Athens.

There are three cases in which the main hall was attached to the stoa in an irregular way: the Melitine Library was attached in the small side of the stoa of the temenos, and in the

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<sup>120</sup> Josephus, *The Jewish War*, 7.158.

<sup>121</sup> MacDonald (1986).

Domitianic Palatine Library, the second hall extended beyond the peristyle. In cases, the library halls were later additions and were not considered in the original plan of the complexes. A third case of an irregular design is the library of Pantainos, where the main hall was off-center in the peristyle. This occurs because the library of Pantainos was dedicated after a renovation of a pre-existing building, which was located at the corner of the Panathenaic Way and the street that connected the Greek and the Roman Agoras, and had an irregular shape. The building and site restrictions resulted in the irregular form of the library. These examples should therefore be considered case-specific characteristics and not general ones.

Roman innovation includes the further evolution of the library into an independent building like the Celsus Library in Ephesus, or an independent complex, like Hadrian's Library in Athens and the Rogatinus Library in Timgad, which occupied a whole city block. Still, this type and design appeared only occasionally, and the library continued to have diversity in scale, arrangement of spaces, and location within a larger building complex. It was the design of the interior of the library hall that was mostly changed during the Roman period. Library halls became bigger and more formalized. At their most monumental, they included the armaria in built-in recesses in walls, which were preceded by a podium, sometimes with steps. On the podium was set an interior colonnade framing the niches. A focal point for a statue was inserted on the center of the back wall in an enlarged bay that emphasized the axuality in the building. These characteristics appear in the Imperial Libraries in Rome as well as in the provinces, and were the outcome of innovations in Roman building construction that allowed for larger spans and the use of glass panels in windows, which altogether improved hall lighting,



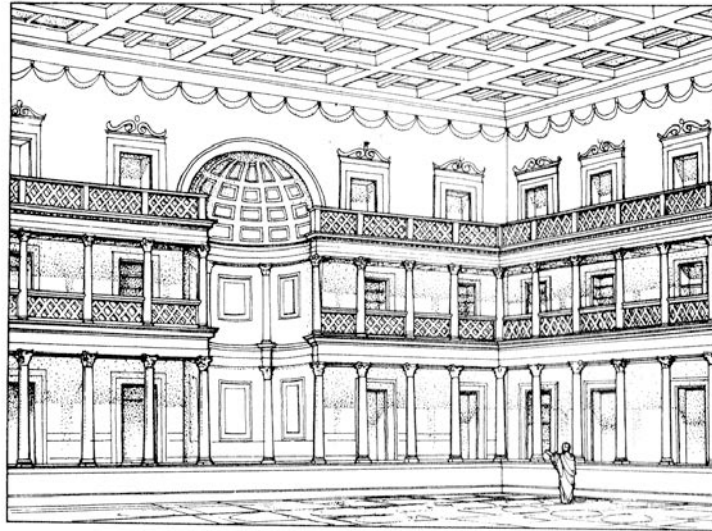
and also that allowed the interior columns to be used chiefly for decoration.<sup>122</sup> These characteristics of interior design will be considered individually here in order to highlight their importance and their occurrence in the design of the Roman library. These characteristics of interior design do not appear in all Roman libraries. Their absence from a hall should not exclude the interpretation of the hall as a library; neither should the identification of a library require the identification of these characteristics.

#### *2.4.3. Elements of the architectural form of Roman libraries*

The most important characteristics of the Roman interior design are the niches, the focal point, the podium, the interior colonnade known also as a column screen, and glassed windows. Libraries that showcase all these characteristics include the Domitianic Palatine Library and the Ulpian Library in Rome, Hadrian's Library in Athens, the Celsus Library in Ephesus and the Rogatinus Library in Timgad. Smaller libraries in the corpus however do not feature these characteristics with the same consistency, as shown in Table 2.1.

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<sup>122</sup> Wilson Jones (2000, 118).



**Figure 2.12** Hypothetical reconstruction of the interior of the Celsus Library (after Wilberg).

**Table 2.1** Table showing the occurrence of niches, podium, column screens, focal point, windows and stairs in Roman libraries. The dash signifies that there is not enough evidence to secure the existence or not of each characteristic, the X signifies the absence and the ✓ signifies the existence of a characteristic in a library.

<i>Library</i>	<i>Niches</i>	<i>Focal P.</i>	<i>Podium</i>	<i>Columns</i>	<i>Windows</i>	<i>Stairs</i>
Augustan Palatine Library	—	✓	✓	—	—	×
Library at the Portico of Octavia	—	—	—	—	—	—
Library at the Temple of Peace	—	✓	✓	—	—	—
Domitian's Palatine Library	✓	✓	✓	✓	—	×
Pantainos Library	—	—	×	×	—	×
Celsus Library	✓	✓	✓	✓	✓	×
Neon Library	✓	✓	×	×	—	×
Library of Nysa	✓	—	✓	—	—	✓
Melitine Library	✓	✓	×	×	✓	×
Ulpian Library	✓	✓	✓	✓	—	—
Hadrian's Library	✓	✓	✓	✓	—	—
Library at the Forum of Philippi	—	—	✓	—	—	×
Rogatinus Library	✓	✓	✓	✓	—	×

The niches and focal point appear to be the most consistent characteristics across most Roman libraries. For the origin of niches in libraries, Wendel<sup>123</sup> suggested that they originated in the Library at the Serapeum in Egypt, where niches were common due to the shortage of wood. Makowiecka<sup>124</sup> argued that there was no technical difficulty for the Romans to construct niches with cement and that niches were commonplace in Roman architecture in general, so that the Egyptian model was not needed for the embedding of niches in the design of a library. The choice to incorporate niches in the design of libraries seems more an aesthetic choice, rather than a need-driven choice. It is true that niches were common in Roman architecture, as well in Egyptian architecture, and even in Egypt that there was a shortage of wood in Egypt, this was not the reason for making niches. Wood was abundantly imported and used for furniture, statuettes and coffins, so that the origin of niches cannot be explained by the lack of wood.

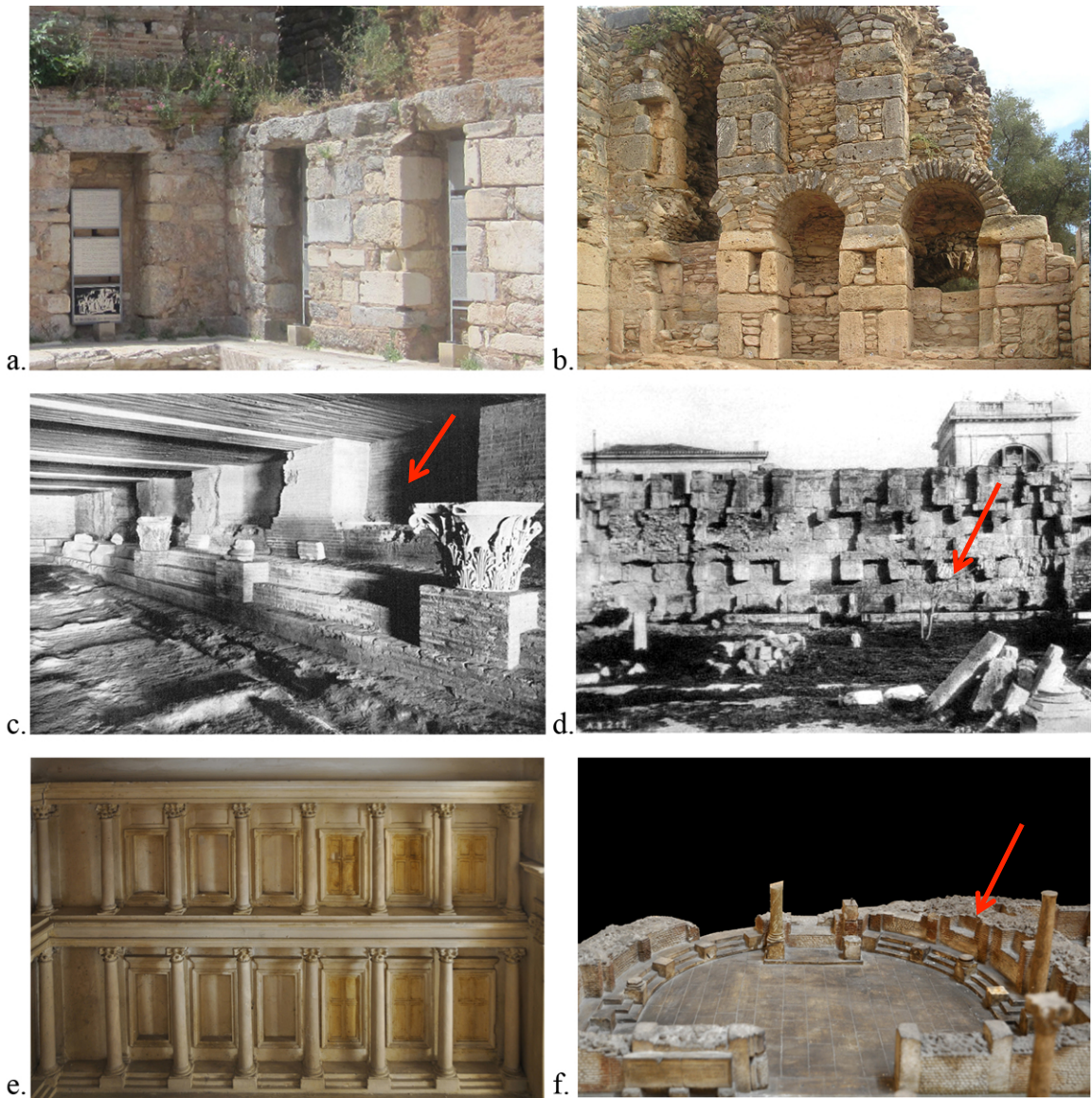
The niches were rectangular recesses in the three walls of the hall, where the armaria or the book cabinets were located. The number of niches per library ranged from eight niches to forty-four according to the scale and significance of the library: the library of Rogatinus had eight niches, while the library of Hadrian in Athens had forty-four. Sixteen is both the median and the mode in the sample of nine libraries that have remains of niches. Niches were always rectangular in plan. In elevation they were mostly rectangular, and in some occasions they were apsidal. In these cases, the apse was structural and was filled afterwards and therefore was not visible, as in the case of the apsidal niches of the Library of Nysa. In cases like the niches of the possible library in

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<sup>123</sup> Wendel (1949, 412).

<sup>124</sup> Makowiecka (1978, 33).

Side (chapter 3.2.6), we can assume that the upper part of the niche was left empty following the insertion of the armarium. Photographs depicting remains of niches as well as their reconstructions are shown in figure 2.13.

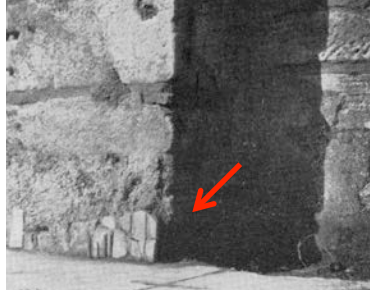


**Figure 2.13** Niches in libraries. a) Library of Celsus (author's photo); b) Library of Nysa (author's photo); c) Ulpian Library (Nash 1961, fig. 556); d) Hadrian's Library (Tigginaga 1999, pl. 126; e) Ulpian Library, north wall, 1:35,000 reconstruction model, Museo della Civiltà Romana (author's photo); f) Rogatinus Library, scale model 1:20 of the state of preservation, Museo della Civiltà Romana (author's photo).

The dimensions of the niches also range: the depth ranges from 0.5 m to 0.9 m, with 0.6 m being the mode value; the width ranges from 1 m to 2 m with 1.2 – 1.25 being the mode value, and the height ranges from 1.9 m to 3.8 m with 2.35 and 2.55 being the median values. The distance between the niches is smaller, equal to or larger than the niche width, and ranges from 0.80 m as in the Neon Library, to 2.3 m as in the Celsus Library. The distance of the niches from the floor ranges between 1 m and 2.35 m and the distance from the level of the podium ranges between 0 and 0.75 m. One would expect that the existence of a podium would force the niches to be located at a higher level, but this is not verified by evidence: the niches at the highest distance from the floor (1.75 – 2.35 m) are the ones in libraries without a podium, namely the Melitine Library and the Neon Library.

It is reasonable to assume that because the niches were filled with armaria and their interiors were not visible, their walls were not finished with luxurious materials. This is confirmed by the building remains of libraries, where the interiors of the niches have a different treatment than the walls of the library. For example, in Hadrian's Library in Athens the interior surfaces of the niches were covered by a 0.02 m gray stucco and in the Celsus Library with a 0.02 m thick white-grey lime plaster, and not by marble veneer as the rest of the walls. On the contrary, in the Ulpian Library, there are remains of marble revetments in the bottom of the niches, which has led to the suggestion that here book cabinets were inserted, but the actual niches supported shelves and doors.

Along their exterior, niches were framed by marble moldings, as evidenced in the Celsus Library, where in the lower part of a niche, the lowest part of the three-stepped marble molding survives (figure 2.14).

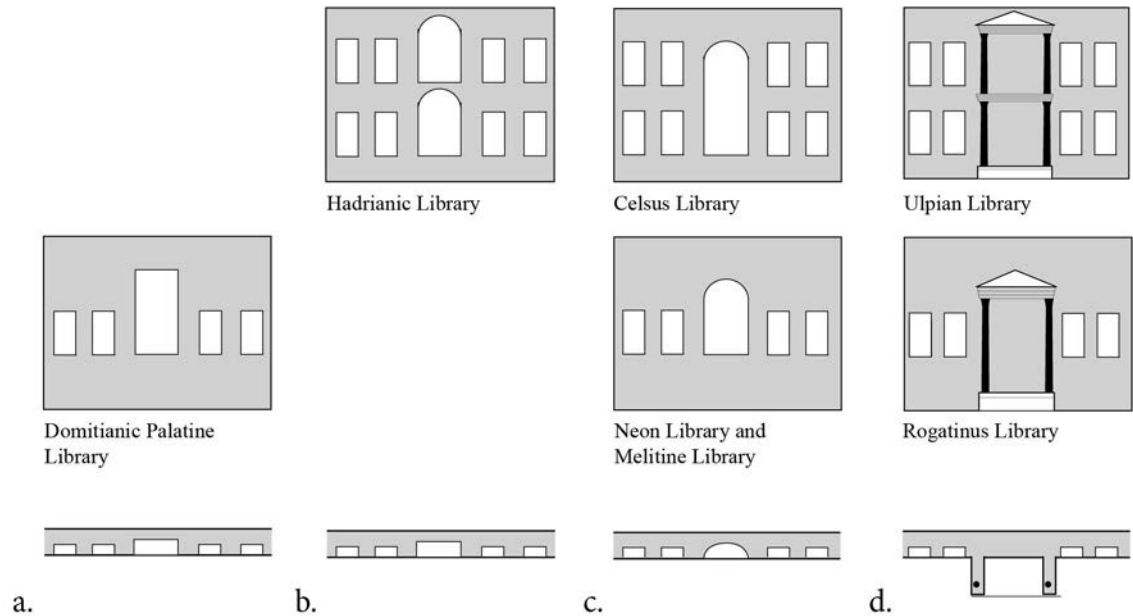


**Figure 2.14** Building remains of the marble molding of a niche from the Celsus Library (Wilberg 1953, fig. 75).

Lastly, it should be assumed that libraries with bookcases located directly on the floor continued to exist.

Another very important characteristic of libraries is the focal point (figures 2.15 and 2.16). Located in the center of the back wall of the main hall, it emphasizes the centerline, the axis and the symmetry of the hall. In its simpler form, it was just a point emphasized in the center of the back wall, for example, with a statue on a pedestal. In more elaborate forms, the focal point was established by either a recess on the back wall, a projection, articulated with an aedicula, as in the case of the Rogatinus Library (figures 2.15d and 2.16h), or with the projection of the podium to the front, as in the case of the Library of Pergamon and the Templum Pacis (figure 2.16a and 2.16b). The focal point in the form of a recess could be articulated with one or two enlarged recesses in the wall, following the row of niches, rectangular in plan, as in the case of the Domitianic Palatine Library, (figures 2.15a and 2.16c), and the Hadrian's Library in Athens (figures 2.15b and 2.17f) or semicircular, as in the case of the Melitine and Neon Libraries (figures 2.15c, 2.16e, and 2.16g) and with a linear or vaulted ending in elevation. Alternatively

and for bigger emphasis, a large apse could cover the whole height of the hall, as in the case of the Celsus Library (figure 2.15d and 2.16d).



**Figure 2.15** Diagrammatic representation of focal points in plan and elevation with one and two rows of niches. Focal point was articulated as: a) rectangular recess; b) rectangular recess with arc end; c) semicircular recess; and d) projection with aedicula. Among all possibilities only the ones that occur in the corpus of libraries are shown.

The dimensions of the focal point vary extensively. They could be the same size as the other niches or larger. The depth is usually larger than the depths of the rest of the niches, and ranges between 1 m and 2.5 m. In two cases, the Hadrian's Library and the Melitine Library, the depth is the same as the rest of the niches, with values 0.5 m and 0.65 m respectively. The width also is typically larger and ranges between 1.65 m and 4.35 m. Only in the Melitine Library does the central semicircular niche have the same width as the other niches. The height of the focal point depends on the number of rows. Most focal points do not survive at their full height, and the sample of building remains is smaller. In

the cases that the focal point is in one row, its height can reach from 3.25 m as in the case of the Domitianic Palatine Library up to more than 7 m as in the central apse of the Celsus Library. In cases that the focal point was in two levels, its height could reach up to 4.32 m, as in the case of the Hadrian's Library.

The focal point was associated with a statue. It is usually believed that the statue of Athena was typical of libraries, however the only evidence for this comes from the Library of Pergamon. Even though it sounds reasonable to expect a statue of Athena, as the goddess of wisdom, other deities should not be excluded. Later on in imperial libraries, gods could be replaced with the statue of the emperor, or in libraries in which there were two recesses, they could be set one above the other.

Evidence of the central statue in libraries can be found in a few libraries. The statue of Athena, copy of the Athena Parthenos of Pheidias, has been found in the Hellenistic Library of Pergamon. In the Temple of Peace, a statue of Peace to whom the Temple was dedicated is restored on the pedestal in the center of the projection of the podium in the central room. From the Pantainos Library two statues have been found: the personifications of Odysseus and Iliad, though their original location is not known. The floor remains of the main hall show that there was no focal point in the room. The statues can be restored standing on pedestals against the back wall.





**Figure 2.16** Examples of different articulations of the focal point in libraries. a) Library of Pergamon, projection of the podium (author's photo); b) Templum Pacis, projection of the podium and pedestal (Fogagnolo 2008, fig.4); c) Domitianic Palatine Library, enlarged rectangular in plan recess (author's photo); d) Celsus Library, apse (author's photo); e) Neon Library, enlarged semicircular in plan recess (Walkens 1993, fig.16); f)

Hadrian's Library, enlarged rectangular recess (Tigginaga 1999, pl.126); g) Melitine Library, enlarged semicircular in plan recess (author's photo); h) Rogatinus Library, aedicular, scale model 1:20 of the state of preservation in Museo della Civiltà Romana (author's photo).

Evidence of statues of emperors appears in the Augustan Palatine Library and the Neon Library. In the Augustan Palatine Library, Pliny<sup>125</sup> mentions a bronze, 50 feet tall statue of Apollo. In the Melitine Library a statue of Hadrian in the nude and a dedicatory inscription to him have been discovered. Both the statue base with the inscription and the statue are reconstructed in the central semicircular niche. From the Roman Neon Library comes one over life-size finger, probably of the Emperor Trajan, during whose reign the library was dedicated.

The podium along the three walls of the library hall, preceding the niches, is yet another important characteristic of a Roman library. The predecessor of the Roman podium in Hellenistic libraries was also set along the walls, but was located forward at a distance of about 0.50 m and functioned as a base for banquet klinai in the symposia between the circle of intellectuals associated with the library. In the Roman library the podium is always set against the wall. In some cases the podium is added between the walls and the floor of the library, as in the case of the Celsus Library (figure 2.17c) and the Library of Nysa (figure 2.17d), and in other cases, the podium is a structural element of the hall, upon which the walls of the library are set, as in the case of Hadrian's Library in Athens (figure 2.17a) and the Neon Library in Sagalassos (figure 2.17b). Depending on the focal point of the library, the podium is either a continuous U-shape, following the three walls

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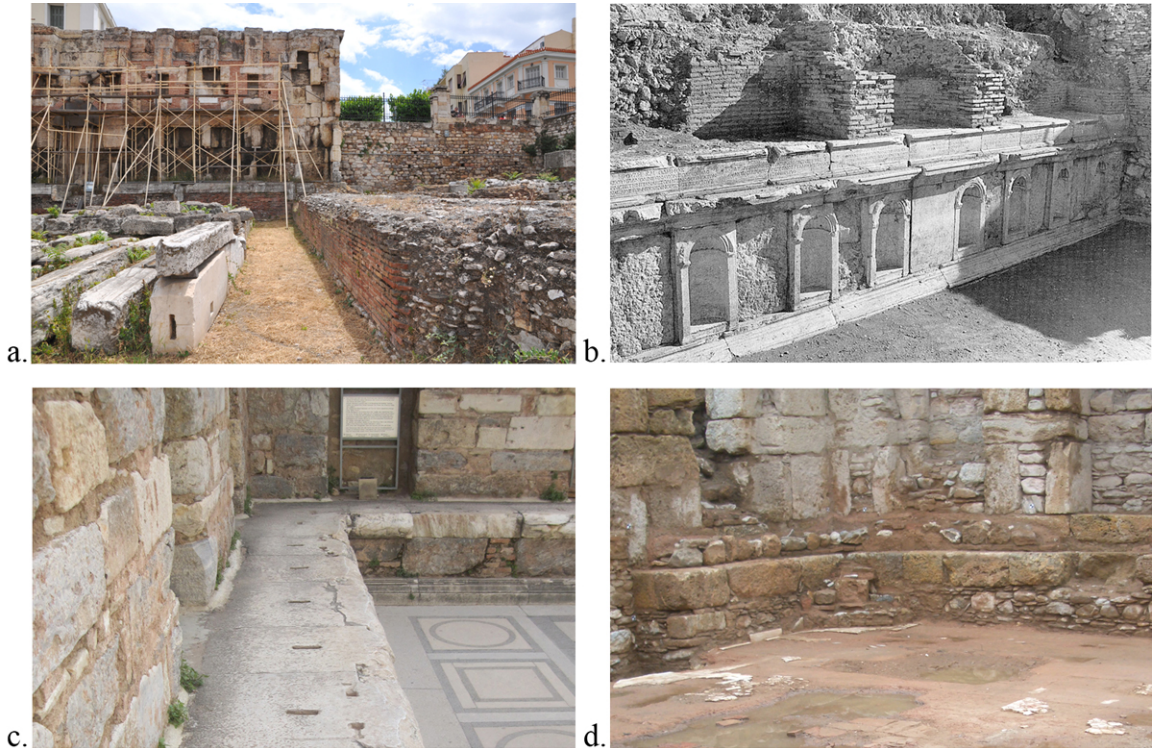
<sup>125</sup> Pliny, *Naturalis Historia*, 34.8.43, "Factitavit colossos et Italia. Videmus certe Tuscanicum Apollinem in bibliotheca templi Augusti quinquaginta pedum a pollice, dubium aere mirabiliorem an pulchritudine."

of the library, or is interrupted by the focal point, so that it consists of two L-shape parts. The parameter defining the shape of the podium is the distance of the focal point from the floor. When the distance of the focal point from the floor is greater or equal to the height of the podium, the podium can be continuous. When the distance of the focal point from the floor is less than the height of the podium, the podium has to be interrupted, otherwise it would block access to the focal point. An example of a continuous podium is the Celsus Library and the Hadrian's Library in Athens, while examples of the interrupted podium are the Ulpian Library and the Rogatinus Library in Timgad, where the focal point is a projecting aedicula that interrupts the podium. The podium of the Library of Nysa constitutes an anomaly, stopping before the south wall, at a distance of 0.65 m in the east side, and 0.69 m in the west side.

The dimensions of the podium vary extensively in relationship to its function. The depth varies from 0.6 m in Rogatinus Library, to 1.5 m in Hadrian's Library. The height also ranges between 0.5 m in Rogatinus Library to 2.35 m in Neon Library in Sagalassos. The median height is 1.20 m. The podium has been interpreted as an important element of the library that insulated the niches from the humidity of the floor while providing access to the niches.<sup>126</sup> However, in most cases the podium is both too high to act as a step and too shallow to serve for circulation, so that it can be better explained as an aesthetic choice rather than as a functional element.

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<sup>126</sup> Gregori (1937, 22); Strocka (1981, 308); Johnson (1984, 134-143); Makowiecka (1978, 19).



**Figure 2.17** Examples of podia in libraries. a) Hadrian's Library in Athens, structural U-shape podium (author's photo); b) Neon Library, structural continuous, originally U-shape podium (Walkens and Poblome 1995, fig. 2); c) Celsus Library, non-structural U-shape podium (author's photo); d) Library of Nysa, non-structural L-shape podium in the west side of the main hall (Freiburg Universität Photo Archive).

Most importantly, the podium should not be considered as a mandatory element of a library. There are libraries in the corpus that do not have a podium. Such cases are the Pantainos Library in Athens and the Melitine Library in Pergamon, where the imprint lines of the marble floor plates indicate that the marble floor pavement reached the edges of the walls, and therefore no permanent podium could have been inserted. Additional evidence comes from the Neon Library in Sagalassos. While there is a structural limestone podium in this library, where the wall with the niches is supported, its depth is so small that no other function can be attributed to it, and its importance can therefore only be stylistic and decorative. Thus, in general, the podium is a flexible characteristic

of the library that is not an essential element in a main hall. When it exists, it works as a visual threshold between the niches and the space in the main hall of the library, and supports an interior colonnade. In cases that it is low enough, or is preceded by steps, it functions as a sitting area, transforming the main hall into an auditorium.

Associated with the podium and niches is another characteristic of libraries, the columnar screen, an interior colonnade set along the interior walls. Columns typically framed recesses in the walls containing statuary, or in the case of libraries, bookcases. Researchers have suggested that columnar screens in libraries function in supporting galleries that provide access to an upper row of niches. However, this hypothesis is not fully supported by material evidence. Firstly, column screens appear even in libraries that have only one row of niches, like in the Rogatinus Library of Timgad, where a gallery would have had no function. Secondly, in many libraries the depth of the podium, and thus the alleged depth of the gallery, is too narrow to allow for free circulation. In the Celsus Library, for example, the podium is only 0.9 m deep. If we subtract the 0.56 m that is the width of the column base, there is only 0.34 m left, which is not wide enough to accommodate the human body. Lastly, in most libraries the existence of a staircase giving access to the second floor has not been verified. It seems more probable that the role of the interior colonnade was primarily decorative, rather than functional. The superimposition of orders framed the niches and the statues and led the attention rhythmically to the central, typically enlarged bay, the focal point, thus reinforcing the axially of the building and establishing as terminal point the deity or the emperor or the dedicator as patron of the library.

Only five libraries provide clear evidence of an interior colonnade: Domitian's Palatine Library and the Ulpian Library, both in Rome, Hadrian's Library in Athens, the Celsus Library in Ephesus and the Rogatinus Library in Timgad. All evidence of capitals points to the Corinthian order. Colonnades were either of one order, as in the case of the Domitian's Library and the Rogatinus Library, or of two orders, as in the Ulpian Library. Hadrian's Library and the Celsus Library are usually reconstructed with two orders, but there is not enough evidence to provide a definitive conclusion. Archaeological findings show that the dimensions of the orders were quite similar to one another. The column base or plinth was around 0.55 m wide, the column diameter around 0.45 m and the entablature was around 4.4 m above podium level. Only the Ulpian Library (chapter 3.1.11) has a bigger order with the column base at 0.79 m wide, the column diameter at 0.59 m and the column height at 4.70 m.

Another characteristic of Roman architecture was the introduction of glassed windows, as elements of design and additional sources of light. In early imperial times, the various internal spaces of a building did not need to conform to a common roofline. By using arched openings, horizontal continuous walls could be eliminated. This expanded the architect's freedom in using and manipulating light. Windows were placed well above the eye level, sometimes in response to neighboring or surrounding structures. In Roman libraries, windows were placed either in the entry wall of the main hall as in the Celsus

Library, or on top of the niches, as in the Melitine Library in Pergamon, where window findings, as shown in figure 2.11 testify to their existence.<sup>127</sup>

Another feature that has been suggested as characteristic of Roman libraries is the stairs providing access to the upper row of niches. The location of these stairs is typically assumed to be in the spaces flanking the main hall of the library. It is also considered that they led to a higher level, from where one could enter through an aperture in the back wall of one of the niches into the interior of the library hall on the gallery that was supported by the colonnade. This suggestion was prompted by the initial identification of the steps in the gaps flanking the Celsus Library as leading to a higher level. This early theory led to the interpretation of rooms as including stairs in other libraries, without any evidence or findings to support this thesis, as in Hadrian's Library in Athens.<sup>128</sup> Recent scholarship has proven that the identified steps led to the crypt with the sarcophagus of Celsus at a lower level, and that the Celsus Library had no stairs to an upper level. Thus such a theory cannot be supported solely on evidence from the Celsus Library.<sup>129</sup>

Among the corpus of Roman libraries, the only libraries that have evidence of an upper row of niches, other than the Celsus Library, are Hadrian's Library, the Ulpian Library and the Library of Nysa. Among them the only one providing evidence for outside access to the main hall is the Library of Nysa, where an aperture in the southwestern niche has been interpreted as the access point from the second floor to the niches of the second

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<sup>127</sup> Deubner (1938, 43).

<sup>128</sup> Sisson (1929, 60); Tigginaga (1999, 295).

<sup>129</sup> Strocka (2003, 37).

level.<sup>130</sup> However, this example is also problematic because it does not provide any conclusive evidence of an interior colonnade and a gallery. In Hadrian's Library, there is no evidence of a stair, even though there is enough space in the plan of the complex for one to have existed. Lastly, in the Ulpian Library, the space behind the main hall is now reserved for the monumental stairwells to the upper level of the Basilica Ulpia.

Due to the lack of any concrete evidence of outside stairs from which one would have been able to reach the upper niches, one must assume that access was granted from the inside through movable stairs. These stairs should reach a level of about 5-7 m. The second row of niches in Nysa are at a height of about 4.9 m above floor level, and the upper niches in Hadrian's Library are 7 m above floor level. Reaching them with a stair would have been possible, but not a function that could be performed at all times. A possible interpretation is that the upper niches did not contain books and therefore did not require constant access. Ancient literary sources make special mention of the sculptural decoration of the libraries with statues, sometimes including statues of the emperor, and possibly his family, which could be located in these upper niches. Therefore, the Roman library continues the tradition of the Hellenistic concept of a library combined with a museum, and also gives a political twist to it by combining it with the imperial cult. This interpretation is convenient in that it puts an end to the long dispute of whether some buildings were libraries or museums, or buildings for the imperial for they were in fact both. The most disputed building is Hadrian's Library in Athens, which has been

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<sup>130</sup> Hiesel and Strocka (2006, 88).



interpreted as a space for the imperial cult, a museum or even a university.<sup>131</sup> It is certain that it contained books, and it is also very possible that it contained statues. It could be all of the above: a library and a museum together, an institution equivalent to the contemporary university that also honored the emperor. Another example is the Melitine Library, which was built symmetrically to the Temple of Zeus-Asclepius, and as the latter, it contained the statue of Hadrian, depicted as god, thus associating the universality of the god with that of the emperor.<sup>132</sup> The library emphasized this symbolism, by associating the emperor with the principle of collecting universal knowledge.<sup>133</sup> Thus, the library functioned both as a library and a hall for the imperial cult.

The duplication of the main hall to separately host Greek and Roman literature is considered the primary Roman innovation in library layout.<sup>134</sup> This characteristic does not appear in Roman libraries in general, but only in the libraries in Rome. The identification of this characteristic was based on the distinction in epigraphic sources between the Bibliotheca Latina and the Bibliotheca Graeca, and the identification of two identical halls in two imperial libraries, the Palatine Library and the Ulpian Library. However, recent excavations have challenged the importance of this characteristic as typical to Roman library design in Rome.

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<sup>131</sup> Karivieri (1994, 89-113) disputes the interpretation of a library and suggests that the Hadrianic structure was a building for the imperial cult. Boatwright (1992, 193-217) and Willers (1990, 14-21) extend the function of the library to that of a Museum and a University.

<sup>132</sup> Petsalis-Diomidis (2010, 171).

<sup>133</sup> Petsalis-Diomidis (2010, 211-216).

<sup>134</sup> Callmer (1944, 159); Dix and Houston (2006, 674); Gregori (1937, 22); Strocka (1981, 309); Wendel (1949, 415).

Firstly, it has been shown that the Augustan phase of the Palatine Library included only one main hall<sup>135</sup> and cannot be considered as evidence for the duplication of the main hall early on with the introduction of the first public libraries in Rome. Also, recent findings suggest that the traditional view of the Ulpian Library as having duplicate halls lacks conclusive evidence as well. Two duplicate inscriptions attribute a funerary character to the two identical halls that have been traditionally been attributed to the Greek and Roman sections of the Ulpian Library.<sup>136</sup> It is possible that these two halls, while being funerary monuments to Trajan and Plotina, could have functioned as libraries, but this is highly conjectural and cannot be proven. Additional evidence from the west hall shows that the original design intent included one colossal order with larger niches, probably for statuary. Later on during the construction, the program of the hall was changed to contain two orders with smaller niches instead.<sup>137</sup> It is not possible to know whether the east hall had the same program of the first phase of the west hall, or if it changed in a similar manner, or whether the two halls had identical programs and functions. Lastly, symmetrically arranged exedras have been identified in the imperial bath complexes of Trajan and Caracalla in Rome. No concrete evidence suggests that these exedras were libraries and their 300 m separation makes them difficult to consider as spaces of the same library.

In summary, there is no concrete evidence suggesting that the duplication of halls was a main characteristic of Roman libraries. Its occurrence in the Palatine Library and possibly

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<sup>135</sup> Iacopi and Tedone (2005-2006).

<sup>136</sup> Egidi and Orlandi (2011). The column of Trajan has been traditionally thought to be the burial place of Trajan, but the space is very small and in the light of the recent findings of the two inscriptions, this view is reconsidered.

<sup>137</sup> Meneghini (2009, 147-150).

the Ulpian Library signifies a later development in the architecture of Roman libraries that cannot be associated with the early libraries in Rome, or the libraries in the provinces. Thus it cannot be considered a generally recognizable design feature of Roman libraries.

## **2.5. Conclusions**

Libraries appeared in a diverse geographic setting and chronological range and vary considerably. They do share some formal and functional characteristics. It is suggested here that libraries can be classified according to their relationship to the architectural and urban context in three categories; a) libraries as part of complexes, b) libraries as complexes, and c) libraries as independent buildings,. This classification acknowledges that the special characteristics of provincial libraries as smaller institutes and buildings accommodate the limited needs of cities of limited scale and importance.

Greek and Roman libraries share a) the existence of a more formal room, the *oikos*, that included book collections and statuary and functioned as a gathering space for the intellectuals associated with the library; and b) a direct relationship of the main hall of the library - and the other spaces of the library, if any- to a stoa and a courtyard too. In this latter case the main hall and the rest of the rooms of the library are perpendicularly attached to the back wall of the stoa. Libraries in which the hall is either attached to the small side of the stoa or extends beyond the limits of the peristyle are case-specific and exist only because library halls were later additions in the complex.

Roman innovations on the design of the Greek/Hellenistic library included a different articulation of the main hall's interior, whereas the bookcases (*armaria*) that contained the rolls were embedded in niches and recesses on the walls of the hall. In more elaborate libraries, a colonnade that framed the recesses and *armaria* stepped upon a podium and often this podium and the preceding steps if any, could also function as a sitting space for the participants in the meetings or lectures occurring within the library. There is little or no evidence suggesting that permanent stairwells gave access to the gallery in front of the second row of niches. It is unlikely that the niches of the upper level were used for books and it seems more plausible that they contained statuary. The duplication of halls for Greek and Roman libraries is testified in only two cases and therefore cannot be considered a generalized characteristic of Roman libraries in general. The use of the term *bibliothecae* in plural does not necessarily signify a spatial differentiation between Greek and Roman collections in different halls, but multiple bookcases or sections within the same hall of library.

These conclusions are supported by the catalogue of all buildings that have been considered as part of the corpus of the ancient Greek, Hellenistic and Roman libraries, given in the next chapter. Each account consists of a brief description of the building, the occurrences of the spatial elements identified so far, drawings showing the state of preservation of the excavation, and a spreadsheet providing a summary of the findings for each building.

## CHAPTER 3

### THE CORPUS OF LIBRARIES

The corpus of the ancient libraries is delineated to provide evidence for the conclusions reached about the architectural form of ancient libraries and also to provide the source for the shape grammar that formalizes these conclusions. The libraries in the corpus are classified in three different categories: a) Libraries (17) that are known from ancient testimonia and have been identified by building remains; b) Libraries (12) that are not known from ancient testimonia but have been suggested by scholars as possible libraries based on archaeological evidence, reasoning and correlation with building remains that exemplify compositional and structural aspects of library forms; and lastly, c) Libraries that are known through testimonia but have not yet been identified with any building remains. All examples are presented in chronological order and in an identical format to draw attention to their similarities and differences. This format includes general historical and geographical data and a current account of the archaeological research and findings pertaining to the alleged spatial characteristics of the libraries, namely, the main hall, podium, colonnade, niches, focal point, floor, stairs, roof and apertures. Actual dimensions of archaeological record are given when available and all literary and epigraphic material when known is given too in its original text format along with a translation in English, when available.

### **3.1. Libraries known from ancient testimonia and identified with building remains**

The libraries that are known from ancient testimonia and are identified with building remains include 17 case studies. These buildings were built in a sequence of more than four centuries, from the Hellenistic Period to the beginning of the 3<sup>rd</sup> century C.E. and in a vast geographical area, from Rome to Asia Minor and from Egypt to Northern Greece.

#### *3.1.1. Library in the Serapeum at Alexandria*

The library at the Serapeum was founded as the daughter library of the Library at the Museum at Alexandria (See chapter 3.3.1). It was a public library, located in the district of Rhakotis, and probably more easily accessible than the mother Library at the Museum, (figure 3.1). It hosted a smaller collection of books, which at the time of Kallimachos, is estimated to be 42.000 volumes.<sup>138</sup>

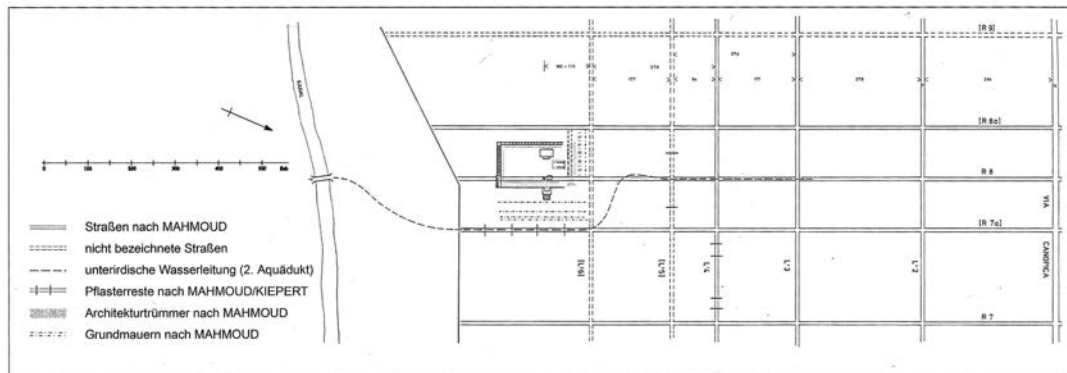
The temenos of Serapis<sup>139</sup> was founded by Ptolemy III Euergetes in the second half of the third century B.C.E., as testified by the foundation plaques found in the southeast and southwest corners of the temenos. The cult of Serapis had already been established by Ptolemy II Philadelphos and Arsinoe, who founded an altar. Also, the south and T-shaped buildings that were connected through an underground passage and were associated with the cult of Serapis were already founded when Ptolemy III built the monumental temple, the stoa-like building next to it and the peristyle enclosing all four buildings. By whom the library was founded is not clear. It is usually assumed that it was founded by Ptolemy

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<sup>138</sup> Callmer (1944, 148).

<sup>139</sup> McKenzie, Gibson, and Reyes (2004, 73-114); Rowe and Drioton (1946); Sabottka (2008).

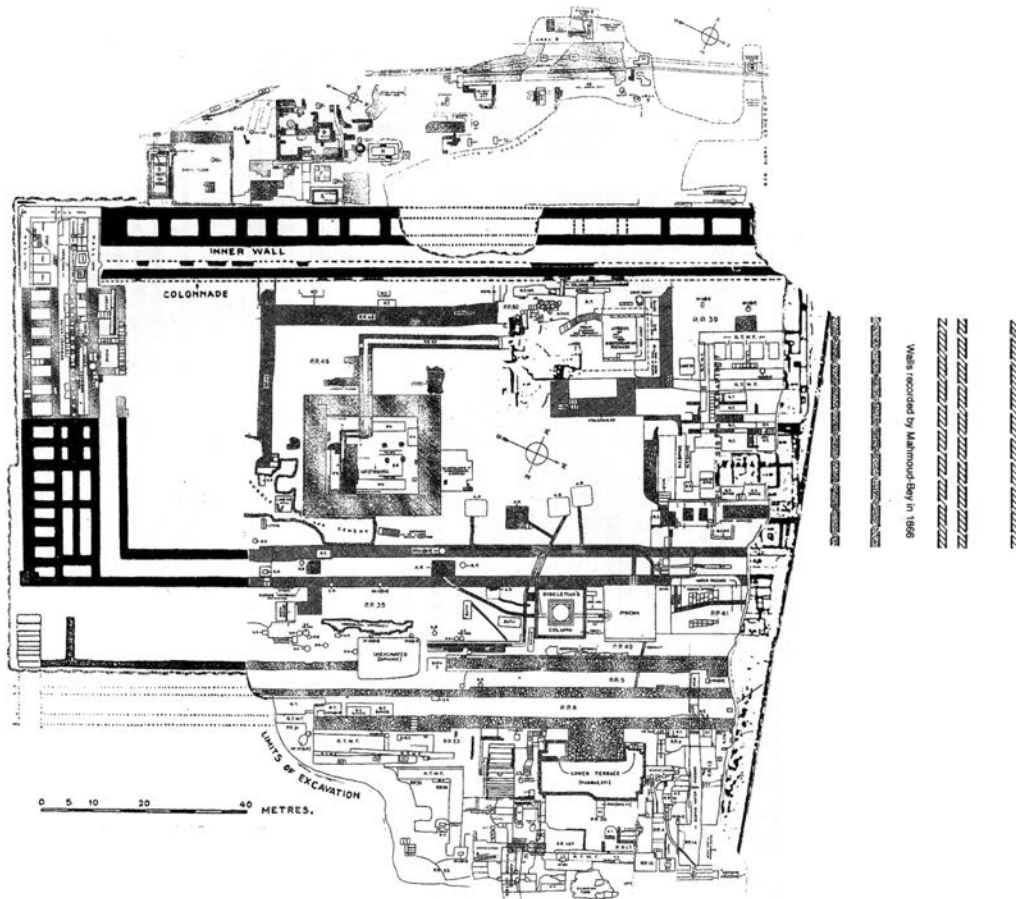
II Philadelphos. Whether pre-existing or founded from scratch, the library must have found a permanent location in the monumental complex of Ptolemy III Euergetes.



**Figure 3.1** Topographic plan of the area of Rhakotis with the Serapeum (Sabottka 2008, fig. 4)

The Ptolemaic complex is built on a natural hilly formation, and consists of a large peristyle, 173.7 m. long on the axis north-south and 77 m. wide on the axis east-west (figures 3.2 and 3.3). It was located along R8, a main north-south street of Alexandria and it had two entrances from its eastern side (figure 3.1). The peristyle enclosed a central courtyard about 142 m. long and 55 m. wide, with the Temple of Serapis, a stoa-like building parallel to it, and two earlier buildings, associated with the cult of Serapis: the so-called T-shaped building and the south building, connected through an underground passage. Later, a shrine to Harpocrates was added next to the temple by Ptolemy IV. The south and west stoas of the peristyle had rooms, about 4.10 - 4.20 m. deep and 2.20 - 3 m. wide attached to their backbone facing the stoa and the courtyard. Due to the formation of the terrain, the south stoa had a lower level with an interior

colonnade and rooms facing inwards. Three more rooms, the so-called “niche” opened to the north in the western half of the lower level.

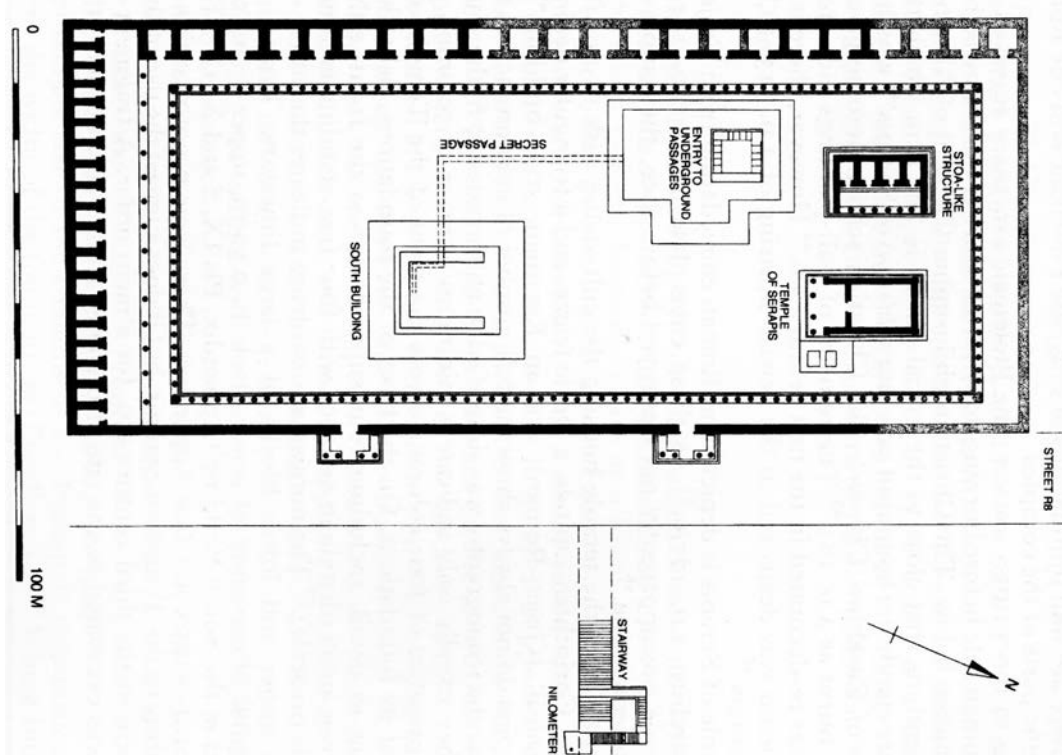


**Figure 3.2** State of Preservation Plan of the Ptolemaic enclosure including the full archaeological record (McKenzie et al. 2004, fig. 4).

In 181 C.E., the complex was burned and thereafter rebuilt in about 211-217 C.E. The Roman phase of the complex preserved the south and the west boundaries of the temenos and the location of the Temple of Serapis and expanded to the east and to the north, so that the Temple was located in the center of the transverse axis of symmetry, and the



dimensions of the complex were 105.55 m by 205.7 m. The peristyle and the temple were rebuilt in larger scale with red and gray granite architectural members. The southern entry to the complex was eliminated, and the complex had only one ceremonial entry in the east facade, preceded by grand staircases. A second entry in the north facade is reconstructed in the end of the R8 Street, assuming that the street could not have been a dead-end.



**Figure 3.3** Restored Plan of the Ptolemaic Enclosure (McKenzie et al. 2004, fig. 8).

The Ptolemaic and the Roman phases are very distinct: the Ptolemaic remains include foundations in rock-cut trenches with limestone blocks, while the Roman phase consists of concrete foundations built with pieces of limestone connected with cement. Both

Ptolemaic and Roman phases were built in a classical style, as testified by numismatic evidence and by the numerous architectural members - capitals, frieze, architrave and cornice pieces found on site.<sup>140</sup>

The library has not been identified with any building remains, but based on the descriptions in ancient testimonia is usually located in the rooms of the south stoa.

### ***Main Hall Description***

There are no clear building remains of a main hall.

Among the archaeological findings, the most elaborate structure is the so-called great niche in the lower level of the south stoa.<sup>141</sup> It was located in the western half of the lower level and opened on the north side of the interior corridor, across the series of the smaller rooms. It was 18 meters long and was divided in three interconnected rooms. In the Roman times, there were two fireplaces in these conduct hot air, which excludes the existence of a library on the lower level due to the risk of fire. So, the only possible spaces for a main hall of a library are the rooms that opened in the stoa of the upper level. There are no building remains of the upper level of the south stoa, but its plan can be reconstructed based on the lower level. It is generally assumed that the upper level of the south stoa repeated the plan of the lower level. Sabottka<sup>142</sup> and McKenzie<sup>143</sup> give two variant reconstructions of the upper level, following the same schema but differing in the depth of the stoa. However, it must be emphasized that the plan of foundations of the

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<sup>140</sup> McKenzie, Gibson, and Reyes (2004, 73-114).

<sup>141</sup> Rowe and Drioton (1946, 23).

<sup>142</sup> Sabottka (2008, fig.18).

<sup>143</sup> McKenzie, Gibson, and Reyes (2004, fig.8).

lower level gives the plan of maximal walls, which doesn't necessarily mean that all of them had to be repeated on the upper level. Some of the shared walls between rooms in the lower level might have been eliminated on the upper level in order to create larger spaces for banqueting rooms, or rooms for the storage and retrieval of books.

Also, in Roman times, the perpendicular supports on the eastern side of the lower level were extended up to the third from south foundation wall. These foundation walls were thicker than the rest and probably had to support a larger structure on the upper level in that spot, which corresponds to the width of the south building and also to the width of the Roman Temple of Serapis. Some of the blocks of these foundations survive. They are limestone blocks in second use, possibly from the koilon of the stadion to the south of the Temenos of Serapis. The fact that they are not concrete as the rest of the Roman phase indicates that they must be dated later than the Ptolemaic phase but before the fire of 181 C.E.

A possible location for a main hall of the library is the combination of any of the rooms of the upper level of the south stoa, in the first phase. Later, a more monumental main hall might have been constructed in the eastern part of the south stoa, where the rooms were modified to extend further to the north and take the space of the second aisle of the interior colonnade.

### ***Findings***

Podium: No findings.

**Column Screens:** There are archaeological remains of an interior colonnade of the lower level of the south stoa. This colonnade supported the roof of the basement level and also divided the corridor in two aisles, one along the chambers, and one along the “great niche.” Construction marks on the limestone blocks that supported the colonnade define the diameter of the columns at 0.77 m and the intercolumniation at 1.84 m.<sup>144</sup> The remains of the colonnade of the peristyle include only the stylobate, based on the size of which is calculated the order; column diameter 0.897 m and intercolumniation of 2.24 m.

Also, there have been found two square column plinths, one in situ in the eastern boundary of the niche, and one overturned, 0.55 m tall and 1.67 m wide and one 9 m tall red-granite column, with diameter 1.26 m at the base and 1.18 m at the top.

**Niches:** No findings. Wendel<sup>145</sup> suggested that since niches were common in Egypt, the Library in the Serapeum must have had niches as well. Wendel suggested that the Library at the Serapeum was the model library for Roman libraries and that Augustus copied the technical aspect of niches from it. Makowiecka<sup>146</sup> contradicted this argument by claiming that niches are a simple construction, easy to make with Roman concrete masonry, and that no parallel is needed in Egypt for this.

**Floor:** There are remains of marble pavement on the interior corridor. The great niche must have also been paved with marble.

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<sup>144</sup> McKenzie, Gibson, and Reyes (2004, 87 n. 53).

<sup>145</sup> Wendel (1949, 412-413).

<sup>146</sup> Makowiecka (1978, 7-21).

**Apertures:** According to literary sources (Rufinus, end of 4th century C.E.), the basement was lit by great openings from above. The rooms of the upper floors would have been lit from windows towards the stoas.

**Roof:** No findings. The room is reconstructed either flat or pitched.

**Stair:** Findings of a staircase that led to the basement.

**Wall:** The remains of the Ptolemaic phase include rock-cut foundations and ashlar masonry walls.

**Table 3.1** Summary of key characteristics and measurements of the library at Serapeum

<i>Features</i>	<i>Data</i>
Location	Sanctuary of Serapis, in rooms adjoining the stoas
Date	246-221 B.C.E.
Founder	Ptolemy III Euergetes I
Orientation	Northwest - Southeast
Identified by	Ancient testimonia and building remains
Main Hall Width	-
Main Hall Length	-
Main Hall Area	-

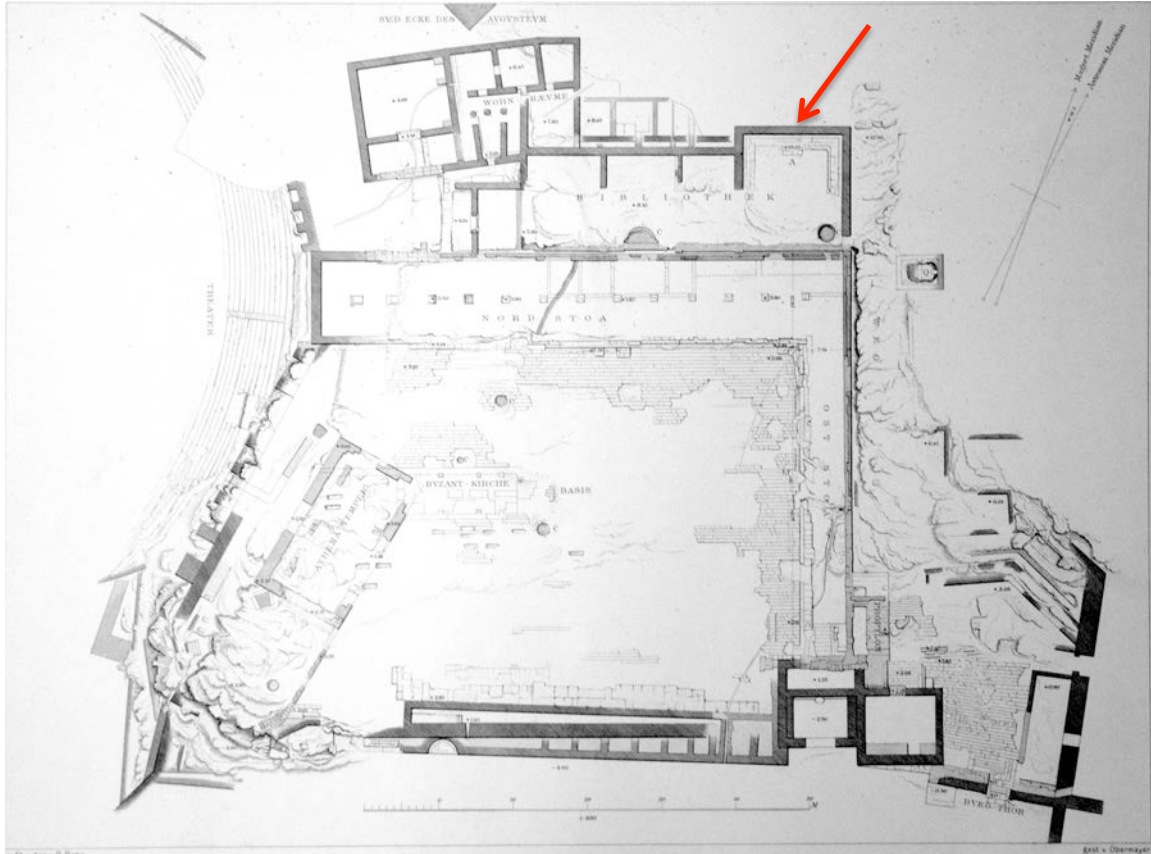
### 3.1.2. Library of Pergamon

The Library of Pergamon<sup>147</sup> has been identified with a series of rooms attached to the second floor of the northern stoa of the Sanctuary of Athena in Pergamon that was dedicated by Eumenes II in the first quarter of the 2nd century B.C.E. (figures 3.4 and

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<sup>147</sup> For information on Pergamon see Akurgal (1973); Hansen (1971); Radt (1999).

3.5). The interpretation of the rooms of the stoa as library is under the condition that the library was first constituted by Eumenes I and rebuilt by Eumenes II.



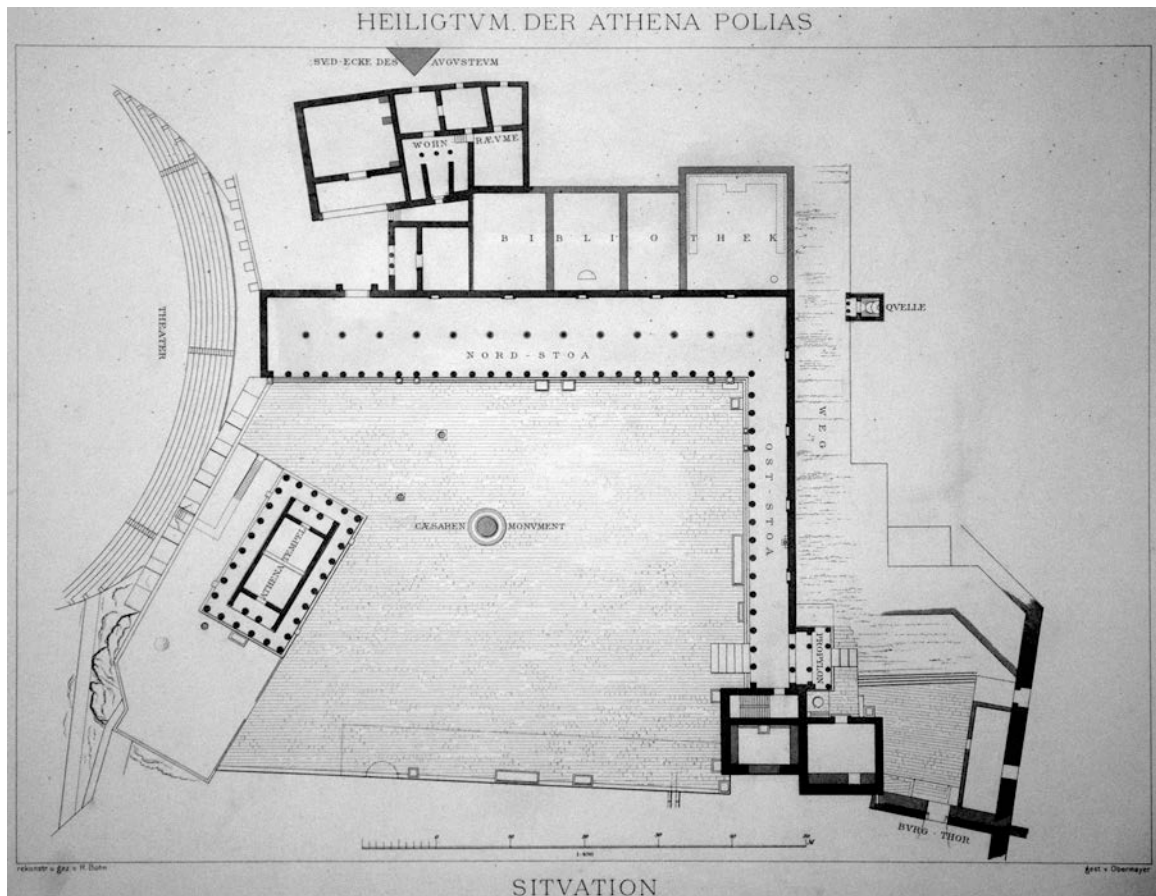
**Figure 3.4** State of Preservation plan of the Temenos of Athena (Bohn 1885, pl. 3)

The library consists of a large northeastern room with rich findings and three smaller rooms to the west, measuring 13.5 m deep and 7 to 10 m wide, with no findings.<sup>148</sup>

Further to the west, there is another room, but with no direct access to the second floor of the stoa and the library rooms. The main evidence comes from the NE room, which

<sup>148</sup> For the library of Pergamon see Bohn and Droysen (1885, 56-78); Callmer (1944, 148-153); Conze (1884, 225-232); Hoepfner (2002, 41-52); Johnson (1984, 44-61); Krone (2004); Makowiecka (1978, 15-19); Strocka (1981, 302-304); Tonsberg (1976, 75-76); Wendel (1949, 407-410).

includes the statue of Athena, and statues of poets and historians, (e.g., Alcaeus, Herodotus), and a continuous podium in front of the three walls. This room has been identified with the oikos of the library, and has been interpreted as a formal room that held statues.



**Figure 3.5** Reconstruction Plan of the Temenos of Athena (Bohn 1885, pl. 40)

The lack of a dedicatory or other inscription that would undoubtedly identify the building remains with the royal library of Pergamon, and the existence of inscriptions referring to libraries at the Pythium and the Gymnasium have led to the suggestion that the library was located either at the Pythium or the Gymnasium. However, the location of the royal

library at the Temenos of Athena does not exclude the parallel existence of smaller libraries at other locations, like the Pythium and the Gymnasium.

### ***Main Hall Description***

The main hall of the library, the *oikos*, has been identified with the northeastern room at the North Stoa in the Temenos of Athena (figure 3.6). The northeastern room is larger than the rest, is projecting to the north, and has rich sculptural findings including an oversize statue of Athena, copy of the statue of Pheidias, and six inscribed statue bases, with the names of authors: Ἀλκαῖος Μυτιλεναῖος, Ἑρόδοτος Ἀλικαρνασσεύς, Τιμόθεος Μιλέσιος, Βάλακρος Μελεάγρου, Ἀπολλώνιος Πιλότου, Ὅμηρος.<sup>149</sup> There are traces of a u-shaped podium, 1.05 m wide at a distance of 0.50 m from the walls. It widens at the center of the back wall to form a 2.74 x 2.11 m projection. It has been suggested that the statue of Athena stood there. To this theory points the fact that the statue of Athena was roughly worked at the back, and was intended to be seen frontally. Other findings of the room include a series of holes on the three walls, above the podium, for the support of a structure, and a channel on the floor.<sup>150</sup>

Researchers agree unanimously that this room was the *oikos* of the library. However, they don't agree on the function of the room. Bohn,<sup>151</sup> Götze,<sup>152</sup> and Hoepfner<sup>153</sup> suggested that this room included *armaria* with books (figure 3.7b), while Mielsch<sup>154</sup>

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<sup>149</sup> Johnson (1984, 55).

<sup>150</sup> Bohn and Droysen (1885, 57-59).

<sup>151</sup> Bohn and Droysen (1885, 69-70).

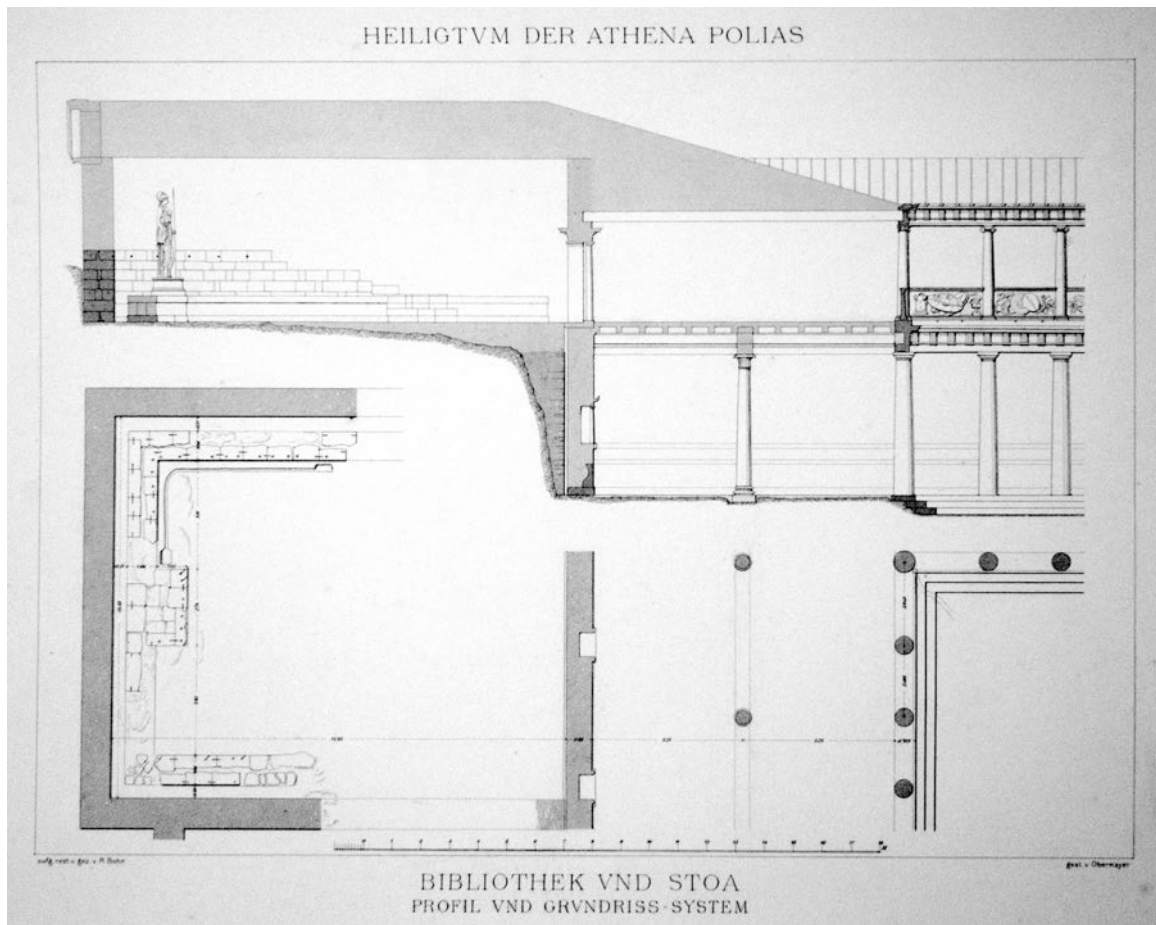
<sup>152</sup> Götze (1937, 228-232).

<sup>153</sup> Hoepfner (2002, 43-50).

<sup>154</sup> Mielsch (1995, 773).



considered it to be a treasury, Dziatzko<sup>155</sup> an art gallery and/or a meeting place of the scholars of the library, and Strocka<sup>156</sup> a banquet hall (3.7a). In any case, the area of the smaller rooms to the south of the main hall would have been enough to host up to 200.000 volumes.<sup>157</sup>

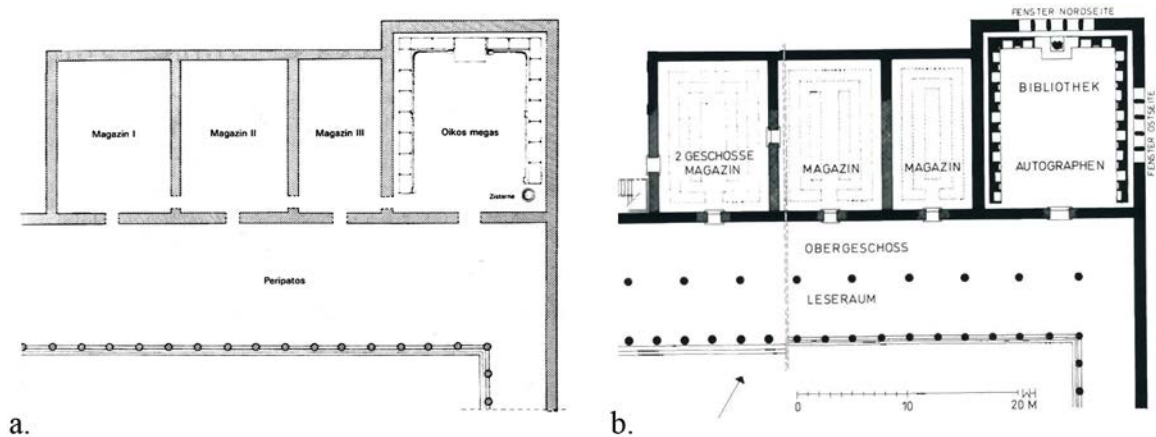


**Figure 3.6** State of Preservation combined with reconstruction plan and section of the main hall of the library and the stoa in front of it (Bohn 1885, pl. 33).

<sup>155</sup> Dziatzko (1896, 45-46).

<sup>156</sup> Strocka (2000, 161-165).

<sup>157</sup> Callmer (1944, 153).



**Figure 3.7** Restored plans of the Main Hall: a) with banquet klinai after Strocka (Strocka 2000, fig. 5); b) with armaria after Hoepfner (Hoepfner 2002, fig. 65).

## Findings

**Podium:** There are the remains of the first course of stone blocks of a U-shaped podium at a height 0.46 m and at a distance of 0.5 m from the wall, and 1.05 wide.<sup>158</sup> In the center of the podium on the west side, the width is doubled, to form a 2.11 x 2.74 m projection into the room. It is made of stone-faced construction. The podium has been interpreted as holding armaria with books<sup>159</sup> (figure 3.8), statuary<sup>160</sup> an interior colonnade<sup>161</sup> or klinai mattresses.<sup>162</sup> Upon The interpretation of the function of the podium depends also the interpretation of the hall as a library, a gallery, or a banquet hall.

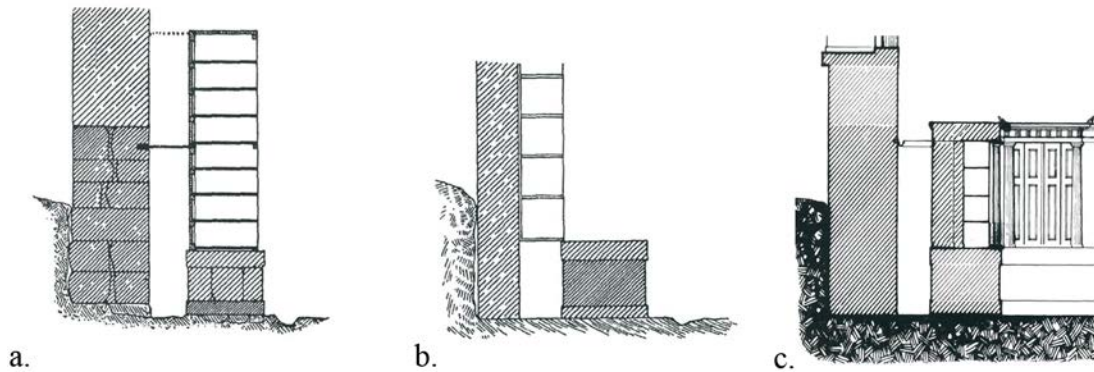
<sup>158</sup> Bohn and Droysen (1885, 57).

<sup>159</sup> Bohn and Droysen (1885, 69-70); Götze (1937, 228-232); Hoepfner (1996, 32-33); Hoepfner (2002, 243-250); Makowiecka (1978, 19).

<sup>160</sup> Dziatzko (1896, 45-47); Johnson (1984, 60).

<sup>161</sup> Johnson (1984, 60).

<sup>162</sup> Strocka (2000, 163-165) reconstructs the podium at about 0.9 m high, and places klinai mattresses on top.



**Figure 3.8** Restored Sections of the podium holding armaria: a) after Bohn (Callmer 1944, fig. 3); b) after Götze (Callmer 1944, fig. 4); and c) after Hoepfner (Hoepfner 2002, fig. 64).

**Column Screens:** No findings of columns in the main hall. There are findings of the colonnade of the stoa that screened the library rooms. The order on the first floor was Doric, and on the second floor Ionic.

**Niches:** No findings.

**Floor:** There is evidence of tesserae on the floor; the floor must have had a mosaic. Also, there is evidence of pavement on the floor the courtyard of the sanctuary. In the NE corner of the main hall, along the inside face of the podium, there are the remains of a channel cut into the floor, which led to a cistern in the southeast corner of the room. This channel is interpreted as used for rituals or cleaning of the room after symposia.<sup>163</sup>

**Apertures:** Evidence of windows comes from pilasters and half-columns.<sup>164</sup> Windows are reconstructed on the North and the East exterior walls of the main room of the library.

<sup>163</sup> Dziatzko (1896, 46); Strocka (2000, 156); Radt (2003, 22).

<sup>164</sup> Bohn and Droysen (1885, 64).

The windows were rectangular, with Doric half columns between the openings and pilasters at the ends.

**Roof:** No findings. The library rooms must have been roofed with a trashed roof.



**Figure 3.9** Views of the library: a) the north wall of the main hall; b) view of the main hall from southwest; c) view of the main hall from northwest; d) view from the northeast of the main hall; e) view of the stoa and the temenos of Athena from the main hall of the library; f) view of the library from the Temple of Athena (author's photos).

**Stair:** No findings of stairs in the library. There were stairs in the two ends of the stoa, where were the two entrances to the sanctuary, and must have given access to the second floor of the stoa.

**Wall:** Walls were made of blocks of local trachite stone. The north and east sides of the main hall survive at a height of 2.5 m.<sup>165</sup> Along the three walls of the main hall, at a height of 2.2 m above the floor level, there is evidence of holes,<sup>166</sup> measuring 4.5 cm high, 7.5 cm wide, and 14 cm deep, and placed 1.03 m apart (figure 3.9a). A second group of holes, 8 cm wide x 1.2 cm high x 6 cm deep, 95 cm above floor level, are located behind the enlarged portion of the podium. Bohn<sup>167</sup> and Götze<sup>168</sup> interpreted the first set of holes as containing metal struts to support the bookshelves located on the podium, creating thus a peristasis at the back to protect the books from dampness, and the second set of holes for the support of the statue of Athena standing on the enlarged portion of the podium along the north side. Gotze suggested that the bookshelves should be located directly against the wall, with their front edge resting upon the podium, and the podium having the use of the Roman libraries. Dziatzko<sup>169</sup> interpreted the holes as supporting an entablature, above the podium that supported statues, while Wolter-von dem Knesebeck<sup>170</sup> interpreted them as supporting marble plates with the catalogue of the most important books, similar to the plates with inscriptions found in Rhodes. Strocka<sup>171</sup> interpreted the holes as supporting a decorative crown molding.

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<sup>165</sup> Radt (2003, 22).

<sup>166</sup> Bohn and Droysen (1885, 57).

<sup>167</sup> Bohn and Droysen (1885, 70).

<sup>168</sup> Götze (1937, 228-232).

<sup>169</sup> Dziatzko (1896, 45).

<sup>170</sup> Wolter-von dem Knesebeck (1995, 56).

<sup>171</sup> Strocka (2000, 158).

**Table 3.2** Summary of key characteristics and measurements of the library of Pergamon.

<i>Features</i>	<i>Data</i>
Location	North Stoa in the Sanctuary of Athena, Pergamon
Date	first quarter of the 2nd century B.C.E.
Founder	Eumenes II
Orientation	Southeast - Northwest
Identified by	ancient testimonia and building remains
Main Hall Dimensions	13.53 m
Main Hall Length	15.95 m
Main Hall Area	215.80 m <sup>2</sup>

### 3.1.3. Academy of Plato

The Academy of Plato<sup>172</sup> was founded in 388 B.C.E. and was named after the area where it was located. The area of the Academy included several shrines and sanctuaries, a palaestra, a gymnasium, gardens and groves, all enclosed in a precinct wall since the archaic period.<sup>173</sup> In the long history of the Plato's Academy of almost 1000 years, until its closing by Justinian, it is assumed that facilities of the school changed were by Plato's students and successors. Hoepfner suggested that a later phase of the Academy should be identified with the great gymnasium<sup>174</sup> excavated in the area of the Academy and dated in the end of Hellenistic, and the beginning of Roman times (figures 3.10 and 3.12).

Findings from that structure survive up to the foundations (figure 3.12). It consists of a large rectangular complex, around 40 m long and 24 m wide,<sup>175</sup> with a rectangular courtyard in the center with a water reservoir, surrounded by stoas on the south, east and west sides, and rooms on the north side (figure 3.10). On the longitudinal axis of each of

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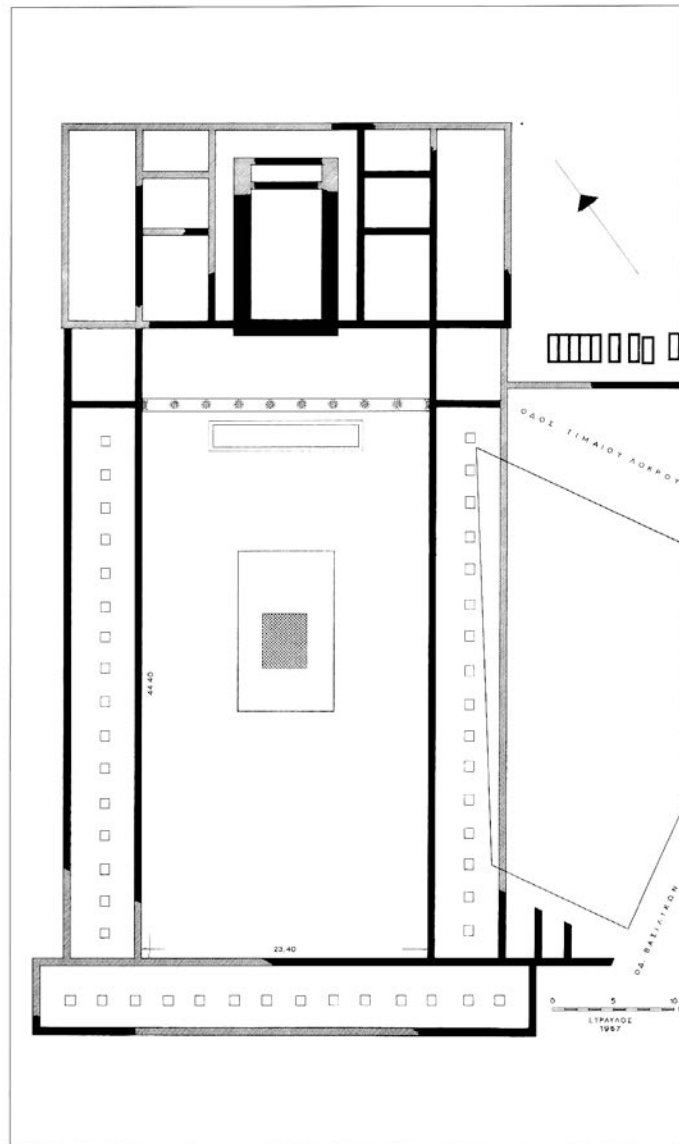
<sup>172</sup> Staikos (2012).

<sup>173</sup> Travlos (1971, 42-43).

<sup>174</sup> Heffner (1931, 324-352); Karo (1933, 209-210); 1932, 124); 1934, 136-139); Riemann (1937, 117)

<sup>175</sup> Karo (1934, 136-139).

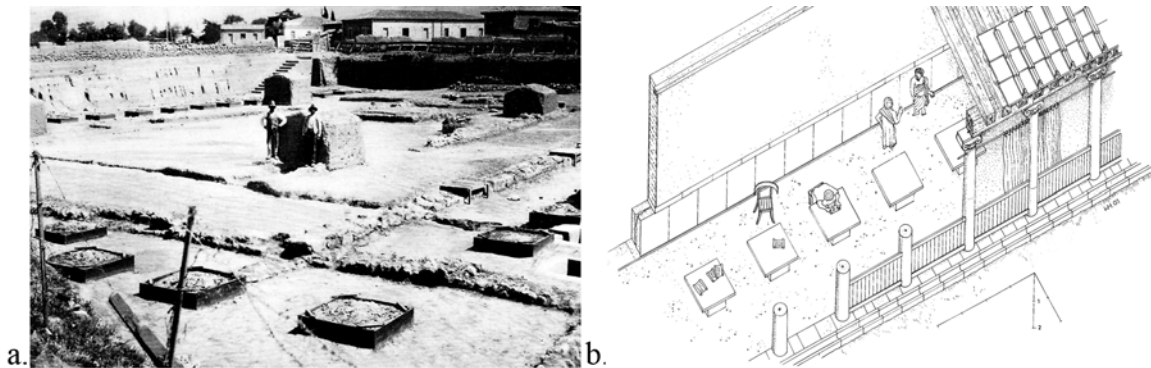
the stoas, a row of foundations for square bases 0.72 x 0.72 m set at regular intervals of 2.75 m have been found, which have been interpreted as supports for the tables for the students<sup>176</sup> (figure 3.11). The north side included a central hall, flanked with four rectangle rooms on each side (figures 3.12 c and d).



**Figure 3.10** Plan of the Academy after Travlos (Travlos 1971, fig. 59)

<sup>176</sup> Thompson in Travlos (1971, 42).

Hoepfner's main argument for the identification of the gymnasium with the Academy is based on the evidence of the foundations for tables in the stoas, the existence of a podium in the main hall, and in the similarity of the general layout of the gymnasium with the later Hadrianic library in Athens. Hoepfner went on to interpret the central north hall as the oikos of the Academy, holding rolls in armaria, and the flanking rooms for extra book storage, and for banquet and lecture halls, with analogy to the Hadrianic complex.<sup>177</sup>



**Figure 3.11** Tables for students to read. a) View of the foundations in the peristyle (Travlos 1971, fig. 60); b) Reconstruction after Hoepfner (2002, fig. 77).

Even though Hoepfner's interpretation of the central hall holding armaria seems overstretched, since it is not based on evidence, but on his theory of identification of the podium of the Library of Pergamon (see chapter 3.1.2) as also holding armaria - a theory that has been challenged by other scholars- his theory of the general identification of the gymnasium with the Academy deserves further consideration.

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<sup>177</sup> Hoepfner (2002, 56-62).



### *Main Hall Description*

On the axis of the building complex, there are the remains of an elongated rectangular hall, which has been identified with the oikos of the complex. Along the three walls of the hall, across the entry, and at a distance from them, there is a 1.35 m thick structure. The interpretation of this structure is very much tied to the different interpretations of the Library of Pergamon. Hoepfner has suggested that it held the wall with the niches of the main hall of the library, while it seems very possible that it held the banquet beds of the oikos. In this case, the book collection would have been stored in the adjacent rooms.



**Figure 3.12** Views of the north rooms: a) view of the main room from the northwest; b) view of the main room from the southwest; c) view of the northeastern rooms from the northeast; d) view of the northeastern rooms from the southeast (author's photos).

## *Findings*

**Podium:** There are the remains of the 1.35 wide wall in the main hall, which could have been a podium (figure 3.12b).

**Column Screens:** No findings.

**Niches:** No findings.

**Floor:** No findings.

**Apertures:** No findings.

**Roof:** No findings.

**Stair:** No findings.

**Wall:** The walls of the north rooms of the complex are made of limestone blocks, in secondary use from classical buildings.<sup>178</sup>

**Table 3.3** Summary of key characteristics and measurements of the Academy of Plato.

<i>Features</i>	<i>Data</i>
Location	Outer Kerameikos, near Kolonos Hippios, Athens
Date	1st century B.C.E.
Founder	Plato
Identified by	Ancient testimonia and building remains
Orientation	Southwest-Northeast
Main Hall Width	11.34 m
Main Hall Length	15.49 m
Main Hall Area	175.66 m <sup>2</sup>

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<sup>178</sup> Travlos (1971, 43).

#### 3.1.4. *Library at the Gymnasium of Rhodes*

The library of Rhodes<sup>179</sup> has been known through three inscriptions that were found in the area east of the Temple of Apollo Pythios on the Acropolis of Rhodes (figure 3.13), and are dated in the end of the second century B.C.E., or the beginning of the first century B.C.E.<sup>180</sup> The inscriptions survive in a fragmentary condition and their transcriptions has not been easy to complete. In the first inscription the word “BYBAIOΘHKAN” is found twice and also the word “ANAΓPAΦAN” which refers at a catalogue of books. The second inscription gives a catalogue of donors and titles of books and has been identified as the catalogue mentioned in the first inscription. In the area, where the inscriptions were found, between the streets P15 and P19, and P26 and the slopes of the Acropolis, there have been found the ruins of a stadium, and a small theater, odeium or auditorium.<sup>181</sup> The stadium and the theater are considered to be part of the gymnasium of the Acropolis. So is the library mentioned in the inscriptions. The design and construction of the gymnasium happened in three phases: first, some city blocks were reserved during the design of the urban plan; second, around 100 B.C.E., the theater and the cavea of the stadium were constructed; and third, in the early imperial period, a renovation took place.<sup>182</sup>

Until recently the library had not been identified with any structure. Hoepfner plausibly suggested that the library was the room with niches found directly to the north of the

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<sup>179</sup> For information on the city of Rhodes see Kontis (1953); Kontis (1958); Kypraiou et al. (1993)

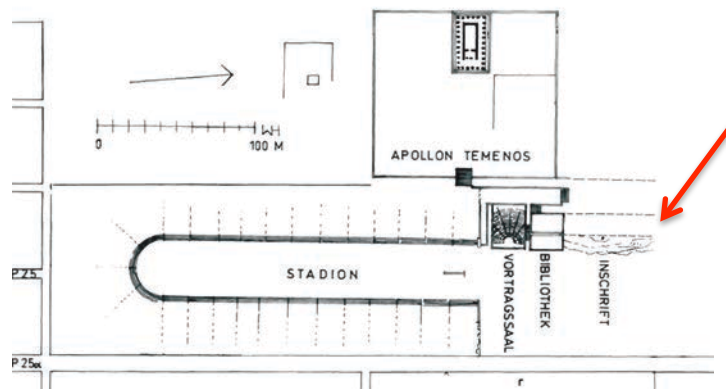
<sup>180</sup> Callmer (1944, 154); Jacopi (1932, 165-256); Maiuri (1925, 7-15); Papachristodoulou (1988, 500-501); Segre (1935, 214-225); 1936, 40).

<sup>181</sup> Jacopi (1932, 165-256); Laurenzi (1938, 16-25).

<sup>182</sup> Zervoudaki (1974, 965).

theater, due to the existence of niches on the first floor, where the books were kept.<sup>183</sup> Lectures would take place at the theater next to the library, while reading spaces would be located on the second floor of the library, which could be reached through the ramp/stairs found between the theater and the library.

The identification of the library with this space needs further consideration, given the width of the niches that surpasses the width of the niches of other library in the corpus, and the entry condition to the main hall.



**Figure 3.13** Restored topographical plan of the gymnasium of Rhodes to the east of the Temple of Apollo. The library is pointed with the arrow (Hoepfner 2002, fig. 87).

### *Main Hall Description*

The room with the niches survives at a very low height, but it has been extensively restored (figure 3.14). Only the west wall remains. There are eight niches of same dimensions and form on the west wall. On the fifth niche from the north, there was a door that gave access to the gap behind the west wall of the library. Traces of a clay pipe on

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<sup>183</sup> Hoepfner (2002, 70-71).

the floor of the room indicate that the water collected in this gap, was led to the east through the pipes.<sup>184</sup>

### *Findings*

**Podium:** No findings.

**Column Screens:** No findings.



**Figure 3.14** View of the Main Hall of the library: a) before its restoration (Laurenzi 1938, pl. 18); b) after the restoration of the niches (Hoepfner 2002, fig. 72).

**Niches:** Building remains include eight niches along the northern wall of the library constructed entirely of stone blocks. The niches are rectangular in plan, 2 m wide and 0.6 m deep. They were preserved at a low height and today they are fully reconstructed with a semicircular ending (figure 3.14b).

**Floor:** Traces of plaster survive on the second floor of the building.

**Apertures:** No findings.

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<sup>184</sup> Hoepfner (2002, 70).

**Roof:** No findings.

**Stair:** Stairs have been found on the two sides of the theater, with a slope of 27 degrees leading to the north and giving access to the upper diazoma of the theater and the upper terrace with the temple of Apollo Pythios, and possibly to the second floor of the library, if there was any.

**Wall:** The wall was made of ashlar blocks of limestone. Strocka suggested that the thickness of the inscription with the catalogue of the books indicates that it could have been an orthostate in the wall of the library.<sup>185</sup>

**Table 3.4** Summary of key characteristics and measurements at the library at the gymnasium of Rhodes.

<i>Features</i>	<i>Data</i>
Location	Gymnasium on the Acropolis of Rhodes, next to the auditorium
Date	100 B.C.E.
Founder	Unknown
Identified by	Ancient testimonia and building remains
Orientation	East-West
Main Hall Width	20.5 m
Main Hall Length	11.7 m
Main Hall Area	239.85 m <sup>2</sup>

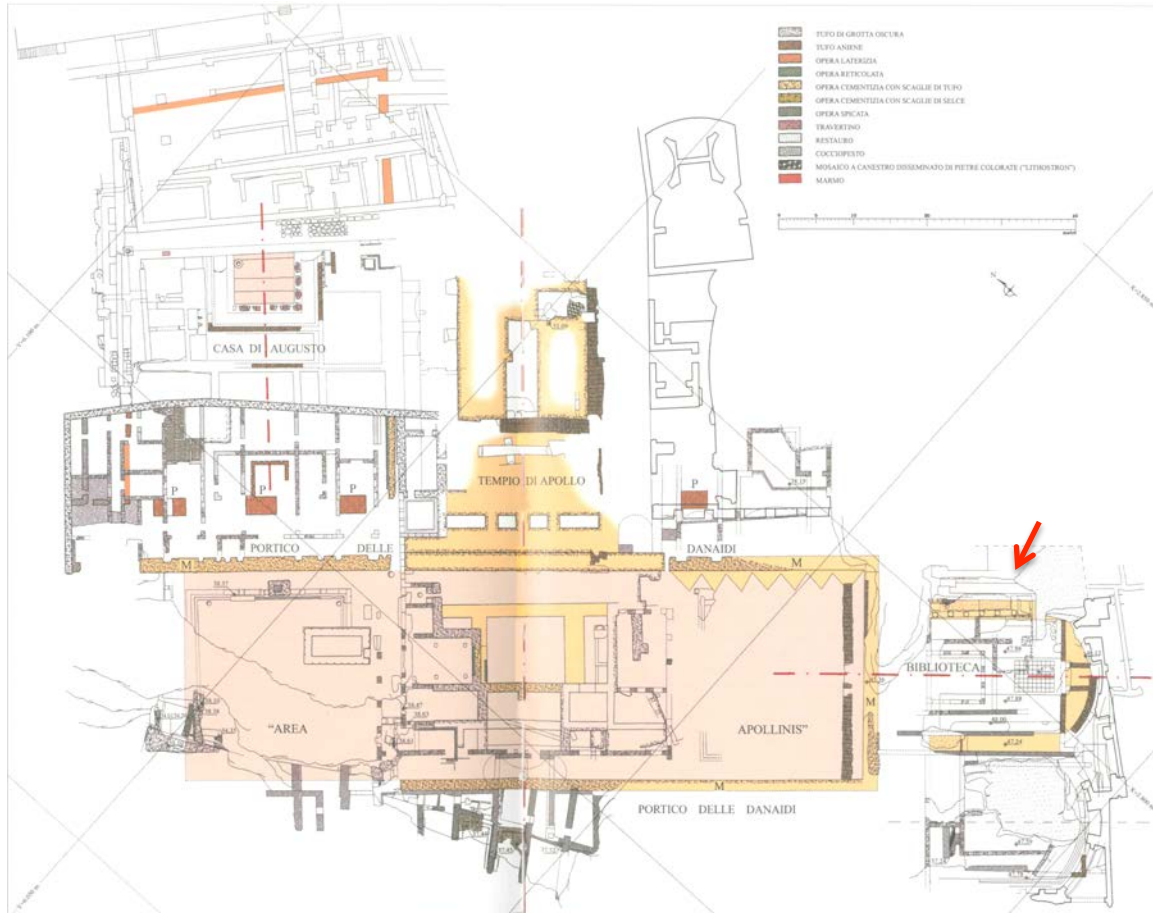
### *3.1.5. Augustan Palatine Library, Rome*

The library in the area of the Temple of Apollo on the Palatine Hill is part of a larger project of Augustus to convert his private residence on the Palatine Hill into a public

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<sup>185</sup> Strocka (2000, 57-58).

space (figure 3.15). This project constitutes the third phase of construction that started after the battle of Actium in 31 B.C.E.<sup>186</sup> The temple was dedicated in 28 B.C.E.<sup>187</sup>



**Figure 3.15** State of preservation of the third phase of the house of Augustus, the Temple of Apollo, the portico and the library. A red arrow points to the library (Iacopi and Tedone 2005-2006, pl. 3).

Until recently, the Augustan library was identified with the vaulted structures (figure 3.18a) in the foundations of the Domitianic libraries (see chapter 3.1.8) and that it was in

<sup>186</sup> Borrello (2009, 4-6).

<sup>187</sup> Boyd (1915, 5-8); Richmond (1914, 194).

close relationship to the House of Augustus.<sup>188</sup> New excavations after 1990 and a closer examination of the remains rejected this theory and instead identified three Augustan phases of construction in the area of the Temple; the first two identifying the remains in the lower level (including the vaulted spaces under the Domitian's library) with the private residence of Augustus, and the last one with his decision to rebuild his residence to the north and convert this area into a large public space with the portico, the library and the Temple of Apollo.<sup>189</sup>

Augustus built a massive wall delineating a rectangle around his private residence with the two courtyards, one to the west and one to the east, which he used as the foundation of his new project (figures 3.18c and 3.18d). Subsequently, he filled the enclosed area including his house with the study, the oikos and the ramp, and the two courtyards, with dirt, and created a large public terrace, 30 x 100 m. On the transverse axis, he built the Temple of Apollo and the altar in front of it, and on the longitudinal axis on the eastern side, he built the library, the "Bibliotheca ad Apollinis," referred to in the literary sources.<sup>190</sup> The terrace had colonnades on all four sides, thus creating the Portico of the Danaids, named after the Herme depicting Danaos and his fifty daughters (figure 3.16).

### ***Main Hall Description***

The architectural form of the Augustan phase of the library at the Temple of Apollo was not known until recently and was generally assumed to have been the same as the

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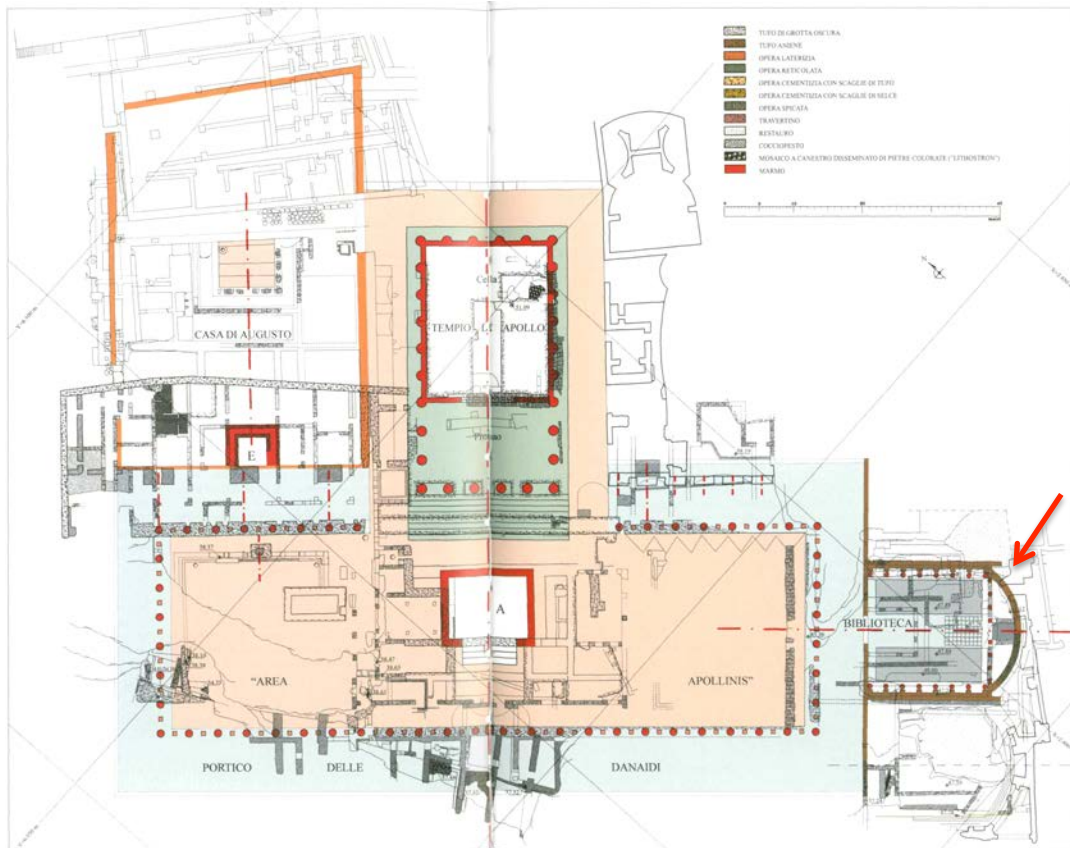
<sup>188</sup> Richmond (1914, 200-204); Strocka (1981, 307-310); Iacopi and Tedone (2005-2006, 352); Carettoni in Iacopi and Tedone (2005-2006, 352).

<sup>189</sup> Borrello (2009, 6).

<sup>190</sup> Iacopi and Tedone (2005-2006, 351-378).



Domitianic phase.<sup>191</sup> However, Iacopi and Tedone<sup>192</sup> showed that the Augustan library consisted of only one hall, on top of which was later built the northern hall of the Domitianic phase (see chapter 3.1.8).



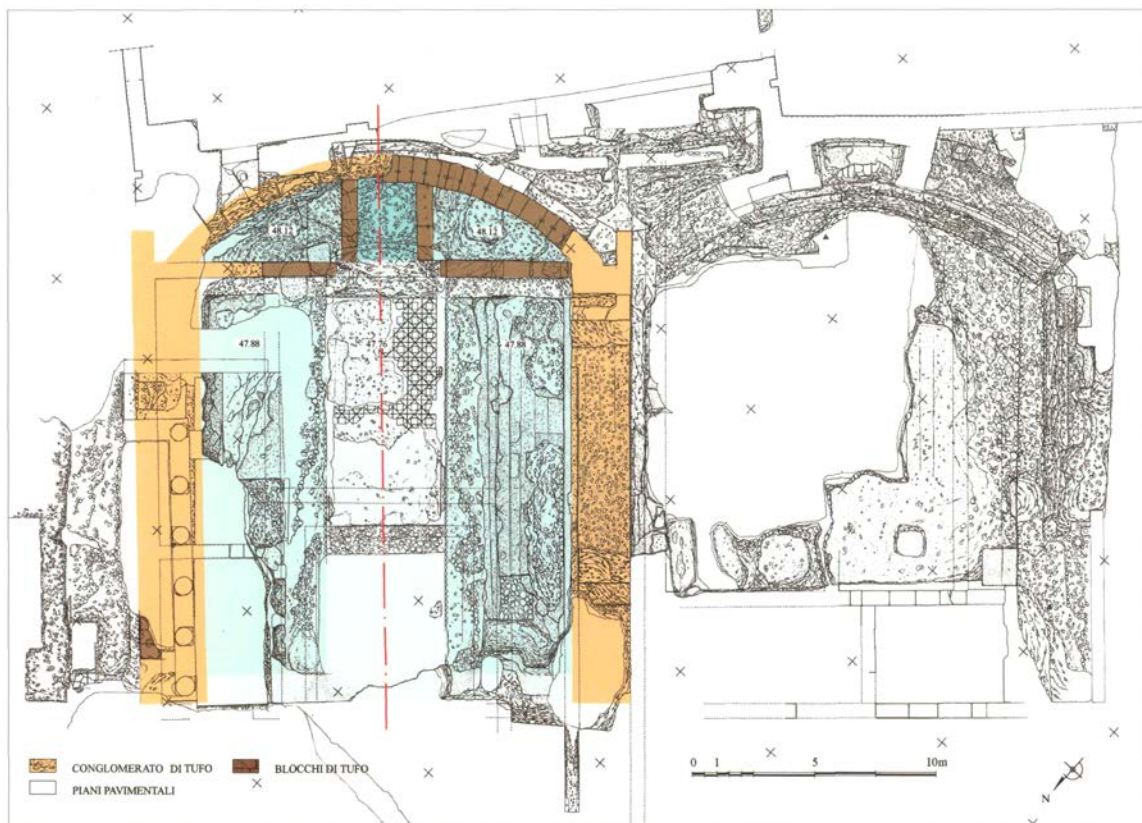
**Figure 3.16** Hypothetical Reconstruction of the third phase of the house of Augustus, the Temple of Apollo, the portico and the library. A red arrow points to the library (Iacopi and Tedone 2005-2006, pl. 8).

The Augustan library hall was rectangular, 15 m wide and 18 m long. In the end, there was a semicircular exedra at the whole width of the hall. The building remains of the hall include a series of rectangular blocks connected with stone dovetail clamps, along the three sides of the rectangular hall (figure 3.17). This is interpreted as a stylobate,

<sup>191</sup> Callmer (1944, 157-159); Stročka (1981, 307-310).

<sup>192</sup> Iacopi and Tedone (2005-2006, 351-378).

probably of an interior colonnade. In the semicircular exedra, there were two perpendicular foundation walls of blocks of tufa, creating a rectangular formation on axis of the building that functioned as a focal point in the hall, probably for the support of a statue. The rectangular hall had a tripartite division, with the central part paved with square and triangular marble tiles. The two side parts were subdivided into large steps along the length of the hall and were paved with rectangular marble slabs.



**Figure 3.17** State of preservation of the Palatine Library. The Augustan phase is in color (Iacopi and Tedone 2005-2006, pl. 2).

The literary sources mention that in the library, there were the statue of Augustus as Apollo and the images of poets, orators, and Drusus and Germanicus. The statue of Augustus is reconstructed in the focal point of the room, while the images of Drusus,

Germanicus and other poets and orators in medallia attached to the entablature of the U-shaped colonnade, along the three sides of the room.

### ***Findings***

**Podium:** There are no remains of a podium, but there are remains of deep steps along the two long sides of the hall. These steps were later subdivided in shallower steps with the addition of opus latericium. The steps were covered with marble rectangular tiles.<sup>193</sup>

These steps covered one third of the total width in each side, which constituted a large portion of the hall. The steps probably functioned as a seating area for the senators, who according to the literary sources gathered there in the time of Augustus and later emperors. The books might have been kept in armaria directly set on the floor or the upper tier of the steps.

**Column Screens:** There are no remains of columns in the hall, other than the series of blocks of tufa delimiting the rectangular hall, which are interpreted as a stylobate for a colonnade. This interpretation is reinforced by the fact that in the Domitianic phase, there were colonnades, remains of which survive today.

The portico of the Danaids, to the longitudinal axis of which the library was attached, had a Doric colonnade with columns with lower diameter 0.72 m and interaxial space 4.26 m. Between the columns, there were the 51 statues of Danaos and his daughters.

**Niches:** No findings.

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<sup>193</sup> Iacopi and Tedone (2005-2006, 353).



**Figure 3.18** Views of the Palatine Library and the portico of the Danaids: a) view from the north of the library, its substructures and the east side of the foundation M; b) view of the library with the tripartite division of the floor dating to the Augustan phase; c) view of the eastern end of the foundation M, supporting the portico; d) view of the foundation M built in front of the earlier phase of the House of Augustus (author's photos).

**Floor:** The floor was all paved with marble tiles. The central part of the floor was paved in opus sectile with triangular and square tiles of pavonazzetto, giallo antico, Proconnesian and Luna marble. The side parts with the steps were paved with rectangular marble tiles.<sup>194</sup>

**Apertures:** No findings.

**Roof:** No findings.

<sup>194</sup> Iacopi and Tedone (2005-2006, 353).

**Stairs:** No findings.

**Walls:** There are only findings from the foundations, constructed in opus cementicum with tufa. On the level of the floor, there are foundation blocks of tufa. The upper walls made in opus latericium are dated in the period of Domitian. There are no findings of any interior decoration or marble revetments.

**Table 3.5** Summary of key characteristics and measurements of the Augustan Palatine library.

<i>Features</i>	<i>Data</i>
Location	Portico of the Danaids, Temple of Apollo, Palatine Hill, Rome
Date	28 B.C.E.
Founder	Augustus
Identified by	Ancient testimonia and building remains
Orientation	Northwest - Southeast
Main Hall Width	15 m
Main Hall Length	18 m
Main Hall Area	270 m <sup>2</sup>

### *3.1.6. Library in the Porticus Octaviae, Rome*

The Porticus Octaviae was located next to the Porticus Philippi in the Campus Martius and was built by Augustus after 27 B.C.E. in replacement of the Portico of Metellus, built in 146 B.C.E.<sup>195</sup>

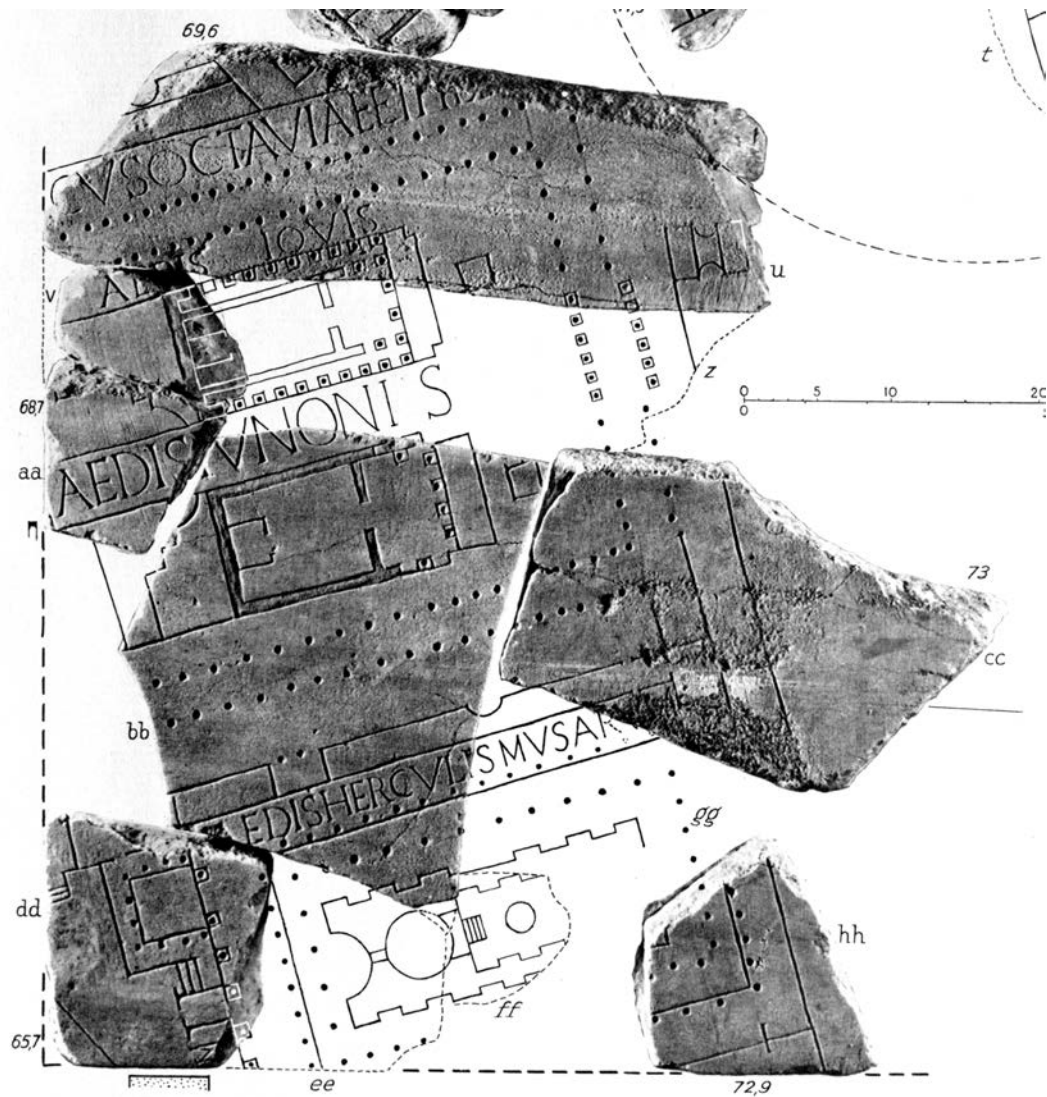
The Porticus Octaviae was built in marble, replacing the earlier tufa building, and followed in dimensions and form its predecessor. It was named after Augustus' sister, Octavia. The porticus consisted of a colonnaded portico with a monumental hexastyle

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<sup>195</sup> Senseney (2011, 421-441).

propylon and framed the earlier temples of Juno and Jupiter stator and their altars.<sup>196</sup>

Octavia also organized the library with Greek and Latin book collections in the Porticus, to honor her son, who died in 23 B.C.E. According to the literary sources, the complex included Greek and Latin libraries<sup>197</sup>, a curia and a schola.



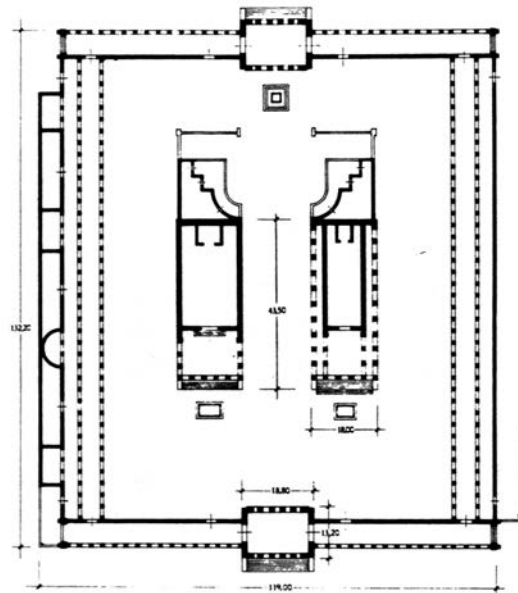
**Figure 3.19** Forma Urbis fragments (Carettoni 1960, pl. 29).

<sup>196</sup> Richardson (1976, 61-62).

<sup>197</sup> Boyd (1915); Callmer (1944); Dix and Houston (2006); Johnson (1984); Makowiecka (1978).

The architectural form of the Porticus Octaviae is known through literary sources and identified through some panels of the Forma Urbis Romae,<sup>198</sup> which gives the general form of the portico with stoas in at least three sides, and the Temples of Juno and Jupiter in the center (figure 3.19). The only building remains of the portico today are the propylon and the southeast corner, dating in a later rebuilding of the early 3rd century (figure 3.21). The rest of the complex is still under the contemporary urban fabric.

The portico was 132 x 140 m and as shown in FUR, it had a double colonnade in its northern stoa, and attached to it a semicircular and a rectangular exedra. Richardson reconstructed the complex with bilateral symmetry and with a second propylon on the north side of the complex (figure 3.20).



**Figure 3.20** Restored plan of the Porticus Octaviae after Richardson (Richardson 1992, fig. 71).

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<sup>198</sup> Carettoni (1960, pl.29).



**Figure 3.21** View of the propylon of the Portico Octaviae, the only building remains visible today (author's photo).

Scholars have been debating over the location of the library in the Porticus. According to one proposal, the library was located along with the schola and the curia at the rear of the two temples.<sup>199</sup> The fragment of FUR shows two apsidal spaces, but these do not look like rooms. According to another proposal, the library could have been located in the rooms joining the stoas.<sup>200</sup> The fragment of FUR shows two exedras, a semicircular and one rectangular, and possibly a third rectangular one, and more could have existed in the east side of the porticus that is not depicted in the fragments of FUR.

The ancient testimonia refer to a Greek and a Latin section, but it is not clear whether the book collections were actually in different rooms or buildings, or just in separate cabinets in the same space.

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<sup>199</sup> Clarke (1901, 14); Makowiecka (1978, 37-39); Middleton (1892, 203).

<sup>200</sup> Callmer (1944, 159-160); Johnson (1984, 96-98).



### *Main Hall Description*

No findings

**Table 3.6** Summary of key characteristics and measurements of the library in the Porticus Octaviae.

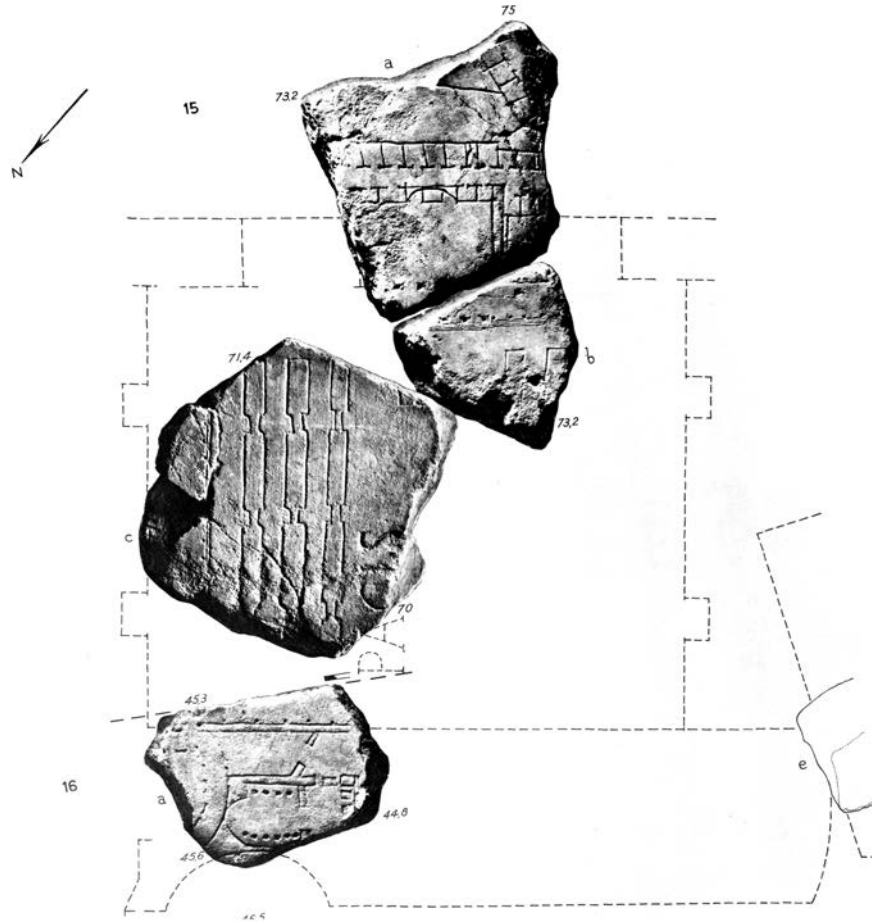
<i>Features</i>	<i>Data</i>
Location	Portico of Octavia, Rome
Date	23 B.C.E.
Founder	Augustus or Octavia
Identified by	Ancient testimonia and FUR
Orientation	Unknown
Main Hall Width	-
Main Hall Length	-
Main Hall Area	-

#### *3.1.7. Library at Templum Pacis, Rome*

The Tempum Pacis or Temple of Peace<sup>201</sup> is known through a) four fragments of FUR (figure 3.22), b) the wall incorporated in the medieval church SS. Coma and Damiano, c) the northern exedra incorporated in the medieval building Torre dei Conti, d) the building remains revealed from the excavations from the main hall of the complex, and d) the building remains of the southwestern corner of the portico and the courtyard.

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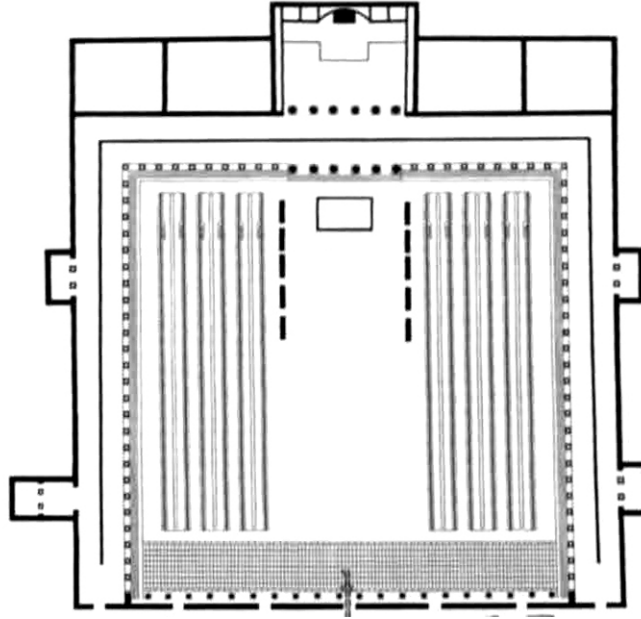
<sup>201</sup> For general information on the Templum Pacis and the library see Boyd (1915, 16-17); Callmer (1944, 161-162); Coarelli and Roma (2009); Dix and Houston (2006, 691-693); Johnson (1984, 99-101); Makowiecka (1978, 43-50).



**Figure 3.22** Forma Urbis Romae fragments (Carettoni 1960, pl.20).

The Templum Pacis consisted of an almost square courtyard (110 x 105 m), surrounded by stoas on its south, north, and east sides (figure 3.23). In the west side, where there was the entry to the complex, there was an interior colonnade, with an entablature against the wall, and a 12 m wide pavement of white marble in front of it. Facing the entry, on the east side there were attached five rooms, the central of which included the cult statue of Peace. The importance of the central room was articulated in plan by the projection of the

stoa towards the courtyard, and the placement of the columns with colossal columns supporting a pediment, giving it a temple-like appearance.<sup>202</sup>



**Figure 3.23** Reconstruction Plan after Meneghini (Meneghini 2007, gif. 65).

On the north and south sides of the portico, there were exedras that were screened by columns. Building remains come from the southwest exedra, which is 2.3 m deep and 4.7 m wide.<sup>203</sup> The order of the portico was Corinthian with red porphyry column shafts and white marble column bases, capitals, entablatures and antefixes, and was continuous all around the courtyard. The portico was raised 1.5 m above ground by five steps.<sup>204</sup> Along the west side the columns were set directly against the wall, on high pedestals to match the height of the columns on the portico.<sup>205</sup> In the center of the courtyard, there was a

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<sup>202</sup> Meneghini (2007, 64-65); 2009, 83-84)

<sup>203</sup> Rizzo (2001, 236).

<sup>204</sup> Rizzo (2001, 235-237); Meneghini (2009, 83).

<sup>205</sup> Meneghini (2007, 61); 2009, 80).

garden with six long structures in opus latericium, 4.7 m wide, set at a distance of 4.7 m to each other (figures 3.24b and 3.25b). Also, the fragments of a marble gutter have been found, which has proven the function of these structures for some sort of landscaping.<sup>206</sup>

The Templum Pacis functioned as a garden, as a museum (figure 3.25d), as a library, and possibly as the office of the Praefectus Urbis. The courtyard was a garden, as described above. The stoas were used for the exhibition of sculpture. Along the stoas and in the center, there have been found the traces of the foundation of a continuous barrier - a wall or thorakion - that divided the stoas in two passages, one for circulation and one for the exhibition of sculpture.<sup>207</sup> The room to the right of the central room contained the Forma Urbis (figure 3.25c), as well as other marble plans of Rome, not associated to Forma Urbis, and thus has been interpreted as the land registry of Rome and the office of Praefectus Urbis.<sup>208</sup>

The library must be identified with the rooms attached on the east side. Initially, the incorporated ancient walls in the church of SS. Cosma and Damiano which included niches in the lower level, had been interpreted as the ancient library and had led to an asymmetric restoration of the plan of the complex with the southeastern room projecting from the walls of the stoas.<sup>209</sup> Later it was shown that the niches incorporated in the church had nothing to do with the original structure of the Templum Pacis,<sup>210</sup> and it was proposed that the two rooms flanking the central room should be identified with the

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<sup>206</sup> Rizzo (2001, 238); (Meneghini 2007, 61-62).

<sup>207</sup> Meneghini (2007, 64).

<sup>208</sup> Meneghini (2009, 87-88).

<sup>209</sup> Lanciani (1882, 29-54).

<sup>210</sup> Castagnoli and Cozza (1959, 119-142).

Greek and Roman libraries.<sup>211</sup> Another interpretation identifies the central room as a library, since it lacks the characteristics of Roman Temple architecture.<sup>212</sup> According to this theory, the deity was represented in the statue in the central apse and an altar in front of the central room. Recent excavations have given some clues about the form of the central room (see below) that do not contradict its identification with a library.

### ***Main Hall Description***

The form of the main hall of the complex is known through both Forma Urbis Romae and the findings of recent excavations.<sup>213</sup> The building remains come from the Severan phase in the third century C.E., when the building was rebuilt after its destruction by fire (figure 3.24a).

The hall is rectangular in plan, with the axis of symmetry coinciding with the short side of the hall. In the entry facade, there are six columns of red granite that separate the hall from the eastern portico of the complex. Along the back wall of the hall, there was a 1.5 m high podium that formed a projection in the center. On top of it was placed the statue of Peace, raised in a pedestal 3.5 m high. Both the podium and the pedestal were made of brick and were covered with marble plates.<sup>214</sup>

The excavation was completed in a small section of the hall, and there is no evidence of the back or the sidewalls, where niches for armaria for books could possibly have been located.

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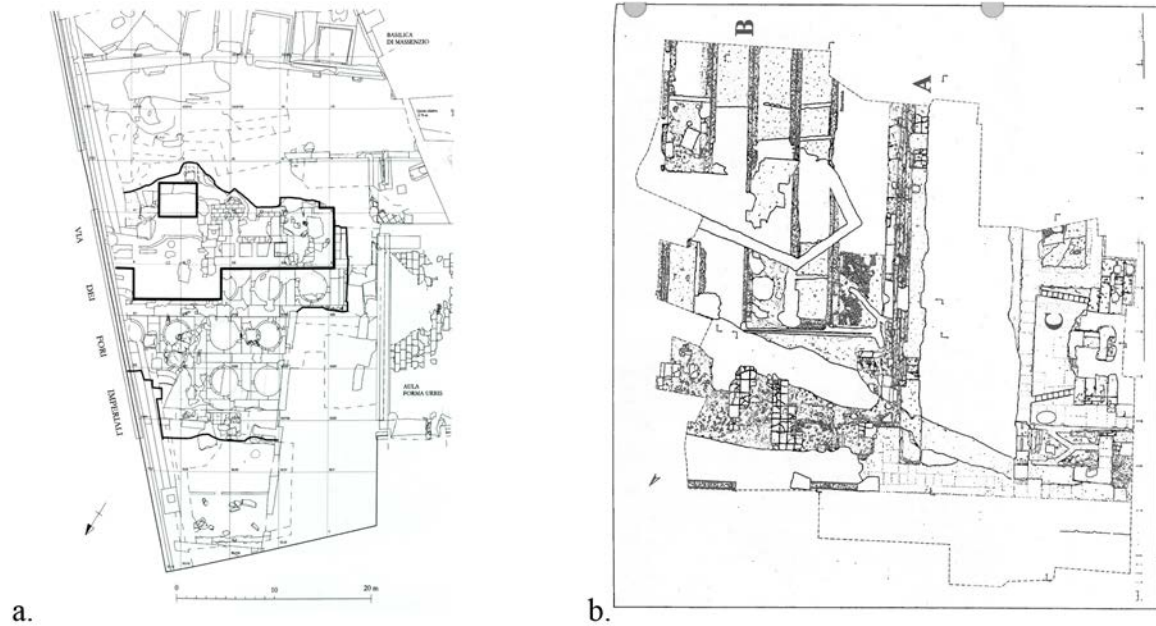
<sup>211</sup> Callmer (1944, 161-162).

<sup>212</sup> Makowiecka (1978, 43-50).

<sup>213</sup> Fogagnolo (2008, 115-141).

<sup>214</sup> Fogagnolo (2008, 118).

The back wall is reconstructed according to the fragment of Forma Urbis, with an apsidal niche in the center for the statue of Peace. The main hall was lavishly decorated with a marble floor pavement and with statues.



**Figure 3.24** State of preservation drawings from different sections of the Templum Pacis: a) Main Hall (Fogagnolo 2008, fig. 2); b) southwest corner of the portico and the courtyard (Rizzo 2001, fig. 23).

### *Findings*

**Podium:** The podium was 1.5 m high and was projecting in the center. On top of the podium was a 3.5 m high pedestal that hosted the cult statue of Peace. The podium is made in opus latericium, and on top of that it has a layer of gray stucco that has the imprint lines of the marble pavement. Evidence also includes five rows of marble plates in pavonazzetto and portasanta, 0.60 m x 0.40 m.<sup>215</sup>

<sup>215</sup> Fogagnolo (2008, 121).



**Figure 3.25** a)View of the podium of the Main Hall with the projection and the pedestal for the statue; b) view of the western corner of the complex with section of the wall, the paved court along the entrance, the stepped stoa and the landscaped garden; c) view of the wall with the dowel holes for the support of the Forma Urbis Romae; d) Bronze statue of the Philosopher Chrisippus, found in Templum Pacis (author's photos).

**Column Screen:** The colonnades of the porticos, as well as the monumental columns in front of the Main Hall, were made of Egyptian red granite, with white Lunian marble bases, capitals, entablatures, roof tiles and antefixes. All columns were of Corinthian order; the columns of the porticos 11 m high, and the columns of the pronaos 14 m high (50 Roman Feet). The columns had a lower diameter 1.3 m and upper diameter 1.15 m and height 11.7 m. They were set on square pedestals 1.45 m wide, and they had Corinthian capitals 1.65 m high. The entablature was 1.75 m high. The interaxial space

was less than 4.8 m.<sup>216</sup> In addition to the columns around the courtyard, the main hall was screened by six columns, and the same is assumed for the other halls too.

**Niches:** No findings.

**Floor:** The floor remains in the main hall are dated in the Severen phase, in the renovation after the fire of 192 C.E. and include a lavishly paved floor, with polychromatic marble that created a sharply contrasting pattern. The floor was paved in opus sectile, with a decorative pattern of a grande modulo quadrato-reticolare, framed by pavonazzetto slabs. The pavonazzetto slabs, 0.94 -1.20 m wide and 2.55-2.7 m long created a grid of squares, where were inserted square slabs, 3.55 m wide of giallo antico. In the square slabs, there were inserted circular slabs, with diameter 2.54 m in pavonazzetto, alternating with granite and red porphyry, which were bordered by a 0.23 thick border in pavonazzetto or porphyry, in contrast to the material of the circle.<sup>217</sup>

The marble floor of the room displaying the Forma Urbis Romae has a decorative pattern of red and alternating rectangular slabs of pavonazzetto and portasanta.<sup>218</sup>

The porticos, as well as the pavement in front of the northern side were paved with large slabs of white marble from Luna.<sup>219</sup>

**Apertures:** No findings

**Roof:** The porticos had a shed roof. Roof tiles and palmette antefixes survive that were made of white marble. There is no evidence of the roof of the main hall or the exedras.

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<sup>216</sup> Rizzo (2001, 236).

<sup>217</sup> Fogagnolo (2008, 125-126).

<sup>218</sup> Fogagnolo (2008, 136).

<sup>219</sup> Rizzo (2001, 236).



**Stairs:** As shown in the Forma Urbis, along the short sides of the main hall, there are double walls, which are interpreted as having stairs leading to the second floor.

**Walls:** The marble decoration of the base of the statue and the wall surrounding the podium had isodomic design. Traces of the plinth and bronze clamps survive.<sup>220</sup>

**Table 3.7** Summary of key characteristics and measurements of the library at Templum Pacis.

<i>Features</i>	<i>Data</i>
Location	Templum Pacis, Rome
Date	75 C.E.
Founder	Vespasian
Identified by	Ancient testimonia and building remains
Orientation	Northwest - Southeast
Main Hall Width	20.81 m
Main Hall Length	21.97 m
Main Hall Area	457.20 m <sup>2</sup>

### 3.1.8. Domitianic Palatine Library, Rome

The libraries of Domitian on the area of the Temple of Apollo on the Palatine Hill, is a remodeling of the preceding library of Augustus, which was destroyed during the fires of 64 or 79 C.E.<sup>221</sup> Domitian rebuilt the portico of the Danaids and the library exactly on top of the Augustan foundations (see chapter 3.1.5), but he also added a new library hall,<sup>222</sup> identical to the first one, and directly to the south, so that the two halls were almost symmetrical to each other and shared a wall (figure 3.26 and 3.37a). Both halls were facing the portico of the Danaids, in the temenos of Apollo. With the addition of the

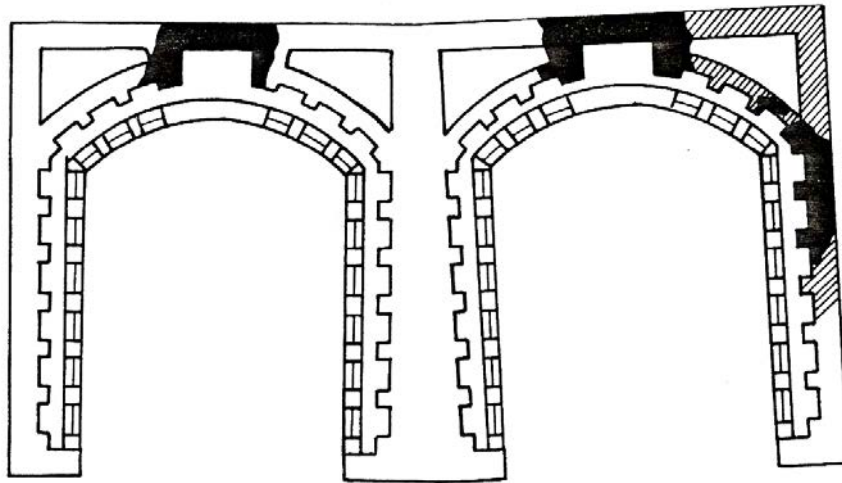
<sup>220</sup> Fogagnolo (2008, 118).

<sup>221</sup> Boyd (1915, 5-8).

<sup>222</sup> Iacopi and Tedone (2005-2006, 355).

second library hall, the axially of the library to the portico and the symmetry of the complex was undermined, since the axis of symmetry of the two buildings did not coincide with the axis of the portico. The buildings have been identified based on ancient testimonia, the *Forma Urbis Romae*<sup>223</sup> and building remains.<sup>224</sup>

The library was finally burnt in 126 C.E., in the fire that burnt the Temple of Peace, as it is known through the extensive account of Galen. At that point, according to Galen, the library contained very rare manuscripts with the writings of Homer, Plato, Aristotle, and Theophrastus, Aristotle, Eudemos, Cleitus, of Phainias, and Chrysippus. Also, there were the original books of several grammarians, orators, doctors and philosophers.<sup>225</sup>



**Figure 3.26** Restored plan of the Domitianic Palatine Library (Gregori 1937, fig. 5).

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<sup>223</sup> Carettoni (1960, pl.22).

<sup>224</sup> Gregori (1937, 13-14); (Richmond 1914, 193-226).

<sup>225</sup> Tucci (2008, 133-139).

### ***Main Hall Description***

The Palatine Library consisted of two almost identical apsidal halls,<sup>226</sup> one for the Greek and one for the Latin literature (figure 3.28a). Both halls had a central deep niche. According to the fragment of FUR, the central niche was framed by double columns on each side, which would have made a strong focal point. The central niche was flanked by three rectangular smaller niches, and six niches on each side wall, where would have been located the armaria with the books. In front of the niches there was a continuous podium, preceded by steps, which were interrupted by column bases.

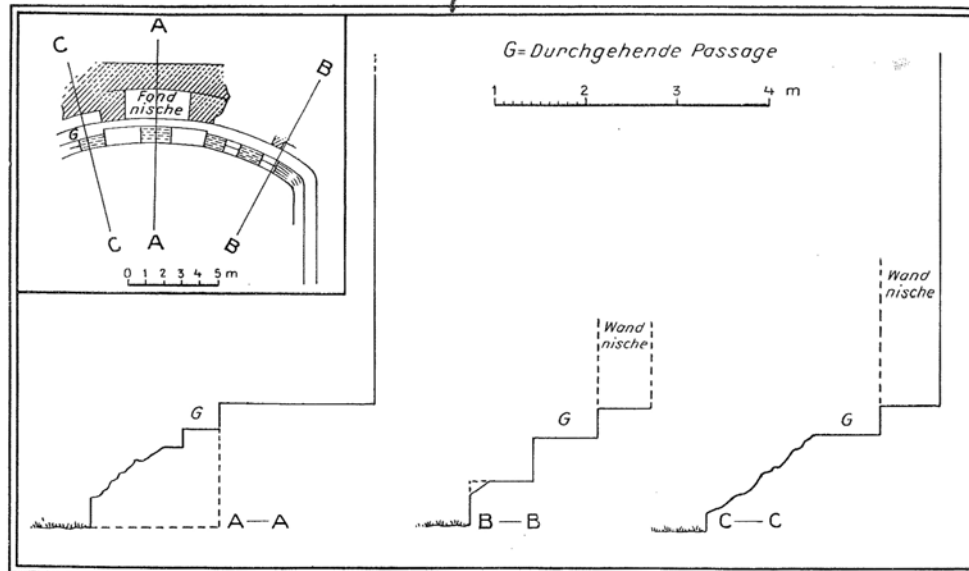
The only remains that survive from the southern hall are the apse (figure 3.28c) and part of the podium (figure 3.28d and 3.28e), and from the northern hall the central apse (figure 3.28b).

### ***Findings***

**Podium:** In front of the niches and along the three interior walls, there was a podium (figure 3.28d), 0.7 deep, and 1.2 m high. In front of the central niche, its depth is 0.4 m. The podium was preceded by two steps, interrupted by column bases that flanked each niche (figure 3.27).

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<sup>226</sup> Callmer (1944, 157-159); Gregori (1937, 13-14); Johnson (1984, 86-95); Makowiecka (1978, 29-33); Strocka (1981, 307-309); Tonsberg (1976, 24); Wendel (1949, 412-413).



**Figure 3.27** Sections of the podium of the library (Callmer 1944, fig. 6).

**Column Screen:** Along the three walls of each hall, and resting on the podium, was a column screen (figure 3.28a). Each column corresponded on the space between two niches and was set on a base. The column screen was only on one level.

**Niches:** Each hall had three kinds of niches: a) one deep central niche in the back wall, 3.25 x 1.65 (figure 3.28b); b) three smaller niches on each of the two sides of the central one, 1.8 m wide x 0.6 m deep x 3.8 m high (figure 3.28f), and c) six smaller ones on each of the two side walls of the library. This makes a total of 15 niches per building and gives a total 32 niches in both halls. The niches were 30 cm above the level of the podium. There was only one row of niches.



**Figure 3.28** Views of the Domitianic Palatine Library: a) view of the south and the north hall; b) view of the central niche of the north hall; c) view of the central niche of the south hall; d) view of the unrestored south wall of the south hall; e) view of the podium of the south hall; f) view of a niche in the south hall (author's photos).

**Floor:** No findings.

**Apertures:** No findings. The halls were open from the entrance side, which brought enough natural light in the halls.

**Roof:** No findings.

**Stairs:** No findings.

**Walls:** The walls were made in opus latericium. Nothing survives of their stucco or other decoration.

**Table 3.8** Summary of key characteristics and measurements of the Domitianic Palatine library.

Features	Data
Location	Portico of the Danaids, Temple of Apollo, Palatine Hill, Rome
Date	81 C.E.
Founder	Domitian
Identified by	Ancient testimonia and building remains
Orientation	Northwest - Southeast
Main Hall Width	17.5 m
Main Hall Length	21.5 m
Main Hall Area	311.95 m <sup>2</sup>

### 3.1.9. *Pantainos Library, Athens*

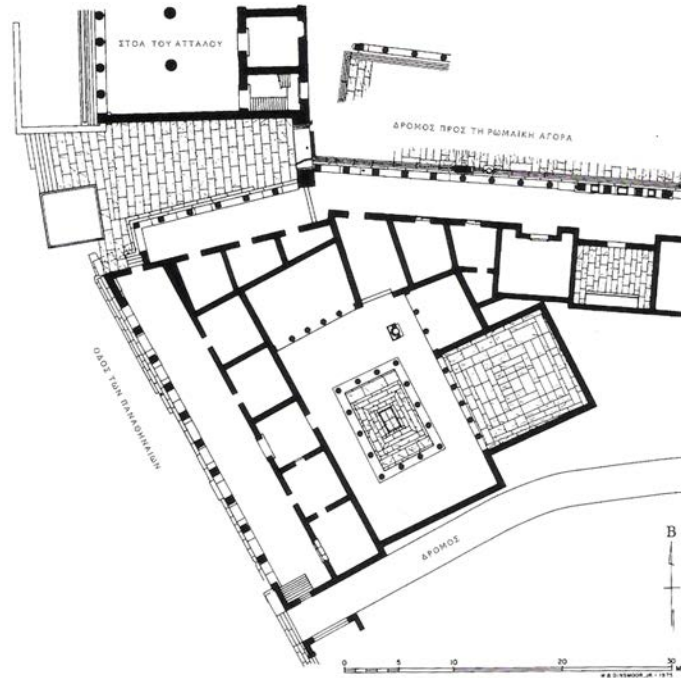
According to the dedicatory inscription, the library of Pantainos was dedicated by Pantainos, his daughter and his son to Trajan, Athena Polias and the city of Athens, and it included outer stoas, a peristyle, book collections and decorations.<sup>227</sup> A second inscription on a stele (figure 3.30a) has been found that gives the regulations of the library.<sup>228</sup> As evidenced in the building remains, the library of Pantainos<sup>229</sup> was part of a

<sup>227</sup> The transcription of the inscription is given by Meritt (1946, 233); Shear (1935, 330-332).

<sup>228</sup> Shear (1936, 42).

<sup>229</sup> Shear (1940, 294-295); Thompson (1947, 202-203); Shear (1973a, 145-146); 1973b, 385-389).

larger building complex with other shops and workshops, located in the corner block of the Agora, along the Panathenaic Street and the platea that led to the Roman Agora (figure 3.29).



**Figure 3.29** Reconstruction of plan of the Pantainos Library after Dinsmoor (Camp 2001, fig. 190).

On the north and west side, the building was enclosed by stoas, attached to which were rooms, five to the west stoa, and three to the north stoa in front of the Stoa of Attalos, and eleven to the north stoa by the street that led to the Roman Agora. The rooms of those stoas were accessed only from the stoas and were independent to the spaces of the library. They were shops and workshops, as for example the Sculptor's Workshop in the southern

end of the west stoa,<sup>230</sup> or spaces of more official functions, as the paved room with podium in the eastern end of the north stoa that has been identified for the imperial cult.<sup>231</sup> At the core of the building complex, was a peristyle. The entrance to the peristyle was in the middle of the west stoa and coincided with the middle room, as indicated by the matching width of its entry and the door lintel with the dedicatory inscription, and by the wearing of the stylobate of the stoa along this space.<sup>232</sup>

The peristyle is roughly rectangle, bordered by the rooms of the northern stoas to the north, and a street to the south. It is 0.22 m (1 step) higher than the level of the western stoa. There have been identified two phases of the portico and the court pavement. Originally, the court was paved with marble chips and covered with a layer of hard red stucco. In the second phase, the dimensions of the peristyle changed and a new stylobate was made. The court was paved directly on top of the original floor, with marble slabs laid in mortar bedding, the line imprints of which survive.<sup>233</sup> Camp suggested that Pantainos possibly made additions and renovations to a preexisted building, which was possibly the philosophical school of his father, Flavius Menadros Diadochos.<sup>234</sup>

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<sup>230</sup> Stevens (1949, 269). Originally, the Sculptor's Workshop included the room of the stoa to the north, with which it communicated through a door in the intermediate wall.

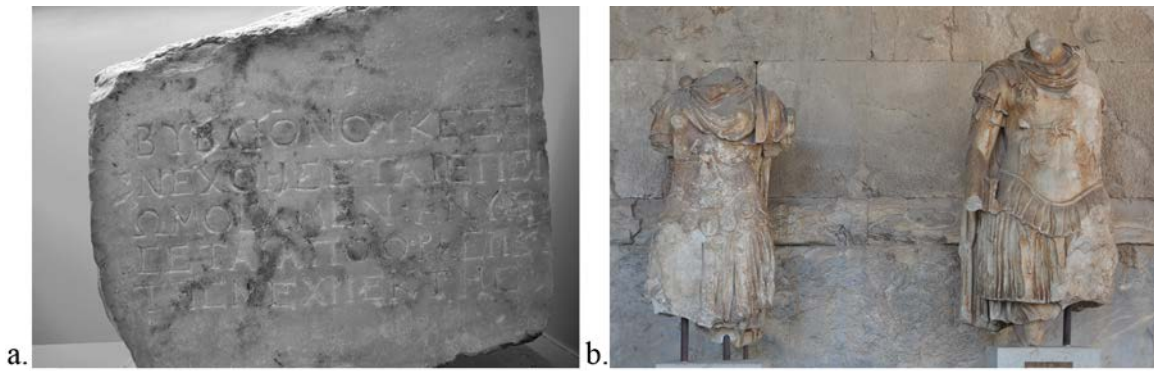
<sup>231</sup> Shear (1973a, 121-179); Shear (1981, 356-377).

<sup>232</sup> Shear (1940, 295).

<sup>233</sup> The different phases of the peristyle and court are mentioned by Shear (1973a, 146). Details about the building remains of the peristyle come from the Excavation Reports of the American School of Archaeology Archive, and await a full publication.

<sup>234</sup> Camp (2001, 196-198). The history of Pantainos' family is discussed by Parsons (1949).





**Figure 3.30** Findings from the Pantainos Library: a) Regulatory Inscription on a herme; b) Statues of the personified Iliad and Odysseus found in the Agora, possibly from the Pantainos Library (author's photos).

The main hall of the library, as referred to in the dedicatory inscription must be identified with the large, almost square room attached to the east side of the peristyle, across the entrance to the peristyle to the west.<sup>235</sup> Two more rooms, one to the north of the main hall, and one on the north side of the peristyle have been identified as additional spaces of the library, but their identification is based on very scarce building remains and the reconstruction is not secure.<sup>236</sup>

Part of the sculptural program of the library, were two big statues of the personified Iliad (figure 3.30b) and Odysseus. Their exact location has not been secured yet.<sup>237</sup>

The library was destroyed during the Herulian sack and it was stripped of its marble revetments and pavements by the 4th century C.E. The Athenians demolished the building in order to reuse its material for the construction of a late Roman fortification wall directly on top of the stylobate of its west stoa.

<sup>235</sup> Shear (1973a).

<sup>236</sup> Shear (1973b, 388).

<sup>237</sup> Thompson (1954, 62-65).

### ***Main Hall Description***

The main hall of the library has been identified with the southeast room. It is almost square in shape, 9.75 m deep and 10.75 m wide, and is parallel to the west stoa and the peristyle. The main hall survives at a very low height. The only findings include the remains of the walls of the hall and the floor, and show evidence of a marble floor pavement and marble revetments on the walls. There is no other evidence of any other special characteristics. The room was accessed from the peristyle from its west side from openings between columns.<sup>238</sup>

### ***Findings***

**Podium:** There are no podium remains. There are also scraps of marble flooring in situ, and broken edges of marble slabs at floor level, along the north wall, and thus the floor pavement is restored to cover all the area of the room. If there was a podium, it could have been made of wood, as in the case of the Melitine Library.<sup>239</sup>

**Column Screen:** The building had five sets of colonnades, one along the west stoa, two along the north stoas, the peristyle, and the columns that closed the east room. There are no findings of the columns of the eastern room, or the peristyle.

From the stoa about 20 m were uncovered, from which survive about 12 m of the single one step, and the stylobate. At the northern edge, survives a stripe of the street pavement bordered by a gutter, which runs under the step of the stoa, and possibly extends until the Roman Agora. The colonnade was Ionic, and the columns rested on Ionic bases on low

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<sup>238</sup> Shear (1973a, 146).

<sup>239</sup> Johnson (1984, 30) rejects the interpretation of a wooden podium.

plinths, two of which survive on situ. The interaxial space was 2.70 m and there were 25 columns in total. At a distance of 3.3 m, there is the back wall of the stoa, behind which open up rooms of varying dimensions and plan.<sup>240</sup>

The west stoa is Ionic and is 35 m long, and 5.20 m wide. Behind the stoa, there are five rooms of dimensions about 4.30 m by 5 m.<sup>241</sup> The central room is the entrance to the interior peristyle. Evidence includes the door lintel of the entrance doorway with the dedicatory inscription.<sup>242</sup>

**Niches:** There are no findings of niches, since the walls are preserved at a maximum height of 0.50 m. The 0.70 m thick stone foundations of the walls makes it improbable that there were niches on the walls.<sup>243</sup>

**Floor:** Evidence of mortar packing on the floor carries the imprint lines of marble rectangular slabs. There are also scraps of marble flooring in situ, and broken edges of marble slabs at floor level, along the north wall.

**Apertures:** There are no findings of windows in the main hall, since the walls survive at a very low height. The main or only source of light in the main hall must have been through the entry wall. Evidence of the foundations shows individual blocks, on which the columns were supported, while light packing covered the space between them.<sup>244</sup>

**Roof:** No findings.

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<sup>240</sup> Shear (1973b, 385-390).

<sup>241</sup> Shear (1940, 295).

<sup>242</sup> Shear (1935, 330-332).

<sup>243</sup> Excavation Reports, American School of Archaeology in Athens.

<sup>244</sup> The details of the building remains are given in the reports of the Excavation of the Athenian Agora and await full publication.

**Stairs:** No findings.

**Walls:** The construction of the walls of the main hall was with a mixed system of large blocks and rubble packing. There is evidence of large blocks in the south wall, at a height of 0.60 m and a width of 0.70 m, in the north wall only at floor level, and in the southern part of the east wall, where there is one large block half of the length of the room. The north end of the wall was made with rubble packing. On the walls of the main hall, there is evidence of heavy mortar, ca. 0.05 – 0.10 m thick, on the south and east walls that carries the imprint of marble revetments. The marble revetments and pavement were stripped off by the fourth century C.E.<sup>245</sup>

**Table 3.9** Summary of key characteristics and measurements of the Pantainos library.

<i>Features</i>	<i>Data</i>
Location	Along the Panathenaic Way, south of the Stoa of Attalos, Agora, Athens
Date	102 C.E.
Founder	T. Flavius Pantainos
Identified by	Ancient testimonia and building remains
Orientation	West - East
Main Hall Width	9.75 m
Main Hall Length	10.75 m
Main Hall Area	104.81 m <sup>2</sup>

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<sup>245</sup> Excavation Reports, American School of Archaeology in Athens.

### 3.1.10. *Celsus Library, Ephesus*

The library of Celsus has been identified based on the dedicatory and honorary inscriptions.<sup>246</sup> The library was dedicated by Tiberius Julius Celsus Polemaeanus, a Roman citizen of Ephesus who was a consul and proconsul of Asia during the reign of Trajan. He dedicated the library under the central apse of which built his burial chamber.

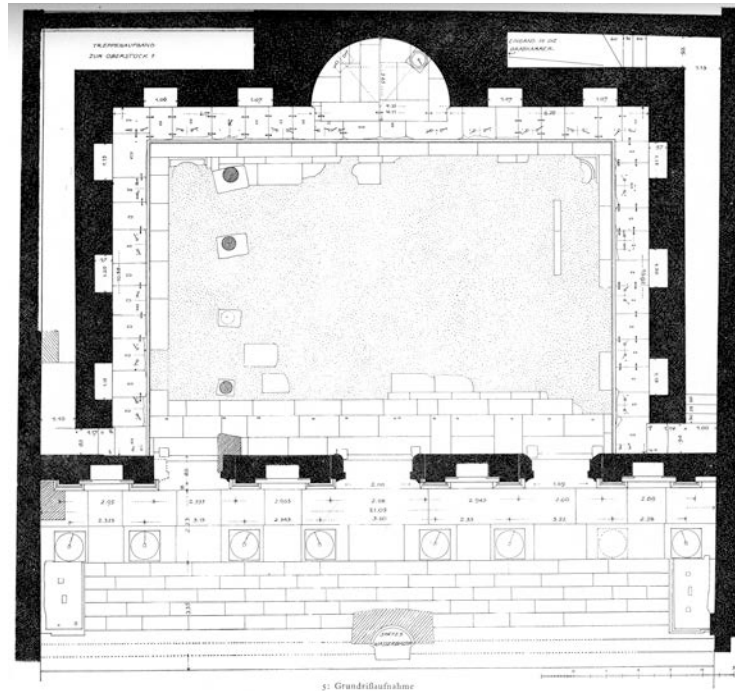
The library consists of one main hall and rests on a crepis of nine steps, and is located outside the southeast gate of the commercial agora of Ephesus. A monumental staircase along the full length of the building gives access to it (figure 3.31). The facade is 21.05 m wide and is reconstructed at a height of more than 16 meters. It is a two-story facade formed by four aediculas with niches and statues and inscriptions on their back wall (figure 3.33a). Among them are the three doors and windows to the interior of the library. On the second floor, there are three aediculae with windows, above the doors.<sup>247</sup>

The interior is a rectangular room with niches on the three walls, and a continuous podium supporting a colonnade. In the center of the back wall of the hall opens a large apse. The colonnade and the entablature follow the curvature of the apse, thus creating a strong focal point in the room (figure 3.32).

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<sup>246</sup> Engelmann (1993, 105-111); Heberdey (1904, 37-56); 1905, 63-80); 1906, 59-60).

<sup>247</sup> Wilberg (1908, 118-135); 1953, 30-35).

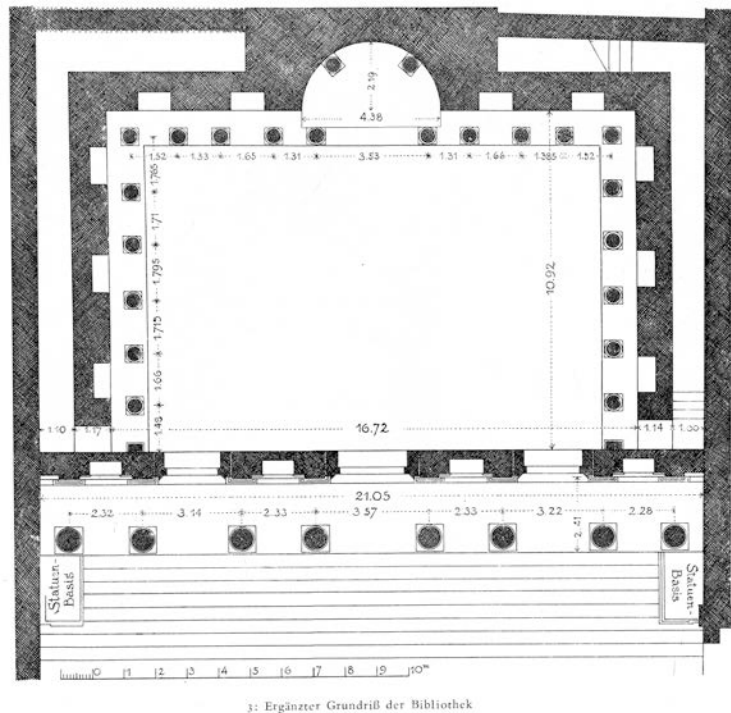


**Figure 3.31** State of preservation plan of the Celsus Library (Wilberg 1953, fig.5).

The Library of Celsus was one of the first libraries to be identified and excavated, and it is one of the best preserved. Thus, the argument of the typology of ancient libraries was largely based on conclusions about the library of Celsus.<sup>248</sup> A main characteristic attributed to libraries is the use of a peristasis for insulation and the protection of books. Main evidence for this comes from the library of Celsus, where there is a gap formed between the walls of the hall and the neighboring buildings (figure 3.33d). However, a reevaluation of the building remains showed that this was not intended to be a roofed space, but was an open space, sloping to the west, where the rain water flows into two

<sup>248</sup> Cagnat (1909, 6-10); Götze (1937, 232-233); Callmer (1944, 170-171); Gregori (1937, 12-13); Hoepfner (2002, 123-126); Johnson (1984, 11-24); Makowiecka (1978, 62-66).

canals under the library and drains in the area in front of the facade.<sup>249</sup> Inevitably, this changes our understanding of the peristasis in libraries.



**Figure 3.32** Reconstruction plan of the Celsus Library (Wilberg 1953, fig. 3).

### *Main Hall Description*

The hall of the Library of Celsus was a wide rectangular room 10.92 x 16.72 m that extended at the center of the back wall, to form a large colossal apse.<sup>250</sup> Access to the hall was given through the three entrances on the east wall. At a distance of 1.15 m from the entrance wall and along the whole length of the hall, there was a railing that controlled

<sup>249</sup> Strocka (1981, 322-323); 2003, 39).

<sup>250</sup> Wilberg (1953, 35).

access to the library. Along the three walls of the hall, runs a continuous podium. At the podium level, there were rectangular niches recessed on the walls, for the storage of the rolls, three on the south and north walls, and four on the west, two on either side of the apse. A second row of niches was located above the first one, the lower parts of which survive today, and it has been suggested that there might have been even a third level. In the eastern ends of the south and north walls, there were also two doors, 94 and 85 cm wide, one on each wall, that gave access to the empty space between the library and other adjoining buildings, from where one could access the burial chamber of Celsus, located under the apse.



**Figure 3.33** Views of the Celsus Library: a) Entry Façade; b) central apse; c) podium; d) gap between library and neighboring building to the south (author's photos).

On the outer edge of the podium, and inside the apse, there were columns that supported a continuous entablature along the three walls, which continued inside the apse, as a



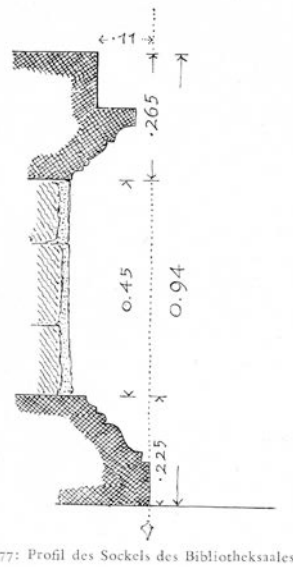
molding following the curvature of the wall. The entablature possibly supported a gallery that gave access to the niches of the second floor, and possibly supported a second tier of columns. The walls and the floor of the hall were covered with marble slabs, and the niches and the podium had moldings around their edges.

### *Findings*

**Podium:** Along the three walls of the main hall, there is a podium,<sup>251</sup> 0.94 m high, above floor level and 1.025 m deep (figure 3.33c). It is constructed in three parts, the lower and higher being of thick white marble plates ending in moldings, and the middle made of roughly cut stone and covered with marble veneer (figure 3.34). The lower part is 0.225 m high, it is made of white marble, and ends in a marble molding. The middle part is 0.45 m high, is made of stone and is plastered and covered with marble slabs, none of which survives today, but only some portions of the red-clay stucco on the walls, where the marble slabs were attached. The upper part, 0.265 m high consists of white marble plates that end in a molding and a recess, of 0.11 m square section. At the area of the apse, the podium extends to the west to become the floor of the apse. The marble slabs of the apse overlap those of the podium by 0.20 m. On the plates of the podium and the floor of apse survive the holes of the joints between the plates, as well as the holes of the joints with the plinths of the column bases of the interior colonnade (figure 3.33c).

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<sup>251</sup> Wilberg (1953, 36).



77: Profil des Sockels des Bibliotheksaales

**Figure 3.34** Section of the podium of the Celsus Library (Wilberg 1953, fig. 77)

**Column Screens:** The library had two column screens, one on the exterior facade, and one along the three walls of the interior.

Most of the architectural members of the exterior facade were found on the site, and the design of the facade was reconstructed in drawing<sup>252</sup> and later physically.<sup>253</sup> The facade was organized on two floors, with eight columns corresponding to eight pilasters attached to the wall, on each floor. The columns and the pilasters carried a continuous entablature, which was supported on alternating sets of two columns and two pilasters, forming four aediculae on the first floor and three aediculae on the second. On the first floor, the aediculae hosted statues, leaving free the space for doors. On the second floor the aediculae protected the windows and the doors of the first floor. The order of the second floor was of smaller dimensions than the order of the first floor. No complete columns

<sup>252</sup> Wilberg (1908).

<sup>253</sup> Hueber and Strocka (1975).

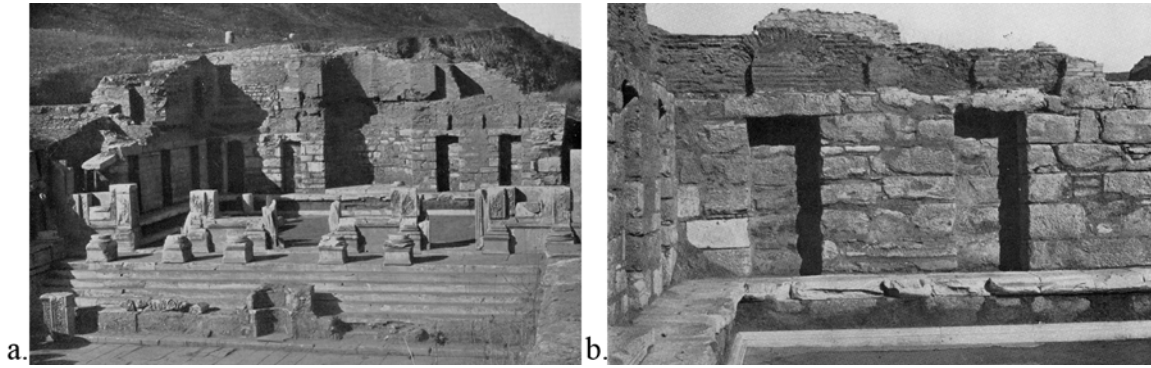
shaft survives from the first floor, and its height is calculated based on the second floor. The columns were monolithic, unfluted, made of marble of Sinnada. They rested on pedestals 0.65 m high, had an Attic base, 0.33 m high, and were 7 m high. The entablature of the first floor was 1.51 m high, and consisted of an architrave, a frieze and a sima with dentils.

From the interior colonnade survives only one column base, 0.56 m square, which is found in its original position, inside the central apse. The location and the height of the columns is reconstructed based on the joint holes on the marble plates of the podium and the revetments on the brick wall above. There is evidence of 0.3 x 0.3 m indentation, located in the central apse, 4.3 m high from the level of the podium, and aligned with the column base found there. This probably supported an entablature or a gallery that provided access to the upper niches.

Based on this evidence, six columns are reconstructed on the south and north sides of the podium, and ten on the west, five in each side of the apse. In addition, there were two more columns inside the apse, located right next to the curved wall. These sixteen columns supported a continuous entablature, rectilinear along the three walls and curvilinear inside the apse.<sup>254</sup>

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<sup>254</sup> Wilberg (1953, 36-38).



**Figure 3.35** Views of the Celsus Library before its restoration: a) View of the main hall with the niches and apse from the east; b) View of the niches and podium on the north wall (Wilberg 1953, fig. 2 and 74).

**Niches:** There is evidence for two types of niches: the niches of the facade, and the niches of the interior walls. Additionally, there was a focal point formed by an enlarged apse.

Across the entrance, in the center of the west wall, there was a central apse on top of the burial chamber of Celsus. The central apse<sup>255</sup> was 2.19 m deep, 4.35 m wide, and more than 7 m high, and was probably hosting a colossal statue, no evidence of which survives today (figure 3.33b).

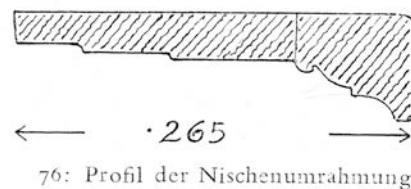
In the interior, there is evidence of ten rectangular niches,<sup>256</sup> at the level of the podium, at regular distances along the three walls of the interior - three on the south and the north walls, and two on each side of the central apse. The niches on the south and north walls were 1.15 m – 1.20 m wide, while the niches on the west wall were 1.07 m wide. All niches were 0.57-0.60 m deep, and 2.55 m high. The varying niche width is interpreted as

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<sup>255</sup> Wilberg (1953, 35).

<sup>256</sup> Wilberg (1953, 36).

an effort for an optical illusion, to make the room look larger. Traces of a 2 cm thick coating of white-grey lime stucco, on top of the 6 cm red brick plaster, indicate that the interior faces of the niches had a different treatment than the rest of the walls- stucco instead of marble veneer. The formation of a second niche above the lower niches on the west wall indicates that there was a second row of niches, making a total of 20 niches. A third level of niches could have also existed in the building, which would bring the total into 30 niches. A fragment of a white marble molding, 0.265 m wide and 0.07 m deep in the second from south niche on the west wall, indicates that the niches had a marble molding around them (figure 3.36).



**Figure 3.36** Section of the niche molding frame (Wilberg 1953, fig. 76).

On the facade of the library, between every two of the pilasters of the east wall, there were four richly decorated niches that hosted bronze statues and inscriptions.

**Floor:** Building remains show a marble floor pavement.<sup>257</sup> It was paved with marble slabs of different colors. The outer edges, 0.36-0.48 m along the podium and 1.20 m along the eastern wall were covered with rectilinear colored marble slabs. The interior area was covered with white marble plates in a pattern of circles and squares. At a distance of 1.15 m from the eastern wall, there are traces of joint holes on the marble

<sup>257</sup> Wilberg (1953, 38-39).

plates that indicate that a railing was supported there, along the whole width of the hall, controlling the entrance to it.

**Apertures:** The library was lit from the east facade, the three entrance doors and six windows, three on the first level and three on the second level. All doors and windows were aligned.

The three doors, were located between wall pilasters and were framed by sculptured doorposts and crowned by a crowing with consoles. The central door had an opening of 2.0 m /1.92 x 4.50 m, and the side doors 1.63 x 3.74 m On top of the doors, there were windows, framed by moldings and closed by stone screens. The window above the central door had an opening 1.92 x 0.83 m, and the windows above the side doors had an opening 1.54 m x 1.72 m On the second floor, there were three windows with framing moldings. Fragments survive, but not enough to give the profile or the dimensions of the windows. The height of the windows is calculated into 2.10 m while the width of the side windows into 1.45 m and the width of the middle window into 1.59 m.<sup>258</sup>

**Roof:** There is no evidence of tiles or any other element of the roof. The only evidence is the holes for the support of the beams on the eastern wall, and based on their distance from the floor, the ceiling is reconstructed at a height of 12.15 m.<sup>259</sup>

**Stairs:** The library was raised on a high podium 2.23 m high, and was accessed by a flight of nine steps, 21 m long, along the whole length of the eastern facade and flanked at the upper steps by two statue bases.

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<sup>258</sup> Wilberg (1953, 33-35).

<sup>259</sup> Strocka (2003, 37).

In the gap between the neighboring buildings and the walls of the library, there were also four steps, which led to the grave chamber with the sarcophagus of Celsus.

**Walls:** From the east wall, only the lower part survives, including the column and pilaster pedestals and bases, the lower wall under the wall niches, and the lower part of the door posts of the three entrances. In the two ends of the wall, survive the lower parts of the niches, with the niche pilasters and the back wall of the niches. This wall, has been reconstructed in full scale in situ, and today is about 16 m high.

The south, north and west walls of the building survive at a height of 4 - 7 m. The central apse that penetrates the west wall survives at the greatest height of 7 m and gives the best evidence from the wall structure. The walls were made of stone up to the height of 4 m and then of red brick, and were covered by a 0.06m layer of red clay plaster which served as a base for the application of marble slabs.<sup>260</sup>

**Table 3.10** Summary of key characteristics and measurements of the Celsus library.

<i>Features</i>	<i>Data</i>
Location	Outside of the Mithridates gate of the Commercial Agora, Ephesus
Date	About 114 C.E.
Founder	Tiberius Julius Aquila Polemaeanus
Identified by	Ancient testimonia and building remains
Orientation	East - West
Main Hall Width	16.72 m
Main Hall Length	10.92 m
Main Hall Area	182.58 m <sup>2</sup>

<sup>260</sup> Wilberg (1953, 36).

### 3.1.11. *Ulpian Library, Rome*

The Ulpian library, mentioned by literary sources as having a Greek and a Latin section, has been identified with the two halls<sup>261</sup> in the east and west sides of the portico surrounding the courtyard (24.9 x 18.3 m) with the column of Trajan, in the Forum of Trajan (figures 3.37 and 3.38). Recently, Meneghini pointed that since most ancient authors reference the library in singular, it is possible that it consisted of only one hall.<sup>262</sup>

Building remains come primarily from the west hall (figure 3.39), include the north wall of the hall, and partially the other three, and show rectangular niches, a stepped podium and an interior colonnade along the three walls with a focal point in the center of the west wall. The entrance was on the atrium and the doorway is restored with two columns in *antis*.<sup>263</sup> Building remains that came to light recently, testify that the design as built in 128 C.E. was different than the design intent until 113 C.E., and that Hadrian, who completed the buildings, modified their interior design.<sup>264</sup>

Building remains also include fragments of two identical inscriptions dedicated by Hadrian to Trajan and Plotina, which have led to the identification of the two halls as dedicatory buildings, and probably funerary monuments.<sup>265</sup> The funerary character of the buildings does not contradict the function of the halls as libraries, as the dual function of a funerary monument and a library is common in the 2nd century C.E., as for example in the Celsus Library, and the library of Nysa. Access to the portico was granted through a monumental propylon to the northwest and through two entrances from Basilica Ulpia.

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<sup>261</sup> Amici (1982, 47-89); Callmer (1944, 147-148); Gregori (1937, 15-16); Johnson (1984, 102-110); Makowiecka (1978, 53-60); Strocka (1981, 310-311).

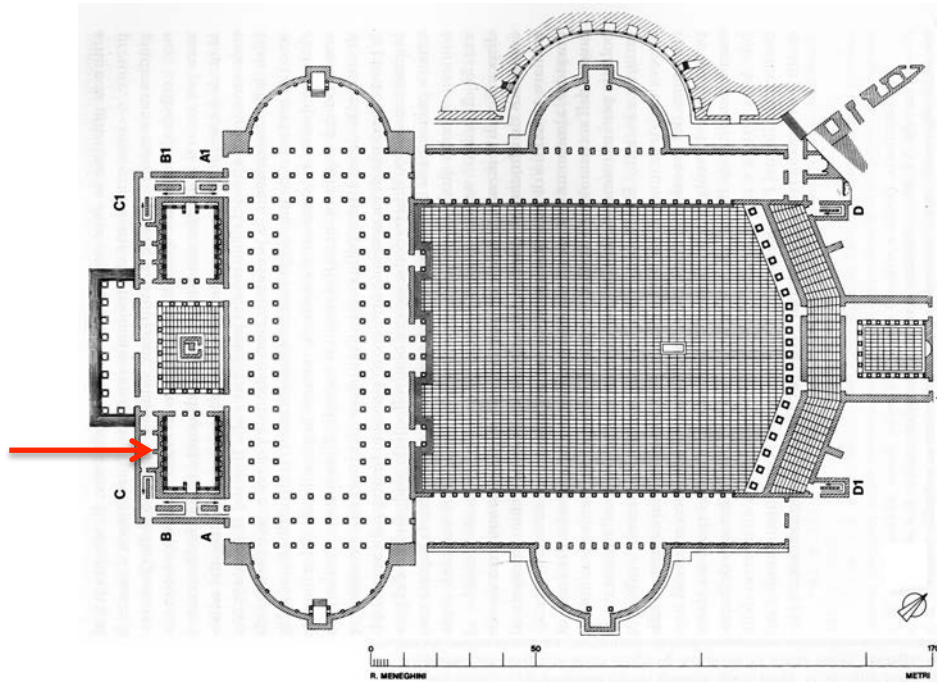
<sup>262</sup> Meneghini (2002b, 658-659).

<sup>263</sup> Amici (1982, 47-89).

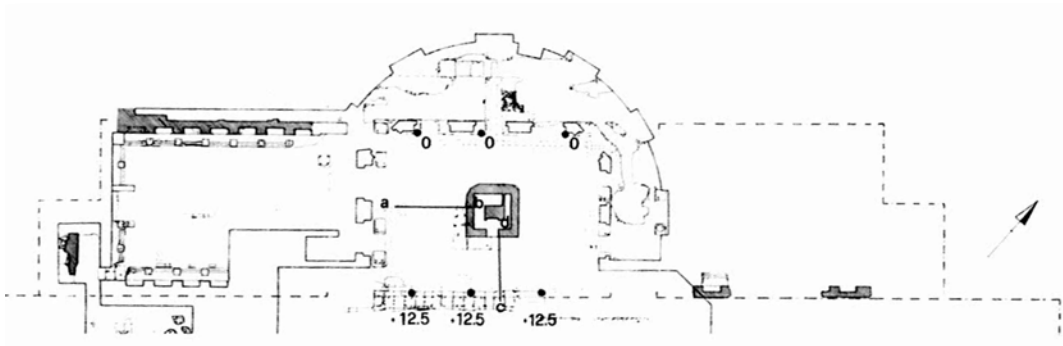
<sup>264</sup> Meneghini (2002a, 117-122); 2002b, 676-682); 2007, 104-110); 2009, 146-161).

<sup>265</sup> Egidi and Orlandi (2011).





**Figure 3.37** Reconstruction plan of the Forum of Trajan after Meneghini. The arrow points to the west library (Meneghini 2002, fig. 5).

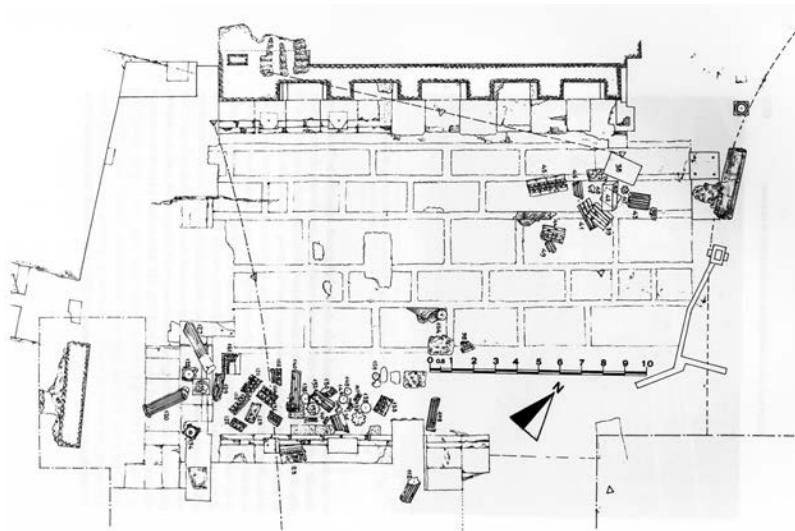


**Figure 3.38** State of Preservation plan of the libraries and the portico with the column of Trajan (Amici 1982, fig. 87).

### *Main Hall Description*

The building remains of the west and east halls give the dimensions and the form of the library.<sup>266</sup>

The two halls were accessed from the portico of the column of Trajan through three door openings. They were 24 m long and 17 m wide, and had a podium with steps running along their side and back walls. The steps were interrupted by column bases that supported a double Corinthian colonnade. The columns and the corresponding piers, set against the wall, were placed at the intervals between rectangular niches, where presumably were put the armaria with the books. The final height of the colonnade is estimated into 12.21 - 12.28 m. On the west wall, there was a focal point 3.5 m x 2.5 m that was framed by two antae and accommodated a statue, probably of Trajan on the first floor and Minerva on the second.



**Figure 3.39** State of preservation plan of the west hall of the library (Meneghini 2002b, fig. 8).

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<sup>266</sup> Amici (1982, 52).

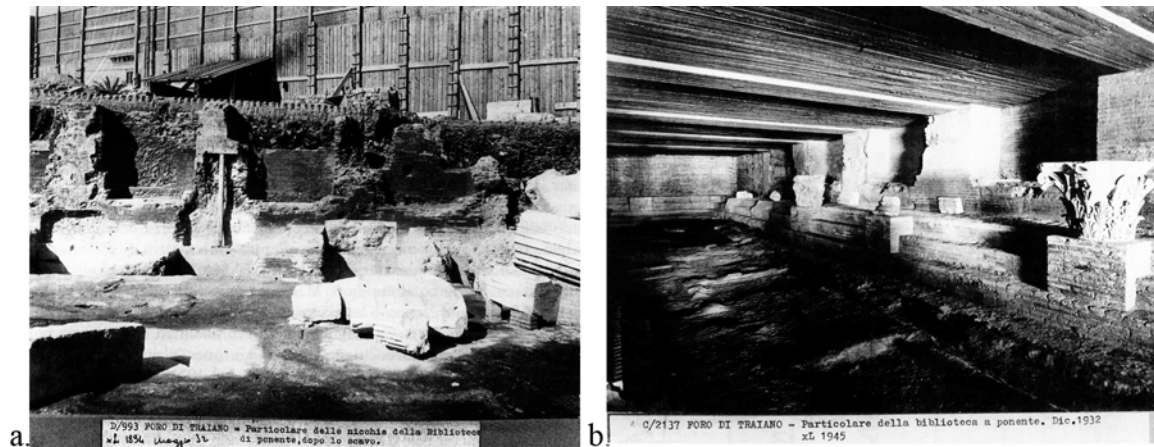
Building remains also include the original phase of the interior design, completed between 107 C.E. and 115 C.E. The original design foresaw only one order in the same dimensions as the one at Basilica Ulpia, at a total height of 12.97 - 13.06 m that framed niches slightly wider than the later ones, 2.05 m wide. After 115 C.E. and until the completion of the project 128 C.E., the design changed into a double order with narrower niches, probably corresponding to a program change of the building made by Hadrian.<sup>267</sup>

Building remains from the west hall include: from the north wall, a large wall segment of the north wall with seven niches (figure 3.40), the corresponding podium with steps in front of it, with two column plinths and fragments of the marble revetments still in their original position; from the east wall, a travertine base, probably of a pilaster that was between the door opening and the east wall of the hall, and a fragment of the floor pavement; from the south wall, a segment of the podium, with its steps, one column plinth, and some fragments of the marble floor pavement; last, from the west wall, remain the southern segment of the podium with one plinth and the column base on top. The podium and the location of the column plinths of the south wall are symmetrical to that on the north wall, the thickness of the wall is also 1.5 m, which proves the bilateral symmetry of the hall.

The building remains of the east hall include two wall segments with niches from the south wall, which correspond in structure, proportions and dimensions to those of the west hall and proves that the two halls were symmetric. Also, there are the plinths of the two columns of the entry wall, which gave a tripartite division to the opening.

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<sup>267</sup> Meneghini (2002b, 676-682).



**Figure 3.40** View of the building remains of the west hall of the Ulpien Library: a) before and b) after the restoration work (Meneghini 2009, fig. 6 and 7).

### *Findings*

**Podium:** There are building remains of a podium only in the west hall, along the north sidewall, the southern part of the back wall and the western side of the south side wall. Building remains include a podium constructed in opus latericium and fragments of marble revetments in giallo antico.<sup>268</sup>

The podium is reconstructed continuous along the north, east and west sides of the hall. It was 0.8 m high, and consisted of three steps, 0.25 m deep, and 0.25 m high. The steps were interrupted by high plinths that supported a colonnade. These corresponded to the wall segments between the niches. The column plinths were made of blocks of travertine, and the column bases in pavonazzetto. From these, there are the remains of three plinths and one fragmentary column base along the north wall, one plinth along the south wall, and one plinth along the west wall.

<sup>268</sup> Amici (1982, 47-49); Meneghini (2002b, 671).

In the west wall of the hall, the width of the steps is 0.5 m narrower than in the south and north. The total height of the structure reached 1 m.<sup>269</sup>

### **Column Screens:**

There are building remains of three different types of orders in the hall; one along the podium and in front of the niches, one in the entrance on the east wall, and one in the focal point on the west wall.

Entry: In the entry wall of the west hall, there are the remains of one travertine square base with four clamp holes arranged in the four corners of its upper surface. Since the other column bases of the hall have only two clap holes, this is interpreted rather for a pilaster, at which ended the east wall. In the center of the entry wall of the east hall, there are the remains of the plinths of two columns at a distance of 2.7 m to each other. This evidence combined, is restored as a large opening on the wall with tripartite division, with pilasters at the two ends, and two columns in the middle.<sup>270</sup>

Interior Colonnade: Building remains include four blocks of travertine in situ, two in the north side, one in the south, and one in the west side, and multiple fragments found in the hall, including pavonazzetto column drums, white marble column bases, Corinthian capitals and entablatures. The interior colonnade is reconstructed in a double Corinthian order that run continuously along the sidewalls and the back wall and was only interrupted by the focal point on the back wall. The first order has bases 0.79 wide and 0.31 m high, columns with diameter 0.59 and height 4.70 m, capitals 0.67 m high,

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<sup>269</sup> Meneghini (2002b, 673).

<sup>270</sup> Meneghini (2002b, 676).

architrave 0.40 m high, frieze 0.40 m high, and cornice 0.50 m high. The second order was slightly smaller than the first and had bases 0.60 m wide and 0.26 m high, column diameter 0.44 m and column height 3.5 m, capitals 0.50 m high, architrave and frieze 0.32 m high each, and cornice 0.40 m.<sup>271</sup>

Focal point: Building remains of the west side include two blocks of travertine interrupting the podium at a distance of 1.75 m from the central axis of the hall. These blocks supported an anta. The focal point is restored 3.5 m wide and 2.5 m deep, framed by antae and two columns in front of them, and probably supporting a statue, possibly that of Trajan.

The columns of the portico had bases 1 m wide, and 0.44 m high, columns 0.90 m in diameter and 7.20 m high, capitals 0.98 m high, architrave and frieze 0.64 m high, and cornice 0.72 m high.

Niches: The building remains include a section of the north wall in opus latericium, at a maximum height of about 3.92 m, which included seven niches. The niches were located 0.55 - 0.65 m above the podium level. The niches were 2.05 m wide and of a varying depth between 0.6 - 0.8 m and were arranged at a distance of 2.48 m one from the other. On the west wall, the space is smaller and the distance between the niches is calculated into 2 m. The niche remains are at a maximum height of 1.3 m.<sup>272</sup>

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<sup>271</sup> Meneghini (2002b, 676-679).

<sup>272</sup> Meneghini (2002b, 671).

In the second construction phase, the niches were narrowed with the addition of two thin walls, 0.18 m in the left side and 0.29 in the right side, so that the final width was reduced to 1.55- 1.60 m In a third phase, the last north niche to the back wall was walled up.<sup>273</sup>

On the sidewalls of the niches, and the middle of their bottom edge, there are the remains of holes, for the support and closing of doors. Also, on the bottom surface of the niches, there are the remains of marble revetments in the interior of the niches, and on the sidewalls remains of plaster. This has led to the suggestion that there were no book-cabinets inserted, but the actual niches supported shelves and doors.<sup>274</sup>

**Floor:** Floor remains include some fragments of the marble slabs, so that the pattern of the floor can be reconstructed.<sup>275</sup> The floor was paved with seven rows of large rectangular slabs of gray granite, of varying lengths, framed by thin stripes of giallo antico marble. The orientation of the pavement was along the longitudinal axis of the hall.

Also, there is one fragment of the pavement of the courtyard, which bears the stamp that it was constructed in 128 C.E.<sup>276</sup>

**Apertures:** There are no remains of windows; the only apertures were the door openings to the portico. The combination of the evidence from the west and east hall, gives the overall form of the entry facade. Evidence includes a pilaster base from the west hall, and two column bases from the east hall. This evidence combined, is restored as a large opening on the wall with tripartite division, with pilasters at the two ends, and two

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<sup>273</sup> Meneghini (2002b, 679-682).

<sup>274</sup> Amici (1982, 48-49).

<sup>275</sup> Meneghini (2002b, 670).

<sup>276</sup> Meneghini (2009, 155).

columns in the middle, making a central intercolumniation of 2.7 m and side intercolumniations of 2.4 m.

**Roof:** There are no building remains of a roof. Packer<sup>277</sup> has suggested that it was roofed with a vaulted roof with cross vaults. On the other side, Meneghini<sup>278</sup> claims that since there are no remains of cross vaults or barrel vault roof in the library, contrary to other parts of the Forum, and since the walls are too thin to have taken the tension of the vaults, this interpretation should be abandoned. Meneghini believes that the roof was supported by beams, more than 15 m long and was pitched.

**Stairs:** Behind the short side of the hall, there are the building remains of monumental stairwells. These had nothing to do with the library. They led from the north entrance of the forum to the second floor of the basilica and they were part of the public circulation, for the people to reach the second floor and witness what was going on inside.<sup>279</sup>

**Walls:** There are building remains of the north and west walls of the west hall, and the south wall of the east hall.

The wall remains of the north wall of the west hall were 1.5 m thick, and survived at a maximum height of 3.92 m. Along with the podium the walls were made of opus latericium. There are some traces of the marble revetments, with which they were covered.

The south part of the west wall also has some remains at a length of about 3.5 m, 0.16 m above the podium and at a depth of 0.75 m.

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<sup>277</sup> Packer (1997, fig.169, 171).

<sup>278</sup> Meneghini (2009, 147).

<sup>279</sup> Meneghini (2009, 150-151).



From the east hall, only two small wall segments survive which correspond to the dimensions of the west hall.

**Table 3.11** Summary of key characteristics and measurements of the Ulpian library.

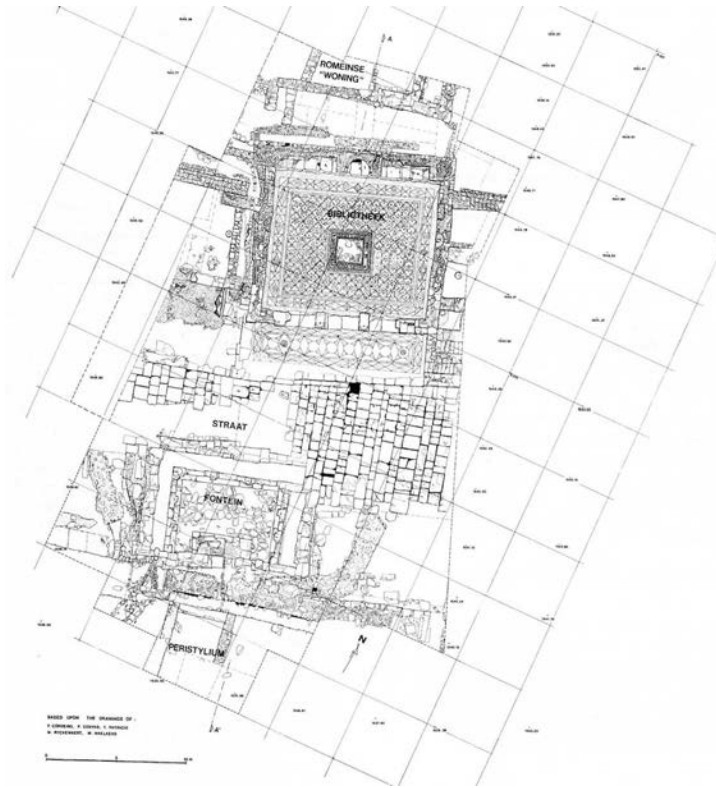
<i>Features</i>	<i>Data</i>
Location	Forum of Trajan, Rome
Date	114- 128 C.E.
Founder	Trajan, completed by Hadrian
Identified by	Ancient testimonia and building remains
Orientation	Southwest-Northeast
Main Hall Width	17.0 m
Main Hall Length	24.0 m
Main Hall Area	408 m <sup>2</sup>

### *3.1.12. Neon Library, Sagalassos*

The Neon Library is identified by the similarity of its building remains to the Library of Celsus (see chapter 3.1.10). The senatorial honorary inscriptions to the dedicator and his family members identify the dedicator as Titus Flavius Severianus Neon, and date the building immediately after 120 C.E.<sup>280</sup>

The library was part of a larger complex with at least three rooms, set behind a raised sidewalk paved with mosaics. It was located directly on the street that connected the upper agora with the theater, on the northern part of the city (figure 3.43a). The complex was built on the slope, in front of a Roman house that succeeded a Hellenistic large building, ca. 12 m wide (figure 3.41).

<sup>280</sup> Devijver (1993, 107-121); Waelkens and Poblome (1993, 14). For the history of the city of Sagalassos see Waelkens, Poblome, and De Rynck (2001).



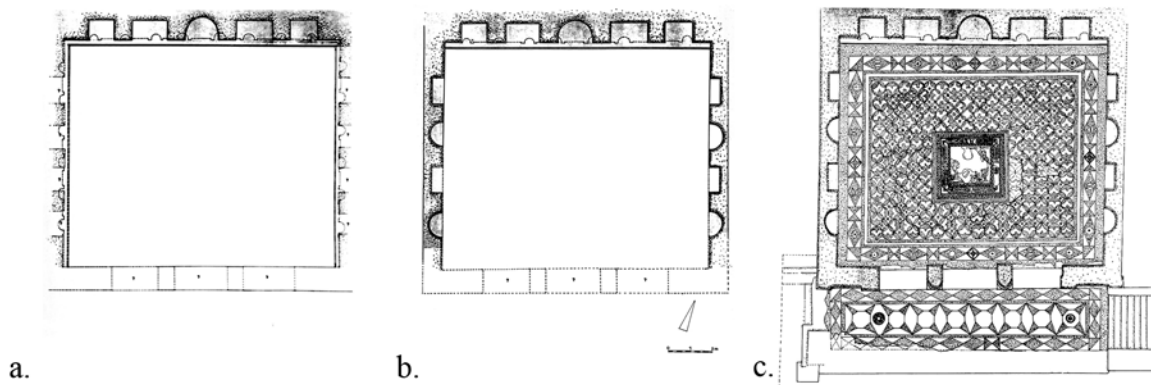
**Figure 3.41** Topographic plan of the area of the Neon Library (Waelkens and Poblome 1995, fig. 1).

The complex has not yet been excavated, except for the three rooms, the central of which has been identified with the main hall of a library. The east and central rooms have the same orientation, while the western one is set at a slight angle, following the curvature of the street.<sup>281</sup>

The main hall of the library was almost square and had a 13.5 m wide facade with three openings. This room was heavily decorated with mosaic floor pavement, a limestone

<sup>281</sup> Waelkens and Poblome (1995, 59)

podium with decorative semicircular niches in the lower part of the back wall, and a stuccoed wall with alternating semicircular and rectangular niches framed by stuccoed half-pilasters and moldings. The library underwent two renovations, one in the later 2nd century C.E, and a second one in 350-375 C.E. From the first phase survives only the back wall with the niches and the podium (figure 3.42a). From the second phase the sidewalls, which were built slightly closer to the center, so that the width of the room was reduced (figure 3.42b). Last, from the third phase survives the rebuilt facade, the mosaic floor that probably replaced a former pavement (figure 3.42c), and the replastering of the sidewalls.<sup>282</sup>



**Figure 3.42** Plans of the three phases of the Neon Library: a) first phase; b) second phase; c) third phase (Waelkens and Poblome 1993, fig. 9, 15 and 18).

From the eastern and western rooms there is no evidence yet other than that they were ca. 6 - 6.5 m deep. The western room has been testified to have had a width of at least 6 m At

<sup>282</sup> Waelkens and Poblome (1993, 14-15)

least the western and main rooms were preceded by a sidewalk, which had a unified iconographic program of geometrical motifs.<sup>283</sup>

In the end of the 4th century, after the death of Julian, the building was vandalized, destroyed, and abandoned.<sup>284</sup> The side rooms were also abandoned, and residences were built in their interior.<sup>285</sup>

### ***Main Hall Description***

The library was richly decorated. It had a limestone 2.35 m high podium along the back wall, and possibly along the sidewalls. The podium survives only in the back wall, and has eight small semicircular niches for small sculpture crowned by an attic molding, and a frieze with seven inscriptions (figure 3.43b and 3.43c). Its profile treatment in the ends indicates that the podium was originally along the side walls two, and in that case included six more semicircular niches on each side.

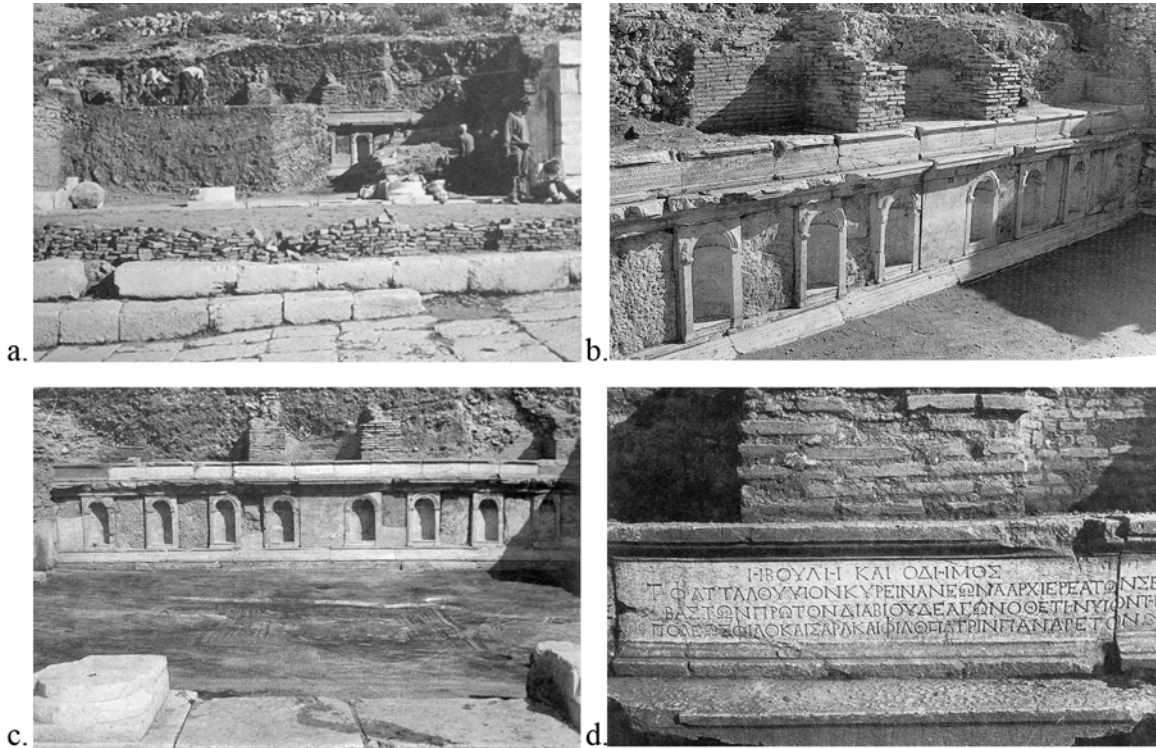
On the back wall, on top of the limestone podium, there was a frieze that included the honorary inscriptions to the founder of the building and six of his family members (figure 3.43d). On top of the frieze, there are five niches: a central semicircular one, probably for a statue, and two rectangular niches on each side, of decreasing width. There is no evidence of the treatment of the sidewalls of the first phase, but it is assumed that it included rectangular niches, same as the back wall.

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<sup>283</sup> Waelkens and Poblome (1995, 59-60)

<sup>284</sup> Waelkens and Poblome (1993, 13-15).

<sup>285</sup> Waelkens and Poblome (1995, 60-61).



**Figure 3.43** Views of the Neon Library: a) from the street (Walkens and Poblome 1993, fig. 50); b) view of the podium and niches (Walkens and Poblome 1995, fig. 18); c) view of the podium (Walkens and Poblome 1993, fig. 1); d) close view of the upper part of the podium and the lower part of two niches (Walkens and Poblome 1993, fig. 4).

In the second phase, the sidewalls were moved inwards, reducing the width of the library. They had no podium, but they had four niches, rectangular alternating with semicircular. The walls were heavily decorated with veneer, plaster stucco, and architectural decoration in stucco, with halfpilasters and moldings with egg-and-dart and bead-and reel around the niches. In the third phase (350-375 C.E.), renovations included the rebuilding of the facade, which does not survive today, the mosaic floor, and the re-plastering of the walls.

## *Findings*

**Podium:** There is evidence of a podium<sup>286</sup> on the back wall of the library that belonged to the first phase of the building. The podium is 2.35 m high and is built of well-cut stones, mortared and placed on a mortared bed. Its surface that is in the interior of the library is covered by limestone veneer and has an elaborate architectural articulation with moldings, niches and frieze. In addition to the decorative, the podium has a structural character, as on it rests the back wall of the library, which is made of brick towards the interior of the library and mortar rubble towards the exterior. However, the podium has no depth, since all its thickness was covered by the back wall, and there was no space left for one to step on or for circulation.

The architectural treatment of the podium consists of a lower molding, a row of semicircular niches with a shell-like arch, for small sculpture, alternating with marble slabs, an upper attica molding, and a frieze with seven honorary inscriptions.

The treatment of the profile of the podium in its two ends indicates that originally the podium turned and followed the sidewalls as well. In this case, based on the dimensions of the niches on the back wall, it is calculated that the podium on each sidewall included six more niches.

**Column Screens:** There is no evidence of column screens in the interior of the building. The podium has no depth, and it would have been impossible for columns to rest on it. However, there is evidence of decorative stucco pilasters framing the niches of the sidewalls.

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<sup>286</sup> Waelkens and Poblome (1993, 14).

**Niches:** The building remains bare evidence for 13 niches,<sup>287</sup> of varying dimensions, four on each sidewall and five on the back wall. The back wall contains five niches: one large semicircular in the center, and two rectangular on each side.

The semicircular niche was 1.5 m wide x 1 m deep, and probably contained a statue. This was followed by two rectangular niches on each side, 0.90 m deep, and 1.5 m wide the first and 1.2 m the second.

On the side walls survive the eight alternating rectangular and semicircular niches of the second phase, 1.1 - 1.2 m wide, and 0.48 m deep the rectangular, and 0.58 m deep the semicircular.

Nothing survives from the sidewalls of the first phase, but four rectangular niches, of similar dimensions to those of the back wall, are restored on each of the side walls. The niches on the back wall and on the sidewalls are restored in two rows, which makes a total of 24 niches.

**Floor:** There is no evidence of the floor pavement of the first phase. The remains of the floor of the third phase show a high quality flooring. Most of the floor was made of black and white tesserae arranged in geometrical patterns (intersecting circles, quatrefoils and peltae). The central part of this area contained a polychrome central panel, with a scene from the Iliad: the departure of Achilles for Troy. Three figures were represented on the

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<sup>287</sup> Waelkens and Poblome (1993, 15).

panel: a woman, most probably Thetis, Achilles and his tutor Phoinix. The panel is signed by the mosaicist Dioskoros.<sup>288</sup>

**Apertures:** There is no evidence of windows. The natural light from the three entrance openings could have been sufficient.

**Roof:** There is no evidence for the design of the roof. There is evidence of a roof beam, which analyzed with the C14 method gives a date for the building in the 1st - 2nd century C.E.

**Stairs:** There are remains of stairs to the east of the sidewalk preceding the library, but they are unrelated to the library.

**Walls:** The back wall of the building (1st phase) was built in the lower part with largish, well-cut stones and mortared together in a mortar bed. The inner face of the wall was covered with the limestone veneer discussed in the podium section. The upper part of the wall was built with brick in the interior and with mortared rubble composed of small irregular stones and completely covered with a layer of mortar towards the exterior.<sup>289</sup>

The sidewalls of the building (2nd phase) were made of brick alternating with mortared rubble. The walls were partially covered with veneering, and stucco, forming half-pilasters and moldings with egg-and-dart and bead-and-reel around the niches.

The back and sidewalls survive at a height of 3 - 6 m, but the front facade wall is entirely dismantled.

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<sup>288</sup> Waelkens and Poblome (1993, 13).

<sup>289</sup> Waelkens and Poblome (1993, 14).



**Table 3.12** Summary of key characteristics and measurements of the Neon library.

<i>Features</i>	<i>Data</i>
Location	Sagalassos, Asia Minor
Date	After 120 C.E.
Founder	T. Flavius Severianos Neon
Identified by	Ancient testimonia and building remains
Orientation	South - North
Main Hall Width	11.8 m
Main Hall Length	9.5 m
Main Hall Area	112.1 m <sup>2</sup>

### *3.1.13. Library of Nysa, Asia Minor*

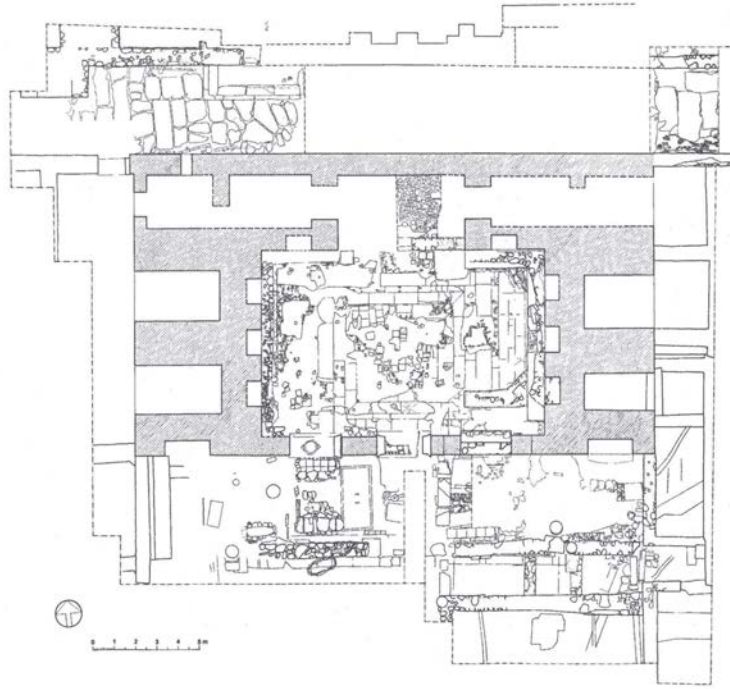
The library of Nysa<sup>290</sup> is known through literary sources and is identified with the remains of a wide rectangular building 24.9 m x 14 m, with a main wide rectangular hall at its core accessed from the south, and other rooms surrounding it on the north, the east and the west sides in two floors (figure 3.44).

The building was located in a prominent district in the city of Nysa, 150 m north of the gymnasium and southwest of the theater, among luxurious residencies. The building was bordered to the north by a paved street, roughly 5 m wide, and was located 38 m from the northeast street junction.<sup>291</sup> The building was bounded to the east and west by a courtyard, roughly 3 m wide. It is not clear what was the south boundary of the building and what were the south, east and west boundaries of the city block.

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<sup>290</sup> Callmer (1944, 171-172); Diest (1913, 49-51); Hiesel and Strocka (2006, 81-97); Hoepfner (2002, 73-78); İdil (2003, 45-55); Johnson (1984, 68-72). For information on the history of the city of Nysa see Kadioglu (2006, 4-10).

<sup>291</sup> Hiesel and Strocka (2006, 93).



**Figure 3.44** Plan combining state of preservation and reconstruction of the Library of Nysa (Hiesel and Strocka 2006, fig. 1).

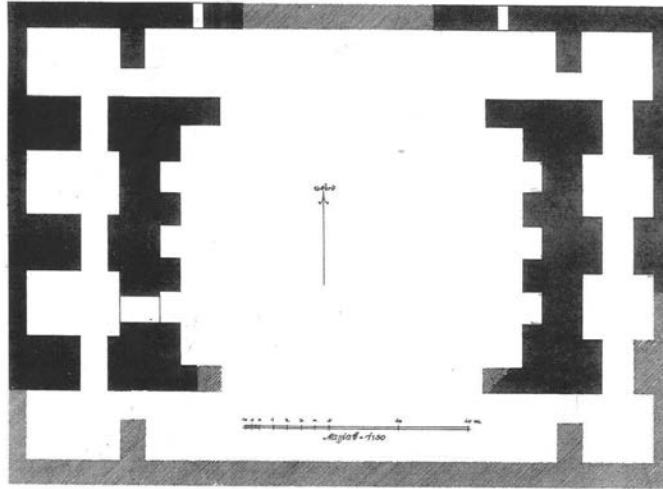
Along the south facade of the building, there was a Doric stoa, 5.25 m deep,<sup>292</sup> in the back wall of which there were three openings, leading to the main hall. Diest<sup>293</sup> had suggested that in the south side, there was a space symmetrical to the north side of the building (figure 3.45), and Hoepfner<sup>294</sup> suggested that there must have been a highly sculptured facade like the one in the Celsus Library (see chapter 3.1.10), but none of these hypotheses is yet confirmed by the archaeological evidence.

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<sup>292</sup> Hiesel and Strocka (2006, 90).

<sup>293</sup> Diest (1913, 50).

<sup>294</sup> Hoepfner (2002, 77)



**Figure 3.45** Restored plan of the second floor of the Library of Nysa (Diest 1913, pl. 8).

The main hall is a large wide rectangular space, 13.35 m wide and 8.68 m deep, with niches and a podium along its east, west and north walls. This has been interpreted as the main hall of the library. In the north wall, there was an opening that gave access to the slightly elevated, northern side of the building. Behind the east and west walls of the main hall, there were three massive buttresses, among which formed spaces, three in each side on each floor (figure 3.47b). The spaces of the first floor were directly accessed from the street, while the spaces of the second floor were intercommunicating through an arched corridor that penetrated the buttresses.<sup>295</sup> It is not very clear what happened in the north side of the building, and where there were stairs that led to the upper floor. Hiesel and Strocka<sup>296</sup> suggested that the building had the mixed function of a basilica, an archive and a library, and that the tribunal was seated in the north exedra attached to the main

<sup>295</sup> Diest (1913, 49-51); Hiesel and Strocka (2006, 81-94).

<sup>296</sup> Hiesel and Strocka (2006, 92-93).

hall. In two sides, there were opening two rooms, where stairs led to the upper floor. The upper floor rooms are interpreted as space for the storage of texts.

In later phases, the main hall was remodeled to become a Christian church. The two eastern door openings and the opening to the exedra were walled-up, a pedestal 2.5 m wide and 1 m deep was built in the middle of the north wall, and doors opened in the southwest and northwest niches, to comply with the orientation and the function of a Christian church. The east and west sides of the building survive at their total height, 8.57 m, while the north and south sides survive fragmentarily at a low height. The building survives stripped of its original marble revetments and marble floor pavement. A sarcophagus with the burials of a man and a woman, possibly the dedicators, was found in situ under the floor of the south porch, between the west and central door openings.<sup>297</sup>

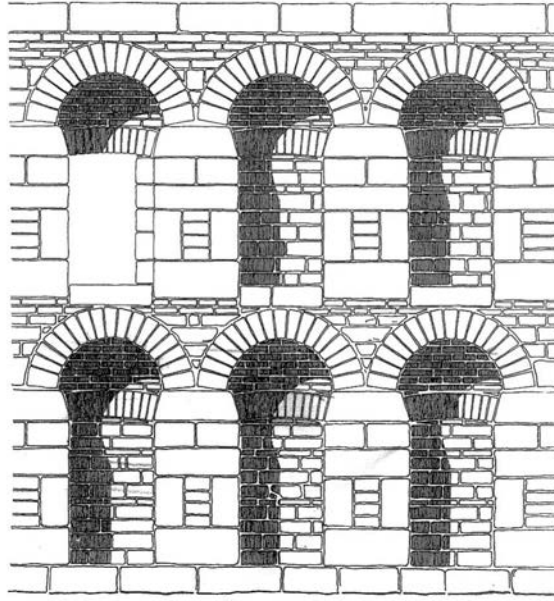
The building is dated based on stylistic characteristics of the sculptured door frames and cover plate of the sarcophagus to the decade between 120 and 130 C.E., and is associated with the Hadrianic period.

### ***Main Hall Description***

The main hall of the library is a wide rectangle, 13.35 m wide, 8.68 m deep, and 8.57 m high, and has been identified as a library due to its characteristics common to a Roman library - the niches, the podium and the focal point - and references in literary sources that Nysa had a library in Roman times.

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<sup>297</sup> Hiesel and Strocka (2006, 90-91).



**Figure 3.46** Reconstructed elevation of the west wall of the main hall of the Library of Nysa (Diest 1913, pl.10).

The entry to the hall was from the south, through three openings. The east, west and north walls included sixteen rectangular niches, arranged in two rows (figure 3.46 and 3.47a), and a podium that ran in front of them. It has been suggested that the podium supported a colonnade and a gallery, as in other libraries, but there is no evidence for this.

In the north wall, the podium is interrupted by a wide opening that created a focal point. At this point the degree of preservation is very low, and its interpretation and restoration is not definite. Hiesel and Strocka<sup>298</sup> suggested that an exedra, 5.92 m wide, 3.49-3.54 m deep, and 0.31 m higher than the main hall opened to the main hall to support the additional function of the library as a courthouse. This

would have been where the judge would have sat.

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<sup>298</sup> Hiesel and Strocka (2006, 84).



**Figure 3.47** View of the Library of Nysa: a) view of the east wall of the main hall with niches and podium (Hiesel and Strocka 2006, fig. 8); b) view of the upper row of niches from the second floor (Hiesel and Strocka 2006, fig. 4); c) detail of an upper part of a niche (author's photo); d) view of the northwest corner for the main hall with plaster remains on the walls and remains of the podium (author's photo).

### *Findings*

**Podium:** There is evidence of the podium in front of the east, west and northern walls of the main hall; the podium of the east and north walls is almost intact (figure 3.47a), while the podium of the west wall survives reduced, as a bench (figure 3.47d). The podium was 0.80 deep, and 0.87 high. The podium stops before the south wall, at a distance of 0.65 m in the east side, and 0.69 m in the west side. The podium was constructed with a mixed

system, with rough stones in the center, and rectangular limestone blocks at the edge. In the north side and the southern end of the east podium, there is evidence of a layer of stucco and marble revetments, 0.03 - 0.035 m thick.<sup>299</sup>

This podium is typically interpreted as supporting a colonnade and a gallery, and being a threshold to the niches. The podium is not that high or deep to be interpreted as giving access, as even without it, access could have been granted directly from the floor level.

**Column Screens:** There is no evidence of an interior colonnade: no holes on the walls for the support of the beams, and no evidence of holes on the podium for the attachment of column bases. The only indirect indication for the existence of a colonnade is a door opening on the back wall of the southwestern niche. This door indicates the existence of a gallery, which must have been supported on a colonnade. Hiesel and Strocka suggested that there might have been a wooden structure, for the support for the gallery. However, there are two libraries, the Pantainos Library (Chapter 3.1.9) and the Melitine Library (Chapter 3.1.14), that do not have a colonnade, or even a podium, and the possibility that there could have been no colonnade should not be excluded. In this case, the door opening might have been from a later phase of the building, or it could have been used during the construction of the building, and then was walled up and plastered.

Evidence from the exterior colonnade of the building, in the south porch, includes the foundations of the stylobate, and the lower part of the western Doric column still in situ. The porch closed in the sides with two walls, which survive at the level of the foundations in the west side, and at a big height in the east.

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<sup>299</sup> Hiesel and Strocka (2006, 82-83).

Also, there is a Corinthian capital found in the main hall in secondary use. It is sunk in the floor and functioned as a threshold to the north exedra in the second phase of the building as a church.

**Niches:** The niches<sup>300</sup> of the east and west walls survive almost intact, while the niches of the north wall, only partially. In total there were sixteen niches, arranged in two rows, six in the east wall, six on the west, and two on east end of the north wall. The niches of the lower row were located 44 cm above the podium, and the niches of the upper row, on top of a 0.36-0.40 m high limestone euthynteria, directly on top of the end of the relieving arches of the lower niches. The niches are 1.18-1.2 m wide, 0.65-0.67 m deep, and 1.87-1.9 m high. They are located at intervals of 1.2 m and they are at a distance of 1.3 m from the north end of the wall and at a distance of 1.5 m from the south end.

The niches are constructed by limestone blocks on their three sides. The upper block of the sidewalls of the niches has a trapezoidal shape, and supported on its side face a brick swallow arch, which was the upper boundary of the niche, and on its upper face a stone semicircular relieving arch. The space between the two arches was filled with horizontally laid bricks (figure 3.47c).

The design of the niches recalls the niches in the Philosophers' Hall in Hadrian's Villa in Tivoli (chapter 3.2.9), even though they are with different materials.<sup>301</sup>

**Floor:** Evidence of the marble pavement of the main hall includes the imprint lines of the marble slabs on the floor and some fragments of the colored marble. The floor was laid

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<sup>300</sup> Hiesel and Strocka (2006, 83).

<sup>301</sup> Diest (1913, 50).



with parallel rows of marble plates of variable width and colors. In the middle, at a width corresponding to the opening towards the north side of the library, there was a pattern inscribed into a square.<sup>302</sup>

**Apertures:** There are the building remains of thresholds of the three door openings to the south wall of the main hall that gave access to the main hall. Also, two doorframes with sculptural relief have been found. On top of the door openings, windows are restored.<sup>303</sup>

**Roof:** Evidence of the roof of the building includes the almost intact ceiling of the small rooms in the east and west sides of the building, and a row of bricks of the ceiling of the main hall.<sup>304</sup>

Evidence of the ceiling of the main hall includes a 2.48 m long row of bricks connected with mortar along the west wall of the main hall. The bricks have similar dimensions (0.42 – 0.45 m wide, 0.67 – 0.58 m long) to the bricks found in the center of the hall, in the destruction fill. The bricks indicate that the hall was roofed by a barrel vault with orientation south/north. Additional evidence supporting this argument is the fact that the east and west sides of the building include three robust buttresses that would have been able to support the big vault. The vault had the shape either of a pointed arch or of a semicircle. In the first case, the total height of the roof is restored to 13.35 and in the second case, 15.26 m Also, the surviving ceiling of the smaller rooms in the east and west sides of the building survives to a large extent and were barrel vaults with orientation

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<sup>302</sup> Hiesel and Strocka (2006, 83).

<sup>303</sup> Hiesel and Strocka (2006, 88).

<sup>304</sup> Hiesel and Strocka (2006, 83).

east-west. The corridor that penetrates the buttresses and gives access from one room to the other was also barrel vaulted with orientation north south.

There is no evidence of the roof of the northern exedra. It could have been roofed either with a barrel or a pointed vault. The whole building must have been covered by a pitched wooden roof.

**Stairs:** There are no remains of stairs. Stairs are typically restored in the rooms of the north side of the building, but there are no remains on the floor or the walls.<sup>305</sup> However, there is evidence of small windows on the north wall of the building, located in different heights that indicate that there must have been stairs behind.

**Walls:** The walls were made with a mixed system of crushed stones (limestone, pebble and slate slabs) connected with mortar, and rectangular limestone blocks around the edges and in structurally important spots. There is evidence of the walls in their original height (8.57 m) in the east and west sides of the building, at a low height in the north wall and south walls. The walls of the main hall were covered by marble. Evidence for this includes traces of a 10 cm thick layer of plaster with brick chips, on the north and east walls (figure 3.47d), a fragment of marble plate still in situ on the north wall, and a series of dowel holes, for the support of the marble slabs.

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<sup>305</sup> Hiesel and Strocka (2006, 85-86).

**Table 3.13** Summary of key characteristics and measurements of the library of Nysa.

<i>Features</i>	<i>Data</i>
Location	150 m north of the gymnasium, Nysa on the Meander, Asia Minor
Date	Around 130 C.E.
Founder	Unknown
Identified by	Ancient testimonia and building remains
Orientation	South - North
Main Hall Dimensions	13.35 m
Main Hall Length	8.68 m
Main Hall Area	115.88 m <sup>2</sup>

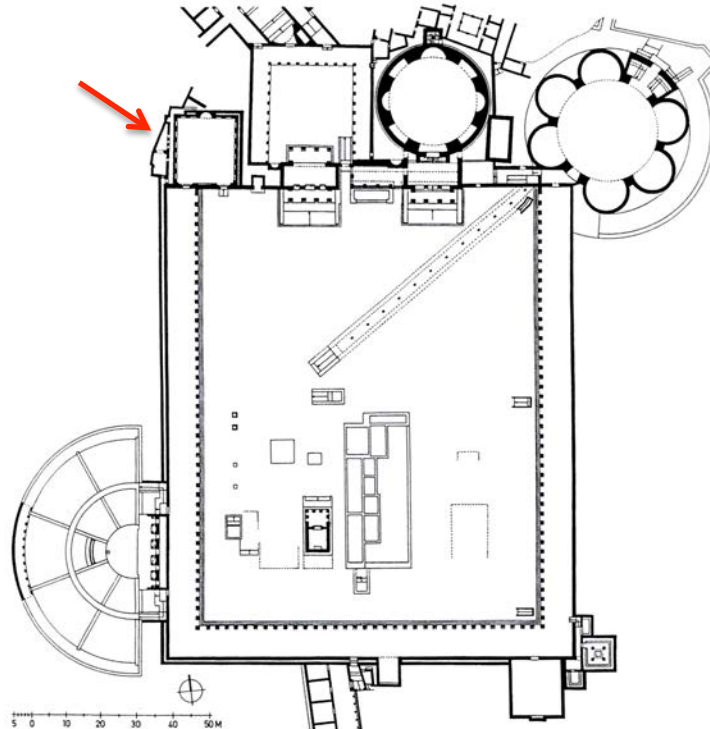
#### *3.1.14. Melitine Library, Pergamon*

The library has been identified with the northeastern room attached perpendicularly to the north stoa of the Sanctuary of Asklepeios in Pergamon<sup>306</sup> (figure 3.48). The room has been identified as a library because of its niches and an honorary inscription that identifies Flavia Melitine as the dedicator of the library.

The library consists of only one room, and is accessed through two doors, one directly from the courtyard of the sanctuary, and one from the north stoa (figure 3.51a). It has rectangular niches on all four walls, and a semicircular apsidal niche in the center of the east wall, in which stood the over-life sized statue of Hadrian. Hadrian was depicted nude, as a hero and the inscription on the statue base called him god. This led to the early interpretation that the hall was dedicated to the cult of the emperor.<sup>307</sup>

<sup>306</sup> Callmer (1944, 175-176); Deubner (1938); Johnson (1984, 78-83); Petsalis-Diomidis (2010, 207-220); Radt (1999, 232-233); Stroocka (1981, 320-322).

<sup>307</sup> Wiegand (1932, 10-11).



**Figure 3.48** Topographical plan of the Temenos of Asklepios in Pergamon. The Melitine library is pointed by an arrow (Radt 1999, fig. 175).

Behind the north wall of the library and at a distance of 1.22 m there is a series of other rooms and walls, and behind the east and south walls at a distance of 0.70 m there is another wall (figure 3.51e). These from the beginning were interpreted as a peristasis.<sup>308</sup>

Wendel also argued that the rooms to the north could have been used for extra book storage.<sup>309</sup> Recent research showed that the rooms to the north had nothing to do with the library.<sup>310</sup>

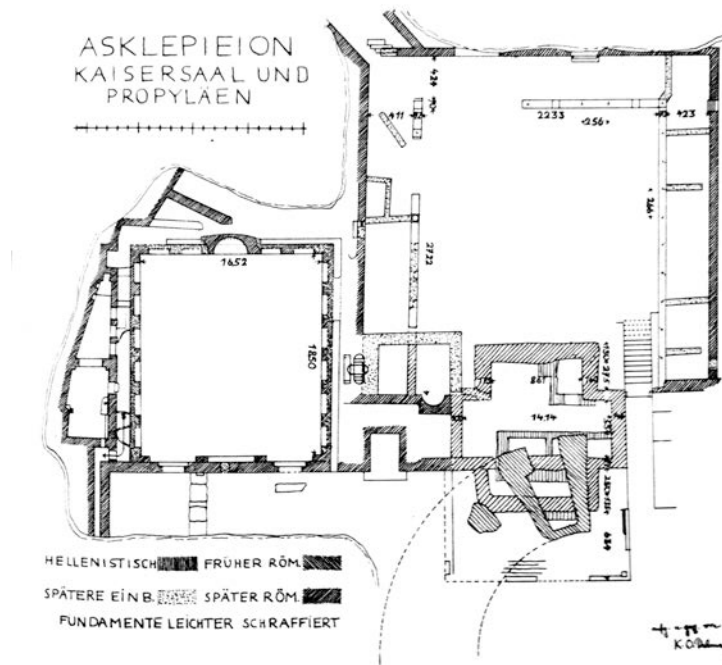
<sup>308</sup> Deubner (1938, 45); Wiegand (1932, 10).

<sup>309</sup> Wendel (1938, 641-650).

<sup>310</sup> Radt (1999, 232-233).

### *Main Hall Description*

The hall of the library, 18.50 m long and 16.52 m wide, is almost square in plan. It has six niches on the sidewalls, and four on the back wall, each two flanking the focal point of the hall, a semicircular apsidal niche, with the statue of the emperor (figure 3.49). All niches were located at a height of 1.75 m above the floor level.

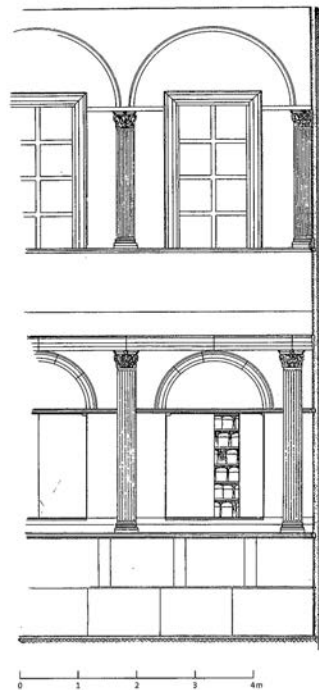


**Figure 3.49** State of preservation plan of the Melitine Library (Wiegand 1932, pl.2).

The hall was richly decorated with plaster on the walls, marble revetments in the niches, marble entavature on the walls, sculpted pilasters, arched and round artictraves creating an architectural setting, and a polychromatic marble floor pavement.

The hall also has some peculiarities. First, the hall is not attached to the long side of a stoa, but to the short one. Second, while in all other cases the number of door openings is

an odd number, the Melitine library has an even number of entrances, one from the roofed north stoa of the sanctuary, and the other directly accessible from the open-air interior of the sanctuary. Also, between the two entrances, there is one wide niche (figure 3.51b). Last, the hall does not have any evidence of a podium or an interior colonnade along its three sidewalls.



**Figure 3.50** Restored elevation of the interior wall of the Melitine Library with niches and windows (Radt 1999, fig. 178).



**Figure 3.51** Views of the Melitine Library: a) view from the portico towards the library; b) View of the entry wall of the library from the inside; c - d) views of the back wall of the library with the semicircular central niche and rectangular niches; e) double walls behind the back wall; f) view of the north wall of the library from the inside (author's photos).

### *Findings*

**Podium:** There are no traces of a podium on the floor of the main hall, and the fact that the remains of the floor pavement reach to the walls, indicates that there was no podium.

The location of the niches at a height of 1.75 m from the level of the floor has led to the interpretation that there must have been a wooden podium that gave access to the niches.<sup>311</sup> An alternative interpretation is that the book collections were located in wooden armaria, set directly on the floor against the wall, and therefore no podium was needed.<sup>312</sup>

**Column Screens:** There are remains of pilaster capitals<sup>313</sup> that must have crowned wall pilasters, as part of the sculptural decoration of the room that carried linear and curvilinear architraves.<sup>314</sup> There are no traces of an interior colonnade on the floor of the main hall.

**Niches:** The library had one central apse on the east wall (figure 3.51d) and a large niche on the west wall, located between the two entrances (figure 3.51b). Evidence also includes the northeast niche, according to which the rest are restored; the central niche was flanked by two niches on each side, and there were six niches on the north and the south walls. The niches were located 1.75 m above the floor level and were 0.65 m deep.<sup>315</sup> The niches on the north (figure 3.51c and 3.51f), south and east walls were roughly 1.45 m wide, while the niche on the west wall was 3.4 m wide.

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<sup>311</sup> Callmer (1944, 175-176); Radt (1999, 232-233); Strocka (1981, 320-322).

<sup>312</sup> Johnson (1984, 82).

<sup>313</sup> Deubner (1938, 45).

<sup>314</sup> Wiegand (1932, 10).

<sup>315</sup> Wiegand (1932, 10).



The rectangular niches had marble revetments, while the central apse was decorated with a mosaic. Dalman<sup>316</sup> suggested that the niches were made out of stone and were not vaulted, but Radt reconstructed them as vaulted.<sup>317</sup>

**Floor:** There are remains of the floor, which was decorated with a colorful arrangement of opus sectile. In the middle, there was a pattern of geometrical motifs in a checkerboard, followed by bands of marble plates in different colors; from the inside to the outside: dark violet, green, grey-blue, white, and blue-green.<sup>318</sup>

**Apertures:** There are findings of window frames, made of thin plates of marble and alabaster. The minimum height of the windows is calculated into 1.4 m and the windows are reconstructed above the niches<sup>319</sup> (figure 3.50). As shown in Deibner's book<sup>320</sup> the fragments of the window members include a pilaster base, fluted pilaster fragments and a molding on the top.

**Roof:** No findings.

The sizable span of the roof only allows the interpretation of a wooden coffered roof.<sup>321</sup>

The thickness of the walls is considered insufficient to have supported a vault.

**Stairs:** No findings.

**Walls:** The walls survive up to the height of the niches and they were made of stone.

From that point on, the walls must have been made of bricks.<sup>322</sup> The walls were decorated

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<sup>316</sup> Wiegand (1932, 10).

<sup>317</sup> Radt (1999, 233).

<sup>318</sup> Wiegand (1932, 10-11).

<sup>319</sup> Deubner (1938, 43).

<sup>320</sup> Deubner (1938, fig.35).

<sup>321</sup> Wiegand (1932, 10).

with colored relief pillars and the niches with marble revetments. There was a mosaic in the apse.<sup>323</sup>

**Table 3.14** Summary of key characteristics and measurements of the Melitine library.

<i>Features</i>	<i>Data</i>
Location	Northeast corner of the Asklepieion, Pergamon
Date	123 - 132 C.E.
Founder	Flavia Melitine
Identified by	Ancient testimonia and building remains
Orientation	West - East
Main Hall Dimensions	16.52 m
Main Hall Length	18.5 m
Main Hall Area	305.62 m <sup>2</sup>

### 3.1.15. Hadrianic Library, Athens

The library of Hadrian has been identified based on the building remains and a reference in the literary sources that the building, built by Hadrian contained books.<sup>324</sup> Still, some scholars identify the structure with a building for the imperial cult that included books, rather than as a library.<sup>325</sup> Others<sup>326</sup> have not only accepted the function of the building as a library, but have expanded its importance to that of a university or a Museum, in the center of Athens, the new center of hellenismus. I argue that the function of the building as a library is not contradictory to that of a Museum or a building for the imperial cult.

<sup>322</sup> Wiegand (1932, 10).

<sup>323</sup> Radt (1999, 233).

<sup>324</sup> Callmer (1944, 172-174); Götze (1937, 237-238); Hoepfner (2002, 63-66); Johnson (1984, 74-77); Kokkou (1971, 162-165); Koumanoudes (1886, 13-24); Makowiecka (1978, 67-69); Sisson (1929, 17-25); Strocka (1981, 318-320); Travlos (1971, 244-252).

<sup>325</sup> Karivieri (1994, 89-113).

<sup>326</sup> Boatwright (1992, 193-217); Choremi-Spetsieri and Tigginaga (2008, 115); Willers and Vereinigung der Freunde Antiker (1990, 14-21).

The library of Hadrian in Athens is a monumental complex, strategically located to the east of the classical agora, and to the north of the Roman Agora, and was part of Hadrian's program of merging Greek and Roman cultures together and elevating Athens as the center of hellenismos.<sup>327</sup> The orientation and the location of the building was determined by two preexisting roads, one that led directly in front of the propylon in the west, and to the south, one between the library and the agora that led to the Basilica, the Pantheon, the Panhellenion, the Olympeion and the new city of Hadrian.

At the core of the library complex (figures 3.52 and 3.53), there was a rectangular courtyard, 82 x 60 m with a water reservoir about 7m deep in the center, which was surrounded by colonnades on four sides.

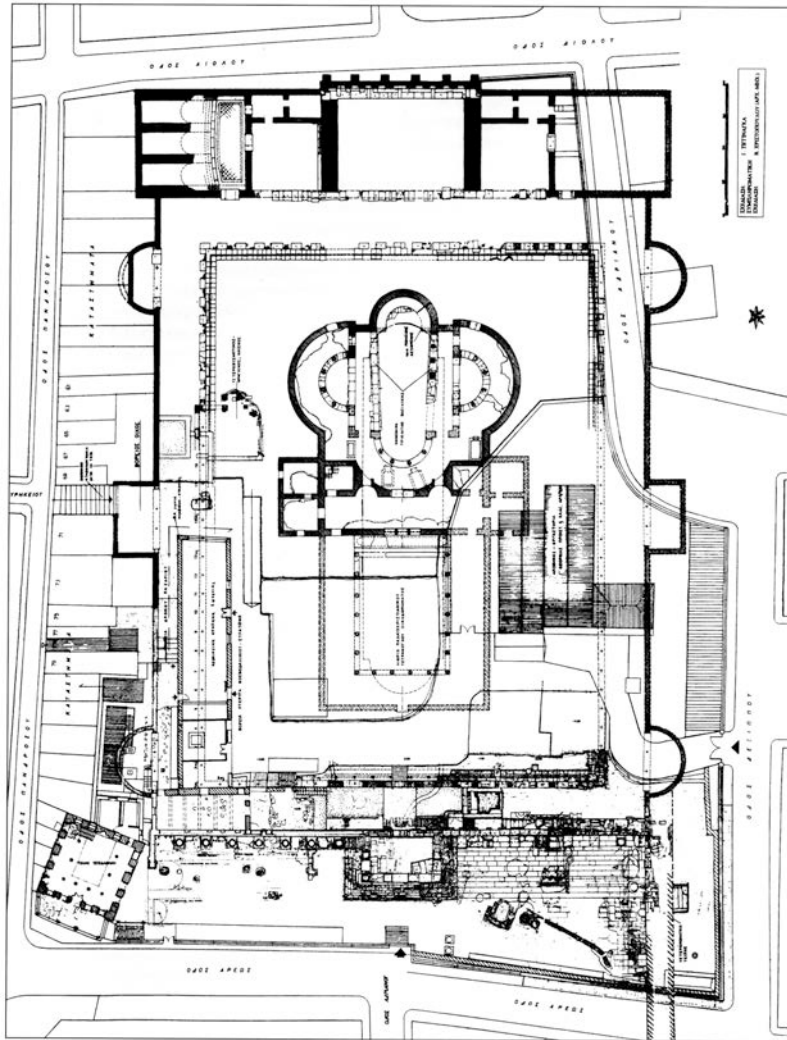
On the west wall, there was the only entrance to the complex, which was marked by a monumental tetrastyle, prostyle, Corinthian propylon (figure 3.56a). On either side of the propylon and along the western wall, there were seven engaged columns on pedestals (figure 3.56b). The architectural elements of the facade and the propylon were made of Pentelic marble, the column shafts of the propylon of Phrygian stone (Pavonazzetto) and the columns of the facade of Carystian stone. Along the facade, there was a 14.5 m wide paved square with Pentelic marble slabs.<sup>328</sup>

On each of the long sides of the peristyle there were three projecting exedras, a rectangular in the middle, and a semicircular on either side (figure 3.56e). These exedras were screened from the peristyle by columns and probably functioned as spaces for recitations and philosophical discussions.

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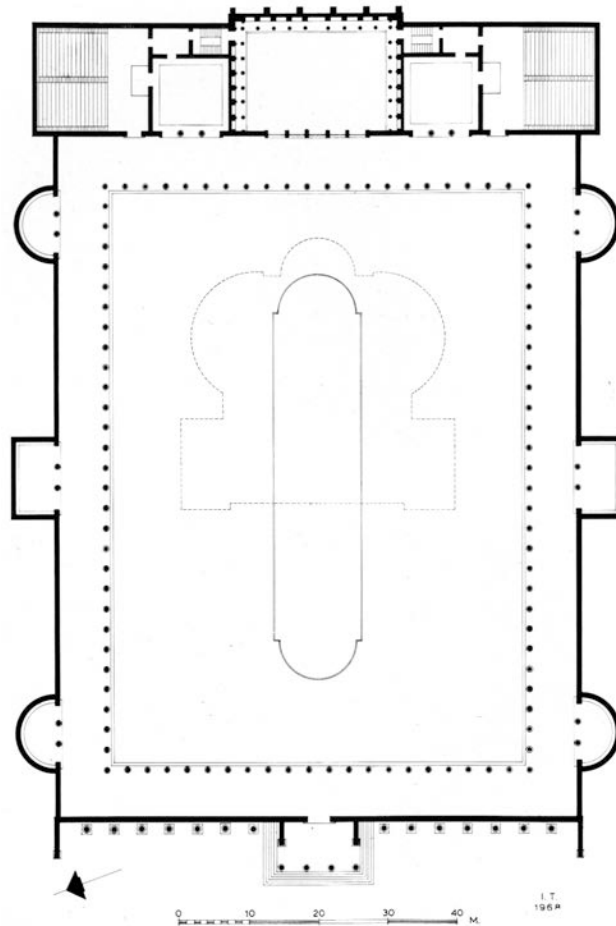
<sup>327</sup> Boatwright (1983, 173-176).

<sup>328</sup> Spetsieri-Choremi (1995, 143); Choremi-Spetsieri and Tigginaga (2008, 121).



**Figure 3.52** State of Preservation plan of the Hadrianic Library after Tigginaga (Tigginaga 1999, fig. 1).

Five rooms opened along the eastern side of the peristyle. The central room was the largest and was the main Hall of the library holding the niches with the books, and opened through five openings between columns or piers (figure 3.54).

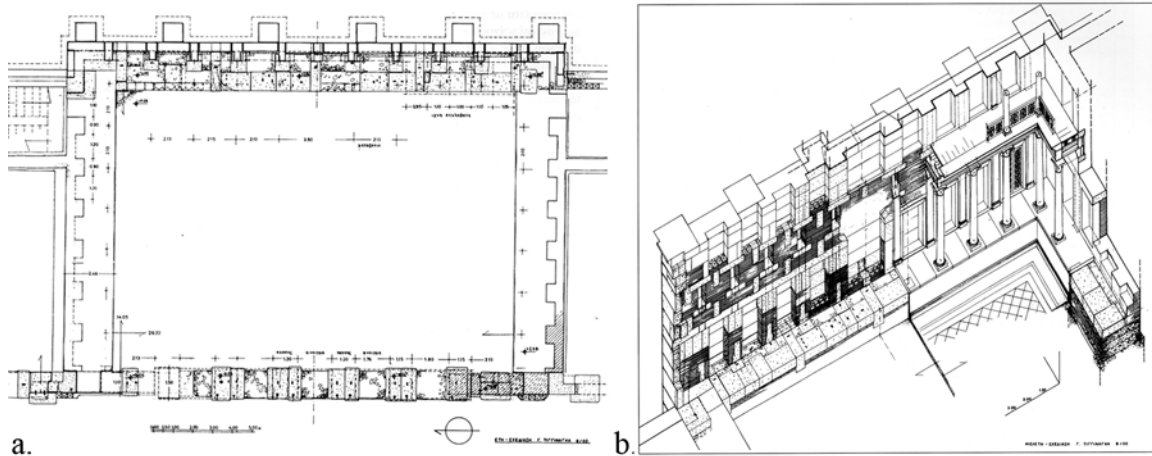


**Figure 3.53** Reconstruction plan of the Hadrianic Library after Travlos (Travlos 1971, fig. 316).

The rooms on the ends of the building opened through a door opening and are reconstructed as auditoria with theatrically arranged rows of seats (figure 3.55). Evidence for this reconstruction comes from the northeastern room; there survive the three walls of the vaults, 1 m wide, 8 m long, which supported the sloped floor, at an angle of 27 degrees (figure 3.56f). Also, there have been found in situ, six of the marble blocks of the

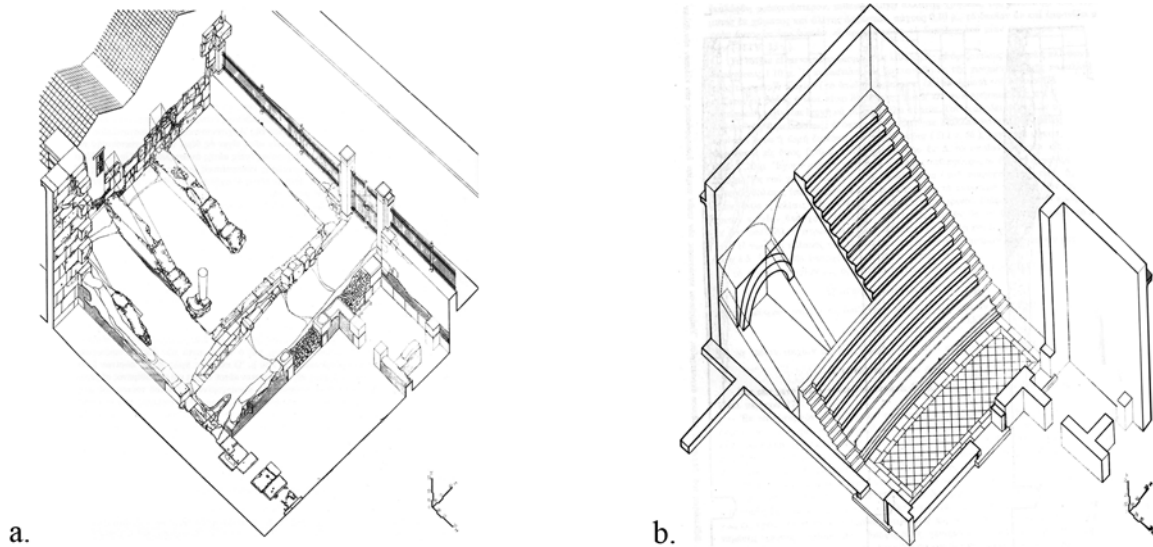
first row of seats, with dimensions 1.35 x0.60 m, arranged in a curvilinear form. Last, there have been found traces of the stairs on the east wall.<sup>329</sup>

The spaces between the main hall and the auditoria opened through openings between columns and are still unidentified. They are almost square and gave access to two smaller ones in the back. In the plan of Dörpfeld, there is a counter-like structure shown in the southernmost room, but nothing survived for further research. On the analogy of the Library of Celsus (see chapter 3.1.10) that once was thought to have stairs, these rooms were interpreted as having stairs, for access to the spaces and the niches of the upper floor, but a fresh look at the evidence suggest other functions, for example offices for copyists and other officers related to the function of the library.



**Figure 3.54** Main Hall of the Hadrianic Library: a) State of Preservation plan after Tigginaga; b) reconstruction axonometric after Tigginaga (Tigginaga 1999 fig. 4 and 5).

<sup>329</sup> Knithakis and Sympolidou (1969, 109-112).



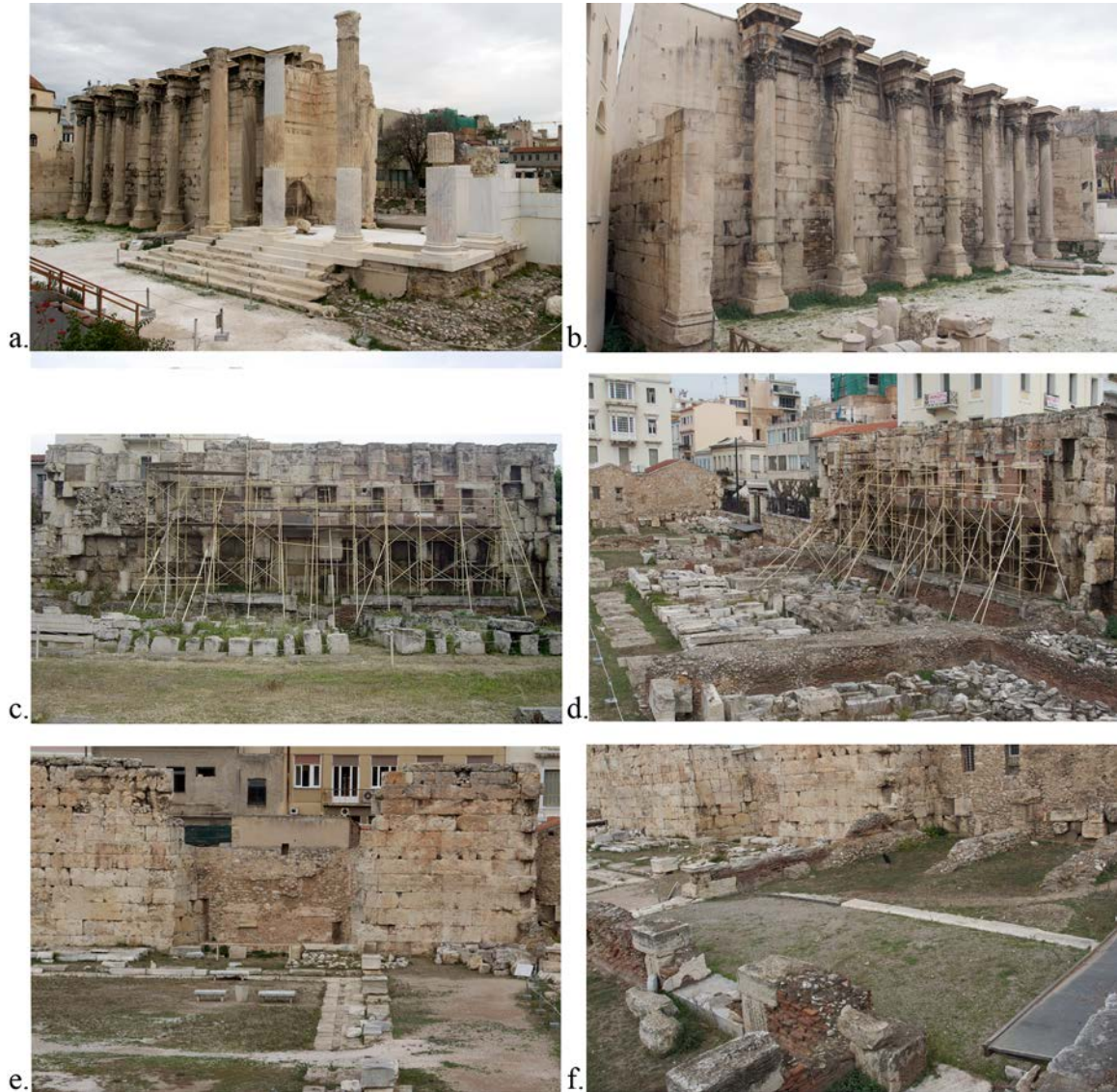
**Figure 3.55** The auditorium in the northeast corner of the complex: a) state of preservation axonometric; b) reconstruction axonometric (Knithakis and Sympolidou 1969, fig. 1 and 4).

### *Main Hall Description*

The main hall of the library, where the books were kept, was the largest room of the complex. It had exterior dimensions 25.11 x 17.65 m and interior dimensions 23.16 x 15.63 m (figure 3.54a, 3.56c and 3.56d). This room projected from the rest of the rooms by 1.4 m to the east and 0.2 m to the west. It opened towards the peristyle with five openings.

It had a wide, tall podium on its three walls, on which raised the exterior walls of the hall in the outer end, and an interior colonnade in the inner end. The walls carried two rows of rectangular niches for the storage of books. In the center of the east wall, there were two enlarged arched niches, one on each level, which created a focal point. In front of the

niches, there is reconstructed a two-story interior colonnade that supported an entablature. The main hall was lavishly decorated with marble revetments on the walls and a marble floor pavement.<sup>330</sup>



**Figure 3.56** Views of the Hadrianic Library: a) The propylon and the west façade; b) the northern section of the west façade with the engaged columns; c –d) the main hall of the complex; e) the northeastern semicircular exedra; f) the auditorium in the northeast corner of the complex (author’s photos).

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<sup>330</sup> Tigginaga (1999, 307-308).



## *Findings*

**Podium:** There was a structural podium,<sup>331</sup> 2.46 - 2.48 m wide and 1.4 m high, on three sides of the main hall. The width of the podium left for circulation was reduced to 1.56 m, after we subtract the 0.91 m thickness of the exterior walls of the room that were set on it. The podium survives as a whole in the east side, and up to the foundations in the north and south sides (figure 3.56d).

In the northeastern interior corner of the podium, there are remains of a red clay plaster layer, 0.06-0.07 m thick.<sup>332</sup>

It is assumed that the surfaces of the podium were covered with marble slabs, set on a toichobate, just like the auditorium in the same complex, and the podium of the Library of Celsus. Thus, it is reconstructed as having a 0.30 m high toichobate in the lower level, on top of which were stepping marble slabs, 0.01-0.015 m thick, and attached to the red-clay plaster with metal clams.<sup>333</sup>

**Column Screens:** The Library of Hadrian had two sets of colonnades, one around the peristyle, and one along the walls of the main hall. No evidence of column shafts or other members survives.

The only evidence of the interior colonnade of the main hall comes from a series of ten rectangular recesses on the interior of the east wall of the main hall, for the support of the beams of the entablature, which indicate the existence, the location and the height of the colonnades. The recesses are 0.55 m wide, 1.10-1.15 m high, and 0.45-0.55 m deep, and

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<sup>331</sup> Tigginaga (1999, 307-309).

<sup>332</sup> Tigginaga (1999, 307).

<sup>333</sup> Tigginaga (1999, 308).

they are spaced at a distance of 2.13-2.15 m apart, and at a height of 4.15 m from the euthenteria. Their function is interpreted to have been for the support of the beams of the entablature carried on the interior colonnade and their location signifies the interaxial spaces and the height of the colonnade.<sup>334</sup>

Additional evidence comes from the slight removal of stone material, at a square area of 0.38-0.41 m wide and 0.02-0.03 m deep, right below these recesses. These additional recesses indicate the existence of swallow pilasters, corresponding to the columns of the colonnade.

The dimensions of the colonnade is inferred from the system of ratios given by Wilson Jones for the Roman Corinthian columns, that has been verified for the columns of the propylon and the western facade: the diameter of the column 0.46 m, the height of the column 4.44 m, the height of the base 0.23 m, the height of the capital 0.508 m and the height of the shaft 3.70 m The colonnade could have been at least two-story, as the surviving height of the building is 7.20 m above the podium, and the row of the second niches is at a height of 5.62 from the podium.<sup>335</sup>

From the colonnade of the peristyle, there is evidence of the Pentelic marble slabs of the stylobate, 0.22 m thick and 1.02 m wide, set at a distance of 6.88 m from the north and south walls and 7.04 from the east. The stylobate steps on a Pentelic marble step, which steps on a course of limestone slabs with a 0.28 m wide gutter cut in it to collect the rainwater from the roof. Under this limestone cover, there is a rainwater drain. On the

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<sup>334</sup> Tigginaga (1999, 311-312).

<sup>335</sup> Tigginaga (1999, 312-315).

stylobate survive the dowel-holes,<sup>336</sup> the guidelines and the traces of the column bases of the colonnade, that indicate a column base were about 0.91m wide, and set at an intercolumniation of 2.90 m. Corresponding to the location of the columns, there are recesses (0.46 m by 0.30 m) on the back wall of the peristyle at a height of 6.55 m that were probably supporting the horizontal beams of the stoa. This evidence indicates a lower column diameter 0.6 m and column height 6.10 m, which give a proportion of 1:10, and which indicates a Corinthian colonnade.<sup>337</sup>

**Niches:** On the east wall of the Main Hall, there is evidence of two rows of nine rectangular niches, one larger in the center and four on each side.

The dimensions of the niches are constant in both rows, width 1.22 m, depth 0.48 - 0.5 m, and height 2.8 m, which is reduced into 2.35 m, after the filling of the lower section (0.4 - 0.45 m) with opus testaceum. The distance between the niches is 1.15 m. The central niches were 2.34 m wide, and 4.32 m high, and were crowned with a semicircular arch, that started at a height of 3.15 m.<sup>338</sup> The niches of the second row have the same width and depth, but their height cannot be testified due to the lack of evidence.

The interior surfaces of the niches were covered by a 0.02 m gray plaster and not by marble veneer as the rest of the walls. This verifies that they were not intended to be visible, as they were hidden by the armaria holding the books.

Only the east wall of the main hall survives to a height that the existence of niches can be verified. This doesn't exclude the possibility that all three walls had niches. Based on the

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<sup>336</sup> Sisson gives the original dimensions of the dowel holes in inches.

<sup>337</sup> Sisson (1929, 55-56).

<sup>338</sup> Tigginaga (1999, 309-311).

arrangement on the east wall, seven niches are reconstructed on each row of each sidewall.

**Floor:** In the northeast corner of the main hall, in front of the podium, there are remnants of a 0.03 m thick red clay plaster, on top of a 0.23 m thick layer of plaster and loosely connected stones. This must have functioned as the substructure for the marble slabs, with which the floor was paved.<sup>339</sup>

More extensive evidence of the luxurious floor pavement comes from the northeastern auditorium, and the square outside of the complex. Fragments of the marble floor of the northeastern auditorium survive, giving evidence for the luxurious construction of a multicolored marble floor. Along the perimeter, there is a band of two rows of rectangular marble plates, 0.94 m long, 0.44 m wide the first, and 0.34 m wide the second. Inside the boundaries of this band, the floor is laid with diagonally arranged, square slabs, made of two materials - green cipollino and deep red marble - that were alternating, forming a checkerboard pattern. The plates were 0.50 m wide, and five of them survive in situ. Evidence for the rest comes from their traces, depicted on the plaster underneath, and plenty of other fragments of marble plates. Also, there has been found in situ a 3.82 m long piece of the marble toichobate.<sup>340</sup>

Along the west facade of the complex there was a paved square<sup>341</sup> at a width of about 14.50 m. There is evidence primarily in the northern part of the façade, where one slab has been found in situ, and a few other fragments in the area. The areas between the

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<sup>339</sup> Tigginaga (1999, 308).

<sup>340</sup> Knithakis and Sympolidou (1969, 110).

<sup>341</sup> Spetsieri-Choremi (1995, 143); Tigginaga (2008, 146).

pedestals of the columns of the facade was covered by two rows of slabs, then in front of the pedestals there was one row, 0.60m wide, and last, at a lower level of about 0.06-0.09 m followed the paved court, made of slabs about 0.75-0.85 m wide and 1.20 - 2.10 m long. The paved square had a slope of about 10% to the west.

**Apertures:** The lighting of the main hall as well as the rooms next to it was through the openings of the west wall. The traces on the stylobate of the west wall of the main hall indicate that the door openings were distributed on the west wall, at a distance of 2.13 - 2.15 m from the south and northern wall. The openings had a width of 1.60 - 1.65 m and were located at intervals of 1.35 - 1.40 m. The stylobate was not constructed along its whole length with the same material: the sections of it corresponding to the openings were constructed with limestone blocks, and the sections corresponding to the walls were constructed with cement.<sup>342</sup>

**Roof:** There is no evidence of the roof of the eastern rooms, but the thinness of the walls indicates that the eastern rooms could not have been vaulted. However, they could have been roofed with wooden trusses, with coffered ceilings of wood or bronze.

Holes, 0.46 m by 0.30 m along the north and western wall, at a height of 6.55 m from the stylobate, and corresponding at the location of the columns give evidence of the shed roof of the peristyle. These holes supported the beams of the roof that ended on the entablature of the colonnade.<sup>343</sup>

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<sup>342</sup> Tigginaga (1999, 315-316).

<sup>343</sup> Sisson gives the dimensions in inches. Sisson (1929, 56).

**Stairs:** There are no findings of stairs associated with the Main Hall. Sisson<sup>344</sup> was the first one to propose the existence of stairs, without giving any evidence, but solely based on the once accepted proposal that the Celsus Library had stairs. Since then, the reconstruction of stairs in the Library of Celsus has been abandoned, and no evidence has been found either in the Library of Hadrian, but subsequent researchers have accepted Sisson's proposal as a given. I argue that since there is no evidence of stairs in any of the libraries, this theory should be abandoned.

There is evidence of stairs inside the northeastern auditorium, along the sidewalls, which gave access to the sloped seating area. Evidence of the height of the steps at 0.22 m comes from the traces on the west surface of the eastern wall, and indication of the length of the steps comes from the floor pattern that did not start but at a distance of 0.90 m from the entrance door, probably because the area in front of the stairs was signified in the floor pattern.<sup>345</sup>

**Walls:** The peristyle walls were 0.66 m thick, made of limestone blocks in the pseudoisodomic system, (ie. courses of stone blocks of different heights, made of blocks of different length) resting on a sequence of toichobate, orthostate, string course. The wall survives to full height in the middle section of the east, partially in the north, and in the north section of the west. Also, the lower part of the southwestern anta wall, with the orthostates, the marble blocks and the anta with its molded base survives. There are remains of holes with metal clamps, where marble slabs were supported. These traces appear up to the height of the beam holes.

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<sup>344</sup> Sisson (1929, 60).

<sup>345</sup> Knithakis and Sympolidou (1969); Koumanoudes (1886, 13-24).

The exterior walls of the eastern rooms are 0.91 m thick and are partially made out a combination of the pseudoisodomic system in the exterior, as the peristyle walls, and brick faced concrete in the interior, with limestone blocks in the corners and around the niches. The interior walls of the eastern rooms are made of brick faced concrete, with stone framed openings.<sup>346</sup>

**Table 3.15** Summary of key characteristics and measurements of Hadrian’s library.

<i>Features</i>	<i>Data</i>
Location	Next to the Roman Agora, Athens
Date	131 C.E.
Founder	Hadrian
Identified by	Ancient testimonia and building remains
Orientation	West - East
Main Hall Width	20.22 m
Main Hall Length	14.05 m
Main Hall Area	284.091 m <sup>2</sup>

### *3.1.16. Library in the Forum of Philippi, Northern Greece*

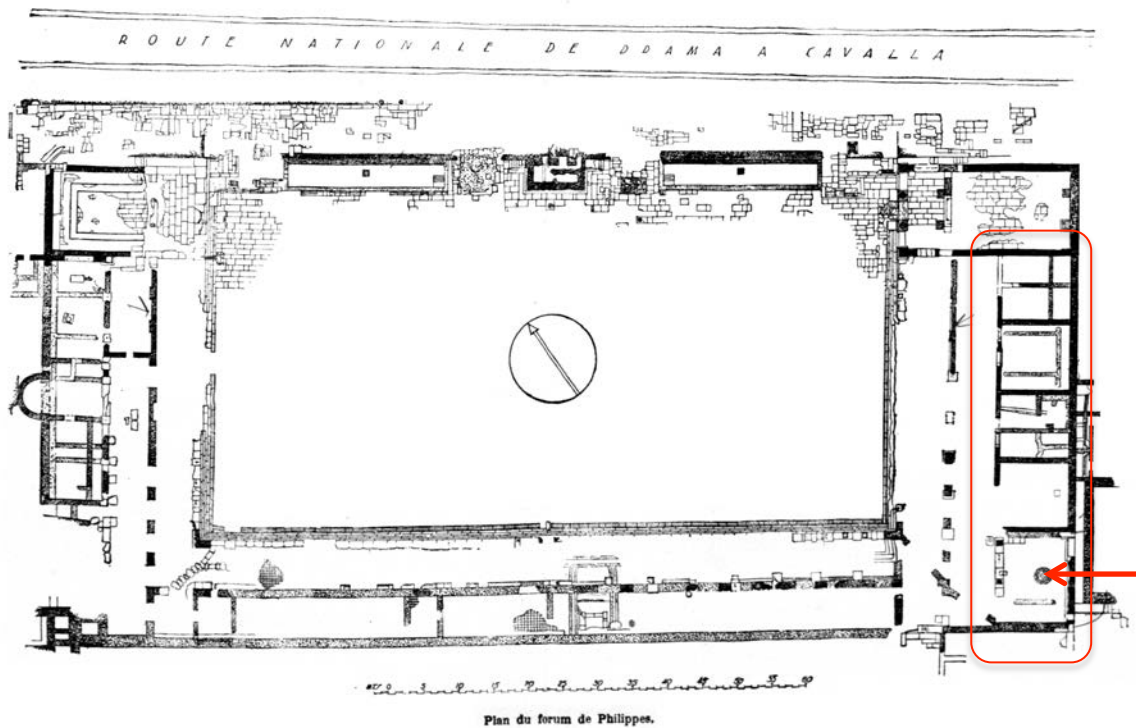
The library at the Forum of Philippi is known through a fragment of the entablature of the forum that bears the dedicatory inscription of the building and clearly names it as the public library of the colony of Philippi.<sup>347</sup> This was on the east side of the forum, along the two-aisle colonnade,<sup>348</sup> which consists of a temple at the north end, and four identical rooms that share a common back wall with the temple, and a larger southeast room (figures 3.57, 3.58 and 3.59a).

<sup>346</sup> Tigginaga (2008, 303-304).

<sup>347</sup> Collart (1937, 338); 1933, 317-320).

<sup>348</sup> Collart (1937, 338-339).

The library was originally identified with the four identical rooms and the larger southeast room (figure 3.57). The overall schema of the library of Philippi, being attached to a colonnade and consisting of several rooms that have no specific characteristics of the interior design of a Roman library, recalls the library of Pergamon (chapter 3.1.2) and led researchers to interpret it as a return to the building type of a Greek library, without the Roman interior design.<sup>349</sup> The main hall of the library was identified with the third from the south room based on the foundation walls in a U-shape formation that are in the center.<sup>350</sup> In this room the doorjambs survive in their original location (figure 3.59d).



**Figure 3.57** State of preservation plan of the Forum of Philippi. The red shape points to the four identical rooms and the southeastern room, identified with the library (Collart 1937, pl. XLIV).

<sup>349</sup> Callmer (1944, 178-181); Tonsberg (1976, 87-88); Strocka (1981, 306-307); Wendel (1949, 410).

<sup>350</sup> Collart (1937, 339).



However, a closer analysis of the data showed that the foundation walls in the third from the north room were from an earlier structure that had been demolished by the time of the construction of the library, and therefore could not be identified as the podium of the library.<sup>351</sup> Also, the fact that there is insufficient evidence of any special characteristics does not mean that the library was a return in the Greek type. There are other Roman libraries that consist of only one room with no special characteristics, for example the Pantainos Library (see chapter 3.1.9) that has no evidence of a podium, niches or colonnade, and the Neon (chapter 3.1.12) and the Melitine Libraries (chapter 3.1.14) that do not have a podium or a colonnade.

It is possible that the library consisted of only one room, the main hall, or that it included extra spaces to the side. In all cases, the main hall should be identified with the southeast room. First, it has a monumental entry with openings between granite columns and pilasters.<sup>352</sup> Also, it is independently constructed, as one would expect from a building dedicated through private patronage and sponsorship. Last, it has similar dimensions to other main halls of provincial libraries, such as the Rogatinus Library (see chapter 3.1.17) and the Library of Nysa (chapter 3.1.13) and was even larger than the Neon Library (chapter 3.1.12) and the Pantainos Library (chapter 3.1.9).

There is not enough evidence to determine whether the four identical rooms to the north were part of the library or not, but given the context, it is more reasonable to consider them part of the overall design and function of the forum and interpret them as administrative offices.

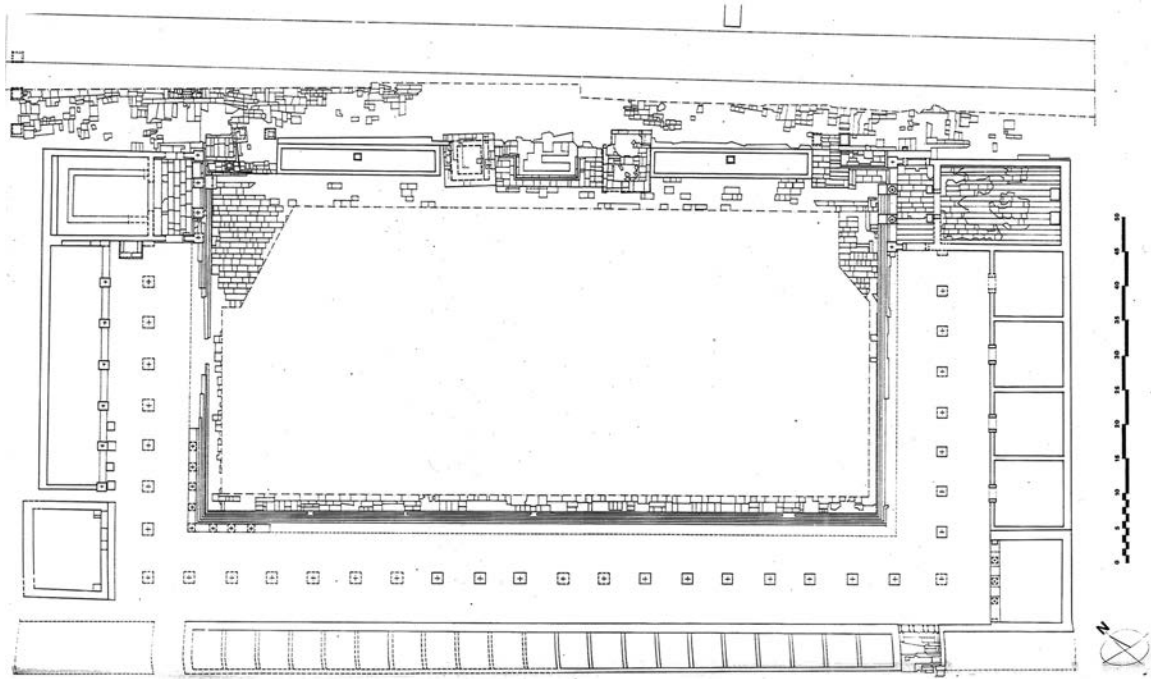
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<sup>351</sup> Johnson (1984, 41-42); Sève (1979, 627-631).

<sup>352</sup> Johnson (1984, 42-43).

### *Main Hall Description*

The main hall of the library is a large room, 13.07 m wide and 9.37 m long (figure 3.59b). It opened to the stoa of the forum with four openings among three granite columns and the pilasters attached to the walls (figure 3.59c). The central column is aligned with the south interior colonnade of the forum. The room has a monumental entrance with three granite columns among pilasters. Johnson mentions that there is a podium along its north wall, but I have not been able to identify this on site.



**Figure 3.58** Reconstruction plan of the Forum of Philippi. The arrow points to the southeastern room, which is identified as the main hall of the library (Sève and Weber 1986, pl. C).

The degree of preservation of the room does not show any special characteristics. The walls do not survive to a big height to determine whether they included niches or not, but

their thickness of about 0.65 m does not exclude the possibility of niches with maximum depth 0.5 m. The walls are stepping on a larger platform, like a structural podium. This structure has a small depth but follows all three walls of the room, and is primarily visible in the southeast and northeast corners of the walls.



**Figure 3.59** Views of the Library in the forum of Phillipi: a) view of the east side of the forum from the northeast; b) view of the main hall from the south; c) view of the main hall from the southwest; d) view fo the doorjamb from the third from the north room; e) view of the northeast corner of the main hall; f) view of the southeast corner of the southeast room (author's photos).

## *Findings*

**Podium:** There is evidence in the southeastern room of a podium along its northern wall. The podium was covered with marble slabs and moldings along the front.

Building remains in the two corners of the southeast room show the three walls were stepping on a structural podium (figures 3.59e and 3.59f). This was at a small distance above the floor level and had a larger depth than the depth of the walls.<sup>353</sup>

**Column Screens:** There is no evidence of any interior column screen.

The entrance to the southeast room was screened by three red granite columns of Corinthian order. The central column was aligned with the interior colonnade of the south stoa of the forum.

**Niches:** No evidence.

**Floor:** No evidence.

**Apertures:** There are four openings between columns and pilasters that cover the whole length of the west side of the southeast room. There is no evidence of windows. The stoa has an eastern orientation and it is assumed that sufficient light could enter from the door openings.

Johnson<sup>354</sup> suggested that the multiple openings between columns would not have been sufficient for the safety of the books, but similar openings are testified in other libraries,

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<sup>353</sup> On site observation.

<sup>354</sup> Johnson (1984, 43).

e.g. in the Ulpian Library (see chapter 3.1.11), Hadrian's Library in Athens (see chapter 3.1.15), and the Neon Library (3.1.12).

**Roof:** No evidence.

**Stairs:** No evidence.

**Walls:** The walls survive to a very low height. They were constructed with ashlar stones.

**Table 3.16** Summary of key characteristics and measurements of the library in the Forum of Philippi.

<i>Features</i>	<i>Data</i>
Location	Philippi
Date	2nd century C.E.
Founder	Optatus
Identified by	Ancient testimonia and building remains
Orientation	East - West
Main Hall Width	13.07 m
Main Hall Length	9.37 m
Main Hall Area	122.47 m <sup>2</sup>

### 3.1.17. *Library of Rogatinus, Timgad*

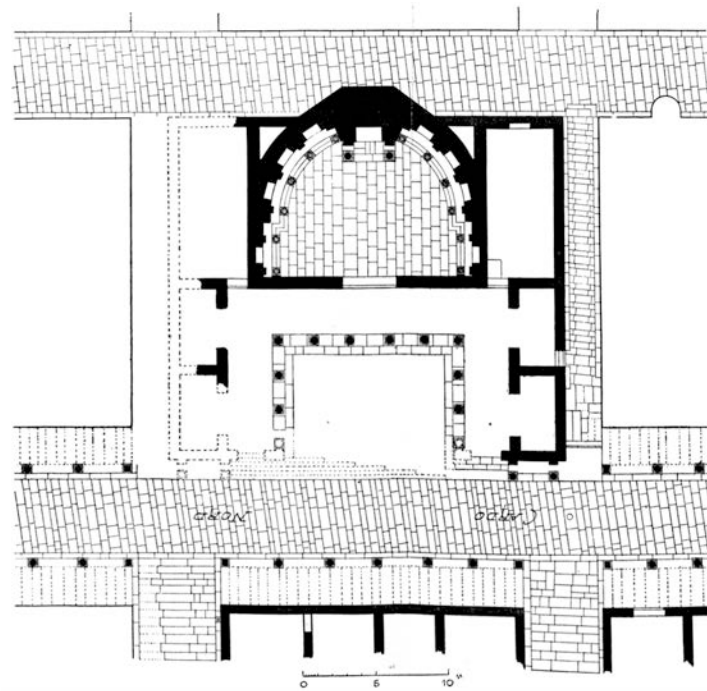
The library of Rogatinus occupied an entire insula, 24.69 x 23.47 m, and is located in a prominent position of the city of Thamugadi,<sup>355</sup> on the *cardo maximus*, to the north of the forum.<sup>356</sup> It is identified by its dedicatory inscription, which is restored above the entrance of the main room. Initially, only part of the inscription was found and the

<sup>355</sup> Boeswillwald, Cagnat, and Ballu (1905); Cagnat (1927).

<sup>356</sup> Cagnat (1909, 10-16); 1927, 103-106); Callmer (1944, 181-182); Götze (1937, 240-243); Johnson (1984, 31-40); Makowiecka (1978, 86-90); Pfeiffer (1931, 157-165); Tonsberg (1976, 106-109); Vössing (1994, 173-174); 2007, 159-160).

building had been interpreted as a meeting place,<sup>357</sup> but after the discovery of the second fragment of the inscription, it was clarified that the building was a library, donated by a citizen of Timgad, Julius Quintianus Flavius Rogatianus.<sup>358</sup>

The building consists of one main hall and six smaller rooms, all located along the three sides at the perimeter of the block, looking towards a central U-shaped portico (figures 3.60 and 3.61). The facade of the building towards the street was open. One had access directly from the street to the courtyard of the portico through steps. From there, one passed through a balustrade, to the portico, which gave access to the different rooms.



**Figure 3.60** Restored plan of the Rogatinus Library in context (Ballu 1903, pl. 5).

<sup>357</sup> Ballu (1903, 24-25).

<sup>358</sup> Cagnat (1909, 11); Pfeiffer (1931, 159).

On the axis of the building, there was the central semicircular apsidal room, which was the main hall of the building. It had a focal point, a podium with steps and niches along its walls (figure 3.62). The main hall was flanked by a rectangular room on either side. In front of them, there are two smaller rectangular rooms in either side. These rooms have no traces of a gate, they were open to the portico, and probably were used for studying.

The courtyard in front of them was paved with limestone slabs, and the portico had twelve Corinthian columns.



**Figure 3.61** View of the Rogatinus Library, scaled state of preservation model (1:20), Museo Civiltà Romana in Rome (author's photo).

### *Main Hall Description*

The main hall of the library follows the typical layout of a Roman library. It has a podium, supporting columns, and steps in front of it, rectangular niches on the walls and a protruding aedicula that forms a strong focal point. Special characteristic of the main hall of this library is the apsidal back wall of the room. In fact the apsidal back wall is so overpowering that it gives the sense that the room is apsidal. Still, the apse is preceded by

short lateral walls, perpendicular to the front. These walls are offset from the apse by 0.46 m. The semicircular back wall projects by a short distance into the street.

There is no evidence or indication of a second level of niches. Were the niches in two floors, the main hall would be too high, and with the semidome, it would be out of proportion to the rest of the building.<sup>359</sup>



**Figure 3.62** View of the main hall of the Library, scaled state of preservation model (1:20), Museo Civiltà Romana in Rome (author's photo).

### *Findings*

**Podium:** There are building remains of a podium, 0.50 m high, by 0.60 m wide, located along the wall, in front of the niches. It is preceded by two steps, each 0.30 m deep and

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<sup>359</sup> Pfeiffer (1931, 163); Strocka (1981, 316-317).



0.20 m high. The steps are interrupted in front of the walls between the niches by plinths 0.55 m high, on top of which were set columns.

**Column Screens:** The facade of the building, the courtyard, and the semicircular apsidal room were screened by columns. On the facade of the building, there were two columns on each side. The courtyard facing the street was screened by twelve columns, among which was a balustrade that enclosed the space behind them.

Also, along the wall of the apsidal room, there was a column screen of twelve columns, framing the niches. The columns are Corinthian 0.45 m diameter and 3.5 m high, and step on plinths 0.55 m high. Two larger twisted columns framed the central niche. All columns were of Corinthian order and carried a continuous entablature, which only broke in front of the focal point.<sup>360</sup>

The exterior columns survive to their full height with their capitals, while a column framing the central niche survives with base and part of the shaft.

**Niches:** The main hall of the library had rectangular niches on its walls and a central aedicula on its axis. The rectangular niches were 1.25 m wide, and 0.5 m deep were located 0.75 m above the level of the podium. There were eight rectangular niches total, two on the two lateral walls, and six on the semicircular walls. The row of niches was interrupted by a central aedicula that was directly across the entrance, and was formed by

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<sup>360</sup> Pfeiffer (1931, 161-162).

a large niche 1.8 m wide and 1 m deep, that was flanked by pilasters with two Corinthian columns, 5 m tall.<sup>361</sup>

**Floor:** Floor remains indicate that the courtyard was paved with white limestone slabs, the portico with mosaics, and the apsidal room with white limestone on the floor, the steps and the podium.<sup>362</sup>

**Apertures:** There is no evidence of windows. However, windows have been restored in the front wall of the main room.

The side rooms would have been illuminated by the door openings: The four small rectangular rooms had wide openings of 2.74 m which brought sufficient natural light for them to function as exedras for study and discussion. The larger rectangular rooms had very narrow doorways that suggest their function as book storage, unless there was another way of lighting.

**Roof:** There is no evidence for the roof. The apsidal area is restored with a semidome, and the area around the short lateral walls, with a flat roof<sup>363</sup> or a wooden barrel vault<sup>364</sup> or stone/brick barrel vault.<sup>365</sup> In the last case, the side rectangular rooms were also covered with similar barrel vaults that would have functioned as buttresses.

**Stairs:** No evidence.

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<sup>361</sup> Ballu (1903, 23); Johnson (1984, 33); (Pfeiffer 1931, 161).

<sup>362</sup> Pfeiffer (1931, 160-161).

<sup>363</sup> Langie (1908, 90-93).

<sup>364</sup> Pfeiffer (1931, 161).

<sup>365</sup> Makowiecka (1978, 89).

**Walls:** The walls of the main room were richly decorated with colored marble revetments.

**Table 3.17** Summary of key characteristics and measurements of the Rogatinus library

<i>Features</i>	<i>Data</i>
Location	On the northern side of Cardo maximus, Timgad
Date	Before 250 C.E.
Founder	Julius Quintianus Flavius Rogatianus
Identified by	Ancient testimonia and building remains
Orientation	West - East
Main Hall Width	15 m
Main Hall Depth	10 m
Main Hall Area	103.59 m <sup>2</sup> . The area of the room is reduced because of its apsidal shape.

### **3.2. Possible Libraries identified with building remains, but not known from ancient testimonia**

The libraries that are not known from ancient testimonia, but are identified with building remains include twelve examples. These libraries have architectural characteristics of libraries and are likely to be libraries, even though there is no reference in ancient testimonia to verify their identification. Each case study is briefly presented below based on geography, and in chronological order. Emphasis is given in the tabulation of the findings pertaining to the spatial characteristics of the libraries, namely, the main hall, podium, colonnade, stairs, apertures, roof, floor, stairs, and walls.

### 3.2.1. Taormina, Library at the Gymnasium

A library has been identified in the gymnasium of Tauromenion in Sicily based on the remains of pieces of plaster with historical text written on it.<sup>366</sup> The architectural form of the library or the gymnasium is not known.

**Table 3.18** Summary of key characteristics and measurements of the library at the Gymnasium of Taormina.

<i>Features</i>	<i>Data</i>
Location	Gymnasium
Date	130 B.C.E.
Founder	Unknown
Identified by	Building Remains
Orientation	-
Main Hall Width	-
Main Hall Depth	-
Main Hall Area	-

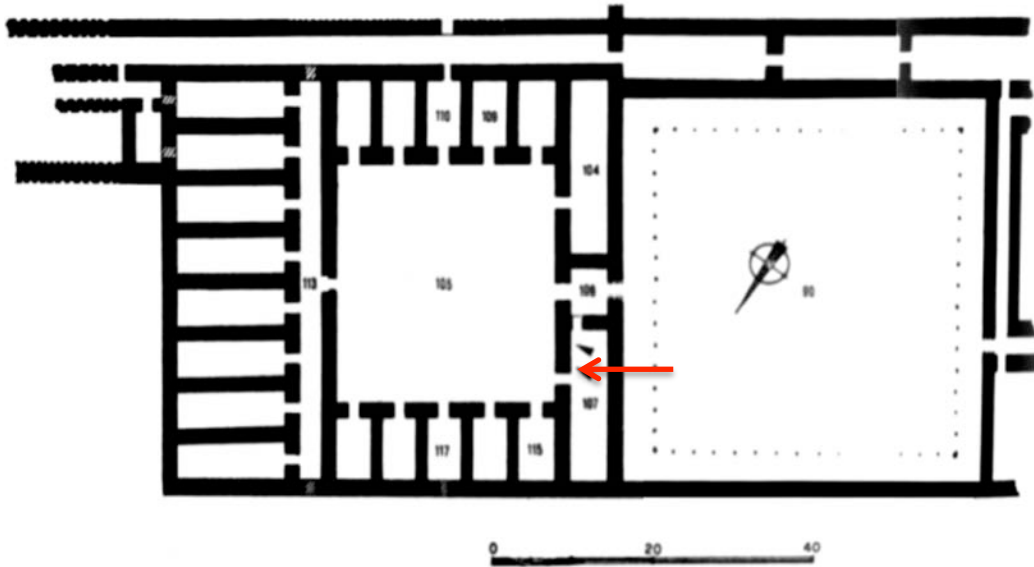
### 3.2.2. Hellenistic Royal Library in the Palace of Bactria

A library has been identified in the Palace of the Hellenistic king Eykratides in the so-called Bactrian city Ai-Khanoum,<sup>367</sup> based on papyruses that were found in one elongated room of the palace (figure 3.63). The room that contained the papyruses was very long and was accessed from a smaller square hall, and also directly from an interior court. The content of the papyruses is philosophical which points to the identification of the hall as a library and not as an archive.

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<sup>366</sup> Manganaro (1974, 389 - 409).

<sup>367</sup> Rapin (1987, 225-265).



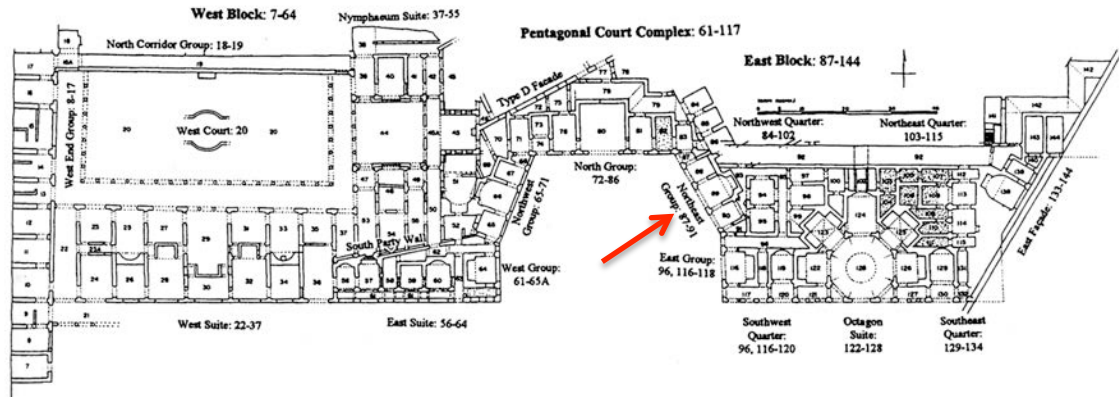
**Figure 3.63** Plan of the Palace of Eykratides in Bactria (Ai-Khanoum). The arrow points to the room, where the papyri were found (Rapin 1987, fig. 1).

**Table 3.19** Summary of key characteristics and measurements of the library in the Palace in Bactria.

<i>Features</i>	<i>Data</i>
Location	Palace of Bactria, contemporary Ai-Khanoum
Date	150 B.C.E.
Founder	Eukratides
Identified by	Building Remains
Orientation	East-West
Main Hall Width	4.55 m
Main Hall Length	18.40 m
Main Hall Area	83.72 m <sup>2</sup>

### 3.2.3. Private Library in Domus Area

A semicircular room in the northeast side of the pentagonal court in Nero's Domus Aurea (figure 3.64) has been identified as a possible library, based on the existence of niches.<sup>368</sup>



**Figure 3.64** The plan of the Esquiline wing of Domus Aurea, Rome (Ball 2003, fig. 3)

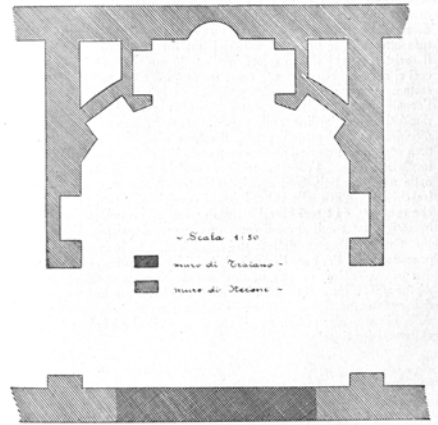
### Main Hall Description

The hall is apsidal in plan and along with two more rooms, one on each of its sides, constitutes the northeast suite that was looking towards the pentagonal court. All three rooms were interconnected to each other through doors. The central apsidal hall was directly entered from the court through door openings (figure 3.64). The central room has two niches on its long sides, and two niches and a focal point on its back wall (figures 3.65 and 3.66).

This tripartite suite recalls the banquet halls in the palace of the Macedonian kings in Vergina<sup>369</sup> and it unlikely that was used as a library, primarily based on the circulation

<sup>368</sup> Callmer (1944, 60-61); Gregori (1937, 21); Strocka (1981, 309, n.28) rejects this view on the basis that there is no podium.

pattern that allowed circulation between the three rooms, and also based on the lack of a threshold, since the apsidal room were not preceded by a stoa or any other threshold.



**Figure 3.65** Restored plan of the Library in Domus Aurea (Gregori 1937, fig. 14).



**Figure 3.66** View of the Library in Domus Aurea (Gregori 1937, fig. 13).

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<sup>369</sup> Kottaridi (2011, fig.32).

## *Findings*

**Podium:** No findings.

**Column Screens:** No findings.

**Niches:** There are four niches on the sidewalls, located around 1 m above the floor level. These niches did not belong in the original phase of the building and were opened up later.<sup>370</sup>

**Floor:** No findings.

**Apertures:** The apsidal hall opens directly into the pentagonal court

**Roof:** The building was roofed with a masonry vault.

**Stairs:** No findings.

**Walls:** Wall remains of the apsidal hall include pre-Neronian and post-Neronian phases.

**Table 3.20** Summary of key characteristics and measurements of the library in the Domus Aurea.

<i>Features</i>	<i>Data</i>
Location	Pentagonal Court, Domus Aurea, Rome
Date	64 C.E.
Founder	Nero
Identified by	Building Remains
Orientation	Southwest - Northeast
Main Hall Width	4.55 m
Main Hall Length	18.40 m
Main Hall Area	83.72 m <sup>2</sup>

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<sup>370</sup> Ball (2003, 90-92).



#### 3.2.4. *Library in the Forum of Pompeii*

The building on the east of the forum (figure 3.67), between the Macellum and the Temple of Vespasian has been identified as a possible library,<sup>371</sup> because its plan resembles the Rogatinus Library (see chapter 3.1.17). Other interpretations of the building are a Temple of the Public Lares, a Curia or Senaculum, or a Temple for the Imperial Cult.<sup>372</sup>

The building has bilateral symmetry and consists of a main hall to which are attached one rectangular exedra on each of the long sides, and a semicircular apse on the axis (figure 3.68).

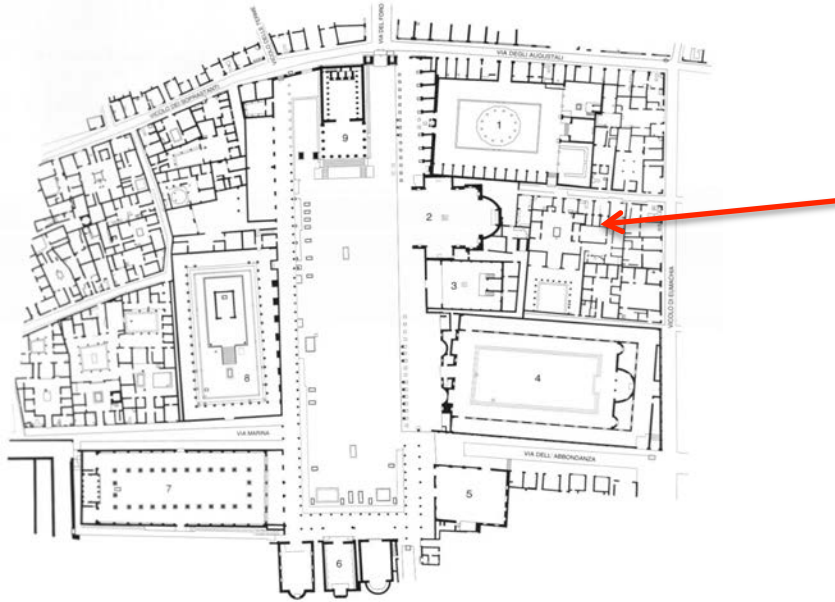
The building has an open exedra to the east side of the forum with eight columns in front of it. Different suggestions can be made about its conceptual geometric form. Dobbins<sup>373</sup> suggests that it was conceived as a square with the main axes coinciding with the centerlines of the square. It is true that the interior dimensions of the building measured from the end of each exedra, and the end of the apse are almost the same, making the building inscribed in a square. Still, the sacred cut does not justify any of the other design features other than the location of the central apse, and even that approximately.

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<sup>371</sup> Cagnat (1909, 16-20); Richardson (1977, 394-402).

<sup>372</sup> Mau (1896, 299-300) interpreted it as a Temple of the Public Lares, Overbeck and Mau (1884, 128-131) as a political building, a curia or a senaculum, and Dobbins (1996, 99-114); Dobbins (1994, 685-688) as a Temple for the Imperial Cult. Callmer (1944, 167-169, n.3) refected the interpretation of the building as a library on the basis that it had a statue base on the center, a feature that does not appear in any other library.

<sup>373</sup> Dobbins (1996, 99-114)

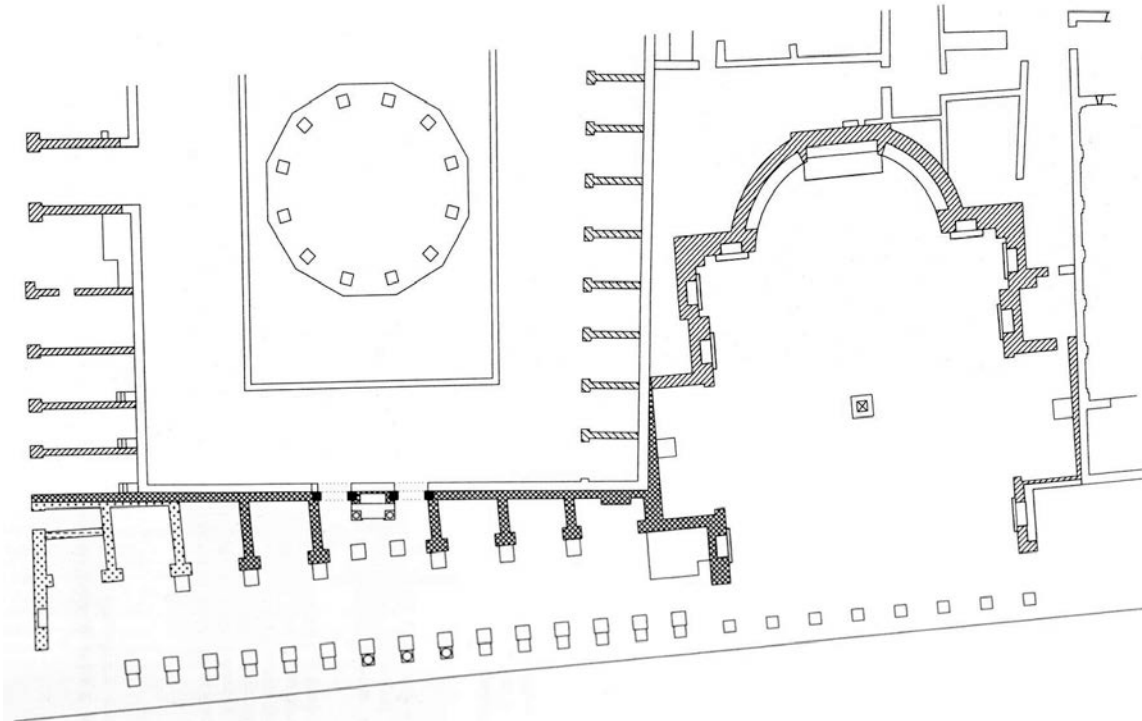


**Figure 3.67** Topographical plan of the forum of Pompeii (Dobbins 1996, fig. 1).

Another interpretation can be suggested if the building is taken as a whole with the space in front of its entrance including the eight columns. In this case, the building acquires the form of a prostyle, octastyle rectangular building, with a tripartite division on the long side, with the placement of the exedras exactly at the center.

The apse has dimensions 11.00 x 6.5 m. Along the wall of the apse, there is a 1.75 m high and 0.85 m wide podium. In the center, the podium is interrupted by an aedicula, 3.03 m wide that projects forward. The aedicula is framed by two columns. In the back wall, there is a rectangular niche, 0.90 m higher than the podium. The podium on each side of the aedicula bears traces of rectangular bases for two columns in the middle, and two half-columns in its two ends.

The two rectangular exedras attached to the long sides of the main hall were screened by two columns, the bases of which remain. The exedras had no other features, other than a 1.55 m high base in the center, probably for a statue.



**Figure 3.68** Restored plan (Dobbins 1996, fig. 4).

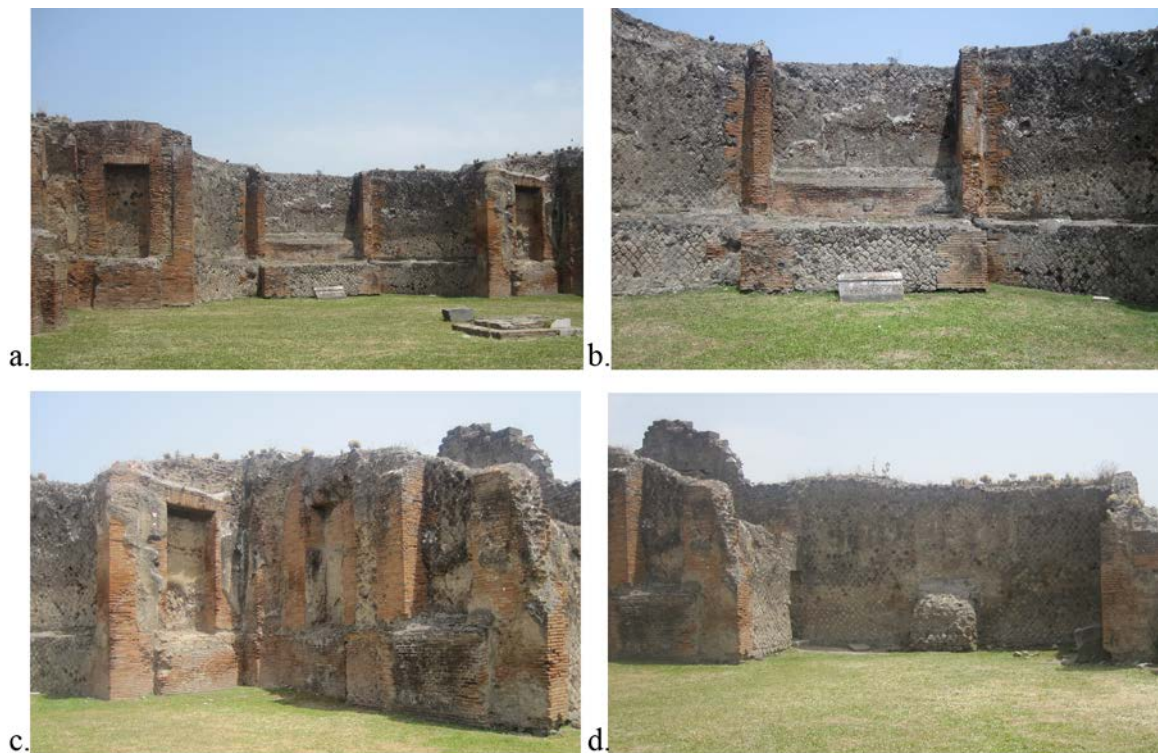
### ***Main Hall Description***

The main hall is slightly elongated, is 18.20 m wide and 19.90 m long. One rectangular exedra is attached to each of the long sides, and a semicircular apse on the axis (figure 3.69a and 3.69b).

Along the walls of the main hall, there were also smaller niches, two framing the exedras, two framing the apse, and two more, each between the niches of the apse and the niches

of the exedras. In front of these niches, the walls formed swallow projections and this is where the columns were set. Traces on the walls indicate that the columns were accompanied by pilasters set as a reflection of the columns against the wall.

In the center of the space, there is an altar. The walls were decorated with marble veneer.



**Figure 3.69** Views of the Hall in Pompeii: a) view of the semicircular exedra in the back; b) view of the niche in the semicircular exedra; c) view of the niches at southeast corner; d) view of the south exedra (author's photos).

### *Findings*

**Podium:** Along the semicircular apse, there is a podium, 0.85m. deep and 1.75 m high.

The podium did not give access to anything. It only supported columns and half columns,

and possibly statues. At the center of the podium there was a projection, like an aedicula that probably supported statues.

**Column Screens:** In the apse, there were two columns between two half-columns on each side of the podium. A focal point was given with the central aedicula, in which two columns supported the entablature.

Columns were also placed on the small basis in front of the niches of the main hall.

Last, the building had eight columns in front of its entrance, which was part of a larger colonnade that screened the forum.

**Niches:** There is a total of eight niches along the walls of the main hall, two framing the semicircular apse (figure 3.69a), and two framing the two rectangular exedras (figure 3.69d). On each side of the main hall, there is one more niche, located between the niche adjacent to the apse and that adjacent to the exedra (figure 3.69c). This last one is recessed further in the wall.

The niches were located 1.70 m above the floor level, and were framed by decorative columns.

**Floor:** There are traces in the corner of marble tiles of different colors alternating in a pattern of squares and circles.

**Apertures:** There are no remains of windows. The lighting of the building was probably from the front facade that opened to the forum.

**Roof:** No findings. There is not enough evidence to conclude on whether the building was roofed or not.

**Stairs:** No findings.

**Walls:** The walls were made of concrete and were faced with polychromatic marble veneer. At the moment of its destruction in 79 C.E., the building was under renovation from its partial destruction from the earthquake of 62 C.E.

**Table 3.21** Summary of key characteristics and measurements of the library in the Forum of Pompeii.

<i>Features</i>	<i>Data</i>
Location	East of the forum, between the Macellum and the Temple of Vespasian
Date	62 C.E.
Founder	Unknown
Identified by	Building remains
Orientation	West - East
Main Hall Width	18.6 m
Main Hall Length	19.90 m
Main Hall Area	370.14 m <sup>2</sup>

### *3.2.5. Library in the Forum of Thessaloniki*

The library or the archive at the Forum of Thessaloniki is identified based on the building remains and their similarity to the Forum of Philippi, where the existence of a library is testified by a dedicatory inscription. The fora of Thessaloniki and Philippi followed the same schema; a U-shaped stoa with rooms attached to it and an open court in the center.

The north side opened to the main street of the city. The forum of Thessaloniki is larger, so that the forum of Philippi could be fit in its open court.<sup>374</sup>

The library has been identified with the southeastern room of the forum, as is the Library of Philippi in the southeast corner of the Forum of Philippi (figure 3.57). This room belongs to the first phase of the forum, in the end of the 1st century C.E., and it was in function throughout the history and the building phases of the forum, from its first organization as a public space until the fifth century C.E., when the forum was abandoned as a public space.<sup>375</sup>

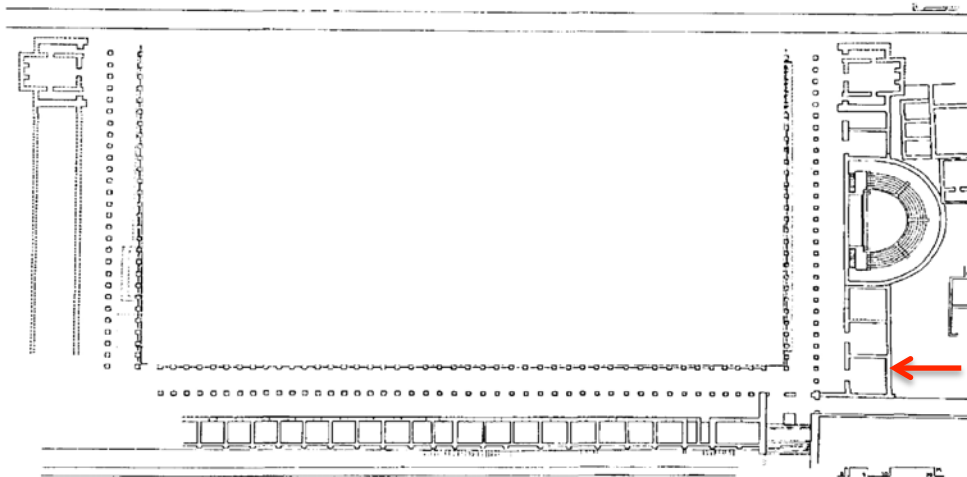
The east side of the forum had bilateral symmetry and was organized with a large hall in the center, the bouleuterion, flanked by a series of three square rooms with no specific characteristics and a larger corner room on each side. The library or archive is identified with the southeastern hall. The northeastern hall has been identified with the mint. The rooms of the east side of the forum were preceded by a stoa, which was closed with screens between the columns, with the exception of an opening in the intercolumniation in the southeastern corner, right in front of the room identified with a library.<sup>376</sup>

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<sup>374</sup> Velenis (1990-1995, 132).

<sup>375</sup> Kalavria and Boli (2001, 44).

<sup>376</sup> Skiadaresis and Chatzidakis (2001, 246).



**Figure 3.70** Restored plan of the Forum of Thessaloniki (Velenis 1990-1995, fig. 4).

### *Main Hall Description*

The archive or library consisted of only of one hall, the southeastern corner room of the forum (figures 3.71 and 3.72b). The hall was accessible from the stoa of the forum through one door opening (figures 3.72a and 3.72e), and had niches inside.<sup>377</sup> The hall of the library was more emphasized and larger than its neighboring rooms: it was wider and deeper to the east.

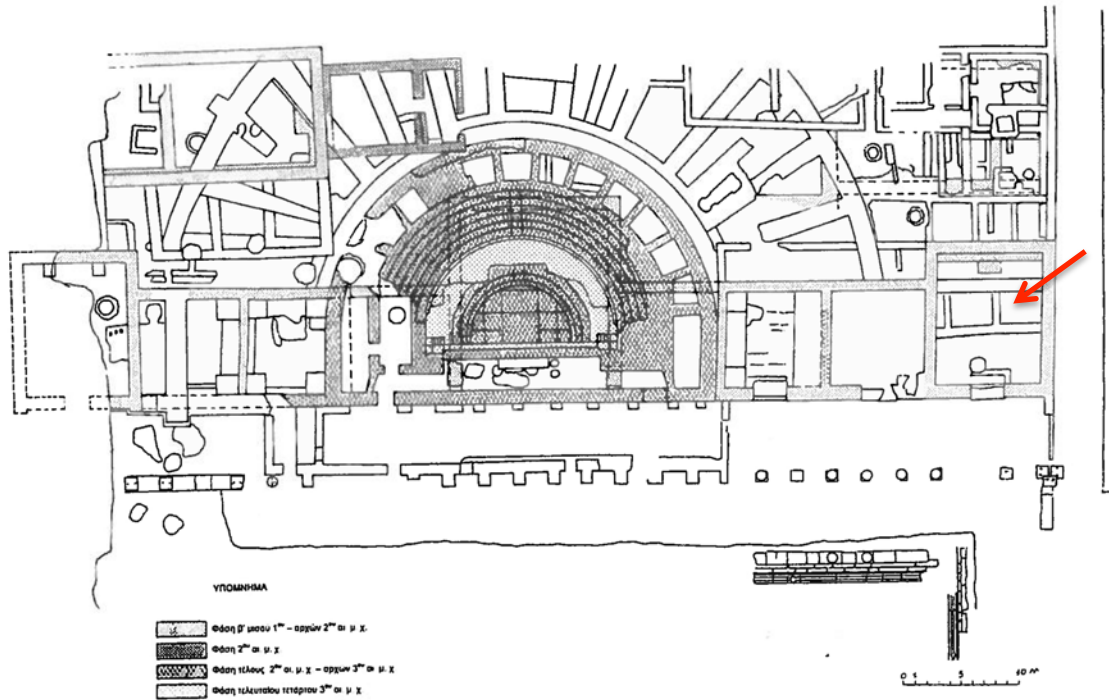
In the third century C.E., when the bouleuterion was expanded into an odeium, the east and south walls of the building were rebuilt. The east wall was shifted inwards, reducing the depth of the hall at the same depth as the other rooms of the forum to the north. The south wall was rebuilt in its original location.

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<sup>377</sup> Veleni (2001, 28). For a discussion on the existence of niches see niche findings.



There are no findings from that hall other than a fragment of a marble table support with sculptural decoration of excellent quality, as appropriate to a public building.<sup>378</sup>



**Figure 3.71** State of preservation plan of the east side of the forum. The arrow points to the southeastern room identified with a library (Kalavria and Boli 2001, fig. 1).

### *Findings*

**Podium:** In the state of preservation plan it appears that there was a podium along the east wall of the hall, but nothing is visible in the building remains.

**Column Screens:** No findings.

<sup>378</sup> Adam-Veleni (1990-1995, 155).

**Niches:** In bibliography<sup>379</sup> it appears that there are findings of niches in the north wall of the hall. However, a visit to the site did not help identify any remains of niches (figure 3.72d).



**Figure 3.72** Views of the Library in the Forum of Thessaloniki: a) view from the peristyle; b) view of the library from north; c) view of the south wall of the library; d) view of the north wall of the library; e) view of the west wall of the library; f) view of the east wall of the library (author's photos).

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<sup>379</sup> Veleni (2001, 28-29).

**Floor:** No findings.

**Apertures:** No evidence of windows. There is evidence of one door in the west wall, the entrance to the hall.

**Roof:** No findings.

**Stairs:** No findings.

**Walls:** The walls are 1.06 m thick and are in opus mixtum, with the use of large stone blocks at the corners. In the southeastern corner of the hall, which coincides with the southeastern corner of the agora complex, the corner stones are made of marble and are arranged at the whole width of the walls on the first row, alternating with vertically arranged stones on the second, and so on.<sup>380</sup> The rest of the walls is constructed in opus incertum alternating with opus latericium of four courses of bricks every 1.9 m

The south and the east walls of the hall were reconstructed in a later phase. At this point the floor level of the hall was lower than the street level, and to protect the walls from humidity, a course of marble blocks at 0.8 m above floor level. Also, the opus latericium of this phase has five courses of bricks, instead of four of the earlier phase.

**Table 3.22** Summary of key characteristics and measurements of the library in the Forum of Thessaloniki.

<i>Features</i>	<i>Data</i>
Location	Southeast corner of the Forum of Thessaloniki
Date	Second half of 1st century - beginning of 2nd century CE

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<sup>380</sup> Kaliga (2001, 108).

Founder	Unknown
Identified by	Building remains
Orientation	West - East
Main Hall Width	8.96 m
Main Hall Length	11.33 m
Main Hall Area	40.59 m <sup>2</sup>

### 3.2.6. *Library at Side*

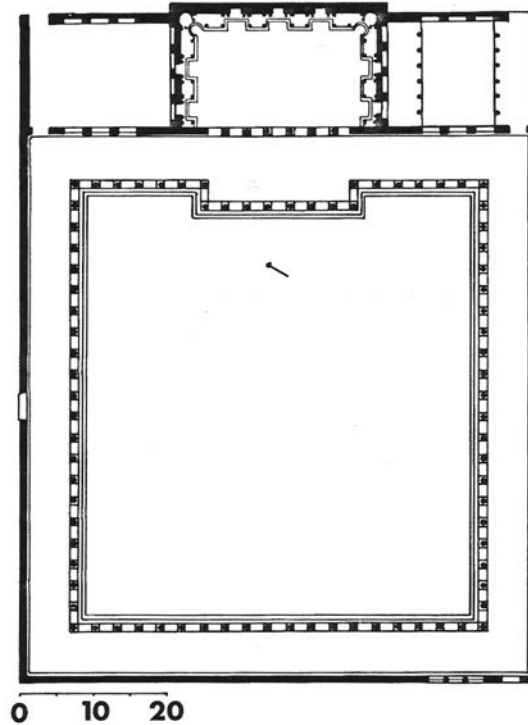
A library has been identified with one or more rooms of the so-called Structure M in Side (figure 3.73). Structure M is a monumental rectangular complex, 88.5 x 69.2 m. It consists of a rectangular courtyard, 57.70 x 53.4 m, surrounded by an Ionic colonnade 7 m deep in all four sides.<sup>381</sup> Along the east side, there are three halls attached.

The central hall is 26.45 x 15.20 m and the south and north halls are 19.50 x 14.75 m. The central hall was lavishly decorated with niches, and aediculae that contained statues (figure 3.74). Corresponding to the length of the central hall, the colonnade of the peristyle projects to further emphasize the importance of the central hall. All three halls are accessed directly from the portico through colonnades and have the axis of symmetry, on their short side.

The entrance to the complex was on the north side. There was also a little door in the south hall, but it is not clear where this door led. It is not clear whether the complex had more entrances in its original phase. The entrances restored in the southwest corner belong to a later phase.

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<sup>381</sup> Mansel (1956, 58-69).



**Figure 3.73** Restored plan of Structure M at Side (Mansel 1956, fig. 18).

The interpretation of Structure M and of the central hall has been debated, and no conclusive agreement has been reached yet. The whole complex has been interpreted as a state agora,<sup>382</sup> or as a gymnasium,<sup>383</sup> and the central hall has been interpreted as a hall for the imperial cult,<sup>384</sup> or just as a museum of sculpture or gallery.<sup>385</sup> The side halls have been interpreted as libraries<sup>386</sup> or also as containing statues.<sup>387</sup>

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<sup>382</sup> Johnson (1984, 176-177).

<sup>383</sup> Mansel (1963, 118-119).

<sup>384</sup> Mansel (1963, 118-119).

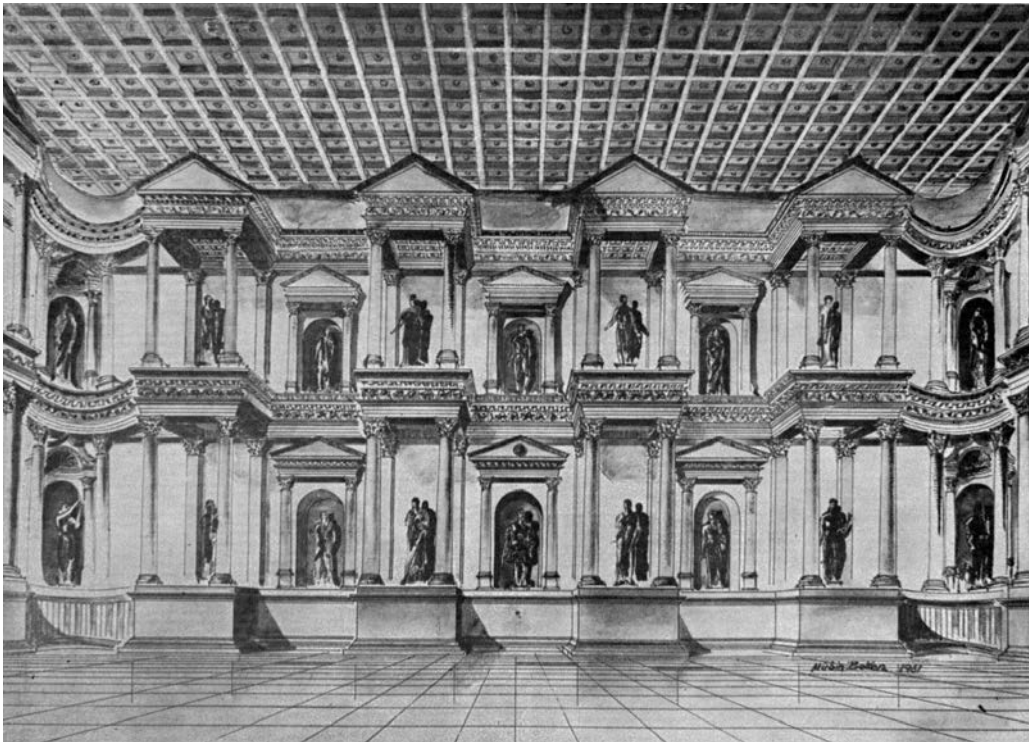
<sup>385</sup> Makowiecka (1978, 69-74).

<sup>386</sup> Mansel (1963, 121).

<sup>387</sup> Johnson (1984, 176-177).

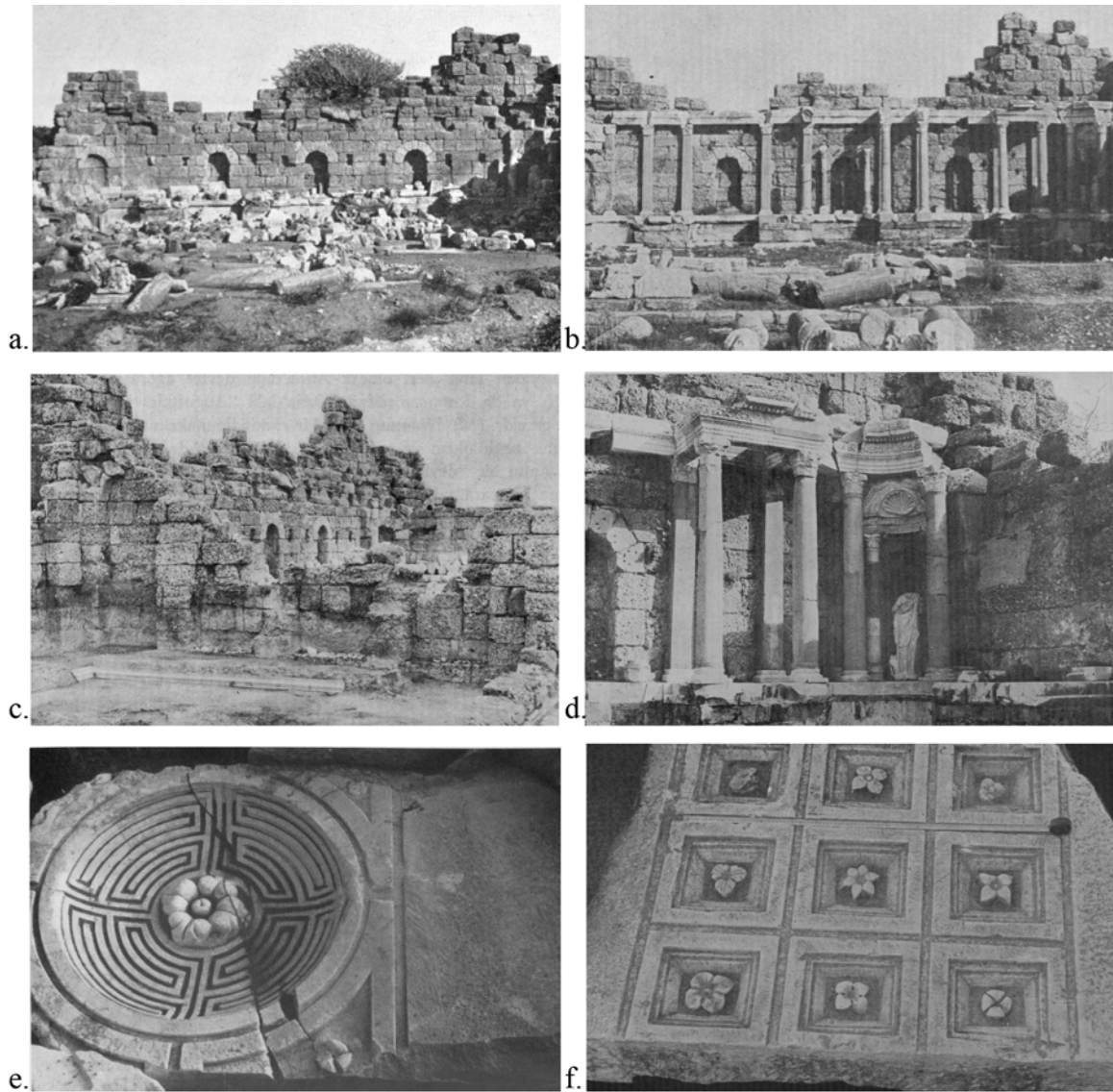
### *Main Hall Description*

The main hall of the complex had a rich architectural decoration on its three walls, and was richly adorned with statues. Along the three walls, there were rectangular apsidal niches alternating with aediculae (figures 3.75a and 3.75b). There were three niches on the back wall and two on each of the sidewalls. On the corners, there were two circular niches (figure 3.75d). A second row of niches is assumed on the second floor. The niches were decorated with small Corinthian columns that supported pediments and they were framed by pilasters. Corresponding to each pilaster there was a column, thus forming aediculae in the wall segments between the niches. Both niches and aediculae are reconstructed containing the statues found on the site (figure 3.74).



**Figure 3.74** Restored perspective of the Main Hall after Beken (Mansel 1963, fig. 90).

The columns of the aediculae were supported on a podium, and are reconstructed in two levels, at a total height of about 12.40 m. The columns were stepping on a podium. The podium and the entablature, carried by the columns, followed the outline of the wall with the aediculae, resulting in an undulating effect.<sup>388</sup>



**Figure 3.75** Views of Structure M at Side: a) main hall before its restoration (Mansel 1956, fig. 19); b) view of the main hall after its restoration (Mansel 1978, fig. 188); c) side room to the north of the main hall (supra, fig. 205); d) restored aedicula and semicircular niche in the main hall (supra, fig. 189); e – f) coffer tiles from the main hall (supra 1978, fig. 192 and 191).

<sup>388</sup> Mansel (1963, 110).

There was no focal point in the room formed by the architectural design. In fact, the design of the room was somehow centrifugal, since the circular niches drew attention in the corners. A focal point could have been established with the sculptural program of the room, if the central niche contained the original statue of the emperor, while the others contained copies of Greek statues or even armaria with books.

The side halls had also distinctive characteristics. Evidence comes primarily from the south hall. The north hall is reconstructed as the reflected version of the south hall. They are wide rectangular halls, divided in three aisles by two colonnades. In the central aisle, there were three big niches, 5.5 m high on the east wall, and door openings to the peristyle on the west wall. On the aisle adjacent to the main hall there were five smaller niches along the sidewall of the hall (figure 3.75c). On the other aisle, there were two aligned doors that gave access directly to the exterior and to the peristyle. These halls have been identified with libraries<sup>389</sup> based on the niches. However, the aligned doors transform the halls in transition spaces and raise issues of security.

### *Findings*

**Podium:** There was a podium along the three walls of the main hall in front of the niches. The podium was 1.65 m high, and had a meandering plan, as it was reserved in front of the niches, it was projecting in front of the flat walls for the formation of the aediculae,

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<sup>389</sup> Mansel (1963, 121).



and in the corner niches it was forming into a curve. The podium had a veneer with thin marble plates, and had a profile on the bottom and top end.<sup>390</sup>

**Column Screens:** The main hall had a two-story interior colonnade along the three sides of the room. The columns were made of gray granite, antique green and multicolor marble, and had Attic bases, and Corinthian capitals. The columns formed aediculae, 5.40 m high on the first level, and 4.80 m on the second. The aediculae of the second floor ended in pediments, 0.58 m high.<sup>391</sup>

A second colonnade with six Corinthian columns screened the main hall from the peristyle.

Column screens were also in the side halls; two longitudinal colonnades divided the hall in three aisles.

Last, the courtyard was screened with the colonnade of the peristyle. The columns were Ionic, 4.7 m high, and were made of green granite. They had Attic bases that were set on a two-stepped crepidoma.

**Niches:** There were three sets of niches in the complex: the niches of the back and sidewalls of the main hall; the large niches of the back wall of the side halls; and the smaller niches of the sidewalls of the side halls. All niches were rectangular in plan and ended in a semicircular arch. They were made of stone blocks, and they were covered with marble veneer.

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<sup>390</sup> Mansel (1963, 110).

<sup>391</sup> Mansel (1963, 110-114).

The niches of the main hall were 1.40 m wide, 0.7m deep, and 2.8 m high. and they were crowned with a marble sculptural part with a shell-like motif. They were framed by small Corinthian columns that supported pediments.

The side halls had large niches, 5.5 m high on the back wall, and five smaller on the sidewall that was shared with the main hall. They have been interpreted for the storage of books<sup>392</sup> or for statues,<sup>393</sup> as the ones in the main hall.

**Floor:** The main hall was paved with thin rectangular marble plates.<sup>394</sup>

**Apertures:** There is no evidence of windows. Light came through the door openings to the peristyle. The central hall was screened with seven Corinthian columns in antis, which created seven openings to the peristyle. The side halls had four openings to the peristyle and one directly to the exterior of the complex.

**Roof:** No findings. The roof was probably wooden with coffers.<sup>395</sup>

**Stairs:** No findings.

**Walls:** Building remains of the walls include the walls of the main hall preserved to a nearly complete height.

**Table 3.23** Summary of key characteristics and measurements of the library at Side.

<i>Features</i>	<i>Data</i>
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<sup>392</sup> Mansel (1963, 118-121).

<sup>393</sup> Johnson (1984, 176-177).

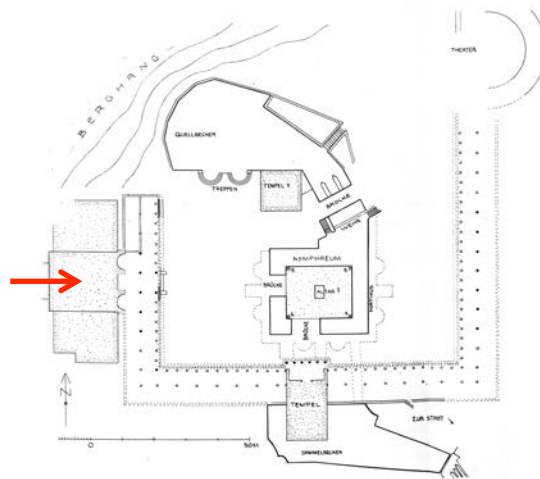
<sup>394</sup> Mansel (1963, 115).

<sup>395</sup> Mansel (1963, 115).

Location	so-called structure M in Side in Pamphylia
Date	second century C.E.
Founder	Unknown
Identified by	building remains
Orientation	West - East
Main Hall Width	26.45 m
Main Hall Length	15.20 m
Main Hall Area	402.04 m <sup>2</sup>

### 3.2.7. Library at Nîme

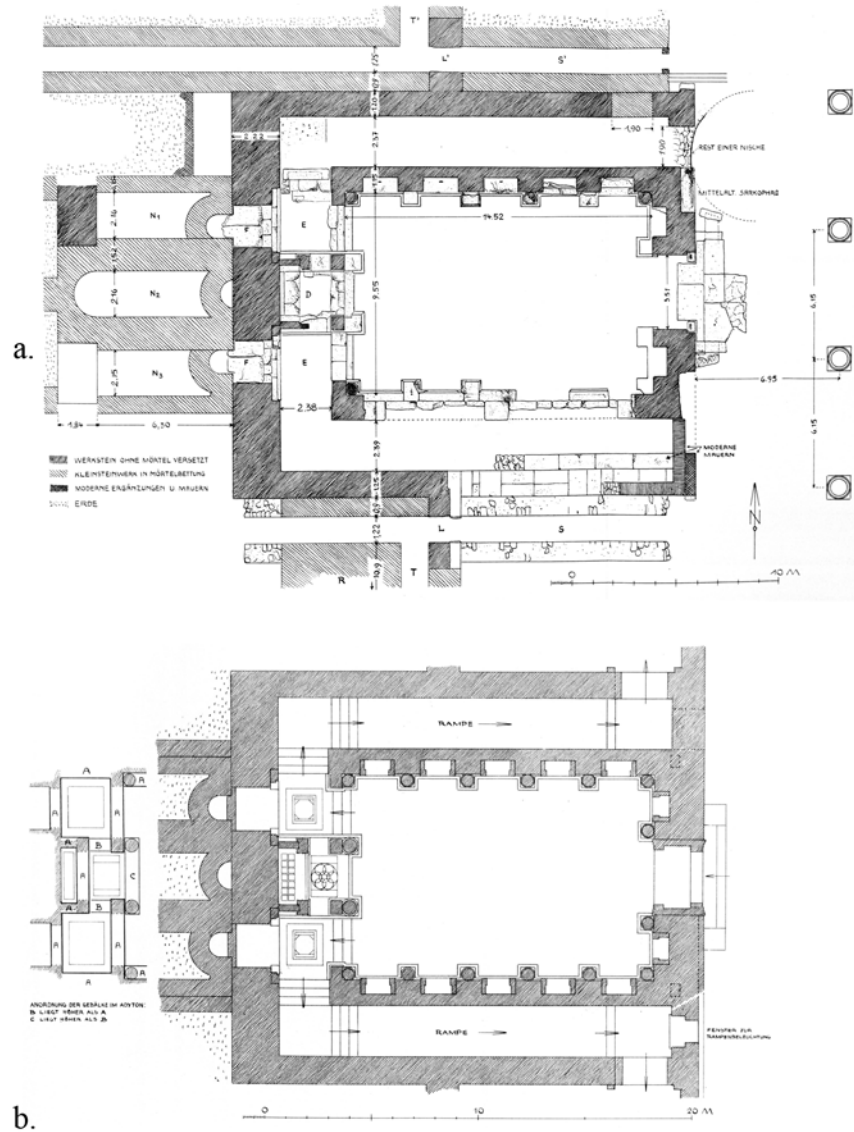
The so-called “Temple of Diana”<sup>396</sup> was attached to the east stoa of the Nymphaeum (figure 3.76) in the northwestern part of the Roman colony Nemausus in southern France, and has been identified with a possible library.<sup>397</sup>



**Figure 3.76** Schematic topographic plan of the Nymphaeum in Nemausus. The arrow points to the possible library (Nauman 1937, fig. 1).

<sup>396</sup> Naumann (1937, 2-22).

<sup>397</sup> Anderson (2013, 172-174); Callmer (1944, 177-178); Makowiecka (1978, 84).



**Figure 3.77** a) State of preservation; b) Reconstruction plan of the Hall (Nauman 1937, pl. 4 and 14)

It is an elongated rectangle hall that is connected to more spaces to the south and north through corridors and ramps. The entrance to the hall is from the west wall, and consists of a big door, 3.51 x 4.8 m high, that ends in a semicircular arch. In the interior, there are twelve niches - ten on the south and north walls, and two next to the entrance, framed by

columns that step on a wall socket. On the back wall, there was an aedicula on the center projecting to the back and two doors next to it, one in each side that gave access to the side corridors and ramps and subsequently to the other spaces (figure 3.77).

The interpretation of the hall has been very controversial. It has been suggested as a Temple of Diana, or a hall for the cult of the emperor, or a library. At the core of the argument are the niches. Callmer interpreted them as holding books,<sup>398</sup> while other researchers<sup>399</sup> interpret them as decorative containing statues. Against the interpretation of the hall as a library is the absence of a podium and the existence of a wall socle instead that was too shallow to give access to the books.<sup>400</sup> However, the library in Sagalassos (chapter 3.1.12) has a similar articulation and thus this should not be considered a determining factor.

A major difference between the Hall in Nimes with other libraries is its connectivity to other spaces. In the ends of the side walls there are two doors leading to neighboring spaces through ramps.

### ***Main Hall Description***

The main hall of the building is an elongated rectangular room. Structurally, it is constructed as two L-shape podia, arranged with bilateral symmetry, one being the reflection of the other. Between them, there is free space for the entrance of the building. On top of the podia step the walls of the hall and a colonnade in front of them that

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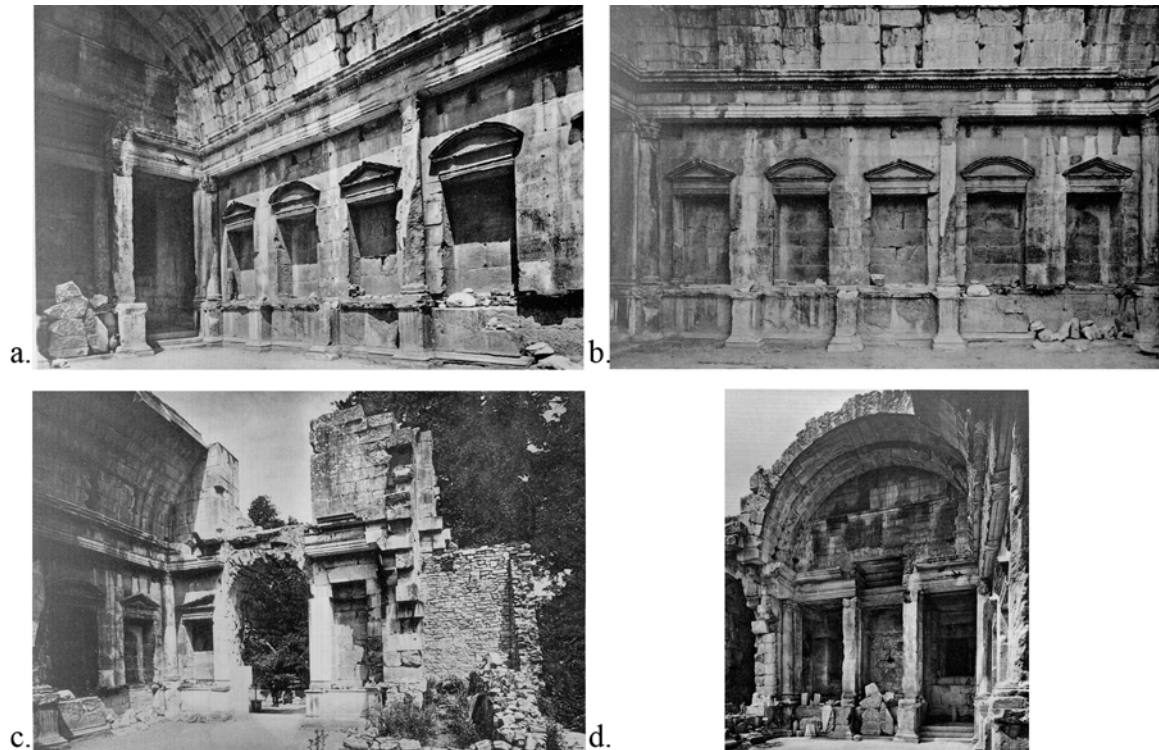
<sup>398</sup> Anderson (2013, 173); Callmer (1944, 177-178).

<sup>399</sup> Johnson (1984, 174-175).

<sup>400</sup> Makowiecka (1978, 78-84); Wendel (1949, 424-425).

support the vaulted roof of the hall. Carved on the walls, in the spaces between the columns, are niches.

On the west end, the space has a tripartite division, with an aedicula in the center. On the sides, there were two spaces with doors that gave access to the corners of the building and the side wings (figure 3.78d).



**Figure 3.78** Views of the Hall: a) view of the northwest corner; b) view of the north wall of the hall; c) view of the east wall of the hall; d) view of the west wall of the hall (Nauman 1937, fig. 29, 31 and 28).

### *Findings*

**Podium:** In the main hall, there is a podium that is so shallow that it resembles more a wall socle than a podium. It is 1.57 m high, on which rest the west, the north and south walls of the hall. Every 2.79 m, the podium projects to form pedestals on which rest

columns, that subdivide the surface of the wall into modules, each of which includes a niche. The podium has a foot and crown molding, and marble plates in between (figure 3.78b).

**Column Screens:** The main hall was surrounded by columns of three different sizes. The columns that rest on the projections of the podium and that support the arches of the vaulted roof have 0.21 m high bases, limestone shafts 4.1 m high, with a diameter of 0.6 m in the base and 0.49 on the top, and capitals of composite order (figure 3.75a and 3.75b). These columns are positioned so close to the wall that they are flat on the back. There was a total of fourteen such columns, six on the north and south walls, and two framing the entrance on the east wall. A second set of columns were the columns that flanked the niches in between the columns of the colonnade. Last, there were two larger columns on the east side that formed the central aedicula.<sup>401</sup>

The hall was attached to an L-shape stoa that defined the cult area in the center. From this stoa, the findings consist of seven column bases in front of the hall that preserve the plinth, the torus and half a trochilus.<sup>402</sup> The stoa was double aisled, with statue based between the columns of the inner colonnade apart from in front of the entrance. There is no indication about the order.

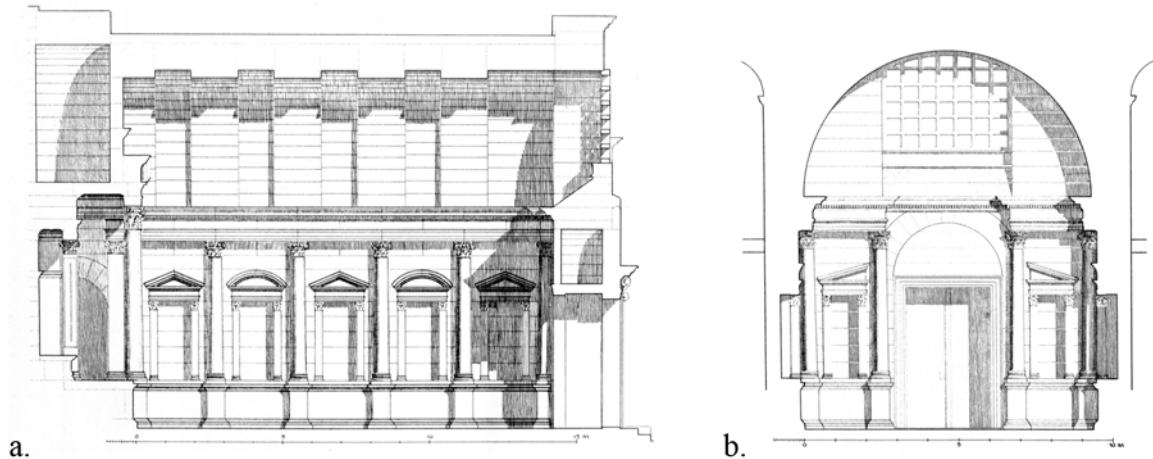
**Niches:** The main hall has twelve rectangular niches, one on each side of the entrance, five on the north and five on the south wall. The niches are 1.60 m wide 0.6 m deep and 2.6 m high, and are located 1.57 m above the level of the floor, directly above the wall socket, and are framed by columns that support entablatures and alternating pointed and

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<sup>401</sup> Naumann (1937, 4).

<sup>402</sup> Baker (1981, 8).

curved pediments (figure 3.79a). The niches were covered in the interior by stone slabs, 0.025 m thick.<sup>403</sup>



**Figure 3.79** a) Resored Longitudinal Elevation; b) West elevation of the Hall in the second phase of the building (Naumann 1937, fig. 17 and 16).

**Floor:** There is no evidence of the pavement of the floor. There are only traces of the marble veneer on the walls. The floor might have been paved by marble plates or mosaics, as in other areas of the complex.<sup>404</sup>

**Apertures:** The lighting of the hall was on the east side, through the main entrance and the large window over it (figure 3.78b and 3.79c). The entrance was 3.51 m wide and 4.8 m high, while the window 4.1 m wide and 2.75 m high. The window reached a height of 9.1 m above the floor level. Two smaller windows on the sides brought light into the north and south wings.<sup>405</sup>

<sup>403</sup> Naumann (1937, 4-5).

<sup>404</sup> Naumann (1937, 13).

<sup>405</sup> Naumann (1937, 5).



The surviving two side arched openings, which vary in height and width, and the corresponding windows were opened later in the facade.<sup>406</sup>

**Roof:** The building remains of the interior walls of the hall, include the lower parts of a barrel vault that roofed the hall along the long axis. The corridors on the side, were also roofed by barrel vaults.

**Stairs:** There is no evidence of stairs related to the hall. There is evidence of ramps located in the side wings that gave access to neighboring rooms. These were accessed from the doors located in the hall. There are also three steps that divide the hall from the entries that led to the corridors and ramps.

**Walls:** The whole building is constructed with ashlar. The blocks are hard limestone, 8 feet long and 3-4 feet high, and are secured together with clamps without mortar.<sup>407</sup> The blocks were covered by a veneer of marble plates attached with dowels.

**Table 3.24** Summary of key characteristics and measurements of the library at Nime.

<i>Features</i>	<i>Data</i>
Location	Nympheum, Nemausus
Date	First half of 2nd century C.E.
Founder	Unknown
Identified by	Building remains
Orientation	East - West
Main Hall Width	9.55 m
Main Hall Length	14.52 m
Main Hall Area	138.66 m <sup>2</sup>

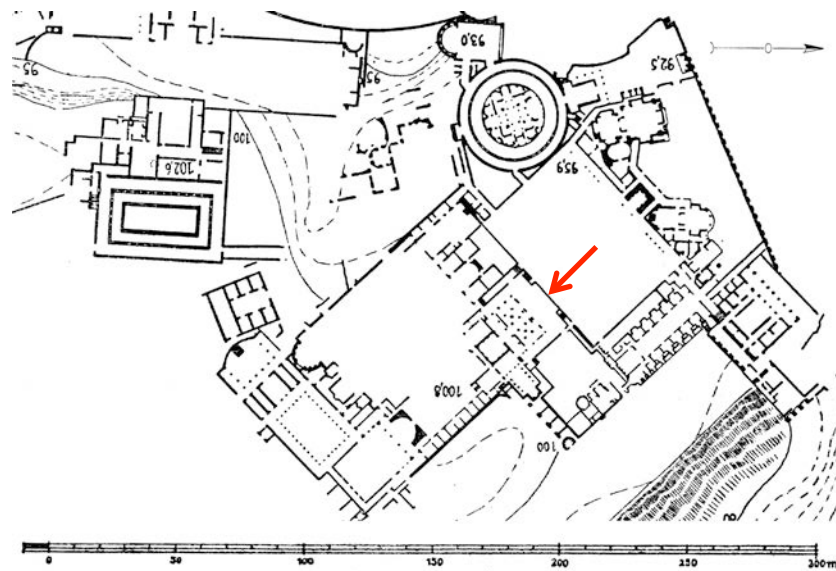
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<sup>406</sup> Baker (1981, 7).

<sup>407</sup> Baker (1981, 7).

### 3.2.8. Private Library in Hadrian's Villa, Tivoli

The complex with a peristyle and rooms, to the south of the so-called “Courtyard of the libraries” has been identified as a possible library (figure 3.80), based on its architectural form.<sup>408</sup> The complex consists of a peristyle with three rooms attached to the south side (figure 3.81). The central room is an almost square room with eight niches on its three walls and one central semicircular niche on axis with the entrance. This room was flanked by two other rectangular rooms with the axis of symmetry coinciding with the long side. On the east wall of the east side room, there were openings that gave access to another elongated rectangular space, with an apsidal end, that has been identified as a triclinium (3.82f).

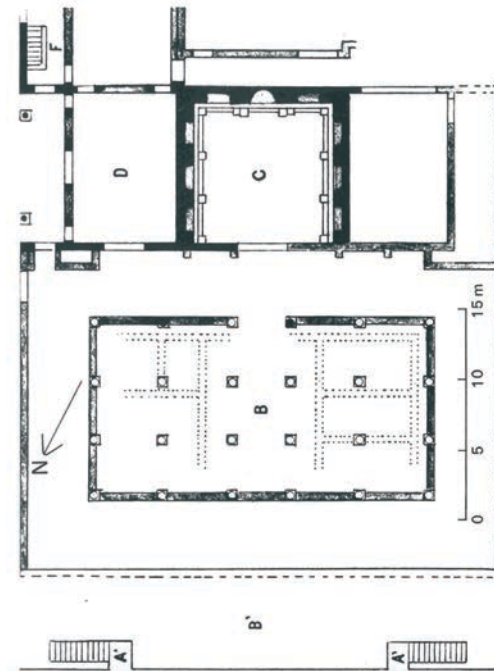


**Figure 3.80** Topographic plan that shows the section of Hadrian's Villa in Tivoli with the courtyard of the libraries and the private library after Kaehler (1950, fig. 1).

<sup>408</sup> Callmer (1944, 176); Gregori (1937, 20); Johnson (1984, 168); Makowiecka (1978, 74).

Makowiecka identified the central room as the Latin section of the library, and the rest of the complex as the Greek section, based on the assumption that libraries had separate Greek and Latin sections. This interpretation does not seem possible, since recent studies have shown that Roman libraries had in most cases combined Greek and Latin sections (see chapter 2.4.3), and it is more probable that both Greek and Latin collections were in the central room.

Next to the west side room, there was a corridor that gave access to the complex. Additional access to the complex was given through small stairs from the Courtyard of the libraries.



**Figure 3.81** Restored plan of the Private Library in Hadrian's Villa in Tivoli (Winnefeld 1895, fig. 8).

### ***Main Hall Description***

The main hall is a square hall with niches along the walls, a focal point, and a two-stepped podium that supported a colonnade (3.82b-e). The walls of the main hall survive at a very low level that gives the plan of the room. Access was given from the peristyle from the north (figure 3.82a). Along the walls of the room, survive the remains of a two-stepped podium. The podium was interrupted by pedestals that supported a colonnade. On each of the side walls there were three rectangular niches, and on the back wall there was one niche on each side flanking a central semicircular niche, which probably contained a statue.

Based on this buildings a full-scale reconstruction of a private library of the Roman times has been made in the Museum Cività Romana in Rome.

### ***Findings***

**Podium:** There was a two-stepped podium along the three walls. The first step is 0.35 m wide, and 0.27 m deep, and the second is 0.4 m deep (figure 3.82c).

**Column Screens:** There are the remains of pedestals, which are as high as the first step of the podium. These supported tan interior colonnade.

**Niches:** The walls survive at a low level, and only the lower part of the niches is identifiable (figures 3.82c-e). There are three niches on each of the sidewalls and one niche on each side of the back wall. In the center of the back wall, there is a focal point

formed by a semicircular niche 1.60 m wide x 0.75 m deep (figure 3.82b). The niches are located 0.35 m above the podium. Their height is not known.<sup>409</sup>



**Figure 3.82** Views of the private library in Hadrian' s Villa in Tivoli: a) view from the peristyle; b) view of the back wall the main hall; c) view of the north side wall of the main hall with the niches; d) view of the south side wall of the main hall; e) view of the main hall from the west corner; f) view of the triclinium (author's photos).

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<sup>409</sup> Johnson (1984, 168).

**Floor:** There are remains of the floor pavement of the peristyle, which was paved with polychromatic marble square and rectangular tiles in geometric pattern, like a fishbone.

**Apertures:** No findings. Access to the room was given through openings on the north.

**Roof:** No findings.

**Stairs:** No findings.

**Walls:** The walls survive at a low height and were made in opus latericium and opus reticulatum. They were probably covered with marble revetments.

**Table 3.25** Summary of key characteristics and measurements of the private library in Hadrian's Villa

<i>Features</i>	<i>Data</i>
Location	Above the southeast side of the "Courtyard of the Libraries," Hadrian's Villa, Tivoli
Date	117 C.E.
Founder	Hadrian
Identified by	Building remains
Orientation	North - South
Main Hall Width	8.20 m
Main Hall Length	8.30 m
Main Hall Area	68.06 m <sup>2</sup>

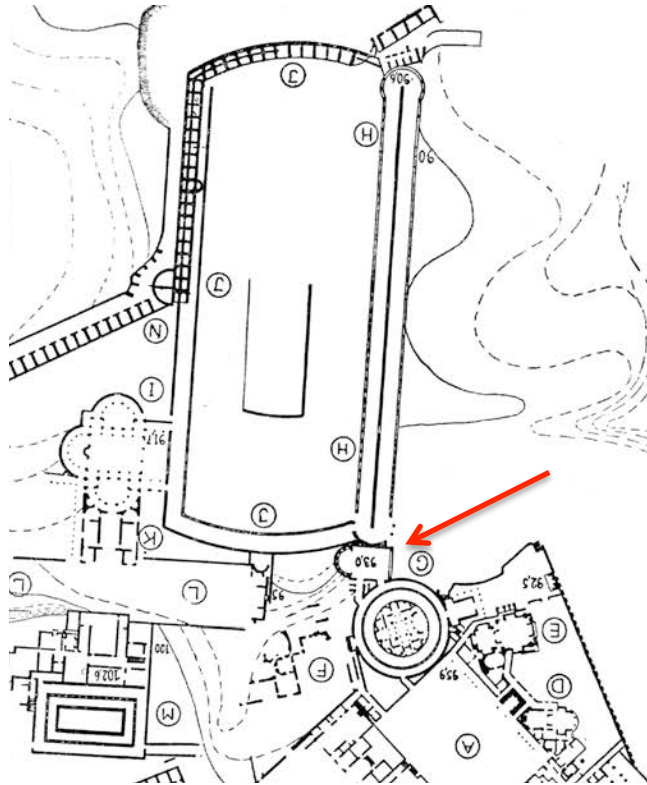
### 3.2.9. *Philosophers' Hall in Hadrian's Villa, Tivoli*

The so-called Philosophers' Hall or Basilica L<sup>410</sup> in Hadrian's villa is an elongated space with an apsidal end, located between the Poikile Stoa and the Maritime Theater (figure 3.83). It is accessed directly from the street through three openings between columns in

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<sup>410</sup> Gusman (1914).

its north side. It is also accessed from the Poikile Stoa through two doors in its west wall, and from the so-called Maritime Theater through two openings in its east wall (figure 3.84).



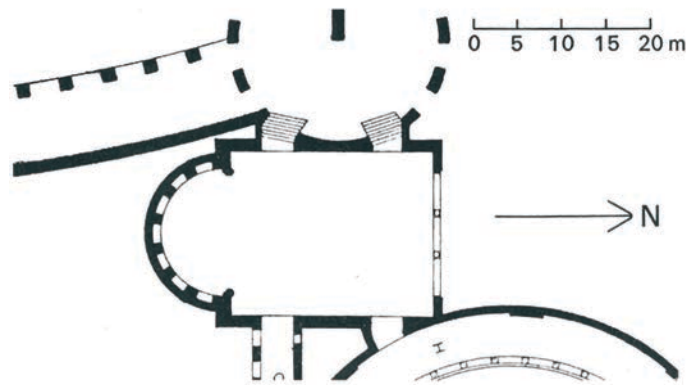
**Figure 3.83** Plan of Hadrian's Villa in Tivoli (Kaehler 1950, fig. 1).

In its south side, it ends in a semicircular apsidal exedra (figure 3.85a), which has seven rectangular niches on its walls, in one row. As the name of the hall indicates, the niches were originally interpreted as containing the statues of the seven Greek wise men. Some researchers though interpreted them as holding armaria with rolls, which led to the

identification of the building with a library.<sup>411</sup> However, the location of the hall between other buildings indicates that it was a transitional or entry space, rather than a library.<sup>412</sup>

### ***Main Hall Description***

The Hall of Philosophers is an elongated room, 14.35 m wide and 20.55 m long that ends in a semicircular exedra (figures 3.84, 3.85a and 3.85f). Its main entrance is in the north side through three openings between four columns (figure 3.85b). The south side is formed into a semicircular exedra that contains seven rectangular niches in one row. In front of the niches, along the exedra, there are the remains of a wall socket. The exedra is roofed by a semi-dome. On each of the west and east walls there are two openings that lead to the Poikile stoa to the west (figure 3.85d), and the so-called Maritime theater to the east (figure 3.85c). There are no other distinct characteristics.



**Figure 3.84** Restored plan of the Philosophers' Hall in Hadrian's Villa (Gusman 1914, fig. 167).

<sup>411</sup> Callmer (1944); Gregori (1937).

<sup>412</sup> Johnson (1984); Makowiecka (1978).





**Figure 3.85** Views of the Philosophers' Hall in Tivoli: a) view of the south end of the hall with the seven niches; b) view of the north end of the hall with access to outdoors; c) view of the east wall of the hall with the two entrances that give access to the Maritime Theater; d) view of the west wall of the hall with the two entrances that give access to outdoors and the Poikile Stoa; e) view of the building from the Poikile Stoa in the southwest; f) view of the back of the building from the southeast (author's photos).

## *Findings*

**Podium:** In front of the niches, there are the remains of a swallow and low wall socket. It is doubtful that this could have the function of a podium.

**Column Screens:** No findings.

**Niches:** The niches are rectangular in appearance, but structurally, they were constructed having an arch on top. A parallel to this construction are the niches of the Library of Nysa. They have the same dimensions and there is no focal point in the exedra.

**Floor:** No findings.

**Apertures:** The two door openings on the east and west walls survive at their full scale. The door openings to the north survive only at the level of foundations.

**Roof:** The semicircular niche was roofed by a semi-dome, which still survives today. There are no other remains. The rest of the hall is reconstructed with a barrel vault.

**Stairs:** No findings.

**Walls:** The walls are constructed with opus latericium. Inside the niches, there are the remains of a thick layer of plaster.

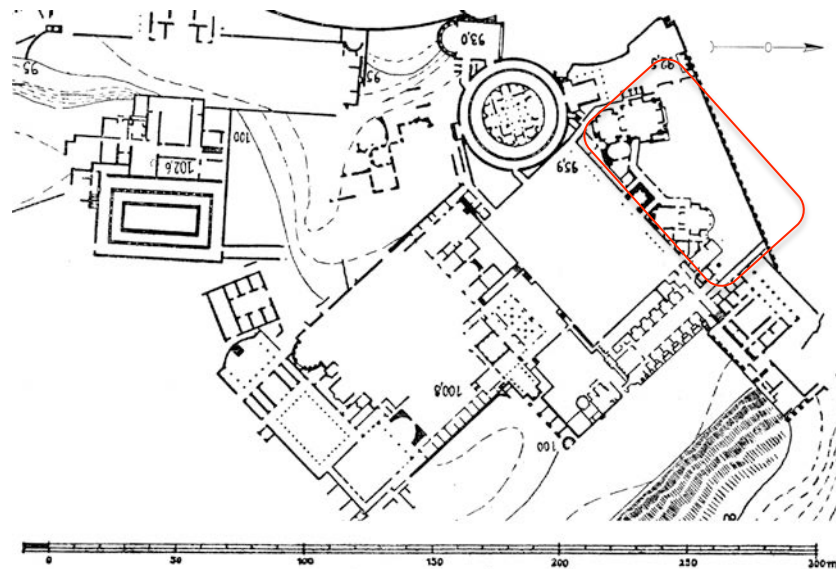
**Table 3.26** Summary of key characteristics and measurements of the Philosopher's Hall in Hadrian's Villa.

<i>Features</i>	<i>Data</i>
Location	Hadrian's Villa, Tivoli
Date	117 C.E.
Founder	Hadrian
Identified by	Building remains

Orientation	North - South
Main Hall Width	14.35 m
Main Hall Length	20.55 m
Main Hall Area	294.89 m <sup>2</sup>

### 3.2.10. So-called Greek and Roman Libraries in Hadrian's Villa, Tivoli

Two vaulted structures to the north of the “courtyard of the libraries,” on a terrace overlooking the valley (figure 3.86) have been identified as the Greek and the Roman libraries based on a reference in Piranesi's drawings.<sup>413</sup>



**Figure 3.86** Topographical Plan of the section of Hadrian's Villa with the courtyard of the libraries and the Greek and Latin Libraries circled by the red shape (after Kaehler 1950, fig. 1).

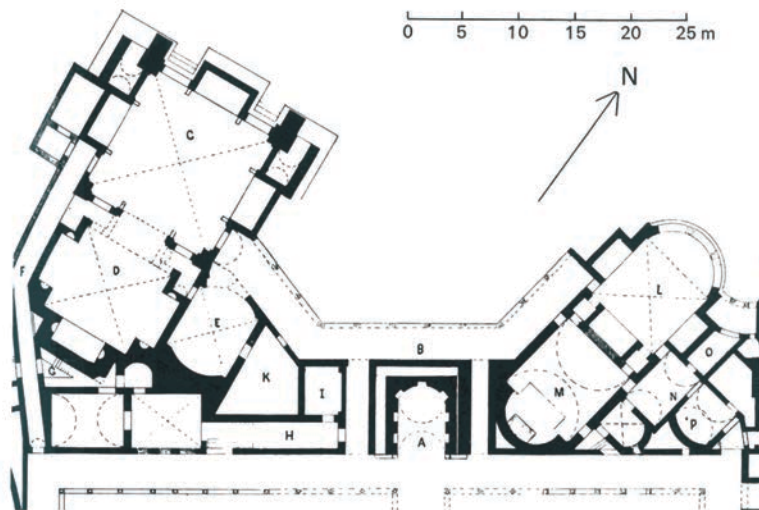
<sup>413</sup> Gusman (1914) identified the structure as a library. Aurigemma (1961); Callmer (1944, 176); Johnson (1984, 168-169); Kaehler (1950); Makowiecka (1978, 74).

These structures were built in around 118 C.E. The complex is attached to the northeast side of the courtyard of the libraries, but it does not follow its orientation. Both buildings are rotated towards north. Today, the identification with these spaces as libraries had been rejected.

### *Main Hall Description*

Among the building remains (figure 3.87), there is no space that can be identified as the main hall of the library.

The larger building, identified as the Greek library consists of two communicating rectangular spaces; the larger to the north opens directly to the garden through small steps, which the smaller to the south has exedras on its south, east and west sides. The ground floor does not communicate with the upper floors, which are accessible through a complex path from the maritime theater.



**Figure 3.87** The terrace with the so-called Greek and the Latin Libraries.

The smaller building, identified as the Latin Library consists of two communicating halls, which end in semicircular apses. The northern is a square hall with three exedras on the sides and roofed by a cross vault, and the southern is square, roofed by a barrel vault.

### ***Findings***

**Podium:** No findings.

**Column Screens:** No findings.

**Niches:** There are six semicircular niches opening in the small sides of the exedras, opening in the south, east and west sides of the southern room of the so-called Greek library.

**Floor:** No findings. The floor must have been paved with marble plates.

**Roof:** The rooms were roofed with cross vaults and barrel vaults.

**Apertures:** No findings of windows. The spaces were lit from the openings to the north.

**Stairs:** The so-called Greek library had two sets of steps in its north side that gave access to the garden.

**Walls:** Walls were made of concrete and covered with marble veneer.

**Table 3.27** Summary of key characteristics and measurements of the so-called Greek and Roman libraries.

<i>Features</i>	<i>Data</i>
Location	North side of the “Courtyard of Libraries”
Date	117 C.E.
Founder	Unknown
Identified by	Building Remains
Orientation	North-South
Main Hall Width	-
Main Hall Length	-
Main Hall Area	-

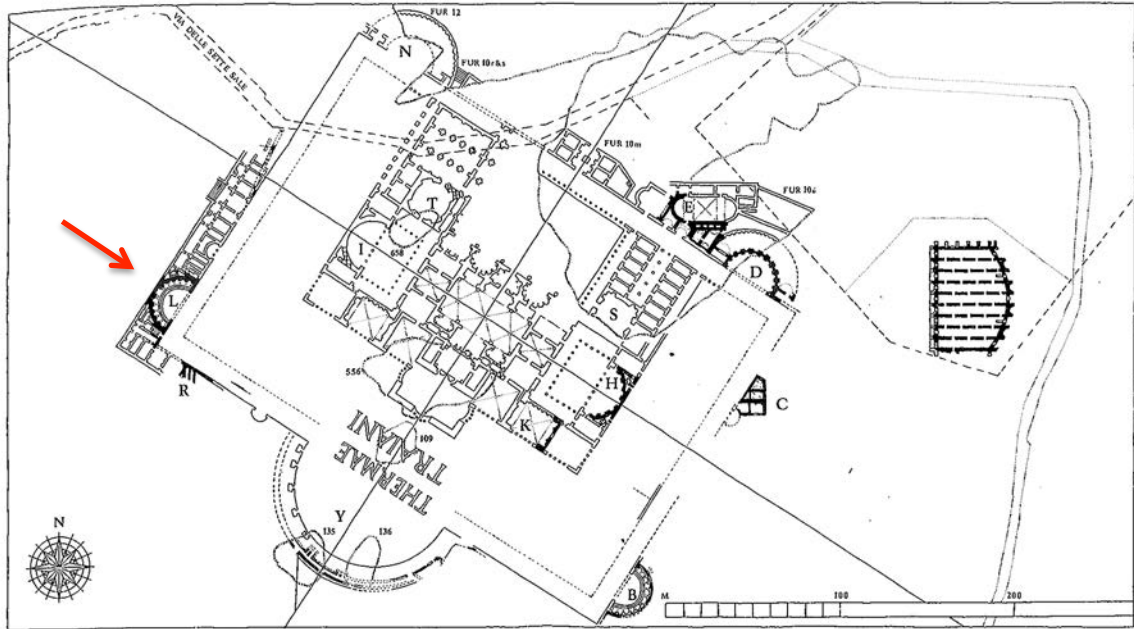
### *3.2.11. Library in the Baths of Trajan, Rome*

The southwest exedra of the Baths of Trajan (figure 3.88) has been identified as a possible location for a library.<sup>414</sup> The southeast exedra is part of the complex of the Baths of Trajan, which consists of the central building with the bath facilities, and the surrounding stoas in four sides that leave a vast green open space. Several exedras and other spaces are attached to the stoas. The complex has all the characteristics of a gymnasium as described by Vitruvius; orientation, bath facilities (balaneion) and stoas as running tracks (xystos), with attached exedras for philosophical discussions and recitations.<sup>415</sup> The identification of the baths with a gymnasium is also testified by Dio Cassius, who calls it Gymnasium. Since gymnasia in classical Greece had libraries, Roman imperial gymnasia must have had libraries as well. In the Baths or the Gymnasium of Trajan, the southwest exedra has the architectural characteristics of

<sup>414</sup> Callmer (1944, 164); Gregori (1937, 18); Johnson (1984, 111-118); Makowiecka (1978, 60-62); Strocka (1981, 311).

<sup>415</sup> Carnabuci (2006, 182-192); Volpe (2007, 428-429).

Roman libraries; direct access to the stoa and the courtyard, and an interior design with niches, podium, gallery, and a focal point.



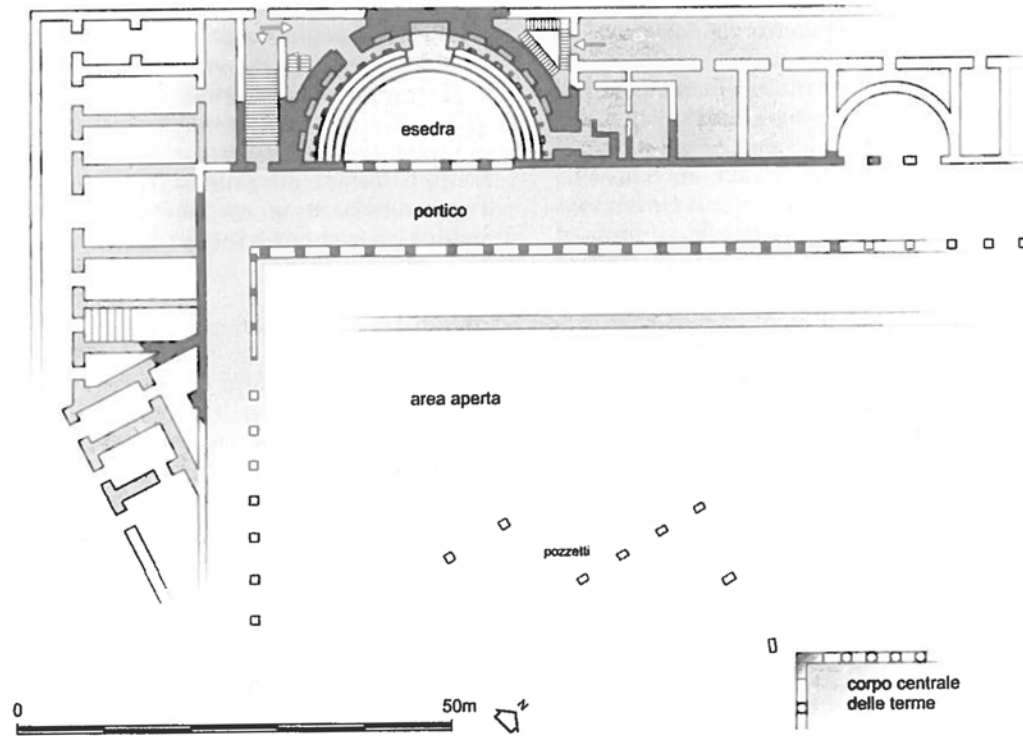
**Figure 3.88** Plan of the Baths of Trajan (De Fine Licht 1990, fig. 7).

However, some researchers have questioned the existence of libraries in baths on the basis that there is no robust evidence for it.<sup>416</sup> Also, recent studies have shown that semicircular exedras in imperial fora were often the seat of an administrator and the location of public archives<sup>417</sup> and have suggested that the semicircular exedra in the Baths of Trajan had a similar function. Carnabuci, based on the fact that the preceding structures excavated in the foundations of the exedra had a fresco depicting a city, suggested that this must be identified with the office of Praefectus Urbanus, which was in

<sup>416</sup> Dix and Houston (1995, 2-4); 2006, 701-706).

<sup>417</sup> Carnabuci (2006, 182-192); Meneghini (2002b, 660-661).

that location prior to the construction of the Baths. With the construction of the baths, the office was transferred to the exedra.<sup>418</sup>



**Figure 3.89** Reconstruction plan of the west corner of the Baths (Caruso et al. 2010, fig. 8).

A more convincing interpretation has been given by Volpe. Volpe suggested that the exedra was the seat of an athletic association. Volpe based her interpretation on a group of inscriptions that refer to an athletic association (*xystike synodos*), the head of which was the archi-priest of the athletic and bath facilities of the complex. The association had its seat at the Baths of Trajan, where the association held its meetings, kept its archive and its sacred objects.<sup>419</sup> The seat of the association has been identified with the

<sup>418</sup> Carnabuci (2006, 182-192).

<sup>419</sup> Volpe (2007, 430-431).



southwest exedra, where the association could have had its meetings at the steps along the exedra, and at the same time store its archive and sacred objects in the niches along the walls.

### ***Main Hall Description***

The exedra is semicircular with a radius of 14.4 m (figure 3.89). It features a strong focal point with two large niches on the axis. These two central niches are framed by a series of ten smaller rectangular niches in each side, arranged in two rows of five. In front of them there is a podium that ended in a three-stepped theater-like formation. On top of the podium, in front of the niches, there are small steps that gave access to the lower niches. The podium also supported a colonnade, which supported a gallery. The walls and the podium were covered by marble, as evidenced by the suspension holes on the wall. The exedra was screened from the portico by four columns, among which there were barriers preventing free access to the exedra.<sup>420</sup>

### ***Findings***

**Podium:** A podium 0.60 m high, and 1.36 - 1.42 m wide runs along the back wall of the exedra in two sections, on the two sides of the central niche (figures 3.90c and 3.90d). In front of the podium is a three-stepped structure with steps 1.02 m, 0.99 m, and 0.99 m deep and 0.24, 0.30, and 0.17 m high.

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<sup>420</sup> Caruso et al. (2010, 259-263).

On the podium, and in front of each niche, there is a smaller step, 0.30 m high. The podium and the three steps had marble revetments of white proconnesian marble, some fragments and the imprint lines of which survive.<sup>421</sup>



**Figure 3.90** Views of the Exedra in the Baths of Trajan: a) View of the exedra; b) view of the upper north niches; c) view of the south part of the podium; d) view of the north part of the podium; e) stair remains at the back of the exedra (author's photos); f) top view of the exedra after the excavation (Caruso et al. 2010, fig. 7).

<sup>421</sup> Caruso et al. (2010, 262-263).

**Column Screens:** There are two rows of wall indentations 0.61 m wide x 0.61 m high x 0.61 m deep, located 1.8 m above the lower niches' relieving arch, and 0.65 m above the upper niches' relieving arch, which are interpreted for the support of a two-story interior colonnade that supported a gallery or entablature (figure 3.90b). There is also evidence of an exterior column screen; the four limestone blocks that supported the columns. The thresholds between the columns bear evident wear towards the exterior side, while they are almost intact towards the interior, which testifies that there were screens in the intercolumniations that controlled the entry to the exedra.<sup>422</sup>

**Niches:** There were twenty rectangular niches arranged in two rows, in the two sides of the central larger niches (figure 3.90a). The niches have no evidence of marble veneer in their interior, which indicates that they were intended not to be visible and thus that they were filled with armaria. The side niches are 2.13 m wide and 0.75 - 0.76 m deep, and are 3.36 m high on the first level, and 4.57 m high on the second. On the axis of the exedra, there is a focal point with two enlarged niches 0.915 m deep, 4.57 m wide, and 6.49 m high on the first level, and 2.75 m wide and 3.36 m high on the second level.<sup>423</sup>

**Floor:** There is evidence of the imprint lines of the lavish marble pavement of the floor of the exedra. The original floor pavement had rectangular slabs and smaller square tiles arranged in a weave pattern (figure 3.90f).

**Apertures:** The lighting of the exedra was through the opening of the exedra to the xystos. The opening was closed at the two ends of the exedra by two walls 4 m long and 0.85 m thick, that ended at the termination points of the stepped podium, and limited the

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<sup>422</sup> Caruso et al. (2010, 263).

<sup>423</sup> Caruso et al. (2010, 259).

opening to 22 m The two wall sections ended in two pilasters or semi-columns. The opening was further subdivided by four columns the foundation of which survive; four blocks of tufa, 1.30 m long and 1.20 m wide.<sup>424</sup>

**Roof:** The exedra was roofed by a semidome, part of it survives today. Additional evidence comes from a drawing of Stefano du Perac, dated in 1680, that depicts the symmetric Exedra B, which had a coffered semi dome with a pattern of alternating hexagons and squares.

**Stairs:** Behind the exedra, there is evidence of two sets of three flights of stairs that led to the upper floor of the structure (figure 3.90e). There are also the remains of openings in two of the upper niches, which could have possibly given access to the interior of the exedra. However, these were walled up with similar materials to the rest of the building, which indicates that the openings were walled at the same time of the construction of the building.

**Walls:** The walls are constructed in opus latericium and survive at the whole height of the exedra. The walls bear evidence of a layer of gray plaster and support holes that indicate marble veneer.

**Table 3.28** Summary of key characteristics and measurements of the library in the Baths of Trajan.

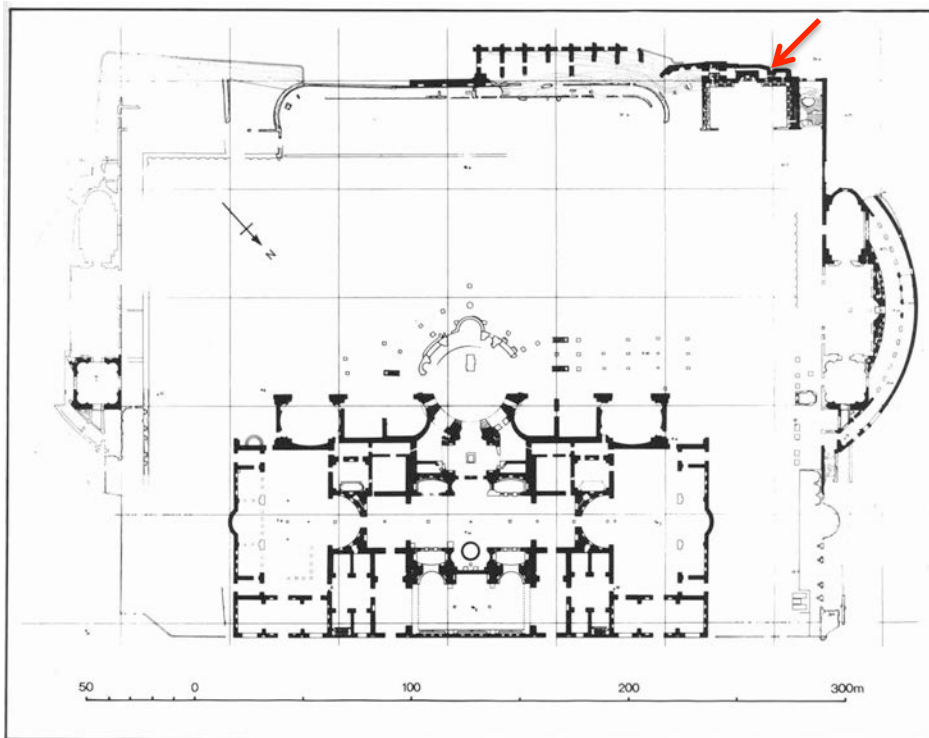
<i>Features</i>	<i>Data</i>
Location	West Exedra of Trajan’ s Baths, Oppian Hill, Rome
Date	109 C.E.
Founder	Trajan
Identified by	Building remains

<sup>424</sup> Caruso et al. (2010, 263).

Orientation	Southeast - Northwest
Main Hall Width	14.4 m
Main Hall Length	28.8 m
Main Hall Area	414.72 m <sup>2</sup>

### 3.2.12. Library in the Baths of Caracalla, Rome

The southwest exedra in the Baths of Caracalla,<sup>425</sup> located between the monumental staircase and the stadium (figure 3.91), has been identified with a library based on the interior design with niches, central apse, podium, interior colonnade and gallery that appear in other Roman libraries.<sup>426</sup>



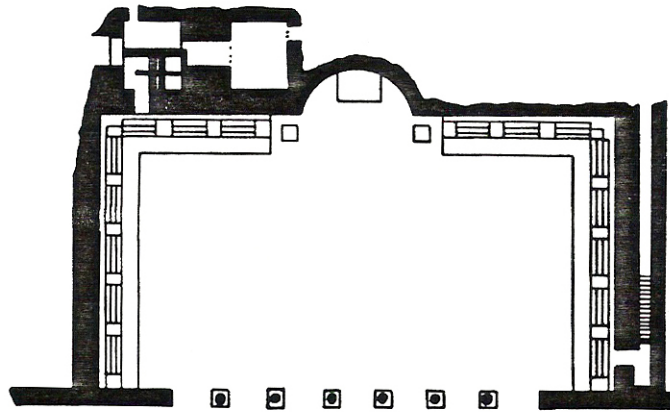
**Figure 3.91** State of preservation plan of the Baths of Caracalla, after Modus (DeLaine (1997, fig.7)).

<sup>425</sup> Piranomonte (1999, 42-48).

<sup>426</sup> Callmer (1944, 164); Ghislanzoni (1912, 311-312); Gregori (1937, 16-18); Makowiecka (1978, 91-92); Strocka (1981, 315-316); Wendel (1949, 422-423).

The Bath Complex constructed by Caracalla and his successors followed in form the innovations of the Baths of Trajan. It consisted of a core building with the bath facilities, a large open space, and a portico enclosing the complex, with attached stoas and theatrical spaces. The Baths were inaugurated in 216, but the completion of the southwest exedra is dated later in the first half of the 3rd century, based on the style of the geometrical pattern of the floor pavement.<sup>427</sup>

The southwest exedra does have the formal characteristics of other libraries. However, matters of scale, with the large span of 36 m that would have been difficult to roof, and the 4 m high niches, that would have made it difficult to reach the books stored in the upper shelves challenge this interpretation.<sup>428</sup>



**Figure 3.92** Restored plan after Ghislanzoni (Johnson 1984, fig. 39).

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<sup>427</sup> Piranomonte and Capodiferro (1993, 334).

<sup>428</sup> Dix and Houston (1995, 2-4); 2006, 703-704); Johnson (1984, 119-124).

### ***Main Hall Description***

The southeast exedra is a wide rectangle space, 38.7 m wide and 22.1 m deep, with an emphasized focal point, a large central apse 8.10 m wide, 3.4 m deep and 15 m high<sup>429</sup> (figure 3.92). In the center of the apse, there is a high pedestal, where stood probably a statue (figures 3.93a and 3.93f).

On the two sides of the central apse on the south wall, and on the east and west walls, there were rectangular niches, a total of 16 niches at a distance of 2 m from the level of the floor (figure 3.93c and 3.93d). A second row of niches survives higher on the walls. The niches were accessible from a podium that had three steps (figure 3.93c). The steps were interrupted by pedestals, 3.6 m wide, 2.2 m deep, and 1.8 m high that carried columns. The columns supported a gallery, the beams of which were supported in recesses in the walls.

Two small doors opened under the southeastern and the northwestern niches, and gave access to in-wall stairs that led to the spaces of the second floor.

The entry to the exedra was from the north side, where two lateral walls closed the opening in the two sides. The remaining opening was subdivided by six columns.

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<sup>429</sup> Ghislanzoni (1912, 311); Piranomonte and Capodiferro (1993, 333).



**Figure 3.93** Views of the exedra G in the Baths of Caracalla: a) view of the back wall with the central apse and the niches; b) view of the exedra from the northwest stoa of the baths; c) view of the southeast corner of the exedra; d) view of the southwest corner of the exedra; e) view of the central apse (author's photos); f) view of the exedra prior to its restoration (Nash 1961, fig. 1237).



## *Findings*

**Podium:** In front of the niches, a stepped podium, 0.81 m high and 1.2 m wide<sup>430</sup> run along the three walls of the hall. The three steps, 0.27 m high and 0.40 m deep, were interrupted by the pedestals supporting the interior colonnade<sup>431</sup> (figure 3.93c).

**Column Screens:** In front of the niches, and stepping on the podium, there was a colonnade. Building remains include the bases of travertine stone, as well as traces of holes on the walls of the hall, for the support of a gallery.

Framing the central apse, there were two colossal columns, the travertine bases of which have been found.

Last, the entrance of the exedra from the xystos consisted of six Ionic columns with the depiction of Isis, Serapis and Harpocrates. Evidence includes the column bases and six Ionic capitals.<sup>432</sup>

**Niches:** The building remains testify to 16 rectangular niches, at a height of 2 m above the floor level and arranged along the three walls of the hall, three on either side of the central apse and five on each side wall. Traces of a second row of niches survived, which have been completely restored on the site.

The niches are 4.1 m high, 1.8 m wide and 0.75 m deep. The central apse was 15 m high, 8.1 m wide and 3.4 m deep (figure 3.93e).

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<sup>430</sup> Tonsberg (1976, 55).

<sup>431</sup> Ghislanzoni (1912, 311).

<sup>432</sup> Piranomonte and Capodiferro (1993, 334).

**Floor:** Floor remains include the imprint lines of the marble slabs on the floor, as well as some fragments of giallo antico, breccia corallina and breccia serpentina. The floor was paved with marble slabs, with consistent thickness of 0.06 - 0.10 m. The area of the floor was subdivided in three transverse sections. The central consisted of two large rectangles that framed a tondo. The two side sections had a geometric pattern of circles inscribed in squares inserted in a grid of rectangular marble slabs. The whole composition was boarded by a row of rectangular slabs that followed the three walls of the hall.<sup>433</sup>

**Apertures:** The hall opened into the portico of the bath complex from its north side. This large opening was subdivided by six columns with intercolumniations of 2.96 m, the foundations of which survive. Between the columns there was a step. Remains of the colonnade include the peperino bases, marble shaft fragments and eight Ionic capitals with Isis, Serapis and Harpocrates.<sup>434</sup>

**Roof:** No findings.

**Stairs:** Remains include two small doors that opened from the main hall, under the lower niches.<sup>435</sup> A door, 1.3 m high, opened under the last niche on the west wall, and led into an encased stair inside the wall. A second door 1.5 m high opened under the niche in the southeast corner of the hall, and gave access to another stair with steps 0.295 m high, 0.21 m deep, and 0.90 m wide., which after eleven meters from the floor level of the main hall, led to two small rooms, one 1.80 x 4.90 m, and another one 4.90 x 2.55 m.

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<sup>433</sup> Piranomonte and Capodiferro (1993, 334).

<sup>434</sup> Piranomonte and Capodiferro (1993, 334).

<sup>435</sup> Ghislanzoni (1912, 311).

**Walls:** The three walls of the exedra survive at a large height. The walls were made in opus latericium and covered with marble revetments.

**Table 3.29** Summary of key characteristics and measurements of the library in the Baths of Caracalla.

<i>Features</i>	<i>Data</i>
Location	Northwest corner of the peribolos of the Baths of Caracalla, Rome
Date	250 C.E.
Founder	Heliogabalus and Severus Alexander
Identified by	Building remains
Orientation	Northeast - Southwest
Main Hall Width	38.7 m
Main Hall Length	22.1
Main Hall Area	855.27 m <sup>2</sup>

### **3.3. Libraries known from ancient testimonia, but not identified with any building remains**

Thirtyseven libraries are known from ancient testimonia, but have not been identified with building remains. Each one is briefly presented below with all information deduced about it from the ancient testimonia. The ancient testimonia along with the translations are given in Appendix B.

#### *3.3.1. Alexandria, Hellenistic Royal Library at the Museum*

The library of Alexandria was founded by Ptolemy I Soter in the first half of the 3<sup>rd</sup> century B.C.E. as part of the Museum, the Temenos of the Muses, and was further expanded by his heir, Ptolemy II Philadelphos. Ptolemy invited Demetrius Phalereus, a former student of Aristotle and director of the Lyceum to organize the Library of

Alexandria.<sup>436</sup> Demetrius probably implemented Aristotle's indexing system of books and the architectural form of the Lyceum, in a more grandiose scale. The Ptolemies funded the library as a building, and the philosophers that lived and worked there as scholars. They also supported the library with a series of laws and funds, so that the book collection would grow to be the biggest in antiquity. It is estimated that the library hosted 500,000 volumes at the time of Kallimachos.<sup>437</sup>

The Museum and the library have not yet been identified and their architectural form is only known through literary resources. According to Strabo, the Library included a peristyle, and smaller stoas for walks and discussions, an oikos for banquets and separate stacks.

### *3.3.2. Alexandria, Library at the Sebasteion*

The Library at the Sebasteion in Alexandria is known through reference in literary sources. It is dated in the middle of the 1<sup>st</sup> century C.E.

### *3.3.3. Antiochia, Hellenistic Royal Library of*

The Hellenistic Library of Antiochia is known through literary sources. It was founded by Antiochos, in the 3<sup>rd</sup> century B.C.E.

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<sup>436</sup> Canfora (1990).

<sup>437</sup> Callmer (1944, 148).

#### *3.3.4. Antiochia, Library of*

The Library of Antiochia is known through literary sources. It was founded by Julian, in the second half of the 4<sup>th</sup> century C.E.

#### *3.3.5. Aphrodisias, Library of Archive*

The library of Aphrodisias is identified with the *grammatophylakion*, as testified by two inscriptions. An honorific inscription named M. Aurelius Iason Prabreus and Iulia Paula as the patrons for the completion of the building complex that was under construction. It is dated in 180-230 C.E.

According to the honorific inscription, the *grammatophylakeion* was a peristyle complex (*peristoon*), with *exedras*, *oikoi* with stone doorframes, bookcases, and wall plasterings, and workshops on its south and north side.

The north stoa already included an *exedra*, an *oikos* and 19 workshops. The funds were used for their completion, the plaster decorations, the ceilings, the bookcases, and the columns of the *oikos*. The south stoa was rebuilt from the foundations up, along with an *oikos*, and two workshops. The east stoa was under construction, and the couple paid for eight new panels for the intercolumniations, while another eight were in second use. This means that the east stoa had at least seventeen columns. Also, the couple sponsored one panel, capitals, architraves, friezes and cornices for all columns, and drums to five columns in the west stoa, and the roofs and doorways for the whole complex.

The building has not been identified with any of the building remains.

### *3.3.6. Athens, Library at the Lyceum*

The library at the Lyceum is known through indirect references in literary sources. Strabo credits Aristotle as the first systematic collector of books, and Diogenes Laetius mentions that Aristotle bequeathed his books to his student, Theophrastus. Thus it is reasonable to consider that a library was located in the philosophical school that he founded in 335 B.C.E. in the Lyceum. Diogenes describes the Museum as having a stoa, a smaller stoa, a promenade, and a garden. The library must have been part of or in combination of these spaces.

### *3.3.7. Athens, Library at the Gymnasium of Ptolemy*

The library at the Gymnasium of Ptolemy is known through three inscriptions. The gymnasium was founded by Ptolemy VI Philometor during his reign (181 – 145 B.C.E.). Pausanias mentions that there were there Hermae and a bronze statue of Ptolemy.

### *3.3.8. Carthage, Library of*

The library of Carthage is known through a reference in Apuleius. It is not known when it was founded, but it existed in the time of Apuleius (125 - 180 C.E.)

### *3.3.9. Como, Library of*

The library of Como is known through literary and epigraphic Sources. It was founded by Pliny the Younger in his hometown, Como, during Domitian's reign (81-96 C.E.).

### *3.3.10. Constantinople, Library of*

The library of Constantinople is known through Codex Theodosianus and Zosimos. It was founded by Constantius II in 354 C.E. and was built next to a portico.

### *3.3.11. Corinth, Library of*

The library of Corinth is known through Dio Chrysostm who mentions that a bust of himself was put in the library. It is dated in the 1st century C.E.

### *3.3.12. Cos, Library at the Gymnasium*

The library at the Gymnasium of Cos is known through an inscription that mentions its founders, Diocles and Apollodorus. It is dated in the 2nd century B.C.E.

### *3.3.13. Cos, Library at the Asklepeion*

The library at the Asklepeion in Cos is known by an inscription, according to which it was dedicated by Gaius Stertinius Xenophon, the famous doctor of Claudius, who was from Cos and is dated in the first century C.E., before 54 C.E., the year of death of Xenophon.

### *3.3.14. Cumae, Library of Faustus*

The Library of Faustus is known to Cicero, who used to go there, and mentions a seat under Aristotle's bust. Faustus is Sulla's son and the library was founded in Faustus' villa

in Cumae with the books, spoils of war from Greece. The library is dated in the first century B.C.E.

*3.3.15. Soli, Library of*

The library of Soli in Cyprus is known through an inscription and is dated in the middle of the 1st century C.E.

*3.3.16. Delphi, Library at the Gymnasium*

The library at the gymnasium of Delphi is known through an inscription that says that Flavius Soclarus gave the money for the foundation of the library. The library is dated in the 2<sup>nd</sup> century C.E.

*3.3.17. Dertona, Library of*

The library of Dertona is known through an inscription dated in 22 B.C.E.

*3.3.18. Dyrrachium, Library of*

The library of Dyrrachium is known through an inscription and is dated in Trajan's reign (98 - 117 C.E.). It was founded by Flavius Aemilianus.



### *3.3.19. Epidaurus, Library at the Asklepeion*

The library at the Temenos of Asklepeios in Epidaurus is known through an inscription dated in the 2<sup>nd</sup> century C.E.. According to the inscription it was founded by Rufus, who also gave the books.

### *3.3.20. Halicarnassus, Library at the Gymnasium*

The library at the gymnasium of Halicarnassus is known through an inscription. It was a public dedication, dated in the 1<sup>st</sup> century B.C.E.

### *3.3.21. Mylasa, Library at the Gymnasium*

The library at the gymnasium of Mylasa is known through an inscription and is dated in the 1<sup>st</sup> century B.C.E.

### *3.3.22. Patra, Library of*

The library of Patra is known only through Aulus Gellius. It is not known when it was founded, but it existed in the 2<sup>nd</sup> century C.E.

### *3.3.23. Pella, Hellenistic Royal Library*

The Royal library of Pella was founded by Antigonos (276 - 239 B.C.E.). It is known through the reference in Plutarch that Aemilius Paulus seized it.

#### *3.3.24. Pergamon, Library at the Gymnasium*

The library at the gymnasium in Pergamon is known through two inscriptions that were found in the gymnasium. The first inscription mentions a sum of money, libraries and presumably books in the Pythium. The second inscription honors the son of Demeas, who may have been in charge of the libraries. The library is dated in the first half of 2nd century B.C.E.

#### *3.3.25. Pireaus, Library of*

The library of Pireaus is known through a dedicatory inscription that mentions several of its authors. It is dated in the 1<sup>st</sup> century B.C.E.

#### *3.3.26. Pontus, Hellenistic Royal Library*

The Hellenistic royal library of Pontus is known through the testimony of Isidor that says that it was seized by Lucullus. It was founded in the 2<sup>nd</sup> century B.C.E.

#### *3.3.27. Prusa, Library of*

The library of Prusa mentioned by Pliny is dated in Trajan's reign (98 - 117 C.E.) and was founded by Dion. Pliny mentions a statue in the library and the tomb of Dion wife and son in a colonnaded space near the library.

### *3.3.28. Rome, Library in the Atrium Libertatis*

The Library in the Atrium Libertatis mentioned by Ovid, Isidor and Pliny, was organized by Asinius Pollio in 37 B.C.E. and was the first public library in Rome. He restored the atrium Libertatis, which at that time functioned as the registry for the liberated former slaves, and was the location of the archive, and also was the place where cases of criminal law involving slaves took place. Asinius Pollio, after renovating the atrium, decorated it with statues, and added the function of the Latin and Greek public libraries.

There are no building remains, but its location is generally considered to be next to the Forum of Caesar, close to the Curia. A fragment of the Severian marble map of Rome depicting the northeast apse of the Basilica Ulpia in the Forum of Trajan, bears the inscription “IBERTA”, which has led to the identification of the location of the Atrium with the area that later was occupied by the Basilica. The atrium must have been destroyed for the construction of the Forum of Trajan. Callmer (1944) identified the relationship between the two buildings and Meneghini (2002) further elaborated on their functional relationship; that the Atrium Libertatis was destroyed to make space for the Forum of Trajan, and that the Forum of Trajan subsumed its functions, the Basilica Ulpia subsumed the judicial function of the Atrium, and the Ulpian Library subsumed the archive and the libraries.

There is no evidence about the architectural form of the library but the name “atrium” indicates that it must have been a peristyle, with rooms opening into the stoas. The library must have been located in some of those rooms.

### *3.3.29. Rome, Library in the Temple of Augustus*

Livia, Tiberius and Caligula built a Temple in honor of Augustus in the 1<sup>st</sup> century B.C.E., which contained a public library. Pliny mentions that there was a colossal bronze Statue of Toscanic Apollo, 50 ft high.

### *3.3.30. Rome, Library in Domus Tiberiana*

The library in Domus Tiberiana is known through literary sources and is dated in the 1<sup>st</sup> century C.E., when it was dedicated by Tiberius. The library is mentioned by Aulus Gellius, Historia Augusta, Galen, and Fronto, and seems that it was in use for at least three centuries. It has been identified with any of the apartments opening off from the peristyle, that was about 100 m square. Only a few traces of the foundations on the south side remain today.

### *3.3.31. Rome, Library in the Temple of Asklepeios*

The public library in the Temple of Asklepeios is dated in 109 C.E.

### *3.3.32. Rome, Library in the Pantheon*

The library in the Pantheon in Rome is known through the testimony of its founder, Sextus Julius Africanus in the 3<sup>rd</sup> century C.E. Nothing more is known about this library.

### *3.3.33. Rome, Library in the Baths of Diocletian*

The library at the baths of Diocletian is known through one later literary source, the *Scriptores Historiae Augustae*, which mentions that the Ulpian library was eventually transferred to the Baths of Diocletian, and secondly from the *Forma Urbis Roma*. No building remains have been examined yet, due to contemporary buildings, built on top of it. The Baths of Diocletian were constructed in 296-305 C.E., which is a *terminus post quem* for the library.

### *3.3.34. Smyrne, Library in the Homereium*

The library in the Homereium was built in the first century B.C.E. and is known by Strabo. It was attached to a peristyle that included the wooden statue of Homer.

### *3.3.35. Suessa, Matidiana Library*

The Maridiana Library is identified by an inscription and was dedicated by Matidia, Hadrian's mother in law, in her hometown Suessa, between the years 68 - 119 C.E.

### *3.3.36. Tivoli, Library in the Temple of Hercules*

The library in the Temple of Hercules in Tivoli existed in the 1<sup>st</sup> century C.E. and is identified by Aulus Gellius.

3.3.37. *Volsinii, Library of*

The library of Volsinii was built during Domitian's reign (81-96 C.E.) and is identified by an inscription.

## CHAPTER 4

### FORMAL AND COMPUTATIONAL METHODS IN ARCHAEOLOGY

In this chapter I outline the use of generative grammars in the formal analysis of archaeological fragments, with the aim of understanding how they might provide strategies for reconstructing the ancient library. I focus on the shape grammar formalism that directly uses shapes in visual computations, because this is more appropriate for archaeological reconstruction. The formalism is presented and illustrated by three shape grammars applications all founded within archaeological discourse: one on the generative specification of the tombs in the Orkney Islands, Scotland;<sup>433</sup> a second on the generative specification of Greek geometric battlement and running meanders;<sup>434</sup> and a third on the generative specification of Makowiecka's schemas for Roman libraries.<sup>435</sup> These studies provide a frame of reference for the formal specification of ancient Greek and Roman libraries, proposed in chapter 5.

#### 4.1. Introduction

Reconstruction of archaeological fragments includes a high degree of uncertainty. Typically this task is taken up by archaeologists, who interpret available data and propose the initial state of an artifact based upon its type, structure, technologies, materials,

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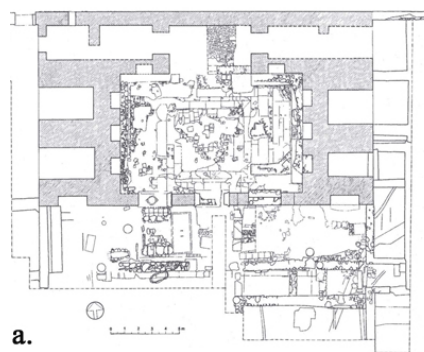
<sup>433</sup> Chippindale (1992).

<sup>434</sup> Weissman-Knight (1986, 29-67).

<sup>435</sup> Mamoli and Knight (2013 (forthcoming)).

ornaments, scale in comparison with other similar objects. Often experts disagree about the interpretation of available evidence and the resulting conjectures about an artifact's original state. Therefore, a substantial gap remains between the representation of the fragmentary existing object, produced through fieldwork, and the proposed representation of a proposed initial state.

Consider for example, one of the case studies discussed in the third chapter, the Hellenistic Library of Nysa. A series of archaeological excavations since the beginning of the 20th century have resulted in the identification of a building in the west side of the city of Nysa as the library mentioned in Julius Africanus's text.<sup>436</sup> The building proper consists of a central rectangular space and a series of auxiliary rooms and corridors organized around it with two sectional levels along the east, north, and west side. The overall structure has dimensions of approximately 28 by 15 meters and the central hall is 14 by 9 meters. The east and west walls each have three niches for books developed in two sectional series. The actual state plan is shown in figure 4.1.



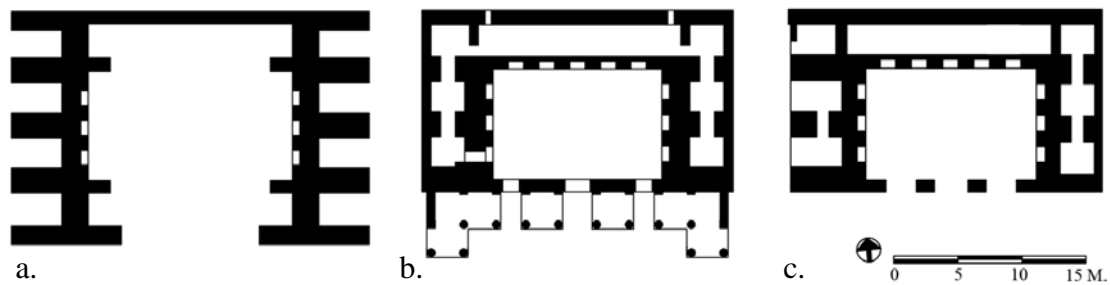
**Figure 4.1** Actual state plan of the Library of Nysa (Hiesel and Strocka 2006, fig. 1).

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<sup>436</sup> See chapter 3.1.13.



Identification of this building with the ancient library is revealed through its striking similarity with the contemporary libraries at Ephesus and Sagalassos, both built in the second century CE and geographically relatively close to Nysa. These similarities include: the podium, the niches, and auxiliary support spaces, all significant characteristics of Hellenistic and Roman libraries.<sup>437</sup> Despite this evidence, there is still no consensus that the building is a library and about the initial form of the building. Three distinct theses propose possible designs of its initial state.<sup>438</sup> Figure 4.2 illustrates the proposals by Diest, Hoepfner, and Idil.



**Figure 4.2** Alternative realizations of the plan of the Library of Nysa: a) Diest; b) Hoepfner; c) Idil.

These interpretations clearly offer different realizations of the building. Moreover, as suggested by the corpus of the identified libraries in the Roman world, other variations are possible too. But, if these proposed realizations (and more) are all possible, how can we begin to reason about these possible interpretations? Upon which premises is one solution better than others? What are the steps, if any, for the modeling of such reconstructions? Is it possible to have such assertions formalized and agreed upon?

<sup>437</sup> See chapter 2.4 The Problem of Design.

<sup>438</sup> Diest (1913), Hoepfner (2002), and Idil (2003).

Questions like those have been increasingly taken on by computational and formal methods in archaeological discourse. The introduction of formal methods in archaeological theory started in the second half of the 20<sup>th</sup> century as part of the emergence of different archaeological theories, including processual archaeology, post-processual archaeology, structural archaeology, post-structural archaeology, that all tried to explain and interpret material culture and the processes that led to it rather than simply describe its remains.<sup>439</sup> Mathematical tools and processes were of course always part of formal analysis in archaeological research, for example, geometrical and arithmetical relations in proportion theory, symmetry analysis and modular coordination, but it was the so-called “new” mathematics including graph theory, lattice theory, combinatorics, statistical analysis, space syntax analysis, and generative grammars that revolutionized analysis in archaeological research. Here emphasis is put on grammars for the generative specification of artifacts, as the most appropriate in reconstruction.

## **4.2. Generative grammars in the analysis of archaeological artifacts**

Grammars have been used in archaeology as a way of classifying and ordering a mass of findings, and as a systematic tool of reconstruction that allows possible reconstructions and interpretations.<sup>440</sup> Archaeological grammars are based on the notion of grammar in language, as described by Levi-Strauss,<sup>441</sup> where a finite set of rules defines an infinite

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<sup>439</sup> Clarke (1968); Clarke (1973); Hodder and Orton (1976); Hodder (1978a, 1978b, 1982a, 1982b, 1989, 1992, 1995, 2001); Hodder and Hutson (2003); Hodder (2005a, 2005b); Renfrew and Cooke (1979); Sabloff (2005); Renfrew and Bahn (2007); Doran and Hodson (1975); Whallon and Brown (1982); Aldenderfer (1987).

<sup>440</sup> Hodder and Hutson (2003).

<sup>441</sup> Lévi-Strauss (1963).

set of words to produce text and meaning.<sup>442</sup> This notion is very useful in archaeology, which deals with a massive amount of fragmentary data that once belonged to a “grammar,” and is at the core of archaeologists’ systematic method of classification and typology. As archaeological research and excavation progresses, and new material evidence come to light, these grammars can be modified to account for the new designs, or the new material can verify hypothesized designs generated by the grammars.

To counterbalance the criticism that formal methods look at form detached from historical, cultural and social meaning, Clarke has suggested a model of three separate but parallel grammars; a pragmatic grammar to address the relationship of artifacts to the individuals that conceptualize (maker) and perceive (observer) them, a semantic grammar to address the relationship of artifacts to their context, and a syntactic grammar to study the artifacts as geometric entities with a set of attributes. Among these grammar types, syntactic grammars are of particular interest because they address shape and geometric form, the basic fundamental physical variables of material evidence.<sup>443</sup>

Syntactic grammars are particularly useful in the classification of artifacts and the interpretations of the processes that generate the specific geometry and form of these artifacts because they focus on the geometric properties of artifacts, without requiring an apriori interpretation of function and meaning to explore systematically diverse ranges of possibilities.<sup>444</sup> Syntactic grammars can be developed with symbols (symbolic grammars) or visually with shapes (shape grammars).

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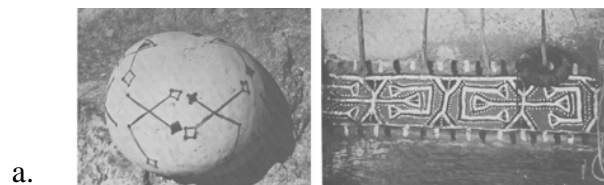
<sup>442</sup> Clarke and Chapman (1978).

<sup>443</sup> Clarke and Chapman (1978).

<sup>444</sup> Chippindale (1992); Clarke and Chapman (1978); Fekri (1988).

The earliest examples of applications of grammars in archaeological research are symbolic grammars.<sup>445</sup> Symbolic grammars consist of a vocabulary of symbols, letters or numbers, a set of rules according to which the vocabulary of symbols is manipulated and an initial symbol that defines the starting point of the computation. The computation is then based on the recursive application of the rules.

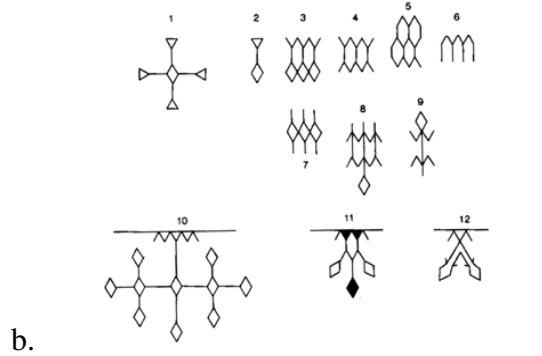
An example of a symbolic grammar in archaeological discourse is the grammar by Hodder of the decorative arts in the area of the Nuba hills in central Sudan.<sup>446</sup> Nuba ornaments appear in the decoration of hut fronts, pots, calabash artifacts, and body painting. The grammar encodes constructively the type definition of Nuba designs by decomposing the underlying motif, the star motif, into a vocabulary of shapes, typically a diamond, a triangle, a chevron, and a line segment, and a set of spatial relationships between these shapes. These spatial relations require that the shapes and the relations should be joined at their vertices in oblique angles and not along the sides or the bases of the triangles and the diamonds. The resulting grammar consists of a small set of commands (rotate, duplicate, etc.) that can compute known and hypothetical designs. A sample of Nuba ornaments, the extraction of the shapes and the spatial relations that are important for the grammar, the grammar (set of rules), and two derivations (productions) are shown in figure 4.3.



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<sup>445</sup> Hodder (1982a).

<sup>446</sup> Hodder (1982a).



b.

**Instructions**

- A. Choose object and part of object (calabash, house, etc.).
- B. Choose starting element (word unit).
- C. Begin design generation.

*Moves*

1. Move horizontally
2. Move vertically
3. Fill
4. Rotate
5. Expansion, reduction
6. Repeat
7. Return

*Possible operations*

At vertices (if possible or oblique angles) CONnect to (R)ight or (L)eft: CONnect after ROTating (in units of 45° or 90°); EXPand size of element; SKIP  
 As 1, moving Up or Down: SKIP  
 SOLid fill: DESigned fill of the spaces generated in 1 and 2: SKIP  
 ROTate whole design so far completed in units or multiples of 90° and redraw: SKIP  
 EXPand or REDuce size of whole design so far completed by 'n' units - a unit being the length of the sides of the A and B elements: SKIP  
 REPEAT design so far completed n times, VERTically or HORIZontally, to Right or Left, Up or Down: SKIP  
 RETurn to nth step or starting point

c.

**Examples**

(a)

*Starting point:* Choose B<sub>1</sub>, ROT(270°), SOL. (Comment: the left triangle is chosen, and obtained by turning B<sub>1</sub> through 270°, and filled.)

1. CON(R) ROT(180°)
2. SKIP
3. SKIP
4. SKIP
5. SKIP
6. REP(1) HOR(R)
7. SKIP



*Starting point:* Choose A, SOL. (Comment: the left lozenge is chosen and filled.)

d.

**Figure 4.3** The Nuba grammar: a) Nuba motifs in calabash and hut front designs; b) Schematic representation of nuba motifs as configurations of the star motif; c) The rules of the grammar (instructions); d) Two examples of computations (Hodder 1982, fig. 81, 82, 83 and table 18).

In the Nuba grammar, the rules are used as an experimentation tool, to test the validity of the theory about the underlying structure of the Nuba designs, and the variation that appears among different designs that appear in different media, or among different groups of people. Hodder states that by defining the whole range of possibilities, the full

richness, complexity, and subtlety of style and design is defined, and it becomes clear not only the extent of similarities but of differences as well. This contributes to the interpretation of why particular traits are not adopted in local areas. By knowing the actual among the possible designs, he was able to identify which underlying rules are tribe-specific, and which rules are common to all tribes of the Nuba.

### 4.3. Shappe Grammars

Grammars have different expressive powers and come in a variety of species. Among them the shape grammar formalism<sup>447</sup> is the most precise, intuitive, and expressive: Shape grammars directly use shapes for computation (as opposed to scripts and codes for the representation of shapes and transformations and operations) and therefore are intuitive in the hands (and eyes) of the researcher, archaeologist, and/or architect who is required to reason directly with rules and shapes. There is nothing extraneous about them, and even though the underlying formalism is difficult to be implemented in a computer.<sup>448</sup> Shape grammars use entirely visual computations as opposed to symbolic ones – for example, the computations that were described above in the Nuba grammar.

Computation in shape grammars is based on recursion and embedding.<sup>449</sup> The rules are of the form  $A \rightarrow B$  and are applied recursively. Every time the left side of a rule  $A$  is embedded, i.e. identified, under any transformation  $t$  in part or all of the design  $C$  so that

$$t(A) \leq C \tag{1}$$

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<sup>447</sup> Gips and Stiny (1973); Knight (1994a); Stiny (1975, 2006).

<sup>448</sup> Stiny (1990).

<sup>449</sup> Stiny (2006, 1976).

the part of the shape C in (1) is substituted by the right part of the rule B as described by the formula

$$[C-t(A)] +t(B) \quad (2)$$

Every time a rule is applied, all shapes fuse and the design is re-described as a set of maximal basic shapes, meaning that overlapping lines are identified as one larger line. The recursive application of the rules throughout the grammar for the generation of a design is called derivation or computation.

The process followed by the calculation uses a non-predefined vocabulary in accordance to predefined rules. In this sense shape grammars can be related both to Chomsky's work and his phrase structure grammar that uses a set of rules to impose a syntactic structure to a set of symbols and produce sentences in the same language,<sup>451</sup> and to Wolfram's work on evolutionary or genetic computation models in cellular automata, in that they are both rule-based systems working with recursion.<sup>452</sup> But more than both, shape grammars provide a mechanism to deal effectively with emergence in spatial design and therefore can become a more effective formal model for visual inquiry (both in analysis and synthesis).

In addition to form, function and materiality can also be embedded in the computation with the use of labels. Labels are markers that are attached to shapes to restrict the application of rules, or to add an extra layer of meaning, function or material to the shapes. Additionally, the grammar can use parametric shapes, which are defined

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<sup>451</sup> Mitchell (1990).

<sup>452</sup> Wolfram (1986).

parametrically according to a set of parameters and a range of valid values to these parameters.

#### *4.3.1. Applications of shape grammars*

A large number of shape grammar applications have already been produced for a variety of disciplines including architecture, furniture, landscape, planning, industrial design, mechanical design, automotive design and other fields that involve design and visual inquiry. In all these fields, shape grammars are used to generate designs, which, all being the productions of the same set of rules, are in the same language of designs.

In the analysis of style in architecture and the visual arts, shape grammars can be particularly useful because they provide a code for type and style definition and stylistic change. To develop a grammar for the analysis of style, a set of known designs is analyzed, the elements of design or the vocabulary is identified, and the design principles are explicitly encoded in rules.

The set of known designs under analysis can consist of as many designs as desired – it can even be only one as in the case of the grammar for the architecture of apartment façades by Terragni.<sup>458</sup> The recursive application of rules must regenerate most of the existing designs in the style, leaving out some case-specific and exceptional designs, as well as other hypothetical ones. Grammars for analysis can be parametric as in the case of the Palladian grammar,<sup>459</sup> can apply to generate irregularity as in the case of the grammar

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<sup>458</sup> Fleming (1981).

<sup>459</sup> Stiny and Mitchell (1978b, 1978a); Stiny and Gips (1978).



of ice-ray lattices,<sup>460</sup> or can approximate curvilinear shapes as in the case of the grammar for the Hepplewhite chair-back designs.<sup>461</sup> Multiple grammars can work in parallel to generate the plan, elevation and other features of designs, as in the grammar for the traditional Chinese Yingzao Fashi house,<sup>462</sup> Analysis grammars have also been created for Turkish houses,<sup>463</sup> Taiwanese traditional vernacular dwellings,<sup>464</sup> Buffalo bungalows,<sup>465</sup> Alvaro Siza houses in Portugal,<sup>466</sup> Queen Ann houses,<sup>467</sup> African homesteads,<sup>468</sup> Japanese tearooms,<sup>469</sup> and Frank Lloyd Wright Prairie and Usonian houses.<sup>470</sup>

In the synthesis of new designs from scratch – where the design of the rules is not predicated on some given set of designs that validate the design of the rules, the situation is different.<sup>471</sup> A series of simple three-dimensional grammars, the so-called kindergarten or basic grammars based on the three-dimensional Froebel gifts<sup>472</sup> have been particularly successful in generating simple recursive designs that are generated by few rules. Similarly pedagogical studios at MIT, Georgia Tech, Carnegie Mellon and elsewhere have utilized the drafting of a few simple rules of parametric grammars that can produce interesting and original visual results.<sup>473</sup>

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<sup>460</sup> Stiny (1977).

<sup>461</sup> Knight (1980).

<sup>462</sup> Li (2005).

<sup>463</sup> Cagdas (1996),

<sup>464</sup> Chiou and Krishnamurti (1995).

<sup>465</sup> Downing and Flemming (1981).

<sup>466</sup> Duarte (2005).

<sup>467</sup> Flemming (1987).

<sup>468</sup> Herbert, Sanders, and Mills (1994).

<sup>469</sup> Knight (1981).

<sup>470</sup> Knight (1994c); Koning and Eizenberg (1981).

<sup>471</sup> Economou (2001).

<sup>472</sup> Stiny (1980); Knight (1994a).

<sup>473</sup> See for example Knight (2012).

A transformation of a shape grammar can produce a related grammar with a related language of designs that can explain stylistic change and transitions from one style to another. As defined by Knight, transformations of a grammar entail three operations; rule deletion, rule addition, and rule change. Rule change happens either with a change in state labels, which affects the sequence the rules are applied, or with a change in spatial labels that affects the way a rule is applied, or by changing the vocabulary of shapes or their spatial relationships. Transformation grammars are valuable in approaching stylistic change between two or more styles; transformations in the grammar explain the transformation of the first style into the second, as well as the transformation of the first style into a variety of other styles, existing or hypothetical.

The extension of shape grammar applications in archaeology has been explored. The three applications discussed show a range of different topics and trajectories and a timeline. The grammars include one on the generative specification of the tombs in the Orkney Islands, Scotland;<sup>474</sup> a second on the generative specification of Greek geometric battlement and running meanders;<sup>475</sup> and a third on the generative specification of Makowiecka's schemas for Roman libraries.<sup>476</sup>

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<sup>474</sup> Chippindale (1992).

<sup>475</sup> Weissman-Knight (1986).

<sup>476</sup> Mamoli and Knight (2013).

#### 4.3.2. *The Orkney Islands grammar*

An early example of a shape grammar in archaeological context is the grammar of megalithic tombs in the Orkney Islands developed by Chippindale.<sup>477</sup> The grammar analyzes and describes constructively the design and the process of the generation of megalithic, chambered tombs constructed out of flat stone slabs, subdivided into modules by vertical slabs, in a linear arrangement. With six rules that add extra flat stone slabs, vertical slabs and terminate the design, the grammar describes the form of known tombs and the process of their construction (figure 4.5a).

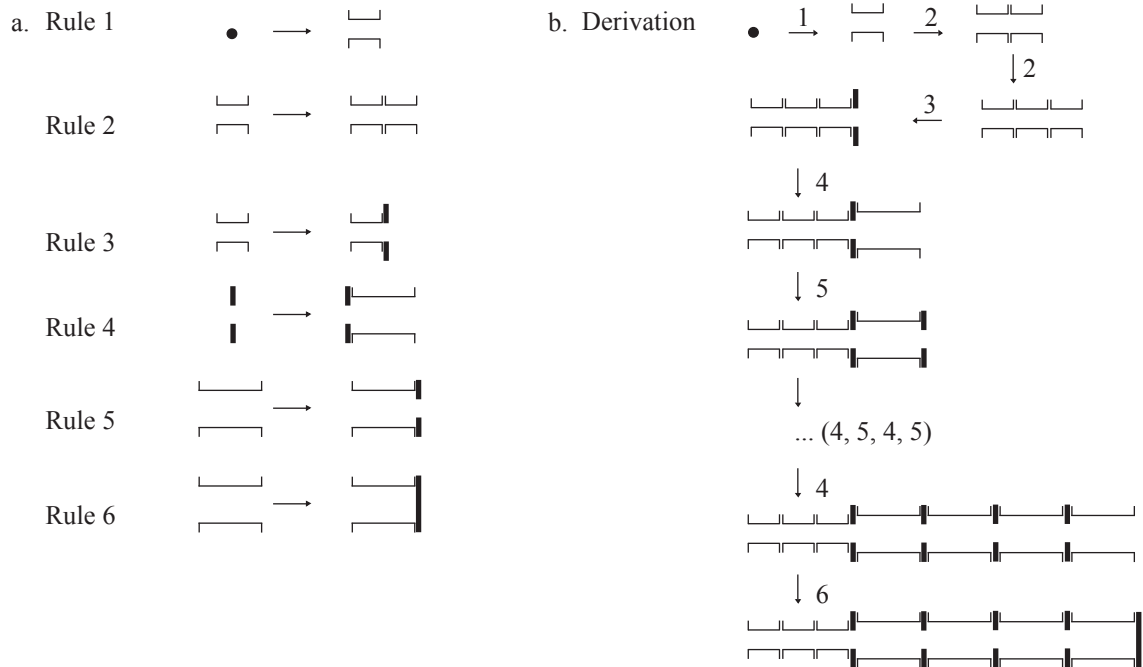


**Figure 4.4** A megalithic chamber tomb from Calf of Eday Long, Eday, Orkney, Scotland. a) plan, b) regularized plan of the tomb (Chippindale 1992, fig.10).

The algorithmic generation of chambered tombs is represented visually with shapes, but also numerically as a string of numbers that give the sequence of rules applied to compute each derivation. Additionally, the grammar classifies the tombs in schemata according to the different processes followed for their actual construction in a very simple way.

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<sup>477</sup> Chippindale (1992).

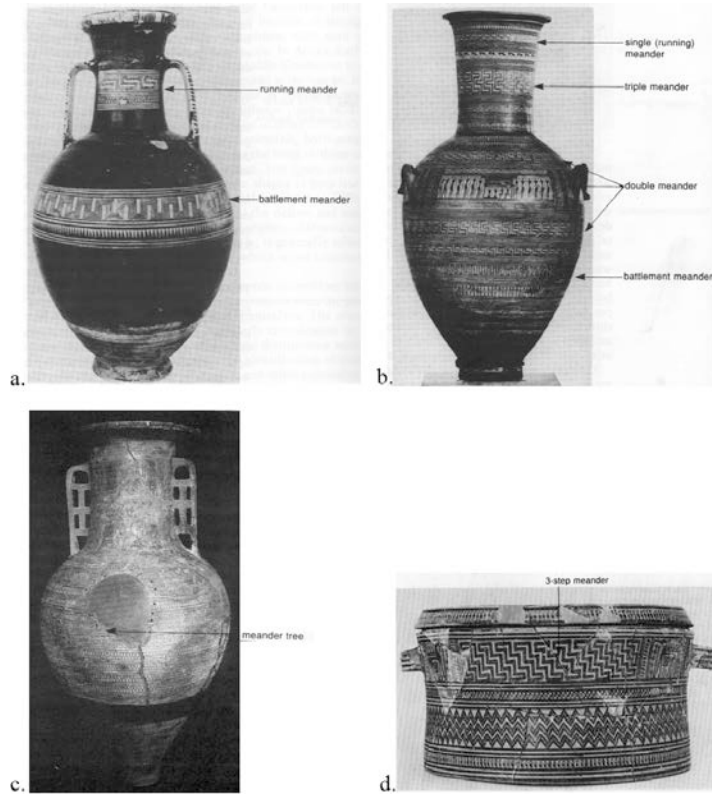


**Figure 4.5** The shape grammar of the megalithic chamber-tombs at the Orkney Islands. a) shape rules; b) derivation of the East chamber at Calf of Eday Long, Orkney, Scotland.

#### 4.3.3. *The Greek meander grammar*

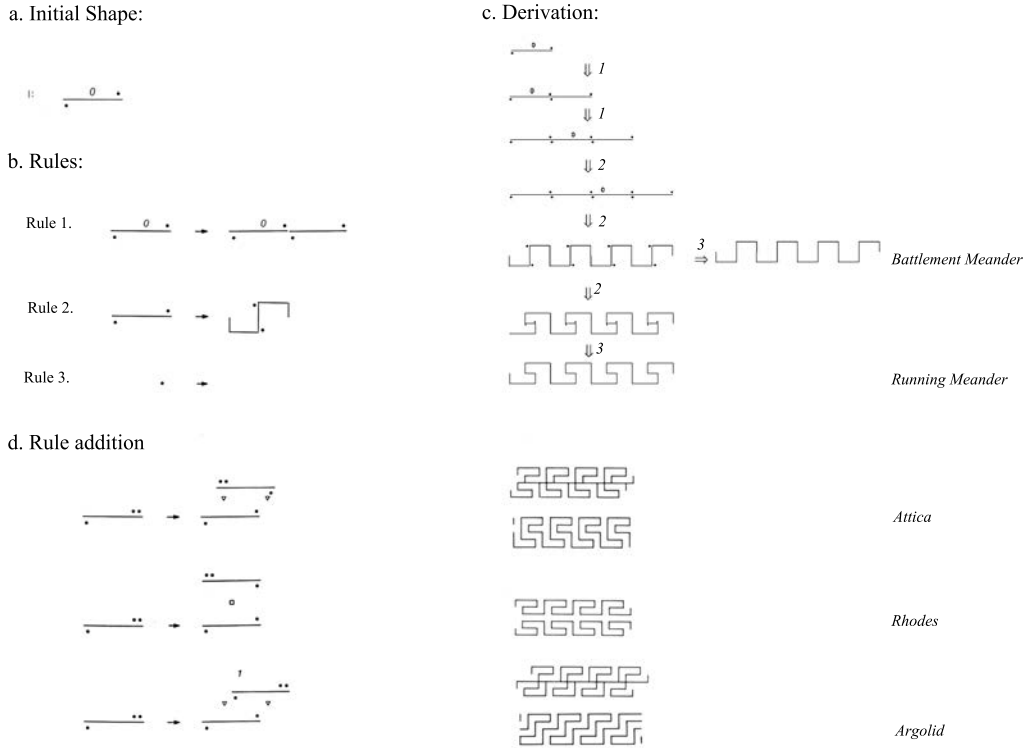
A shape grammar that describes stylistic change is the grammar for the Greek meander motif in Geometric pottery developed by Knight.<sup>478</sup> The grammar is designed in three stages to capture stylistic change due to temporal and geographic criteria. In the first stage, the grammar consists of the initial shape and two rules (figure 4.7a and 4.7b) that generate simple battlement and running meanders of the Early and Middle Geometric pottery (figures 4.6a and 4.6c).

<sup>478</sup> Knight (1994b); Weissman-Knight (1986).



**Figure 4.6** Geometric pottery. a) Early Geometric battlement and running meanders, Attica; b) Late Geometric single, double and triple running meanders, Attica; c) Late Geometric meander tree, Rhodes; and d) Late Geometric step meander, Argolid (Knight 1994b, fig. 6.1 a, c, w, p).

In a second stage, the grammar is transformed with rule addition to account for the more complex meanders of Late Geometric pottery (figure 4.6 b-d); A stacking rule allows the stacking of meanders and a rule deletes the overlapping lines to generate double and triple meanders. Additionally, rule change with shifts of 0,  $\frac{1}{4}$  or  $\frac{1}{2}$  units account for meanders of different areas (figure 4.7d). In the third stage, the grammar is transformed to account for stylistic change based on the style of different workshops of the same area and same period.



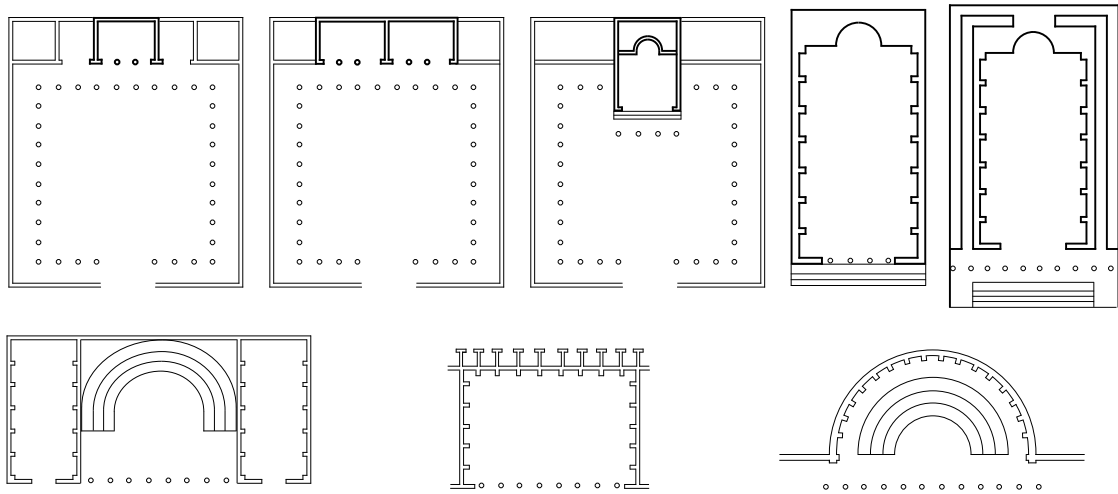
**Figure 4.7** Transformational shape grammars for the Greek meander. a) Initial shape, b) Rules that generate the Early Geometric battlement meanders, and the Middle Geometric running meander; c) Derivation of the Early and Middle Geometric meanders; and d) Addition of the stacking rule to generate Late Geometric meanders. Rule change in the stacking rule in terms of  $\frac{1}{4}$ , 0, and  $\frac{1}{2}$  shifts account for stylistic change between different regions.

#### 4.3.4. A grammar for Macowiecka's Roman library schemata

This third shape grammar application, by Mamoli and Knight, takes on the problem of archaeological reconstruction,. The grammar, rather than relying on original data, uses an existing catalogue of conjectural schemas for a given set of buildings – the underlying schemas of the ancient Roman classical libraries as proposed by Makowiecka<sup>479</sup> and attempts to see whether the heuristic account proposed in the initial publication exhausts

<sup>479</sup> Makowiecka (1978, 99-103).

or not the possible schemas that may have been used in the design of the classical libraries. The eight schemata proposed by Makowiecka are shown in figure 4.8.

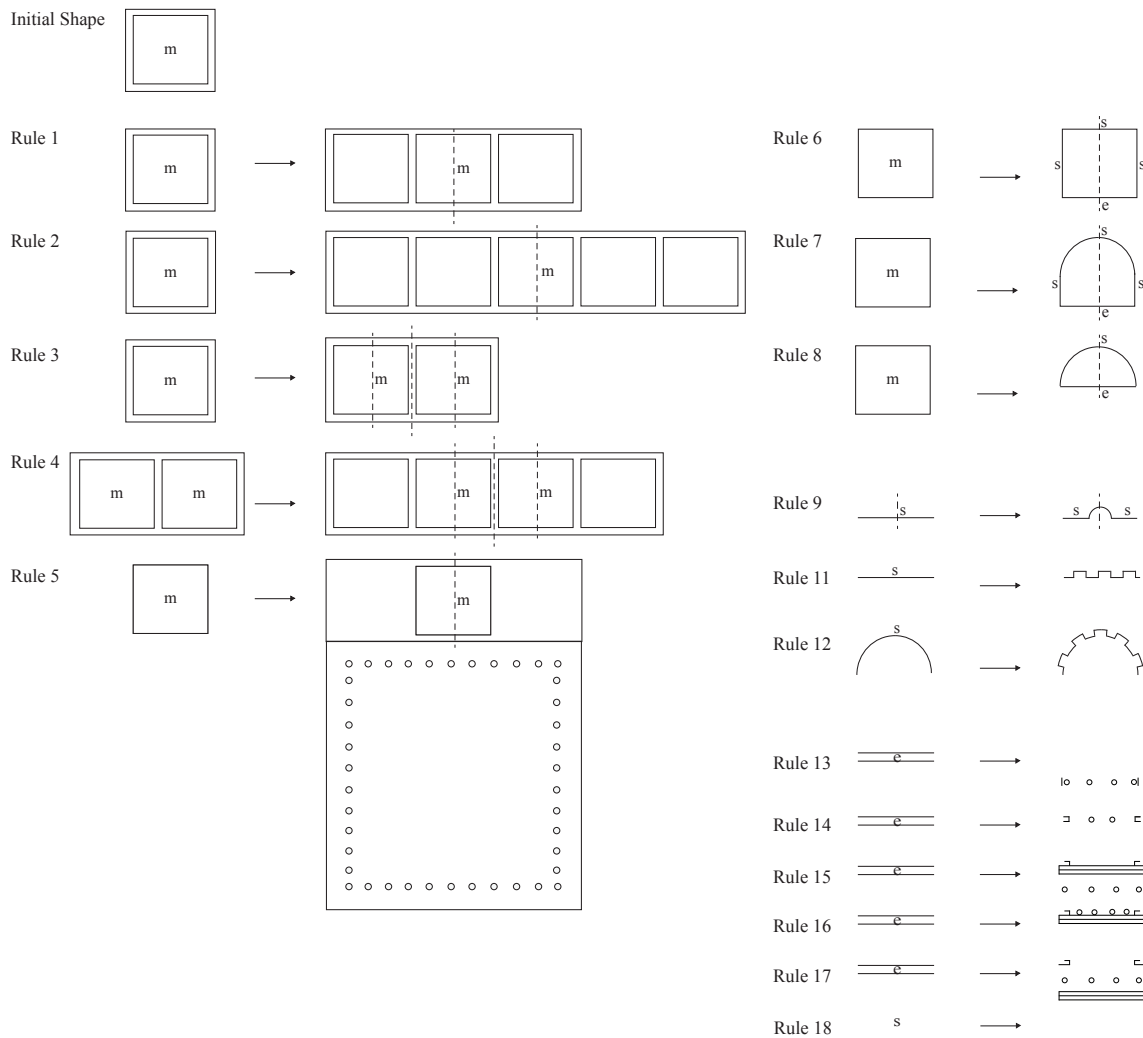


**Figure 4.8** Schemata of Roman libraries (Makowiecka 1978, redrawn after fig. 18-25).

A brief outline of a grammar that generates the libraries that follow the design principles as exemplified in Makowiecka's schemata is given below to demonstrate how a generative grammar provides a better approach than the parametric schemata in accounting for possible designs. Specific parameters, conditions and labels in rules are omitted here for clarity (figure 4.9).

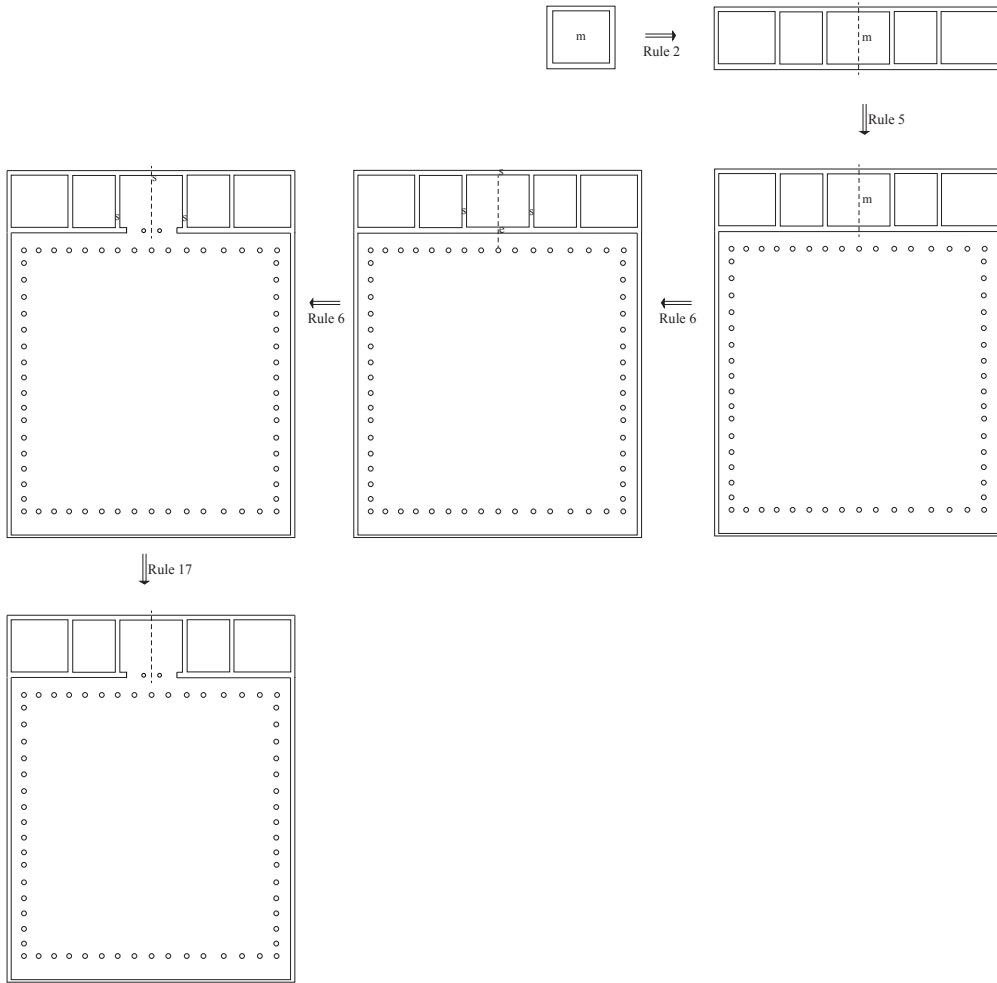
The parametric rules 1-5 add additional rooms, and/or duplicate the main hall and add a peristyle with a courtyard. The parametric rules 6-18 generate the interior of the main hall: Rules 6-8 generate the plan of the main hall, modify the back wall or the whole main hall into a semi-circular space and add a central semi-circular exedra; Rules 9-12 generate

niches and Rules 13-18 generate the openings to the main hall, add niches, and modify the entrance wall into openings between columns in antis, prostyle entrances, with or without steps. Two derivations are shown in figures 4.10 and 4.11. The first generates a library identical with the first schema of Mackowiecka, and the second generates a library not accounted in Makowiecka's schemata.

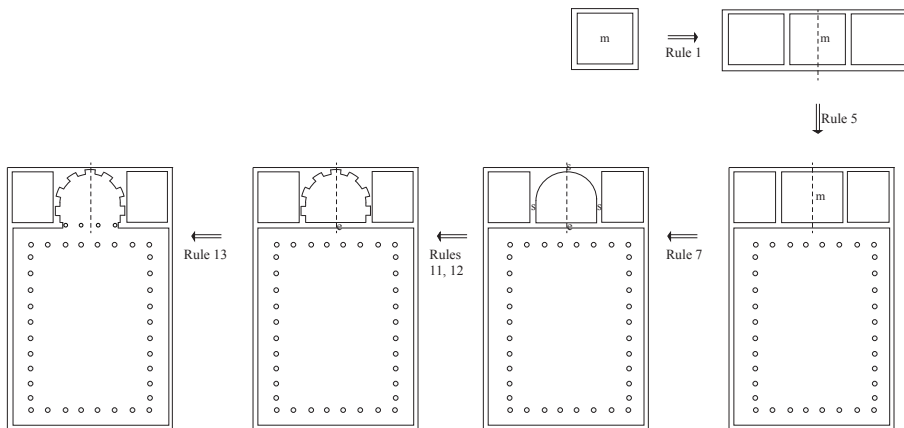


**Figure 4.9** The library grammar that generates the general layout and the main hall of the libraries presented in the schemas of Makowiecka and other hypothetical ones. Rules 1-5 generate the layout of libraries, Rules 6-8 generate the plan of the main hall; Rules 9-12 generate niches; and Rules 13-18 generate the openings to the main hall (Mamoli and Knight 2013, fig. 6).





**Figure 4.10** Derivation of a library as given in the schemata of Makowiecka (Mamoli and Knight 2013, fig. 7).



**Figure 4.11** Derivation of a possible library not included in the parametric schemata of Makowiecka (Mamoli and Knight 2013, fig. 8).

Clearly, Macowiecka's work did not include all possible schemata for libraries. Her schemata give the false impression that characteristics included in one schema cannot appear in the others, therefore excluding combinations between schemata. For example, the Library of Rogatinus in Timgad is a combination of the schema with the two storage rooms and the central semicircular space and the schema with the portico. I will explain this idea further in chapter 5, when I set up the proper formalization of the Hellenistic and Roman libraries, with a complete library grammar to provide a generative description of the seventeen libraries in the corpus of ancient Greek and Roman known and identified libraries.

#### **4.4. Discussion**

While a range of formal methods are useful in formal analysis and reconstruction in archaeological research, the advantages of employing shape grammars in analysis of style in archaeology are straightforward. They enable the researcher to explicitly articulate statements about the artifact and its underlying configuration in visual rules that are intuitive and descriptive and can be tested against the data. They provide a systematic approach to explore variation and possibilities within a typology or style. This is a powerful tool in the hands of the historian who can identify the actual among the possible. Knowing the range of possibilities, the historian can make a hypothesis, explain and interpret the existence or non-existence of designs among cultures and cultural groups. Their transformations with rule addition, rule deletion or rule change can produce transformational languages of designs, an excellent guide to explore stylistic change and to inquire of how different styles are related to each other.

Still, shape grammars are tied to the description, interpretation and evaluation of existing archaeological records. The data exist, and it is up to the researcher to deconstruct these data in specific elements and relations, design rules and apply them to produce the original data plus additional descriptions that can substantially enhance and/or challenge the original interpretation of the work.

The specific challenge that rises here is the deployment of the formalism in the reconstruction of the initial state of an artifact that is given only fragmentarily. Here the original data that need to be deconstructed in elements and spatial relations survives only partially and the rules have to be of another sort.

There are many ways to complete a picture, and the various ways that architects or archaeologists complete the picture of a representation of a building in some initial state can differ dramatically, and can produce different results. It is clear as well that the ways a building or an artifact can be completed based on some evidence can differ dramatically with respect to the kind of building or artifact it is, and our prior engagement and understanding of it. The clarity of the shape grammars is that it allows for such hypotheses to be made and tested easily, visually. The work that follows on the generative description of the corpus of the Greek and Roman libraries identified in the previous chapters is a series of hypotheses. In this sense it is hoped that the work here will be useful to the archaeologists and the architects because it attempts to formalize a specific body of archaeological work, and can be useful to shape grammarians and formal researchers in morphology because it attempts to generate the whole, starting from fragments. The formal specification of the reconstruction of the Greek and Roman libraries is given in the next chapter.

## CHAPTER 5

### THE LIBRARY GRAMMAR

To create the shape grammar, seventeen libraries identified by ancient testimonia and building remains are represented in a pictorial manner to foreground similarities and differences between the archaeological remains of the libraries. The pictorial representation of the state-of-preservation plans foregrounds the elements of the buildings that are central to the research here. The plans are redrawn in an identical scale, manner and set of graphical conventions to produce the initial analysis set of the seventeen libraries. A shape grammar for the ancient libraries is postulated upon these drawings and is given in two series: one for the arrangement of the main hall of the library, the *oikos*; and a second for the arrangement of the whole building complex including auxiliary rooms, porticos, stoas, *exedras*, and *propyla*. A series of derivations is given for the generation of parametric libraries that are juxtaposed to the state-of-preservation plans that comprise the corpus of the grammar. A series of alternative derivations of some of the libraries in the corpus is given to critically discuss the conventions and the merits of other proposed reconstructions of the libraries. Last, a series of derivations is given for the buildings that have been identified as possible libraries, to evaluate them as libraries or non-libraries.

## 5.1. Introduction

The grammar is based on an analysis of the archaeological record of the seventeen libraries that have been identified by ancient testimonia and building remains. For easy reference the libraries are given in Table 5.1 assigned letters of the alphabet.

**Table 5.1** Corpus of libraries used in the analysis for the grammar.

#	Library	Location	Date
a.	Library at the Serapeum	Alexandria	300-250 BCE
b.	Library of Pergamon	Pergamon	200-175 BCE
c.	Academy of Plato	Athens	1 <sup>st</sup> c. BCE
d.	Library in the gymnasium of Rhodes	Rhodes	100 BCE
e.	Augustan Palatine Library	Rome	28 BCE
f.	Library in the Portico of Octavia	Rome	23 BCE
g.	Library at the Templum Pacis	Rome	75 CE
h.	Domitian's Palatine library	Rome	80 CE
i.	Pantainos Library	Athens	102 CE
j.	Celsus Library	Ephesus	117 CE
k.	Ulpian Library	Rome	114-128 CE
l.	Neon Library	Sagalassos	120 CE
m.	Library of Nysa	Nysa	2 <sup>nd</sup> c. CE
n.	Melitine Library	Pergamon	123 CE
o.	Hadrian's Library	Athens	131 CE
p.	Library in the Forum of Philippi	Philippi	2 <sup>nd</sup> c. CE
q.	Library of Rogatinus	Timgad	150-200 CE

The plans depicting the actual state of these libraries differ significantly in quality, detail and complexity, due to the various circumstances, including later phases and usages of the building, natural decay and intentional destruction, diverse interpretative and evaluative bias of the teams mapping the findings of the excavations, different methods of data acquisition, and in general a great variety of conventions of representation: some drawings depict earlier and later phases together, other depict state of preservation and reconstruction in the same drawing, and altogether they follow different conventions of line, hatching and color that makes them hardly comparable. In addition, for some buildings there is no drawing that depicts the whole archaeological record, as for example for the Templum Pacis, for which there is no complete drawing that brings together the state of preservation of the different parts excavated, and the parts of the plan known from the FUR. Last, different drawings depict different levels of detail. For example in some drawings, walls are given in outline, while in others they are represented in much greater detail, including individual stones or even rubble packing.

Here these state-of-preservation plans are redrawn in an identical scale, manner and set of graphical conventions to produce the initial pictorial set of the seventeen libraries. All drawings depict only the parts that belong to the original form of the building, and in few cases, the form of the building in its best-known version.<sup>485</sup>

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<sup>485</sup> The full archaeological record with earlier and later phases is given in a separate set of drawings in Appendix D.

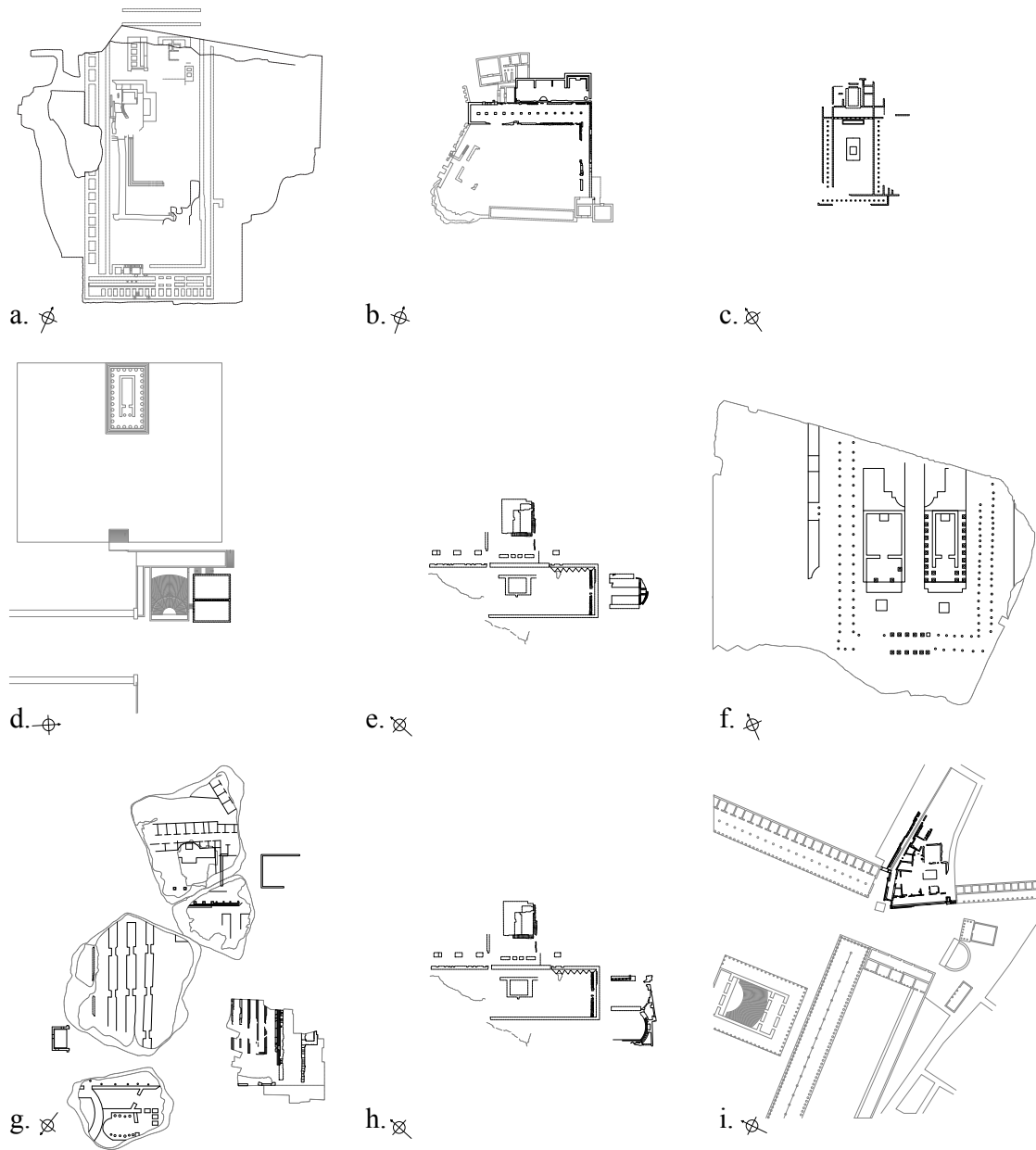
These drawings have been modeled at two scales, one at an urban scale and one at an architectural scale. Each has a different level of detail and amount of information to begin to suggest patterns of form and usage at both the scale of the urban context of which these buildings are part, as well as at the scale of their interior arrangement.

The first set of the drawings shows the urban and the architectural context of the libraries and includes the archaeological remains of the street networks, block configurations, adjacent buildings, and stoas. The graphical conventions for mapping this information on the model follow the conventions of the 1:500 metric scale.<sup>486</sup> To clarify the relation of the main hall to the rest of the building complex and the city fabric, the main hall of the library is drawn with black lines, the support spaces of the library with dark grey lines and the context of the library with light grey lines. Solid lines represent remains of structures in the ground floor, while dashed lines represent foundations. These drawings are set out in figure 5.1.

The second set of drawings focus on the archaeological remains of the main hall and include the remains of the niches, the podium, the focal point, the interior colonnade, the entrance, and other support spaces. The graphical conventions of the mapping of this information on the model follow the conventions of the 1:200 metric scale. Both sets of drawings provide the basis for the analysis and the design of the library grammar. The fifteen libraries that have traces of the architectural arrangement of their main hall and entry sequence are shown in Figure 5.2.

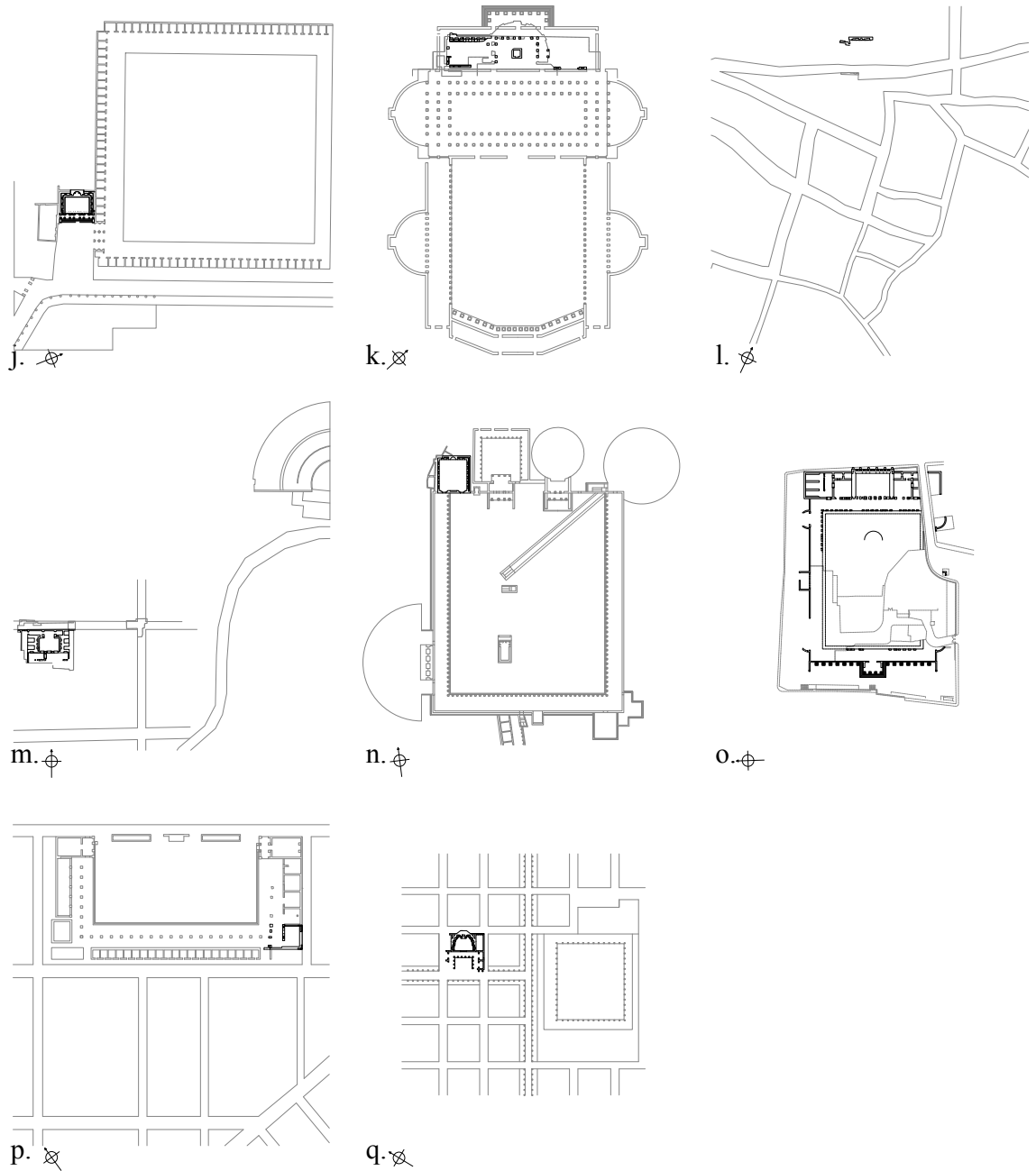
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<sup>486</sup> The drawings printed here are at a scale 1:4000 in order to fit in the paper.



**Figure 5.1** Redrawn state-of-preservation plans of the seventeen libraries foregrounding the fragments of the initial form of the libraries in their urban context, in the scale 1:4000 (author's drawing). a) Library at the Serapeum; b) Library of Pergamon; c) Academy of Plato; d) Library in the gymnasium of Rhodes; e) Augustan Palatine Library; f) Library in the Portico of Octavia; g) Library at the Templum Pacis, h) Domitianic Palatine Library; i) Pantainos Library.

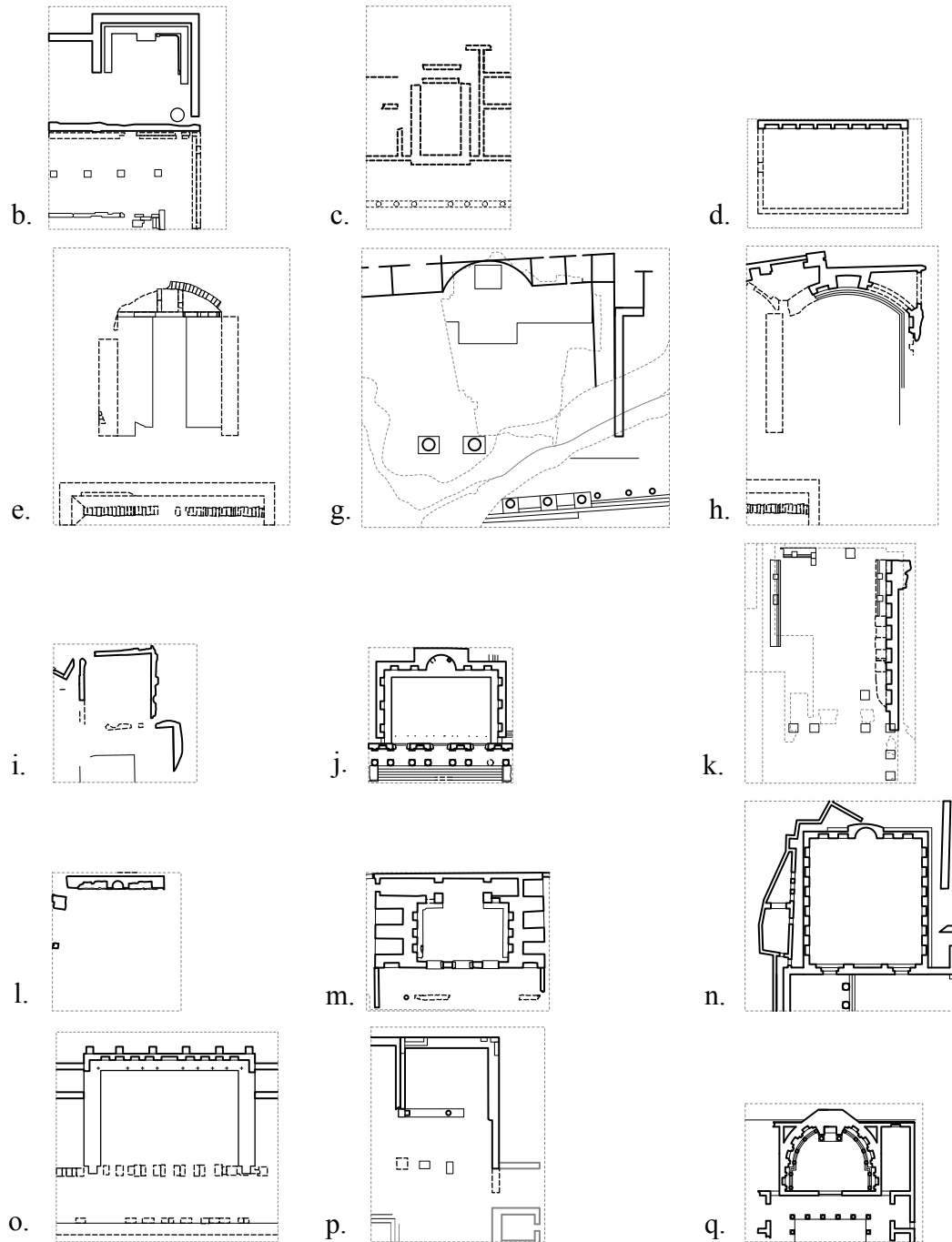




**Figure 5.1** (Continued) Redrawn state-of-preservation plans of the seventeen libraries foregrounding the fragments of the initial form of the libraries in their urban context in the scale of 1:4000 (author's drawing). j) Celsus Library; k) Ulpian Library; l) Neon Library; m) Library of Nysa; n) Melitine Library; o) Hadrian's Library; p) Library in the Forum of Philippi; and q) Library of Rogatinus.

The comparison of the seventeen libraries at the urban scale suggests the diverse circumstances within which these buildings were conceived and designed. Some designs show the library as an independent building within the structure of the city occupying a complete urban block or a significant portion of it –for example, the cases of Nysa or Timgad. Other libraries are shown as a part of an architectural ensemble or an architectural configuration with its own compositional criteria and demands - see for example the cases of Pergamum or Philippi. In other cases the design is very formal obeying strict rules of bilateral symmetry and hierarchical sequence of ordered spaces, as for example, the Ulpian Library or Hadrian's Library in Athens. In other cases the fragments suggest informal arrangements such as the Pantainos Library in Athens. Last, in some cases the architecture of these building remains point to a trabeated system of construction, see for example the Academy of Plato and the Serapeun while in other cases the architecture points to an arcuated system of construction – see for example, the Library of Nysa, and the Rogatinus Library in Timgad, and possibly the Melitine Library.

The complexity of this initial reading of the libraries is not limited to the urban scale. The same complexity and multiplicity of readings in the decomposition or reconstruction appears and is even exacerbated at the architectural scale. The main hall of the library, appears with a variety of designs with different degree of monumentality: with a rectangular or apsidal, wide or elongated plan, and with or without interior colonnade and podium, and with, and less frequently without niches for the armaria and focal point for the statue of the patron of the library.



**Figure 5.2** Redrawn state-of-preservation plans of the fifteen libraries that have building remains of a main hall, foregrounding the fragments of the initial form of the hall of the libraries, in scale 1:1000 (author's drawing). b) Library of Pergamon; c) Academy of Plato; d) Library of Rhodes; e) Augustan Palatine Library; g) Library at the Templum Pacis; h) Domitianic Palatine library; i) Pantainos Library; j) Celsus Library; k) Ulpian Library; l) Neon Library; m) Library of Nysa; n) Melitine Library; o) Hadrian's Library; p) Library in the Forum of Philippi; and q) Library of Rogatinus.

The grammar is based on the visual aspects of these plans as well as in the historical analysis of the architectural form of libraries, outlined in chapter 2. The goal of the grammar is to generate possible reconstructions that will confirm or refute the existing reconstructions presented by researchers, or propose alternative reconstructions that have not been suggested yet, and to evaluate the suggested buildings as libraries or not.

## **5.2. The library grammar**

The library grammar consists of two major parts that roughly correspond to the generation process of a building or a building complex: the first set of rules defines the main hall of the library and its architectural articulation; the second set defines the building envelope and the general layout of the building or the building complex. It is not suggested that the grammar corresponds to actual design processes carried out for the design and execution of the buildings. These two generation processes and the rules used to characterize them are presented here to define a uniform treatment of the design of these buildings. Both consist of several subsets or stages, each defining a proper part of the generation process.

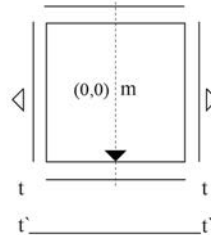
More specifically, each part of the grammar consists of six stages. Stages I through VI generate the layout of the main hall of the library with its interior design. Stages VII through XI generate the rest of the layout of the library, the side rooms, the stoas with the exedras, the entrance and the courtyard, if any. Last, stage XII generates the interior design of the side rooms. The stages are:

## PART 1

- I. Main Hall Layout
- II. Podium
- III. Interior Colonnade
- IV. Niches
- V. Focal Point
- VI. Entrance Openings

## PART 2

- VII. Main hall and side rooms
- VIII. Exterior walls
- IX. Thresholds, stoas and courtyards
- X. Exedras
- XI. Entry to complex
- XII. Functional characteristics of support spaces



**Figure 5.3** The initial shape from which all library plans are generated.

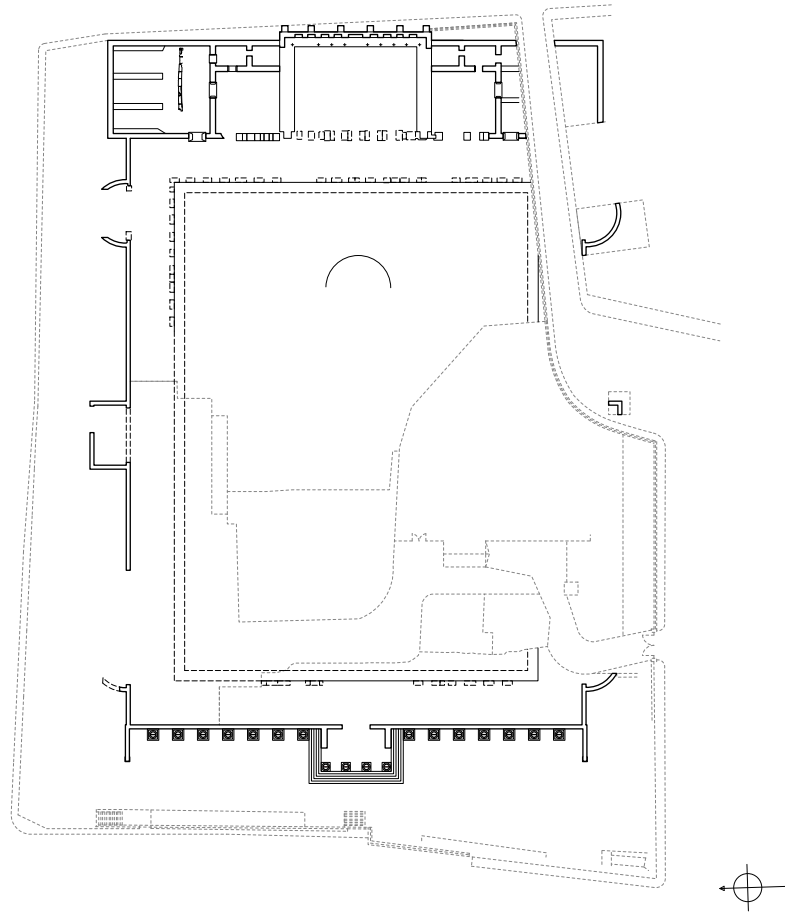
The initial shape from which all plans are generated by the recursive application of the rules specified below is the labeled shape  $m$  shown in figure 5.3. The initial shape includes a rectangular outline for the main hall, the label  $m$  to signify that this space is a main hall, the label  $\triangleleft$  to allow further addition of rooms and the label  $\blacktriangle$  to point to the

entrance of the main hall and to allow the generation of an entry condition. The initial shape is parametric.<sup>487</sup> The parameters refer to the width  $m_w$  and depth of the main hall  $m_d$ , the wall thickness  $w$ , and the distance of  $t't'$  from  $tt$ , which corresponds to the depth of the entry condition  $tt'$ . On the side of each rule are the conditions for the rule, and also the metadata for the rule. Conditions refer to the conditions that are necessary to be met in order for the rules to apply, and metadata refer to the libraries in the corpus on which a rule is based.

I will describe the different stages of the rules, illustrating the application of rules using as an example Hadrian's Library. Hadrian's Library is one of the best-documented complexes in the corpus and its main hall is one of the best preserved since it includes the back wall almost at its full height, thus leaving little space for speculation, as shown in figure 5.4.

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<sup>487</sup> For an analytic account of all parameters in the initial shape and the rules see Appendix E.

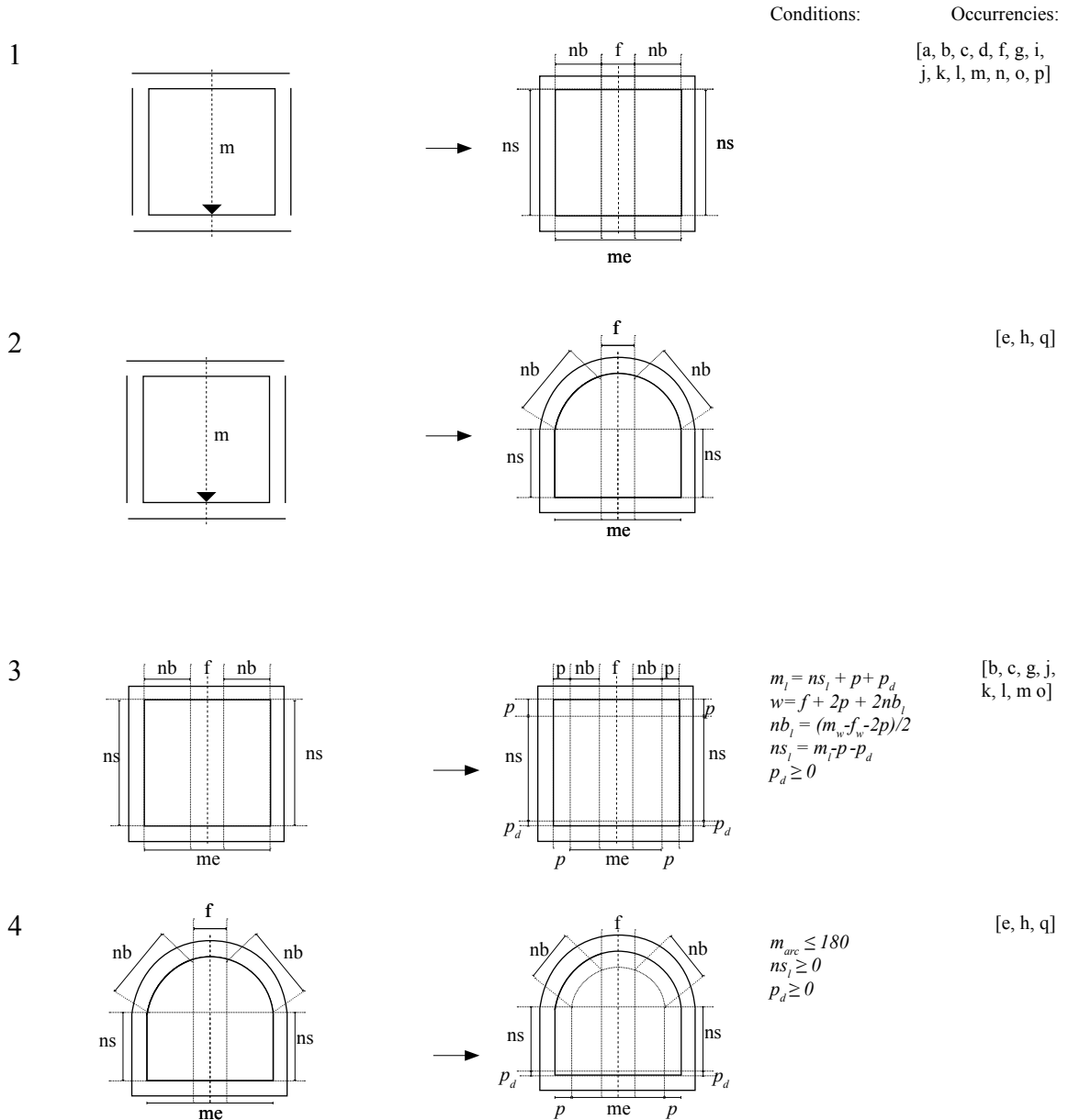


**Figure 5.4** State of preservation of Hadrian's Library in Athens.

*5.2.1. Stage I: Main Hall*

The rules of Stage I create the basic subdivisions in the main hall, the oikos, and define its basic structure by specifying its shape and labeling its different parts: the walls with the armaria, the podium if any, the central and axial characteristic in the back wall, and the entrance. These rules are given in figure 5.5.

Rule 1 specifies the main hall as rectangular and rule 2 as apsidal. Both rules label the different walls of the main hall: the space in the back wall that will be taken by the focal point, the rest of the back walls and the side walls, where the niches or the bookcases will be placed, and the wall where the main entrance will be added.

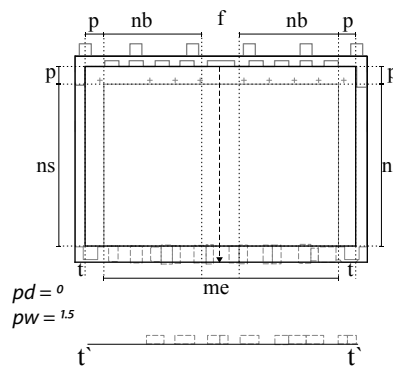


**Figure 5.5** Stage I rules that generate the basic subdivisions in the main hall of the library.



Rules 3 and 4 further subdivide the floor plan of the rectangular or the apsidal main hall to generate a border along the walls  $ns$  and  $nb$  with a width  $p$ . This border can reach the entrance wall or can stop at a distance  $p_d$  from the entrance wall. Another effect of this rule is the reduction of the maximum length of the entrance to the main hall  $me$ , which cannot overlap with the space defined by  $p$ . These rules are optional and lead to the next stage that adds a podium.

Figure 5.6 shows the outcome of the derivation of the rules in Stage I for Hadrian's Library in Athens. The main hall of Hadrian's Library is rectangular with niches in the walls, a focal point and a podium. Rules 1 and 3 apply to label the sidewalls  $ns$ , and back walls  $nb$ , the focal point  $f$ , and the space for the podium and also to reduce the allowable length for an opening to the width of the room minus the width of the podium.



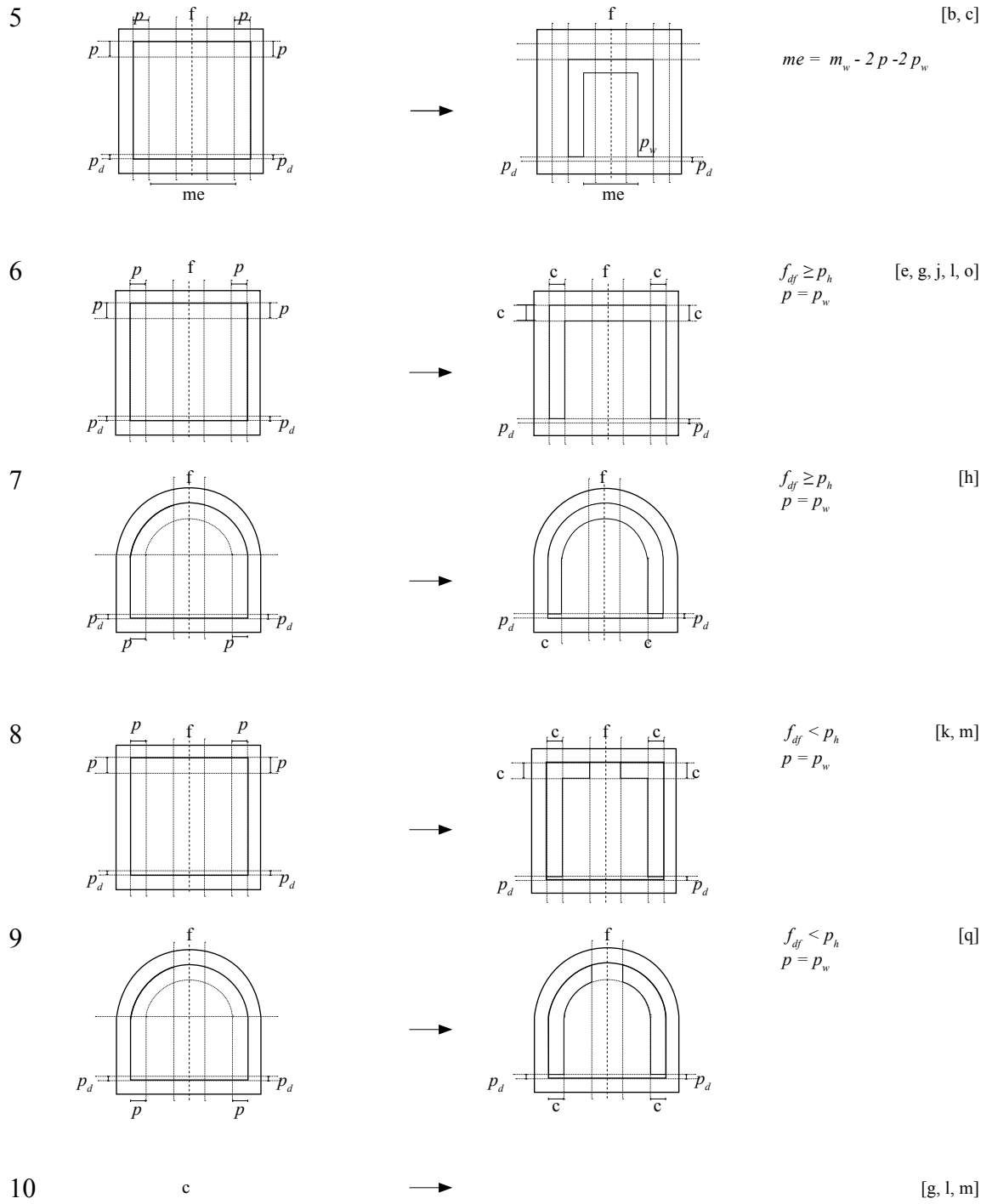
**Figure 5.6** Subdivision of the main hall for Hadrian's Library in Athens.

### 5.2.2. Stage II: Podium

The podium in ancient libraries was a low wall along the side and back wall of the main hall used primarily as a threshold to the niches on the walls, and also as a sitting space in those cases where it was preceded by steps. The set of rules that generate different choices for a podium of the main hall of the library is given in Figure 5.7.

Rule 5 places the podium at a distance from the wall of the main hall. This distance is specified by the border labeled  $p$ . This kind of podium existed in Hellenistic architecture and was probably intended to host statues or banquet *klinai*. The parametric distance  $p$  from the wall is initialized at 0.5 m. and the width of the podium  $p_w$  at 1 m. The podium can stop at a distance  $me$  from the entrance wall.

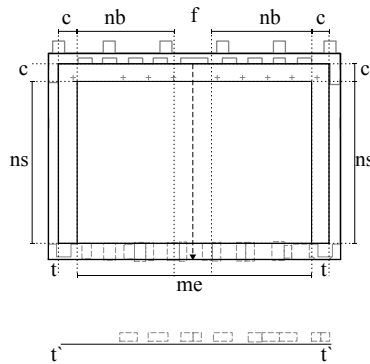
Rules 6 through 7 generate a podium placed directly against the walls of the main hall, as it was in Roman architecture. Rules 6 and 7 generate a continuous U-shaped podium along the walls  $ns$  and  $nb$ . The condition for these rules is that the podium height is less than the distance of the focal point from the floor, so that the podium does not block the visual and physical access to the focal point. Rules 8 and 9 account for the case that the focal point is directly placed on the floor or at a distance less than the podium height. In this case, the podium is interrupted by the focal point, resulting in two L-shaped podia. The rules are parametric and generate a podium with width  $p_w$  0.8 to 1.5 m., which can reach the wall of the main entrance or stop at a distance  $p_d$  from it, about 0.35 – 0.55 m. Rules 6 - 9 also substitute the label  $p$  with  $c$ , which allows for the next stage to apply, that will generate a colonnade stepping on the podium.



**Figure 5.7** Stage II rules that generate a podium in the main hall.

Lastly, rule 10 erases the label  $c$  to account for cases where the podium is not accompanied by an interior colonnade. In all, rule 5 generates a freestanding podium, rules 6 and 7 a U-shape podium set against the walls, and rules 8 and 9 two L-shaped podia, set apart by the focal point.

Figure 5.8 shows the outcome of the derivation of the rules in Stage II for Hadrian's Library. The library has a continuous podium, 1.5 m. wide that reaches the entrance wall  $me$ , and on which is set a colonnade. Here only rule 6 applies in this stage for  $p_w = 1.5$  m. and  $p_d = 0$ . The label  $c$  is retained in order to generate a colonnade in the stage III.



**Figure 5.8** Addition of a continuous U-shaped podium for Hadrian's Library in Athens.

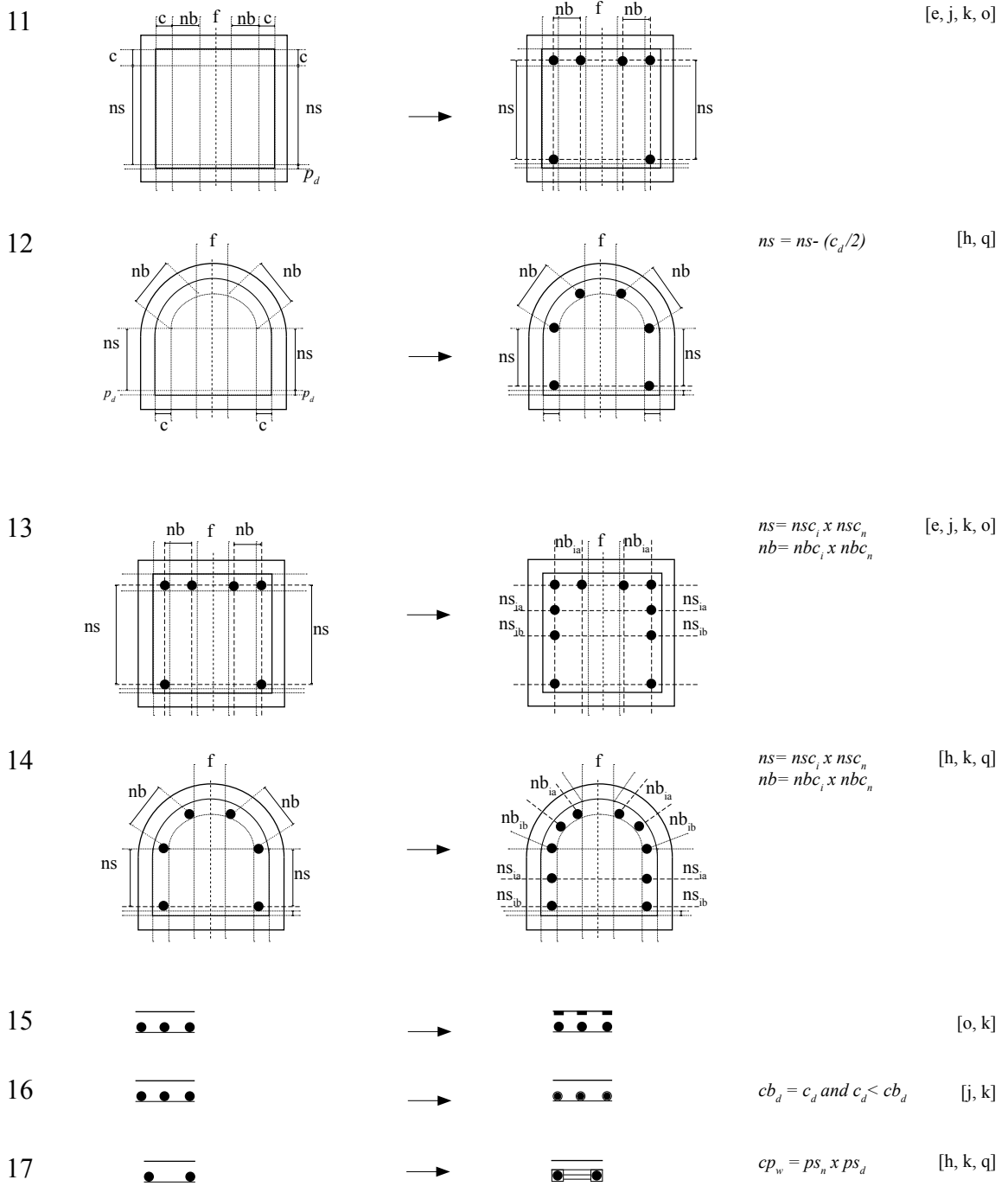
### 5.2.3. Stage III: Interior Colonnade

Roman libraries often had a column screen set on the podium. Rules in Stage III apply to generate a colonnade on the podium generated by the previous stage, and labeled  $c$ . The rules in this stage insert end columns in the podium and then propagate the colonnade

based on a standard interaxial dimension, the  $ns_c$  for the wall,  $ns$  and the  $nb_c$  for the back wall of the main hall. While  $ns_c$  often equals  $nb_c$ , it is not unusual for the two walls to have a different interaxial space. The set of rules that generate the interior colonnade of the main hall of the library is given in Figure 5.9.

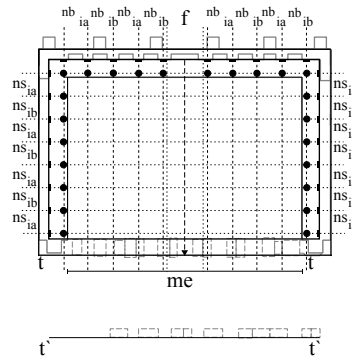
Rule 11 places the corner columns in a rectangular hall, perpendicular to the axes specified by the labels  $c$  and  $f$ . The column is placed at the intersection of the two  $c$  axes, in the inner corner, perpendicular to both of them. The space between the end columns in the side walls  $ns$  and in the back walls  $nb$  is shifted by a half column diameter, so that the space is centered in the interaxial of the two end columns. Rule 12 places the columns in an apsidal hall, perpendicular to the axes and the curve defined by the label  $c$  and the axes defined by the label  $f$ . The intermediate columns between  $ns$  and  $nb$  are placed at the point where the projections of  $ns$  and  $nb$  intersect with the podium. The distance between the end columns in the back wall is the same as  $nb$ , and the distance between the end columns in sidewalls is the dimension of  $ns$  minus half a column diameter.

Rules 13 and 14 calculate the interaxial space between two columns based on the overall dimension and the number of columns that can fit, so that the interaxial space is not less than 1 m, which is the minimum width of a niche. Last, rules 15, 16 and 17 add stylistic characteristics to the columns: rule 15 adds half pilasters against the wall as reflections of the columns, rule 16 adds a column base to the columns to denote an Ionic or Corinthian order, and rule 17 adds pedestals to the columns and substitutes the podium with steps up to the width of the column pedestals, thus giving the effect of a seating space around the main hall.



**Figure 5.9** Stage III rules that generate the interior colonnade in the main hall of the library.

Figure 5.10 shows the outcome of the derivation of the rules in Stage III for Hadrian's Library in Athens. In the library there are building remains of the beam supports for the colonnade in the back wall that define the interaxial space 2.15 m - 2.18 m. long. The same interaxial space is used for the calculation of the colonnade in the sidewalls. With that value in the parameter given, rules 11 and 13 generate the colonnade parametrically with ten columns in the back wall and seven columns in each of the sidewalls (the corner columns are calculated twice). Last, rule 15 adds half pilasters as reflections of the columns and rule 16 adds column bases.



**Figure 5.10** Addition of an interior colonnade for the main hall of Hadrian's Library in Athens.

#### 5.2.4. Stage IV: Bookcases and niches

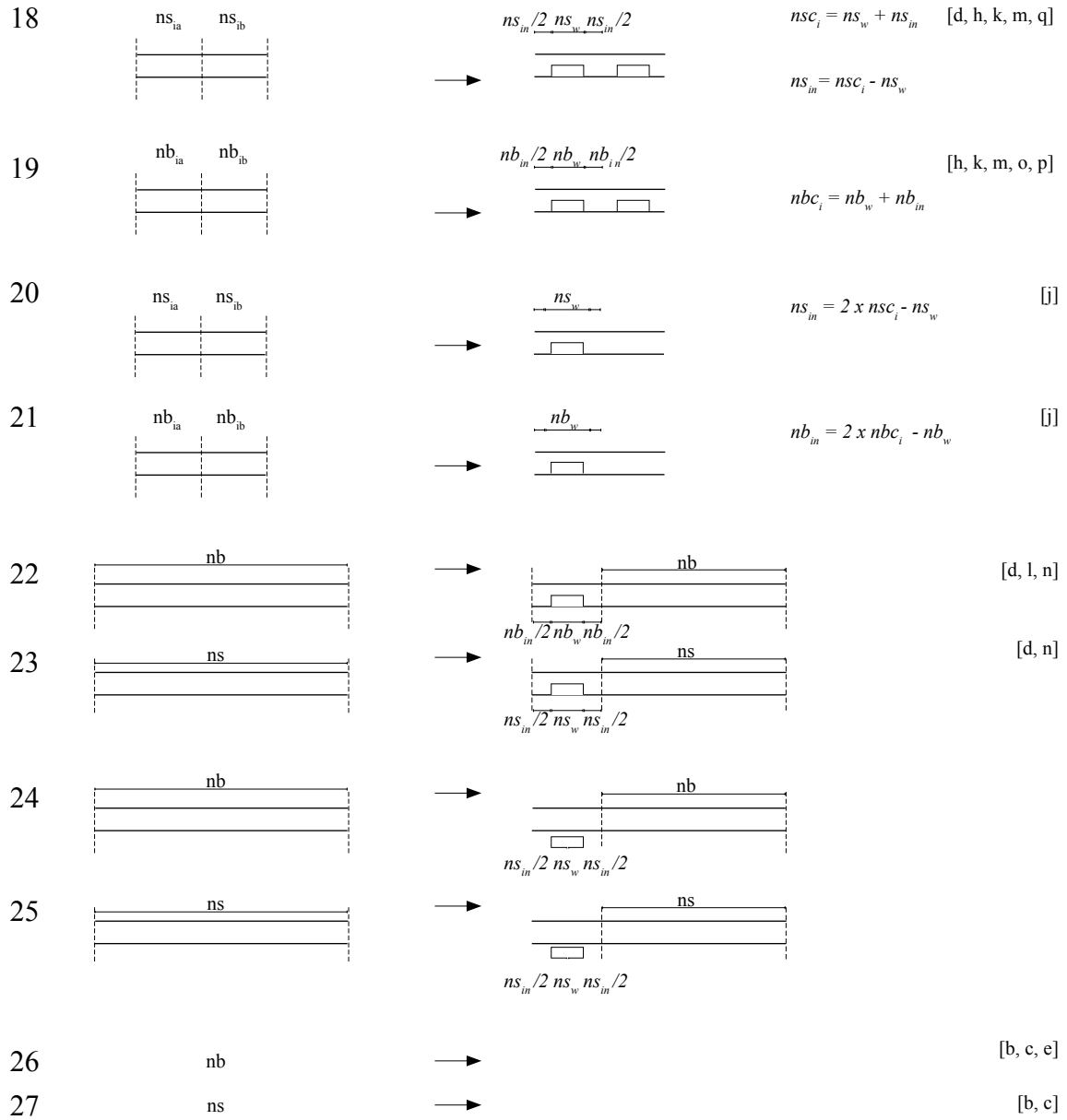
As presented in the first half of the dissertation, books in libraries were placed in wooden book cabinets or armaria, which were either set in rectangular niches on the back and sidewalls, or were set freestanding on the floor. Niches were thus the most common characteristic of libraries. Even though their existence is usually associated with the

podium and the colonnade, there are libraries that had niches but not a podium or a colonnade. Within each library, the niches were of a constant width and depth and were set at regular intervals. If there is a colonnade in the main hall, the niches must be aligned with the intercolumniations, so that the columns do not block the access to the niches. Rules in this stage generate niches on the walls and/or armaria set directly on the floor to account both for formal and monumental libraries or libraries of smaller scale. The set of rules that generate the niches and the armaria in the main hall of the library is given in Figure 5.11.

Rules 18 to 21 generate niches in the interaxial spaces between the columns of the interior colonnade, as specified in the previous stage. Rules 18 and 19 place a niche in all interaxial spaces on the side and back walls, labeled  $ia$  and  $ib$ . In this case, the interaxial space of the colonnade defines parametrically the total width of the niche and the space between two niches. Rules 20 and 21 place a niche only in the interaxial spaces labeled  $ia$ , so that the space between niches  $ns_{in}$  is bigger and is defined as two interaxial spaces minus the width of the niche  $ns_w$ .

Rules 22 and 23 generate niches on the side and back walls respectively, without the restriction of a colonnade. These rules subtract recursively from the total wall length a parametrically defined niche module that is defined as the sum of the niche width  $ns_w$  and  $nb_w$  and the space between niches  $ns_{in}$  and  $nb_{in}$ . The space  $ns_{in}$  and  $nb_{in}$  are split into two so that two half spaces from two subsequent niches make the total space in-between the two niches. This in-between space can be smaller, equal to, or larger than the niche width.





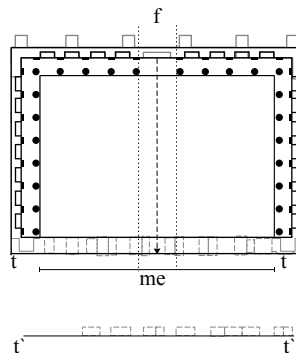
**Figure 5.11** Stage IV rules that generate the location of the bookcases in the main hall of a library, either in niches on the walls, or freestanding on the floor.

Rules 24 and 25 account for smaller libraries, where the interior design is not formalized with niches on the walls. We must assume that armaria have been placed directly on the

floor. The rules add armaria, in front of the side and back wall of the main hall labeled  $ns$  and  $nb$ .

Rules 26 and 27 erase the labels that generate niches and armaria and account for the cases of the Hellenistic libraries, in which the podium was in front of the walls and there were no armaria in the space between the podium and the walls.

Figure 5.12 shows the outcome of the derivation of the rules in Stage IV for Hadrian's Library. In the library there is evidence of eight niches on the back wall. The niche width  $nb_w$  is 1.22 m. and their between distance is 1.02 m. There is not enough evidence of niches on the side wall, but it is assumed that they had the same dimensions as the ones on the back wall. From the previous stage, the side and back walls are subdivided by the interaxials of the colonnade and are labeled with the rhythm  $ia$  and  $ib$ . Rules 18 and 19 substitute the labels  $ns_{ia}/ns_{ib}$  and  $nb_{ia}/nb_{ib}$  with a niche, where  $ns_w = nb_w = 1.22$  m., and  $ns_{in} = nb_{in} = 1.02$  m., so  $ns_{in}/2 = 0.5$  m.



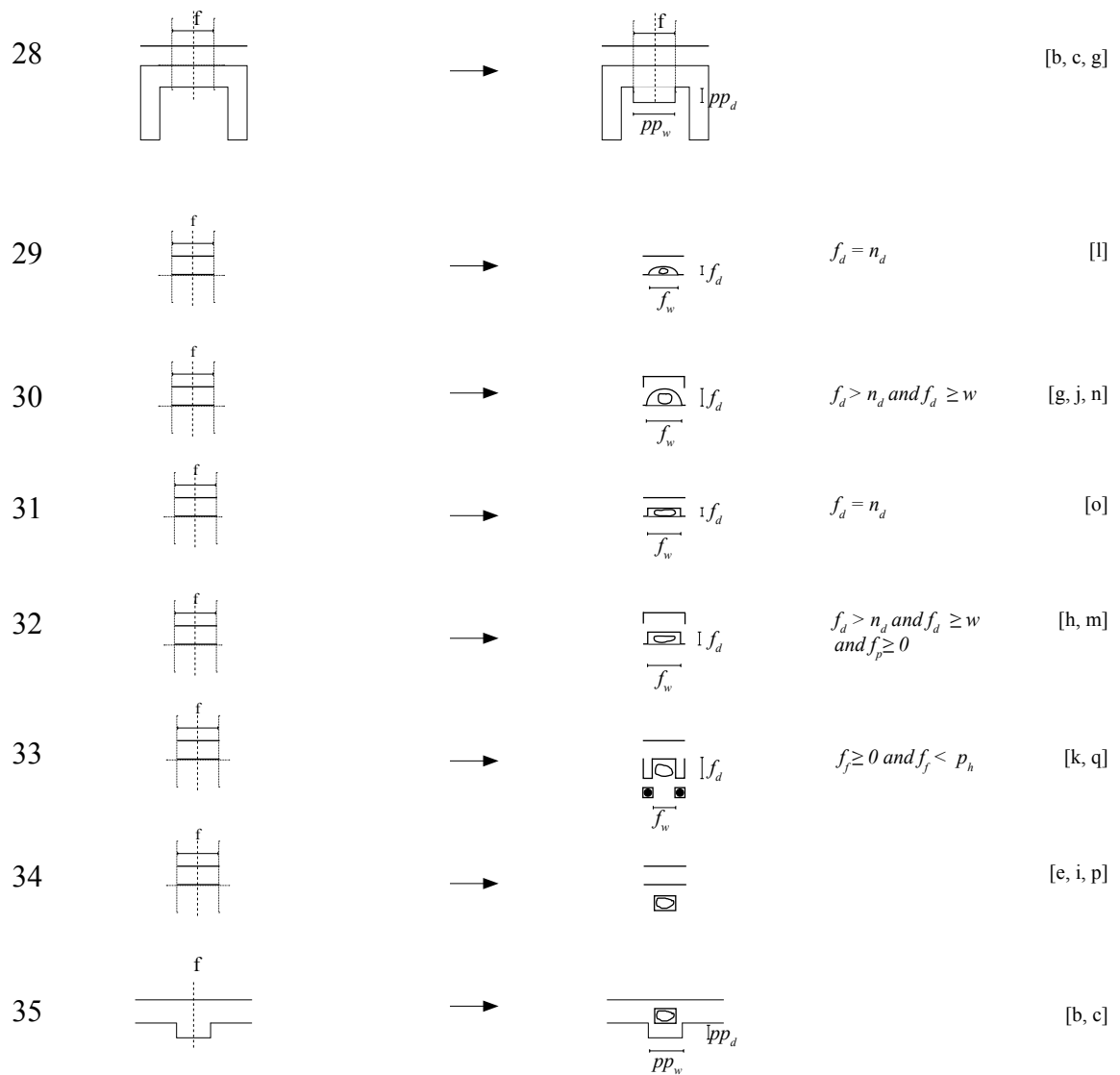
**Figure 5.12** Addition of niches for the main hall of Hadrian's Library in Athens.

### 5.2.5. Stage V: Focal point

Ancient libraries always had an emphasized point in the center of the back wall. This focal point in its simplest form was a standing statue, usually of the goddess Athena, the patron of libraries, or of an emperor. In more monumental and formalized forms the focal point was a constructed feature. It could be either a projection of the podium or a recess in the back wall or an aedicula, or a combination of the above. The set of rules that generate the focal point and place a statue in it is given in Figure 5.13.

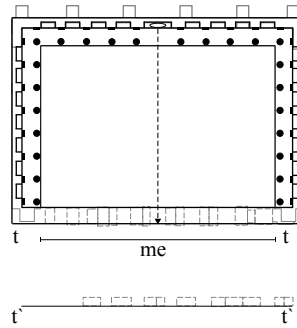
Rule 28 generates a projection in the podium with width  $pp_w$  and depth  $pp_d$  in the center of the main hall and on axis with the  $f$  axis. Rules 29 to 32 generate a recess in the wall.

Rule 29 generates a semicircular niche of equal depth as the other niches. Rule 30 generates a semicircular niche of greater depth than the niches for books, so that an extra thickness must be added to the wall. The width  $f_w$  of this niche is defined parametrically from the evidence presented in Appendix C and can be as wide as 4.5 m. and the depth can be as great as 2.2 m. Rule 31 generates a rectangular niche, with a parametrically defined width, but with depth  $f_d$  equal to the depth of the other niches  $nb_d$ . Similarly, rule 32 generates a rectangular niche, but with a greater depth, which requires the projection of the back wall. Rule 33 adds two perpendicular low walls that support columns and create a projecting aedicula. Rules 34 and 35 account for cases in which there is no recess in the wall, and in that case it must be assumed that at least a statue was standing in front of the wall, or on top of the podium, if there was one.



**Figure 5.13** Stage V rules that generate the focal point in the main hall of a library.

Figure 5.14 shows the outcome of the derivation of the rules in Stage V for Hadrian's Library. The library has a widened central rectangular niche with width 2.34 m. and depth equal to the other niche depth. It is generated by the rule 31, where  $f_w = 2.34$  m. and  $f_d = 0.5$  m.

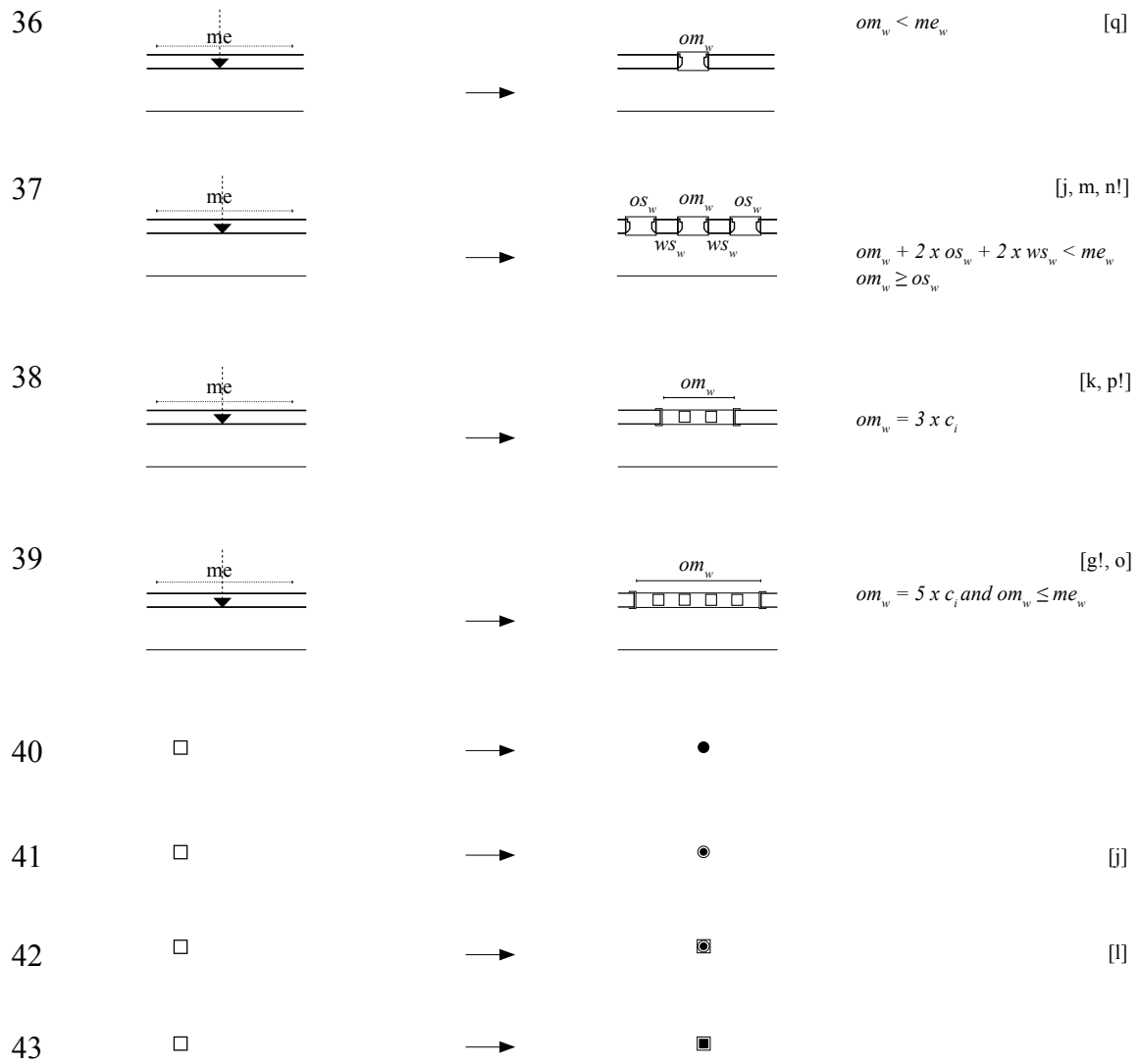


**Figure 5.14** Addition of an enlarged niche as a focal point for Hadrian's Library in Athens.

### 5.2.6. Stage VI: Entrance

The entry to the main hall of the library consisted of one or more openings in the front wall. The rules in this stage add the door openings parametrically to align with the intercolumniations of the stoa in the threshold to the main hall and specify doorposts, whether they are columns, half-columns or pilasters. The set of rules that generate the entrances to the main hall of the library is given in Figure 5.15.

Rule 36 adds one door opening with a doorframe on the center of the wall segment of the front wall  $me$ . The width of the door opening  $om_w$  is defined parametrically and can be as large as 3.5 m. Rule 37 adds three door openings, one central and one on each side. The total width of the middle opening  $om_w$  with the side openings  $os_w$ , and the width of the walls between the middle and side openings  $ws_w$  has to be less than the width of the wall  $me$ ,  $me_w$ . The width of the middle opening  $om_w$  can be greater than or equal to the width of the side openings  $os_w$ .

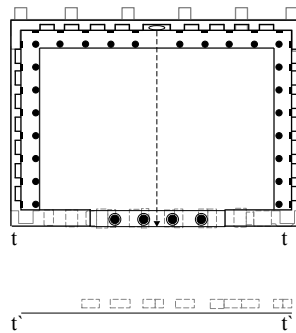


**Figure 5.15** Stage VI rules that generate the entrance to the main hall.

Rule 38 generates an opening in antis with two posts – columns or pilasters – that have as an outcome one opening with a tri-partite division. The post and the antae have to align with the columns of the threshold so the width of this opening  $om_w$  is parametrically defined as the sum of three interaxial spaces of the threshold. In a similar way, rule 39 generates an opening with a quintuple division where the total width of the opening is

equal to five interaxial spaces. Rules 40 to 43 specify the posts as Doric columns, Ionic or Corinthian columns with and without pilasters, and as piers with pilasters respectively.

Figure 5.16 shows the outcome of the derivation of the rules in Stage VI for Hadrian's Library. The library is a wide rectangle and has evidence of the foundations of four posts that subdivide the opening into five parts, and can be generated by rule 39. No evidence survives of the posts so any of the rules 40-43 that specify the Doric, Ionic or Corinthian columns or pilasters can apply to generate the entrance. Here the generation of four Corinthian columns is selected with the application of rules 39 and 41.



**Figure 5.16** Addition of entrance openings for Hadrian's Library in Athens.

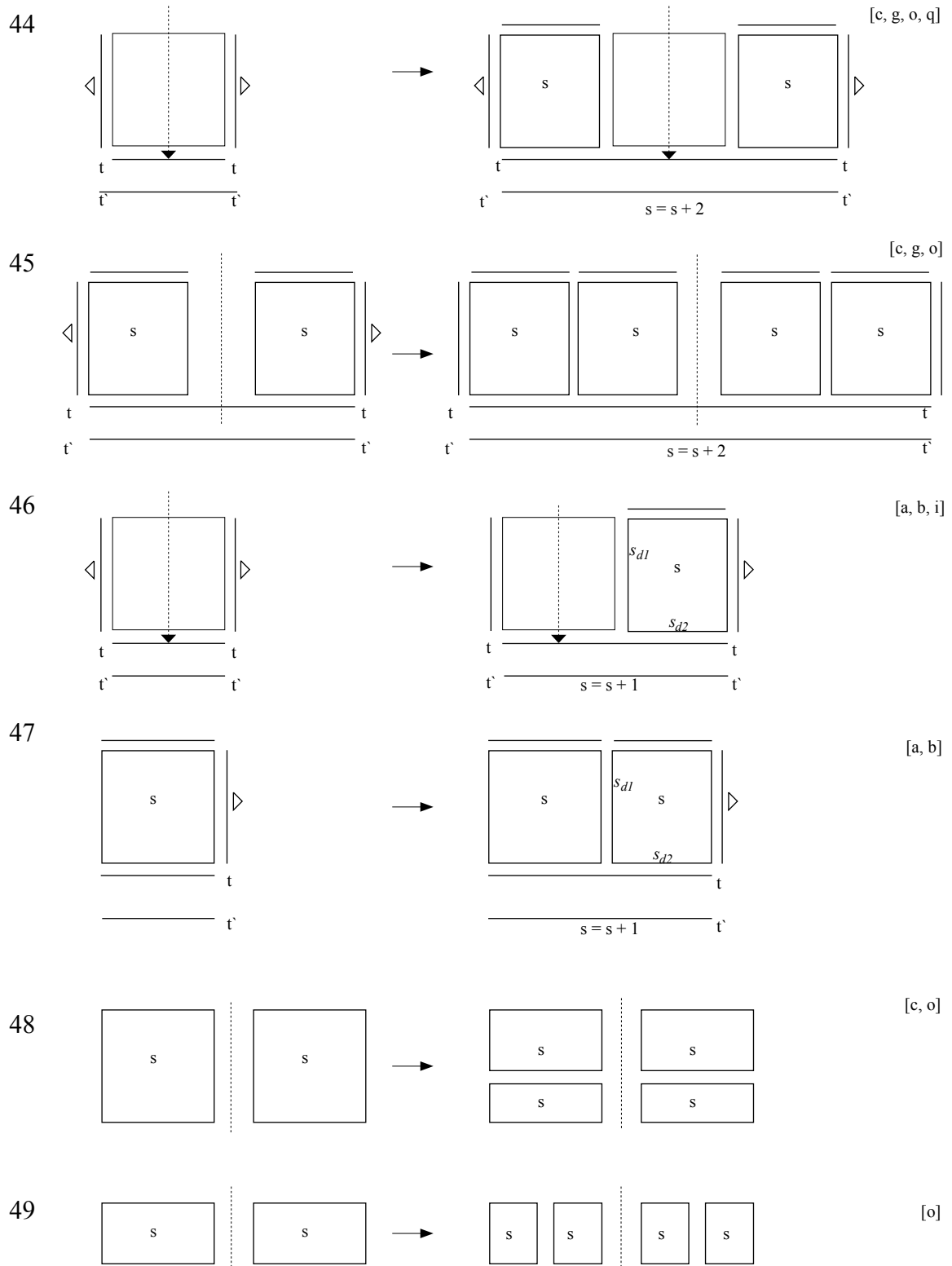
### 5.2.7. Stage VII: Main hall layout and side rooms

The most striking differentiation in ancient libraries is their scale. At the very least, libraries consisted of a single room, which coincides with the main hall. However, in many libraries, more rooms, typically of smaller dimensions, frame the main hall. On

some occasions the side rooms were further subdivided into smaller subspaces. The rules in this stage generate the layout of the library adjoining the main hall of the library with a number of adjacent rooms producing a scheme with or without bilateral symmetry. The rules work parametrically, so that the depth and width of the side rooms  $s_d$  and  $s_w$  can be equal or smaller to the depth of the main hall. The set of rules that generate the main hall and the side rooms are given in Figure 5.17.

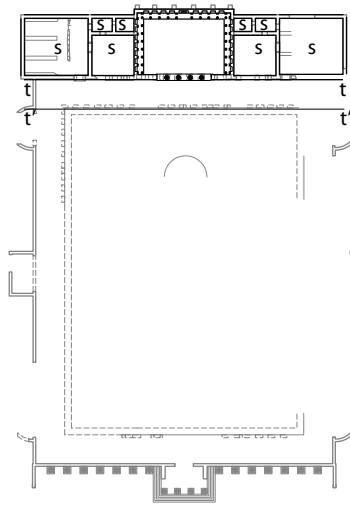
Rule 44 adds two rooms with bilateral symmetry, and rule 45 adds two additional rooms with bilateral symmetry, both resulting in symmetrical structures. Rule 46 generates asymmetric structures, with the main hall being on the side and not on axis. Rule 47 adds more rooms to the side rooms that have been generated by rule 46. Rules 48 and 49 split the side rooms into two horizontally and vertically, while preserving the bilateral symmetry. Note that every time a room is added, a line segment parallel to its upper side at a distance  $w$  that represents the thickness of the wall, is also added, while the sideline segments with the triangular labels are shifted after the last added room. Every time a room is added the state label increases by one. The state label is defined into five and controls the maximum number of rooms that can be added, thus controls the maximum number of times the rules that add rooms can apply. Last, the line segments with the labels  $tt$  and  $t't'$  that represent the threshold in front of the main hall extend to the new boundaries of the library proper.





**Figure 5.17** Stage VII rules that generate the layout of the library proper.

Figure 5.18 shows the outcome of the derivation of the rules in Stage VII for Hadrian's Library. The application of the rules 44, 45, 48, and 49 generates parametrically the overall layout of the library. The parametric shape defined by the sequence of these rules is shown here in a metric version to match the evidence of the archaeological remains as illustrated in Figure 5.2 (o). Solid black lines denote the main room and the side rooms of the library that are generated by the grammar and light grey lines denote the underlying archaeological evidence of the initial form of the library.

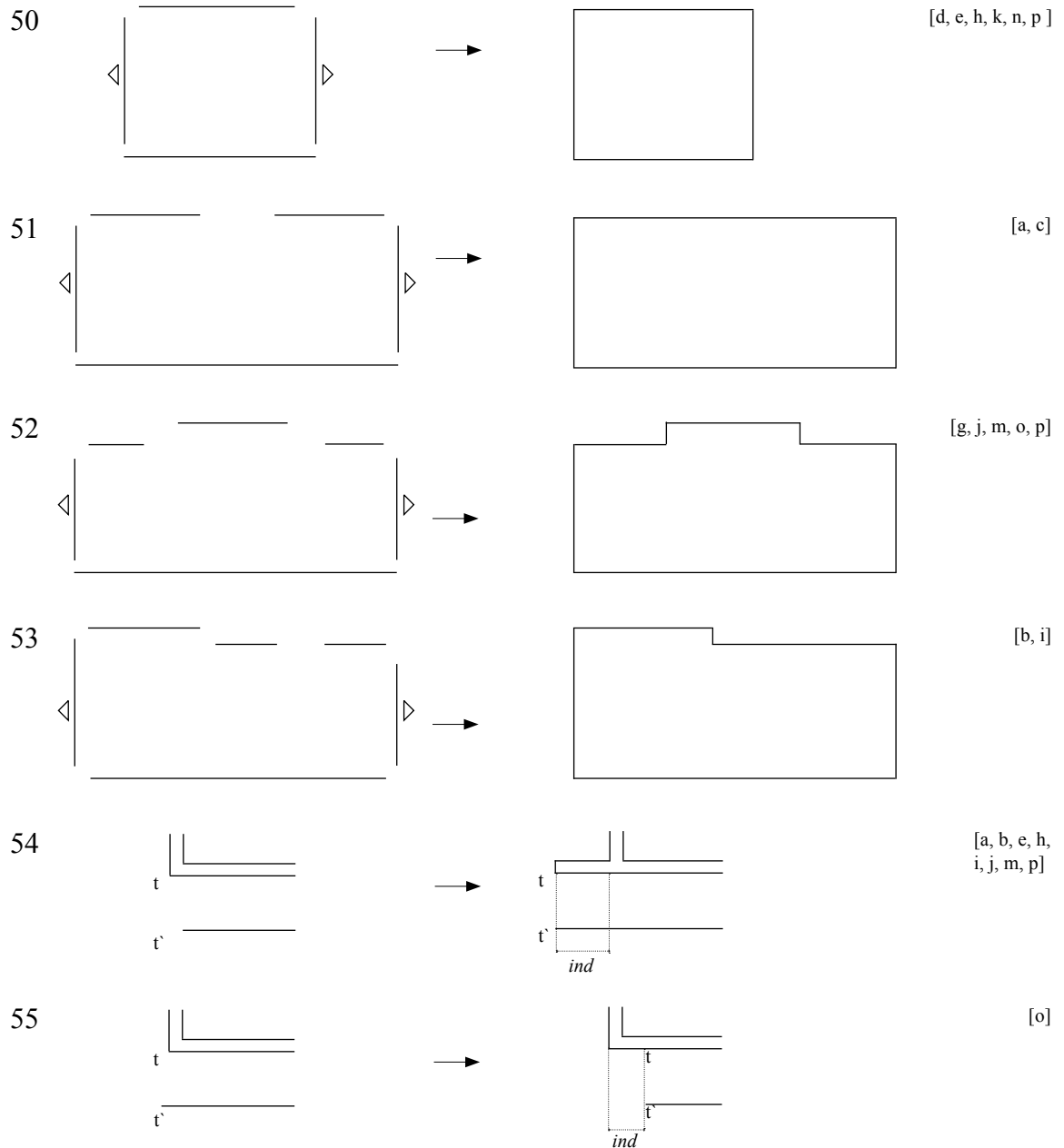


**Figure 5.18** The layout of the main hall and side rooms of the Hadrian's Library in Athens.

#### 5.2.8. Stage VIII: Exterior walls

The rules in Stage VIII generate the outer wall of the interior layout. The rules close perpendicular, parallel and collinear walls generated in the previous stages in the design

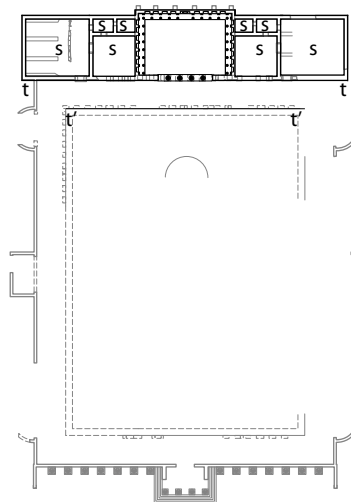
of the layout of the interior of the library to produce an outer wall that will be later perforated to produce the openings, secondary entries, windows. The set of rules that generate the exterior wall of the interior layout of the library is given in Figure 5.19.



**Figure 5.19** Stage VIII rules for the generation of the exterior walls of the main hall and side rooms of the library.

Rules 50-53 define the line segments parallel to the rectangular shapes to create a continuous line that encloses the main hall and the support rooms. Rules 54 and 55 redefine the threshold labels so that the threshold can either extend further from the main hall of the library and its support spaces, or alternatively cover a smaller distance than the total length. More specifically, rule 54 extends the threshold beyond the walls of the library hall and rooms, and rule 55 reduces the threshold, thus letting the exterior walls of the library project beyond the threshold

Figure 5.20 shows the outcome of the derivation of the rules in Stage VIII for Hadrian's Library. Rule 52 generates the outer wall and rule 55 reduces the length of the threshold and lets the side rooms that flank the main hall extend slightly beyond end of the stoa, keeping the bilateral symmetry of the scheme.



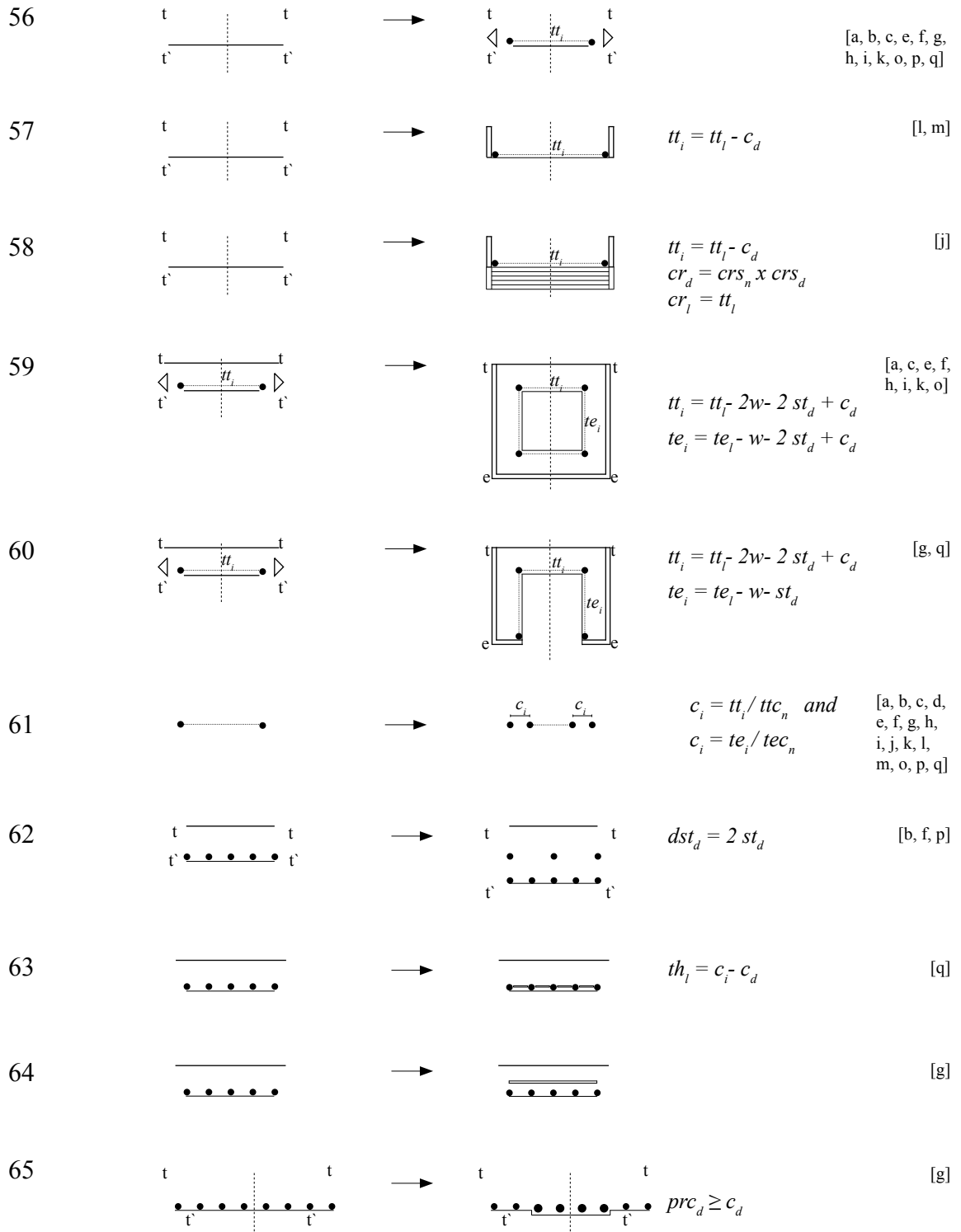
**Figure 5.20** The exterior wall of the main hall of Hadrian's Library in Athens and the threshold reduced to a smaller width.

### 5.2.9. Stage IX. Thresholds, stoas and courtyard

Ancient libraries were either part of a larger building complex and thus attached to its stoa or were independent buildings preceded by a stoa, a peristyle, or a U-shaped stoa. The rules specified in Stage IX generate these alternative variations of thresholds with stoas and courtyards. The set of rules that generate the exterior threshold of the core of the library in terms of a series of linear stoas and U-shaped stoas is given in Figure 5.21.

Rules 56-58 convert the threshold into a linear stoa that can come in three variations: a linear stoa that extends to the flanks of the main hall and will be completed with subsequent rules; a stoa that is framed by walls along the façade of the library; and a stoa framed by walls and preceded by a monumental stairway. In rules 57 and 58 the interaxial space between the corner columns  $tt_i$  is defined parametrically as the remainder from the length of the threshold  $tt_l$  minus the wall thickness  $w$  and one column diameter  $c_d$ , half in each side. Also, in rule 58, the depth of the stairway is defined parametrically as the number of steps  $crs_n$  by the depth of each step  $crs_d$ .

Rules 59 and 60 add a peristyle or a U-shaped stoa to the stoa generated by rule 57. In both rules the interaxial space between the corner columns  $tt_i$  is defined as the remainder of the threshold length  $tt_l$  minus twice the wall thickness  $w$  and the depth of the stoa plus one column diameter  $c_d$ . The length of the colonnade on the two sides of the peristyle  $te$  is defined in the same way as the  $tt$ . In the U-shaped stoa, the length of  $te$  is parametrically defined as the remainder of the length of  $te$  minus one times the wall thickness and the depth of the stoa.



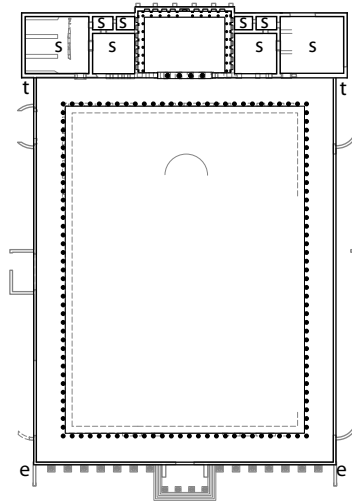
**Figure 5.21** Stage IX rules for the generation of porticoes in front of the main hall and its adjacent rooms. The rules generate linear stoas and U-shape stoas and peristyles with courtyards in the center.

Rule 61 applies recursively to populate the stoas with columns. The interaxial space between the corner columns is subdivided by the number of columns of each side, so that the interaxial space  $c_i$  is defined. The interaxial space has to be the same in both  $te$  and  $tt$  sides of the stoas. The rule generates recursively two columns at a  $c_i$  distance from the original columns and reduces the space that is still to be propagated with columns to the space between the newly generated columns.

Rules 63-65 add stylistic characteristics to the colonnades. Rule 63 converts the stoa into a two-aisled stoa by doubling its depth  $dst_d = 2 st_d$  and by inserting a second colonnade with interaxial space double the interaxial space of the exterior colonnade  $dst_i = 2c_i$ . Rules 63 and 64 are added to account for balustrades (thorakia) along the stoas. More specifically, Rule 63 adds thorakia among columns, the length  $th_l$  of which is parametrically defined as the interaxial  $c_i$  minus the column diameter  $c_d$ ; and rule 64 subdivides the stoa into two aisles with a low wall, which could support statuary or prevent circulation among statues in the back. Both rules apply only when the colonnade is against the stoa wall and not in front of a door opening. Lastly, rule 65 generates a projection of the stoa on the axis of the courtyard that further emphasizes symmetry and axuality. The diameter of the columns at the projection  $prc_d$  can be greater than or equal to that of the rest of the columns  $c_d$ .

Figure 5.22 shows the generation of the U-shaped peristyle of Hadrian's Library. The peristyle is generated with the recursive application of the rules 56, 59 and 61 to generate

a parametric schema consisting of 22 by 30 columns. Note that several applications of these rules are needed to generate the overall schema. The further numerical refinement of the schema with a lower diameter of the column of 1.2 m. and an interaxial module of 2.9 m. produce the actual total width  $tt_i$  of the library of 60.9 m. and  $te_i$  of 83.7 m.

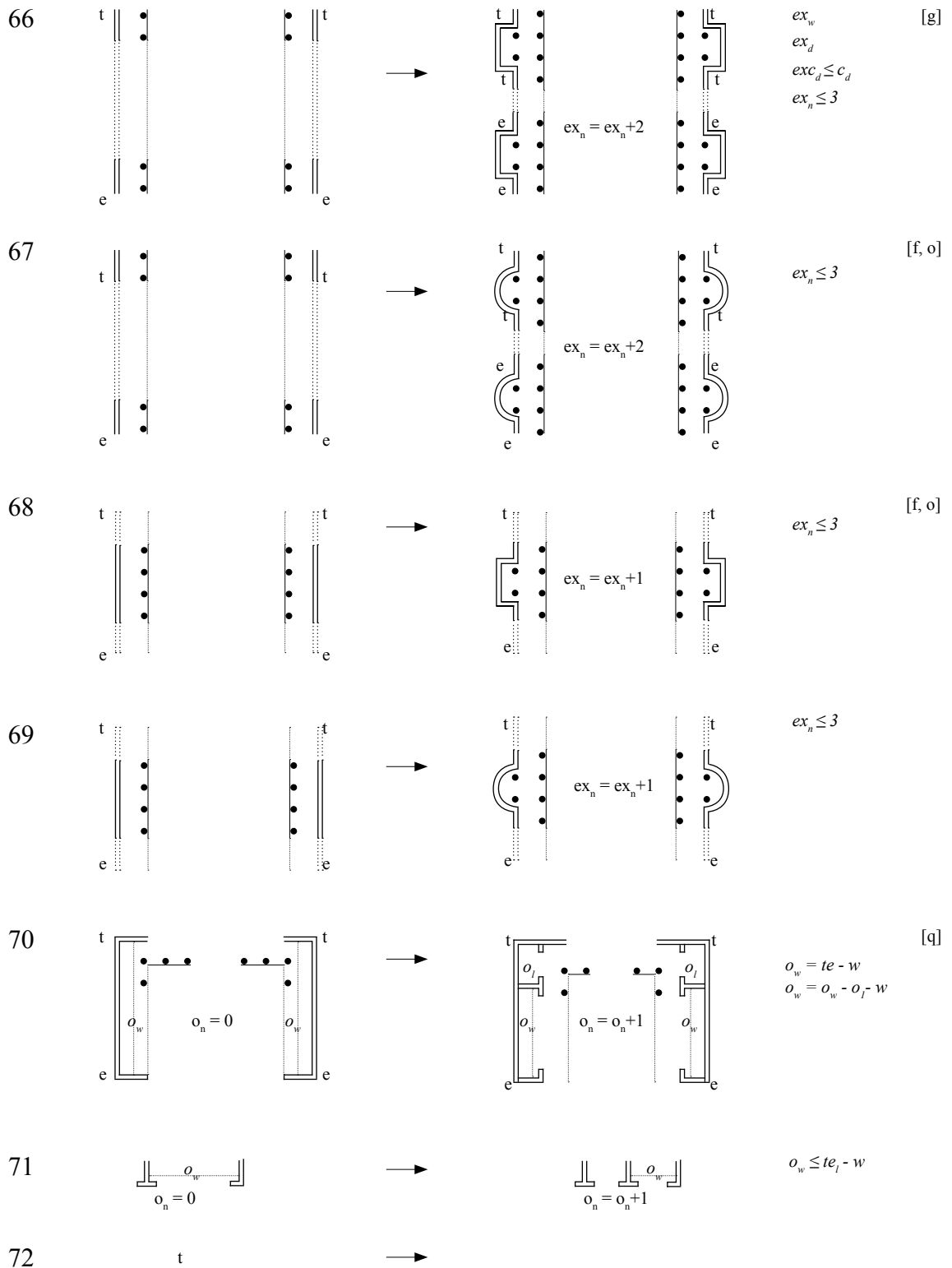


**Figure 5.22** Peristyle and courtyard of the Hadrian's Library in Athens.

#### 5.2.10. Stage X: Exedras and auxiliary oikoi

Stage X generates additional exedras or rooms opening off the stoas that were shaded open spaces, used for recitations and discussions. These spaces were either exedras projecting outside of the wall of the stoa, or oikoi, i.e. rooms along the back of the stoa. Exedras were rectangular or semicircular ones. Rectangular exedras could alternate with semicircular, but bilateral symmetry was kept. The set of rules that generate the exedras and the oikoi feeding to the peristyle is given in Figure 5.23.



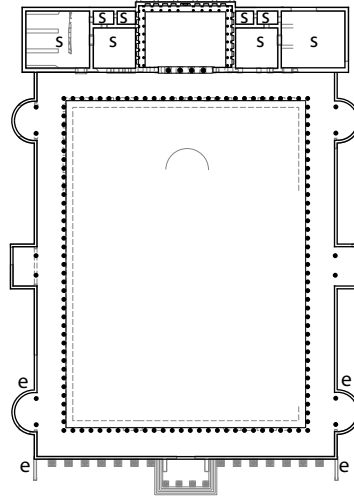


**Figure 5.23** Stage X rules that generate exedras along the sides of the peristyle or U-shape stoa of the library complex.

Rules 66 and 67 generate two identical exedras in the two ends of the  $te$  wall of the stoa and shift the labels  $t$  and  $e$  in the wall segment between them so that the rules can reapply recursively. Rules 68 and 69 generate one exedra in the center of the wall segment with the labels  $t$  and  $e$ . These rules may apply before or after rules 66 and 67 have applied.

Rule 70 duplicates the depth of the stoa by shifting the colonnade inwards, and adds subdivisions perpendicular to the wall of the stoa that form semi-open rooms, the oikoi. The dimension  $o_w$  is originally the length of the stoa minus the wall thickness. After the first room is generated the  $o_w$  is re-calculated as the total length minus the width of the first oikos. Then rule 71 applies to recursively generate more rooms parametrically and in parallel to both sides of the peristyle or U-shape stoa. Last, rule 72 applies to erase the label  $t$ , terminate the application of the rules for this stages and move the derivation to the next stage.

Figure 5.24 shows the outcome of the derivation of the rules in Stage X for Hadrian's Library. First, rule 67 applies to generate the four semicircular exedras on the sides. Then, the left side of rule 68 is embedded in the central part of the stoas, between the semicircular exedras, and generates the central rectangular exedras. Lastly, rule 72 erases the labels  $t$  and moves the derivation to the next stage. The dimensions of the added exedras are taken from the actual measurements of the architectural remains. Typically the rooms along the stoas were about half the dimensions of the exedras, about 5 m. wide and 2 m. deep.

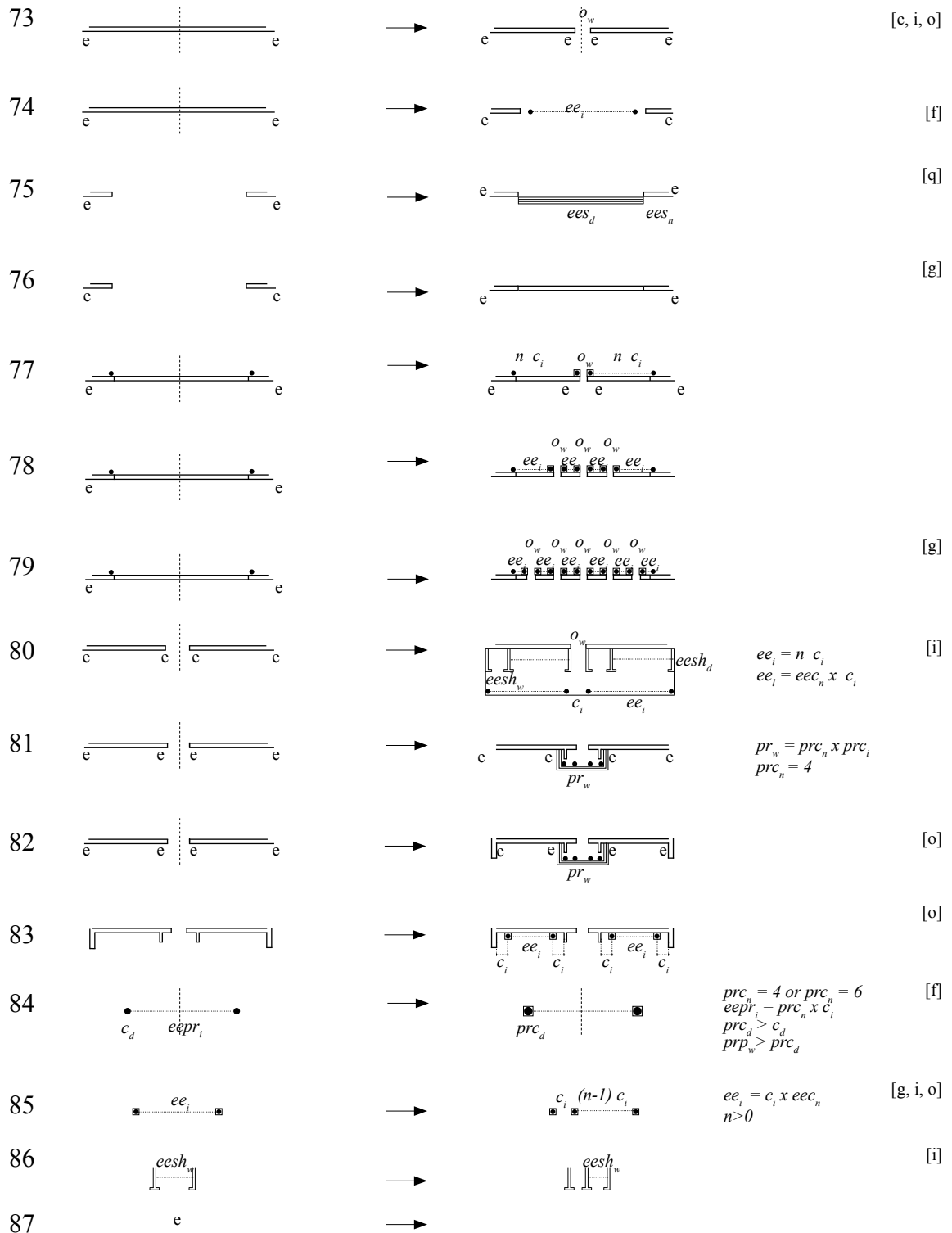


**Figure 5.24** Addition of exedras for Hadrian's Library in Athens.

#### 5.2.11. Stage XI: Entry to complex

Once the parti of the building complex has been generated, the next stage of rules generates the entry to the building complex in the side labeled *ee*. The set of rules that generate the entry sequence for the peristyle of the library is given in Figure 5.25.

Rules 73 and 74 specify the entrance in a peristyle, the first creating an entrance opening and the second substituting parametrically part of the wall segment with a colonnade, as a reflection of the colonnade of the peristyle. Rules 75 and 76 specify the entrance in a U-shape stoa, the first adding some steps in the opening, and the second closing the opening with a wall.



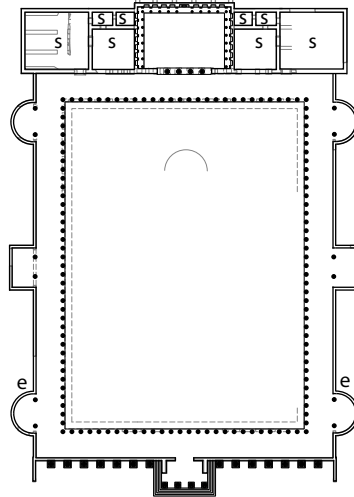
**Figure 5.25** Stage XI Rules that generate the entrance and its stylistic characteristics to the building complex.

Rules 77, 78 and 79 generate one, three and five openings respectively and add columns in the interior to continue the order of the peristyle. Rules 80 – 83 specify the exterior façade of the building complex with one opening: rule 80 adds shops and a stoa, rule 81 adds a monumental gate, a propylon with four columns, and rule 82 adds a propylon with four columns framed by two projecting wings. Note that rules 81 and 82 keep the labels *ee* to allow for an optional recursive application of rule 83 that adds a decorative exterior colonnade. Rule 84 applies in the case that a double colonnade has been generated by rule 74, and further emphasizes the axis by changing the order of the four or six central columns: the column diameter  $prc_d$  is increased, and the column pedestal width  $prp_w$  is specified.

Rules 85 and 86 are recursive rules that add repeatedly the columns and the shops in the scheme. Rule 85 propagates the columns in any interaxial space  $ee_i$  between two corner columns by adding one more column at a distance  $c_i$ , one interaxial space, as defined before. This rule allows for the total number of columns to be odd or even. In a similar way, repeated applications of rule 86 add the shops in a stoa by calculating the distance  $esh_w$  and adding each time a wall divider to generate one new shop. Lastly, rule 87 is an erasing rule that erases the labels *ee* and thus prohibits the further addition of stylistic characteristics to the entrance façade, such as propylon, columns, wings, etc.

Figure 5.26 shows the outcome of the derivation of the rules in Stage XI for Hadrian's Library. Rule 73 is first computed to generate one single opening in the stoa. Then, rule 82 adds a propylon framed by wings in front of the opening and denotes the sidewalls with the labels *ee*, thus allowing rule 83 to apply. Rules 83 and 85 propagate the

colonnade against the exterior wall of the stoa, between the propylon and the wings. In the end, rule 87 erases the labels c.

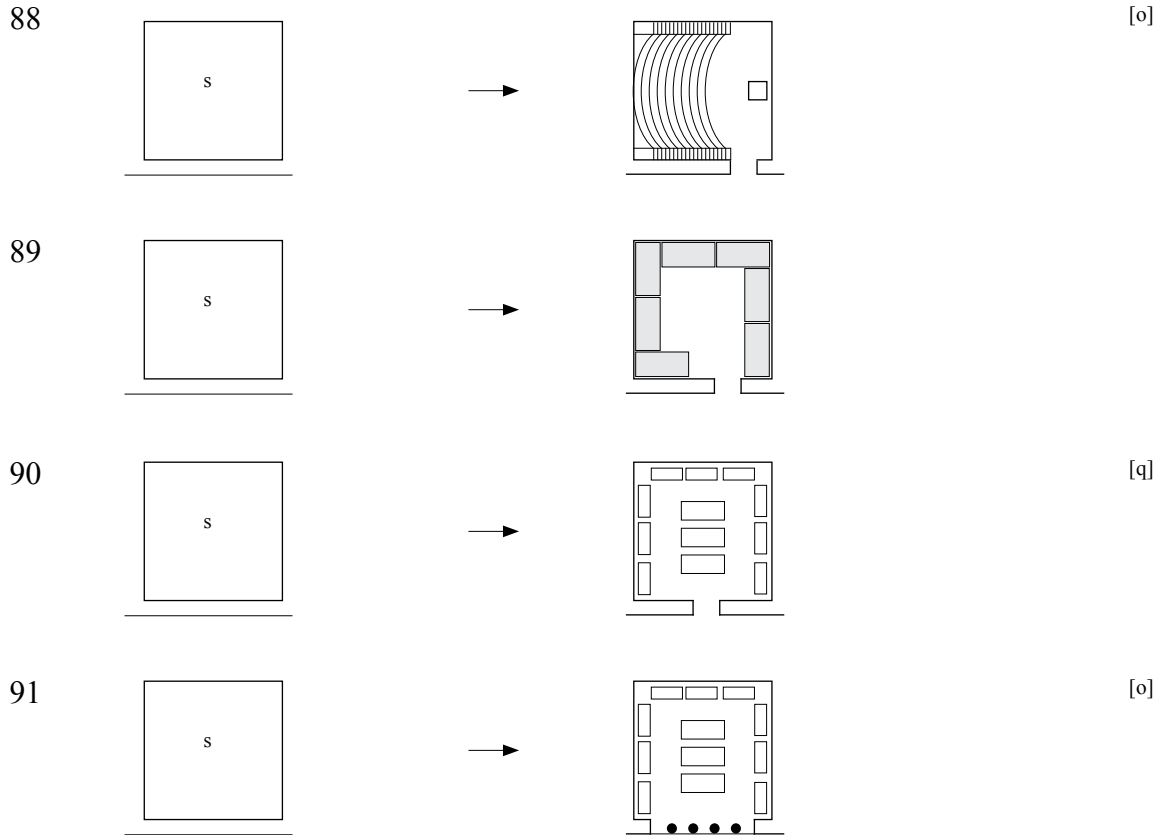


**Figure 5.26** Addition of entry propylon and engaged colonnade in the front wall of Hadrian's Library in Athens.

#### *5.2.12. Stage XII: Support spaces*

The support spaces of the ancient library are typically auxiliary spaces for additional auditoria, banquet halls, offices, and storage. The set of rules that generates the functional characteristics of the interior design in the side rooms adjacent to the main hall is given in Figure 5.27.

Rules 88 through 91 specify the interior compartment of rooms with different functions, as it was the case in larger library complexes, where the library consisted of more than one space and supported multiple functions. Note that the dimensions of these rooms have already been defined by the previous stage of the derivation; here the rules define their internal organization.

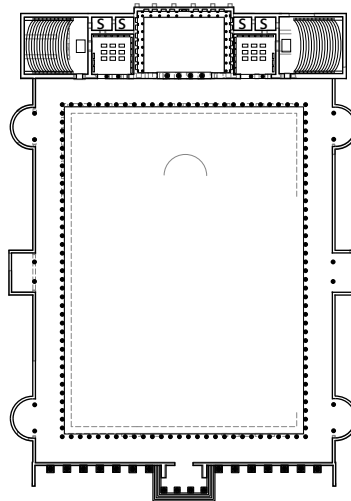


**Figure 5.27** Stage XII rules that generate the interior design of the side rooms of the main hall of the library.

Rule 88 generates an auditorium with steps along the sidewalls and a rostrum or *bema* on axis of the opposite wall. Parameters here are the curvature of the seating area, the number of seating rows, their depth and the width of the steps on the side. Rule 89 generates a banquet hall, where the door is placed off axis, in order for the banquet klinai to fit rotationally in the room. Rules 90 and 91 generate offices or stacks with bookcases along the walls and desks placed in the center to support different functions, such as copying of manuscripts. Archaeological evidence from such spaces does not survive

today due to the perishable materials of which furniture was made, but it seems more than reasonable to assume their existence.

Figure 5.28 shows the outcome of the derivation of the rules in Stage XII for Hadrian's Library. The library has two large rooms on each side of the main hall accessed directly from the peristyle. The remains of seating prove that the corner rooms are auditoria. The rooms between the main hall and the auditoria had two smaller spaces in the back and were connected to them and the auditorium through doors. There is no evidence in the archeological record for their interior design. They are reconstructed as banquet halls or reading/writing spaces, while the smaller rooms in the back are reconstructed as additional support or storage spaces. Here the derivation of Hadrian's Library specifies two auditoria and two office spaces with the derivation of the rules 88 and 91.



**Figure 5.28** The final plan generated for the Hadrian's Library in Athens.



The only areas of the complex for which alternative reconstructions can be proposed are the almost square side rooms, next to the auditoria that have two smaller rooms in the back each. For these, the function of banquet halls has been proposed or that of book storage or office space. The two smallest rooms in the back can be reconstructed as storage space. The only aspect of the building that the grammar does not generate is the free circulation between the side rooms.

### **5.3. Grammatical derivations of libraries in the corpus**

The grammar presented above is able to generate library plans as complete building complexes. The rules from Stage I to Stage XII generate the library layout that includes the maximum number of components: multiple rooms, stoas, courtyards, exedras and monumental entrances. In a similar way, and by applying the rules of all the stages of the grammar, the grammar can generate the plans of building complexes that are libraries, or building complexes, part of which are libraries, like the Templum Pacis and the Augustan Palatine Library.

The grammar can also generate the plans of smaller libraries that consisted of only one space, the main hall. The rules remain the same, but the application of the rules change by skipping the stages for the generation of peristyle, courtyard, exedras, and other spaces. The grammar starts from the initial shape, generates the exterior walls and the entry condition and then defines the interior design of the main hall.

The derivations of the seventeen libraries are given below to demonstrate the constructive power of the grammar to capture existing reconstructions and suggest theoretically viable alternatives. In the following pages, the final grammar-generated design is provided, along with the string of rules applied to generate the design. When a rule is denoted with a “!” it means that the rule is approximated in existing building remains, and when a rule is denoted with a “\*” it means that the rule is applied without any evidence in the building remains.

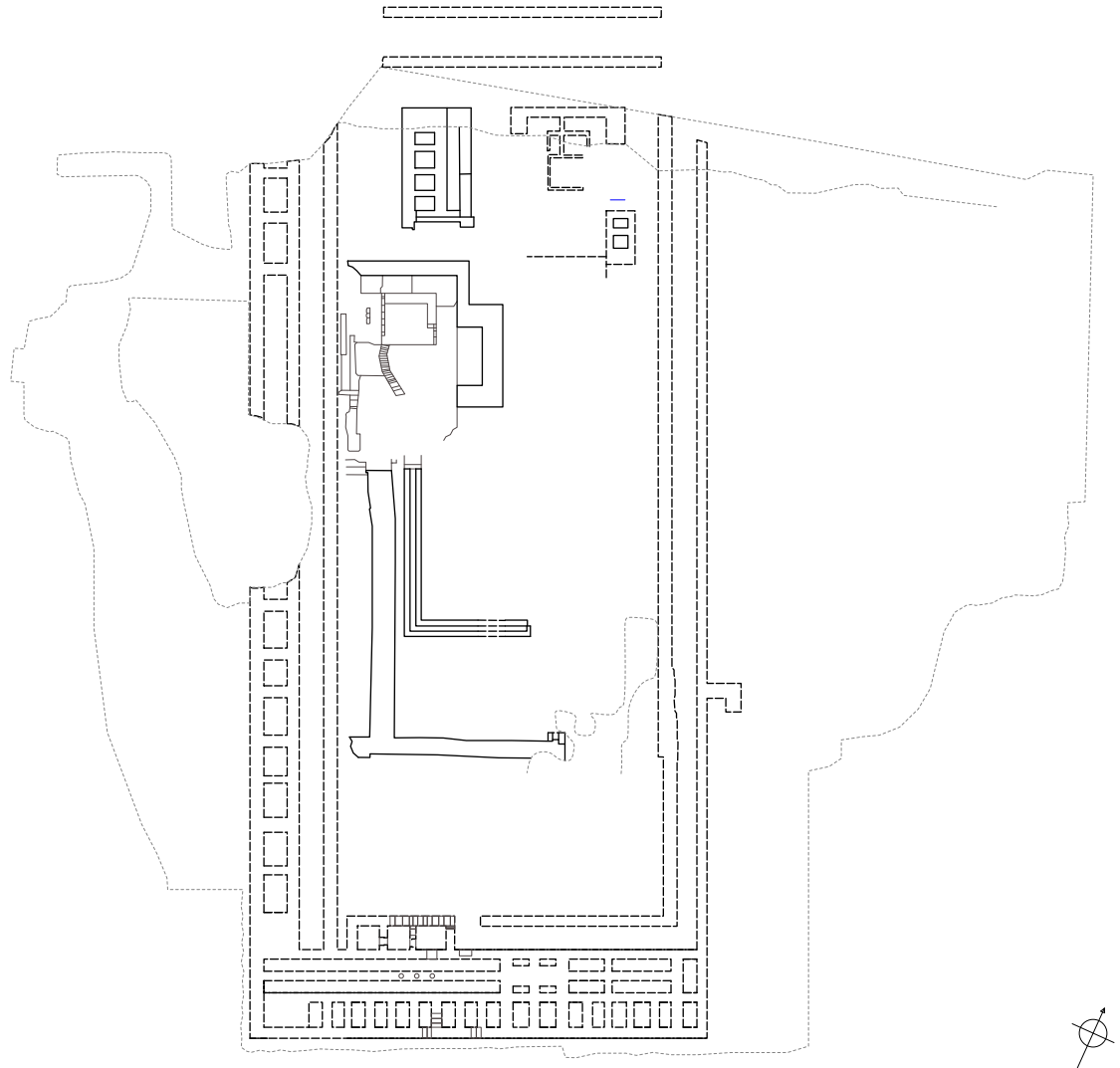
### *5.3.1. A computational derivation of the library at the Serapeum in Alexandria*

The architectural form and the exact location of the main hall of the library in the Serapeum is not known and can only be speculated. Proposed reconstructions of the temenos locate the library in the rooms in the south stoa of the Temenos. However the south stoa is always reconstructed with multiple identical rooms behind a single or double colonnade, without pointing to a specific subspace of the stoa as the main hall of the library.<sup>488</sup> The building remains include the foundations of a rectangular peristyle with a small temple and other buildings in the center of the courtyard (figure 5.29). The peristyle had a greater depth in the southern side, where rooms were attached in the back of the stoa. The building remains of the southern side of the peristyle include the foundation trenches of the walls of the basement and indicate the layout of the stoa in the

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<sup>488</sup> See chapter 3.1.1

lower level. Even though it is assumed that the ground level repeated the same layout, minor deviations are also possible.

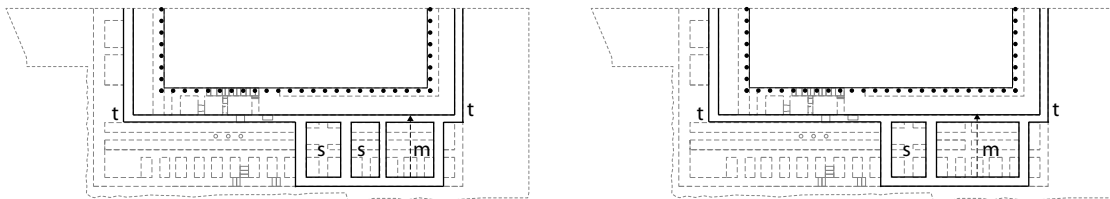


**Figure 5.29** State of preservation plan of the Hellenistic phase of the Serapeum.

Looking at the building remains, the main hall of the library can be identified in the southwestern part of the peristyle, where transverse wall foundations in the stoa, could be

identified as the sidewalls of deep rooms. The grammar can embed in the deep foundations in the southwestern part of the peristyle the rules that generate a main hall with different depth than the side rooms. The rest of the southern stoa that does not have the transverse walls could just have been a single aisled stoa without rooms, so that the corridor with columns and the “Great niche” in the basement could have received light from the top, as the ancient testimonia suggest. Alternatively, the stoa could continue as a double aisled stoa without rooms.

The grammar starts with the initial shape that identifies the possible location of the main hall in the archaeological remains. Because there is not enough evidence to restrict this identification, the grammar is able to identify two possibilities: one with a small main hall (figure 5.30a) and one with a larger main hall about 17 wide and a smaller secondary room (figure 5.30b). The latter possibility works better with the wall thicknesses, because both sidewalls of the library, as testified by the archaeological record have the same thickness. In both cases the outer wall of the main hall does not coincide with the outer wall of the foundations, because this small space is usually interpreted as the location of the stairwell that led to the lower level.



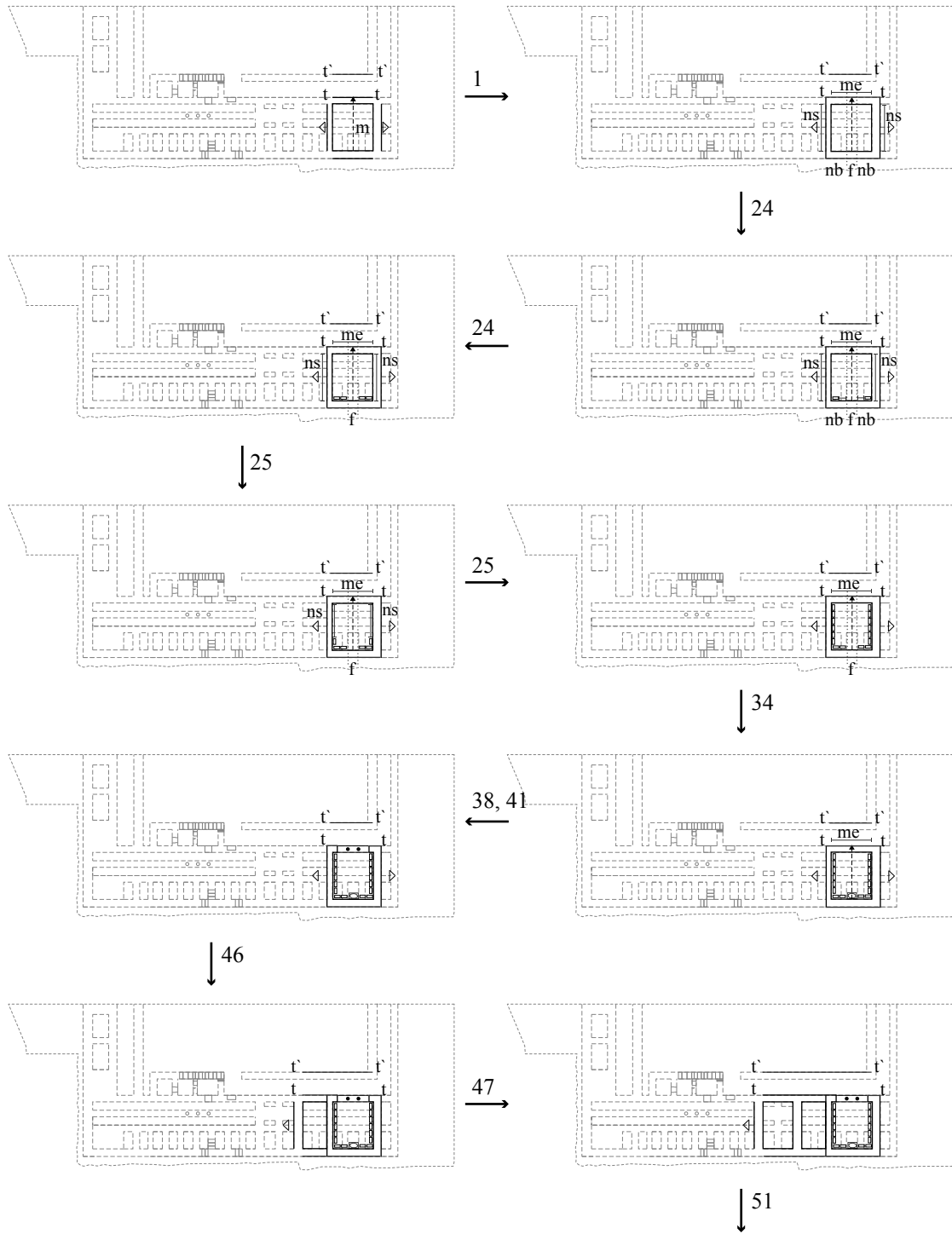
**Figure 5.30** Possible layouts of the library at the Serapeum: a) with an elongated main hall and two side rooms, b) with one main hall and one side room.

Variant reconstructions can be generated for the interior design of the main hall. The main hall could have been as simple as having bookcases directly set on the floor, or could have had niches recessed in the walls (the wall thickness is more than 2 m. that would allow the niches to be added).

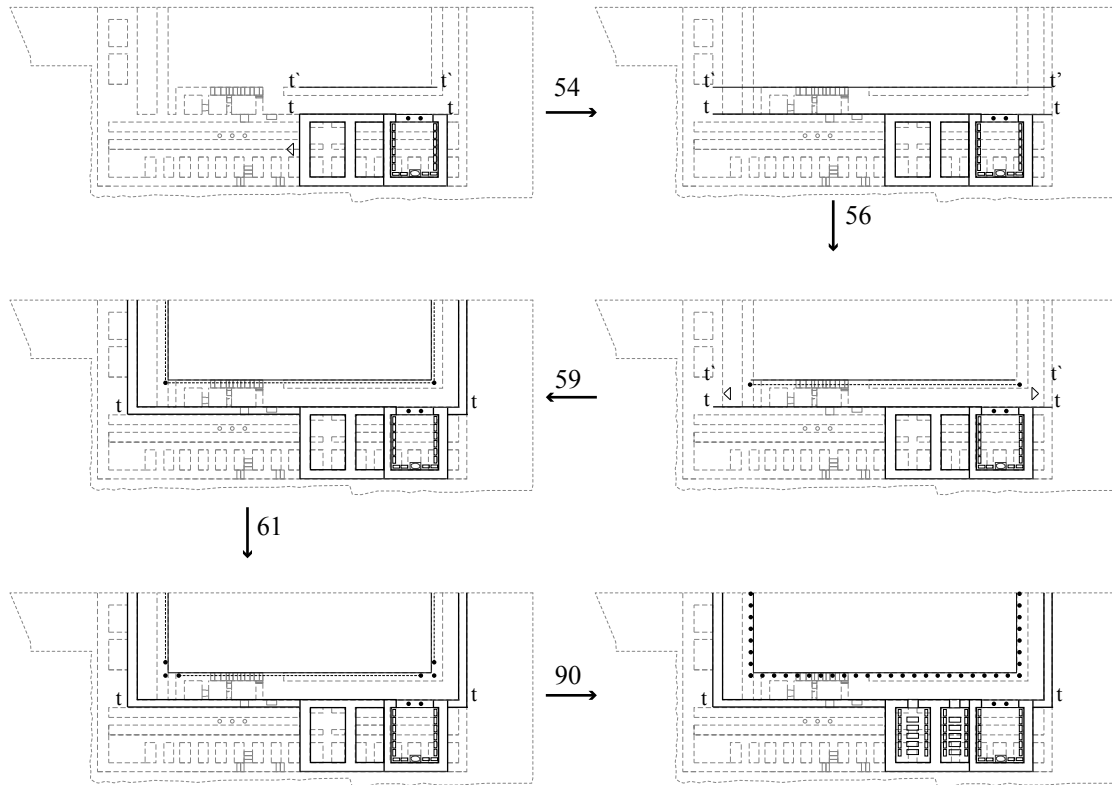
Figure 5.31 shows the derivation of the library with a small main hall with a simple design with bookcases and a statue for a focal point.

After the initial shape is instantiated, rule 1 applies to subdivide and label the different parts of the main hall, the back walls, the sidewalls, the focal point and the main entrance. Then rules 24 and 25 apply to add bookcases against the back wall framing the focal point, and against the side walls, rule 34 adds a statue on a pedestal against the back wall, and rule 38 adds an entry with a tripartite division with columns. Rule 41 specifies the columns as Corinthian, since fragments of Corinthian capitals have been found.

After the generation of the main hall, the derivation applies rules 46 and 47 that add side rooms to one side only and at the same time extends the threshold. Then rule 51 generates the exterior wall of the three rooms and rule 54 extends the threshold beyond the



**Figure 5.31** Derivation of the plan at the Library at the Serapeum.



**Figure 5.31** (continued) Derivation of the plan of the Library at the Serapeum.

boundaries of the main and side rooms. Rules 56 and 59 define the threshold into a peristyle, and rule 61 propagates the columns recursively. Here, because the peristyle is part of a larger complex, only the portion of the peristyle closer to the library is shown. Lastly, rule 90 generates the interior design of the side rooms with bookcases and desks.

This derivation succeeds in many ways. Firstly, the grammar points to a possible part of the archaeological record that can be identified as the main hall and the side rooms of the library, and shows variant possibilities for the reconstruction of the general layout of the library and the main hall. Past researchers have pointed to the south stoa as the possible

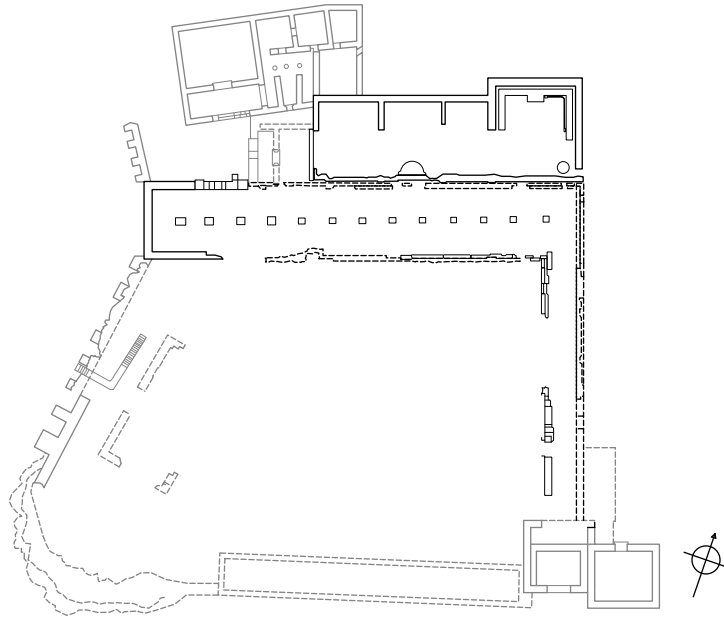
location of the library but have not identified any specific space as a possible location and arrangement of the library. Secondly, the grammar succeeds in suggesting a function for the massive foundations in the southeast part of the library, for which no interpretation has been previously suggested. Thirdly, the grammar illustrates what a simple library without built-in elements of interior design, with bookcases simply set on the floor would have looked. This interpretation is suggested in archaeological research in writing rather than through a drawing, as most researchers are reluctant to suggest a purely hypothetical reconstruction.. In addition, the grammar can generate alternative reconstructions with niches recessed in the walls, opening the possibility that this library could have been a more substantial library. Lastly the derivation of the Library at the Serapeum demonstrates how the grammar can generate libraries that are part of larger building complexes with diverse functions, in this case a temenos.

### *5.3.2. A computational derivation of the Library of Pergamon*

The Library of Pergamon is the earliest library for which there are identifiable building remains. The building remains locate the library on the second floor of the north stoa at the Temenos of Athena in Pergamon (figure 5.32). The library is typically identified with the building remains of the larger room and the three smaller ones attached to the stoa.

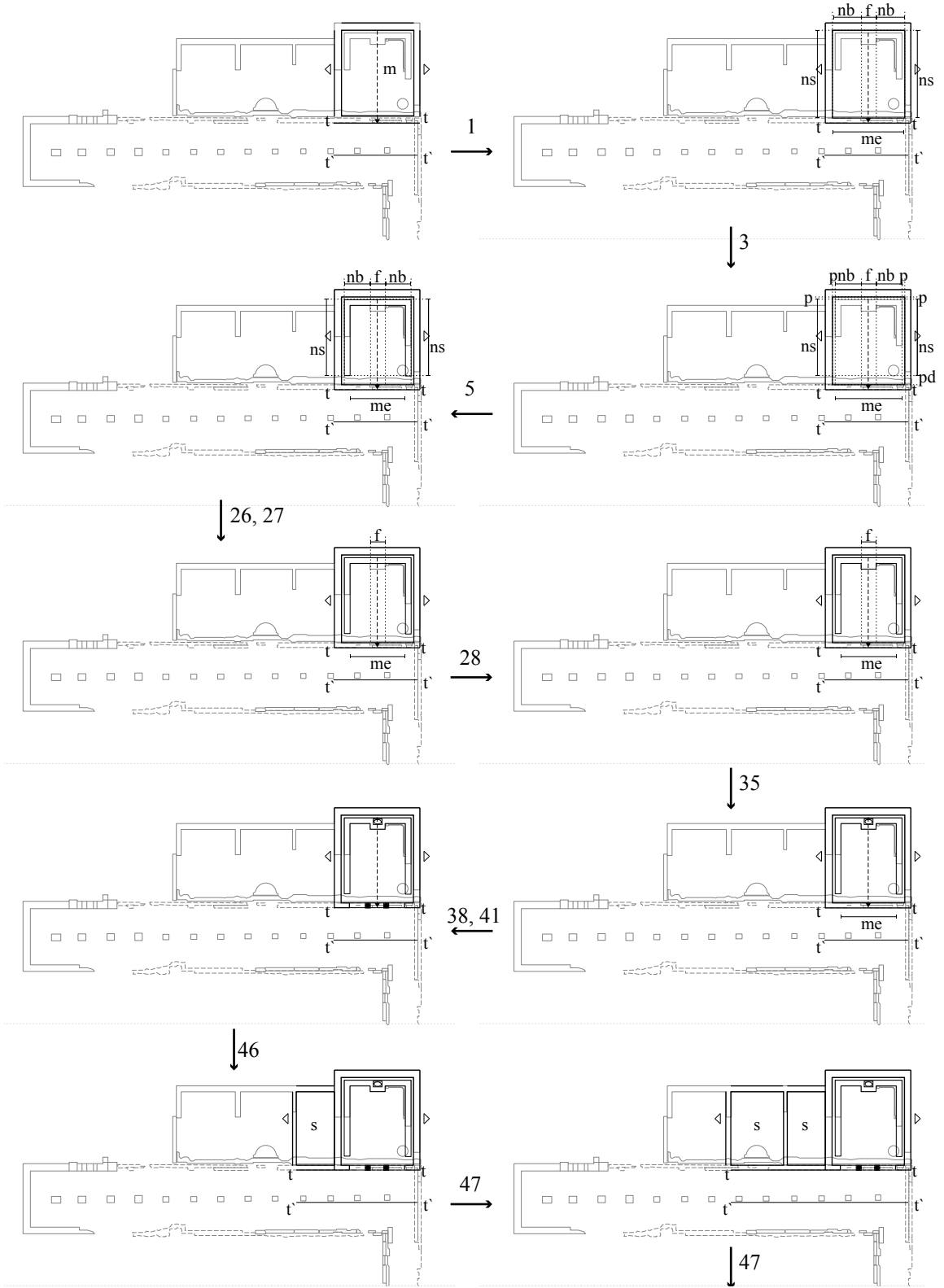
The derivation of the plan of the Library of Pergamon is given in figure 5.33. The grammar starts with embedding the initial shape in the northeastern room and labeling it as the main hall with width 13.22 m. and length 16.45 m.



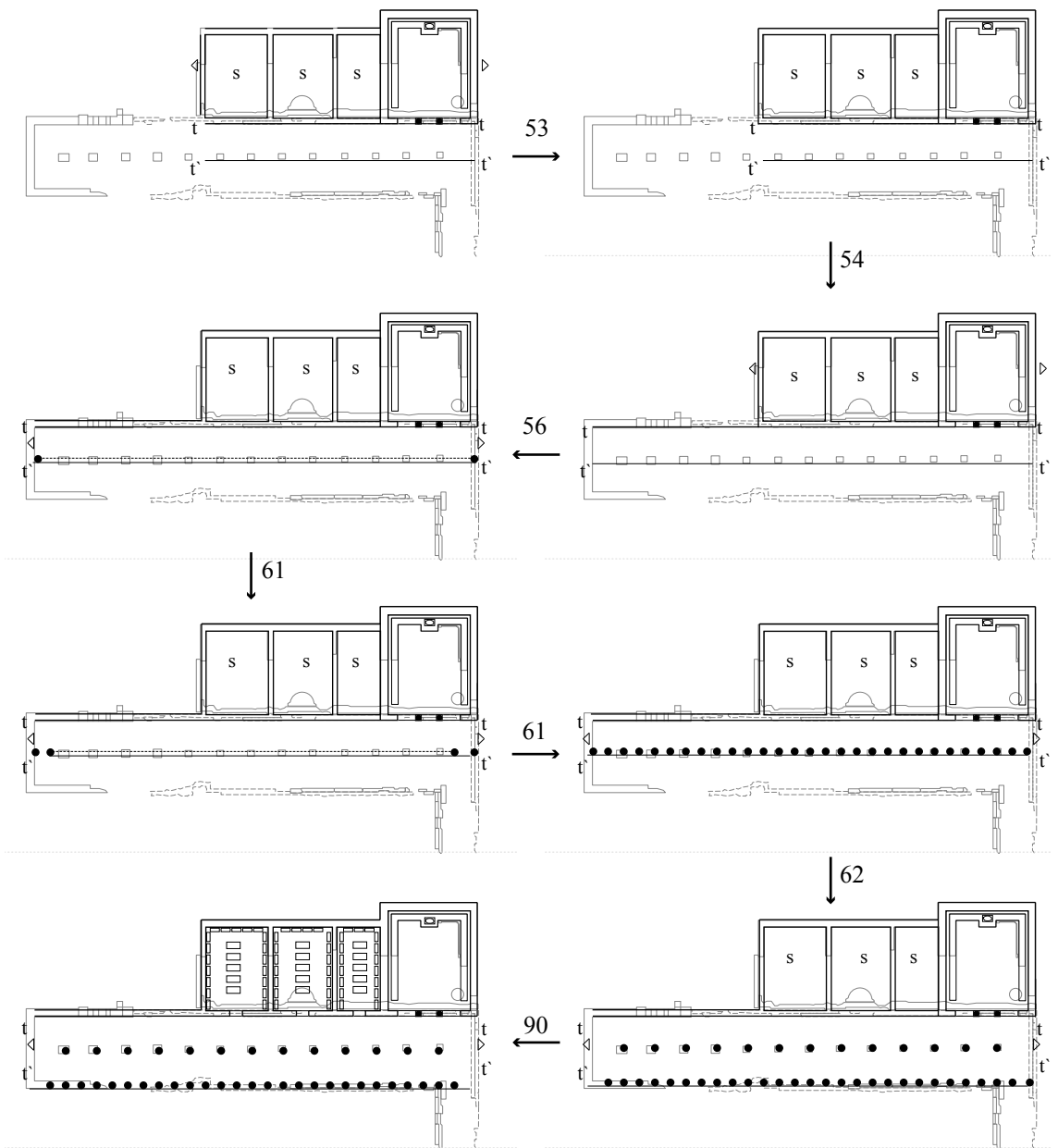


**Figure 5.32** State of preservation plan of the Temenos of Athena with the Library of Pergamon.

Rule 1 labels the different parts of the library, so that the width of the focal point  $f_w$  is 2.74 m. Rule 3 makes the basic subdivisions that set apart from the side and back walls a distance  $p = 0.5$  m. and  $p_d = 2.48$  m. Rule 5 adds the podium in front of the axis defining its distance from the wall and with width 1.05 m. Rules 26 and 27 erase the labels  $nb$  and  $ns$  so that the generation of niches or bookcases is prevented. Rules 28 and 35 generate the focal point by making a projection in the podium by 1.05 m. and by adding a statue on top of it. Rules 38 and 41 generate the entry to the main hall with an opening with a tripartite division between Ionic columns.



**Figure 5.33** Derivation of the plan of the Library of Pergamon.



**Figure 5.33** (continued) Derivation of the plan of the Library of Pergamon.

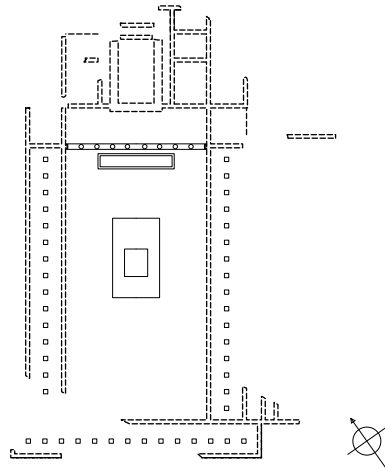
In the second stage, rules 46 and 47 generate additional support rooms of smaller length than the main hall,  $s_l = 12.51$  m., and varying width, 7.07 m the first, 9.5 m the second and 9.92 m the third. Rule 53 generates the exterior walls of the three rooms. Rules 54 – 61 generate the stoa in front of the library that extends beyond its boundaries. Then rule 62 duplicates its width by adding one more aisle with an interior colonnade and last, rule 90 adds bookcases and desks in the side rooms of the library.

The grammar is able to generate the proposed reconstruction of the building remains consisting of smaller rooms and one main hall, with a podium set at a distance from the wall, as reconstructed by Bohn, and also interpreted as seating or reclining area during banquets, as proposed by Strocka. Since the grammar was based upon this interpretation, it is no surprise that the grammar generates this interpretation and excludes the interpretation of other researchers, who suggested that the podium supported armaria. The value of this derivation is that it proves the validity of the grammar in generating building forms, as verified by well-preserved building remains. If the grammar was not able to generate this well documented library, then this would mean that the rules are not well done and that the grammar is not a valid tool of reconstructing other less well preserved libraries.

### *5.3.3. A computational derivation of the Academy*

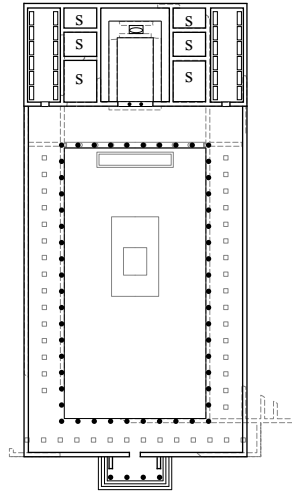
The central room in the north side of the gymnasium at the Academy has been identified as a library. The building remains survive at the level of the foundations (figure 5.34) and indicate several peculiarities in plan: the south stoa projects beyond the boundaries of the

east and west stoas, the stoas of the peristyle might have been separated by walls, and the podium in the main hall projects beyond the boundaries of the main hall into the stoa.



**Figure 5.34** State of preservation plan of the Academy.

The grammar is able to generate the Academy as a more regularized version that does not take into account the peculiarities of its plan. The peristyle is generated without the projections of the south stoa, and without the transverse walls that separate the different stoas. The grammar is not able to generate the peculiarity of the podium that appears as a closed shape and projects towards the stoa. This feature is emphasized as an exceptional feature. The derivation is given in figure 5.35.

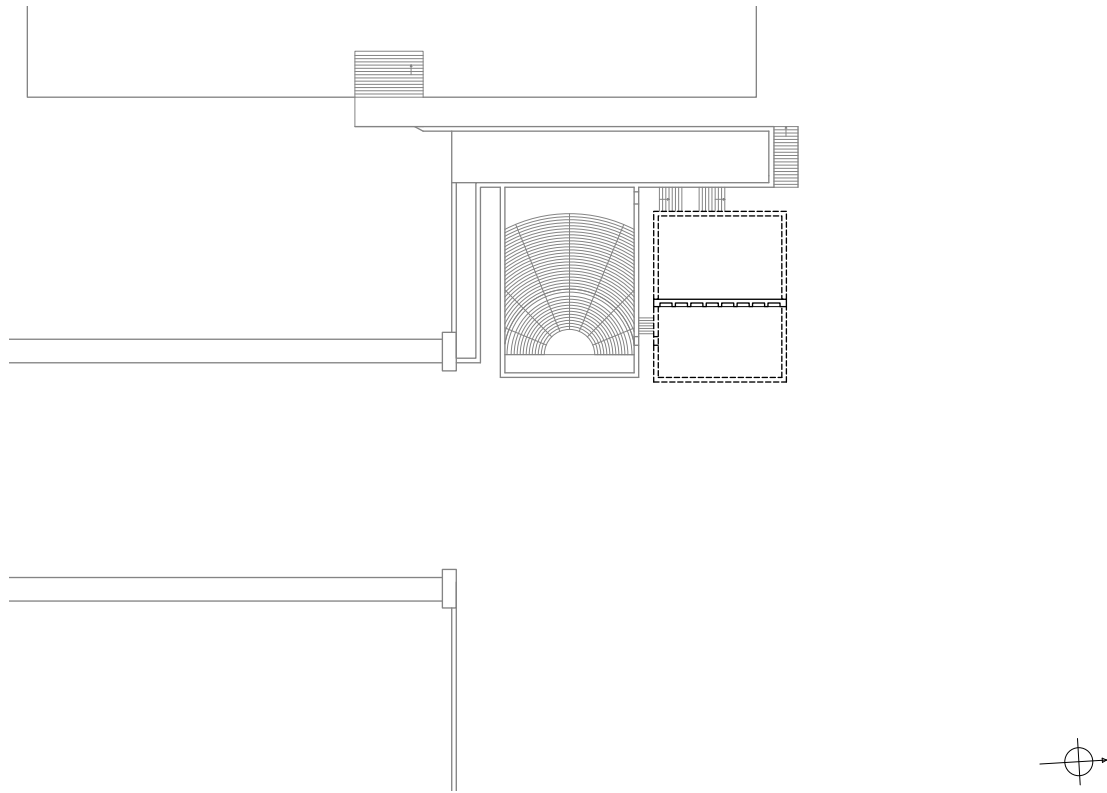


[1, 3, 5!, 26, 27, 28, 35, 38\*, 41\*, 44, 45, 48, 51, 56, 59!, 61, 72, 73, 81\*, 87, 90\*]

**Figure 5.35** Grammar generated plan of the Academy

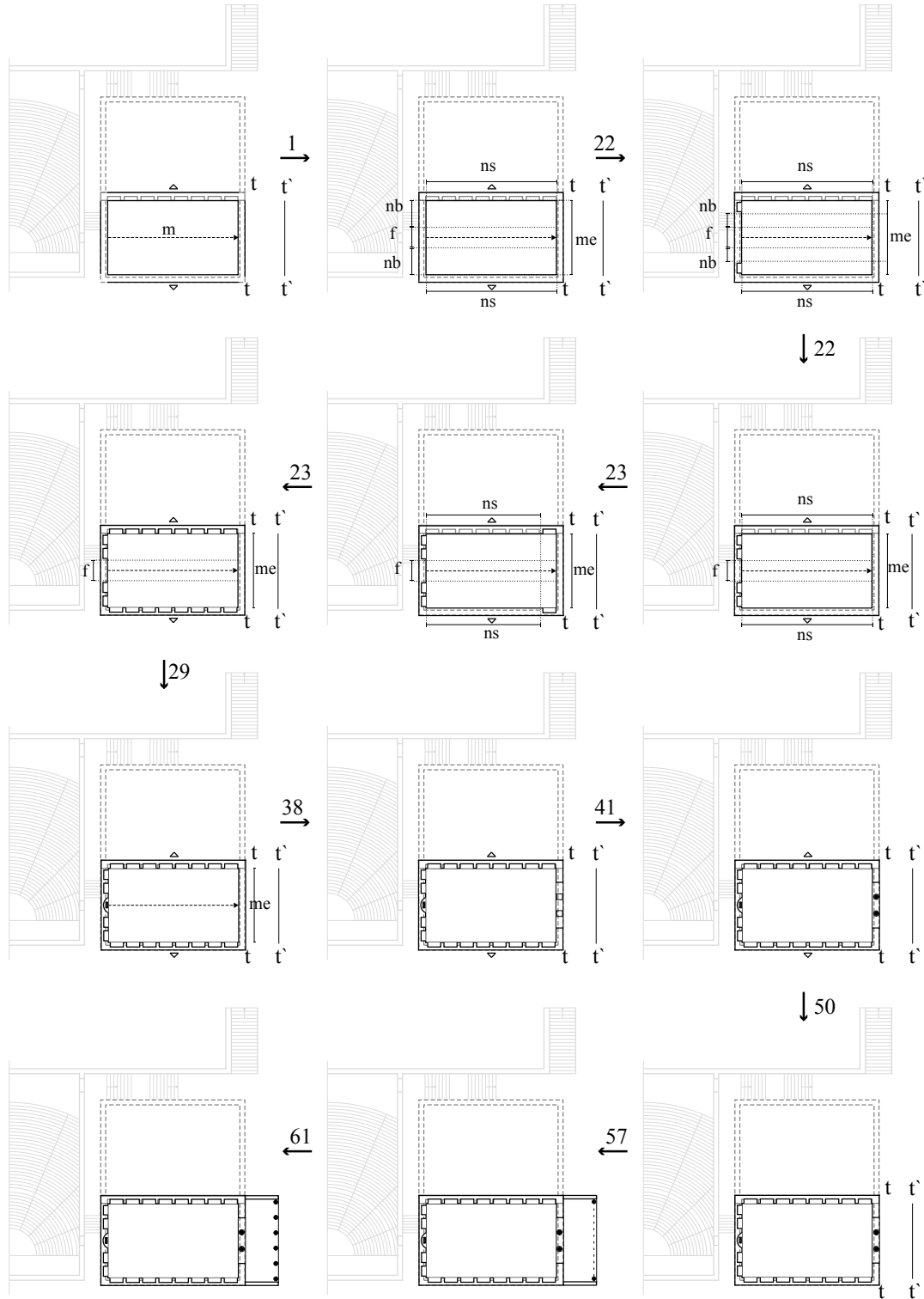
*5.3.4. A computational derivation of the library at the gymnasium of Rhodes*

A room next to the odeium, in front of the stadium at the gymnasium of Rhodes has been identified as the library at the gymnasium, testified by inscriptions. The building remains include the lower part of the west wall of the hall, and the foundations of the rest of the walls (figure 5.36).



**Figure 5.36** State of preservation plan of the Library at the gymnasium in Rhodes.

The grammar is able to embed the initial shape in the hall and generate the library, as a library consisting only of one hall. Rule 1 applies to label the different walls of the library: the surviving west wall is identified as a sidewall, due to the absence of a focal point; the entry wall is identified in the northern wall, where there is space to add the threshold. The rules generate the main hall without a podium and interior colonnade, but with eight niches on the sidewalls and two in each side of the back wall. The reconstructed semicircular focal point is entirely conjectural. The library hall is accessed through openings between two columns and is preceded by a colonnaded porch.



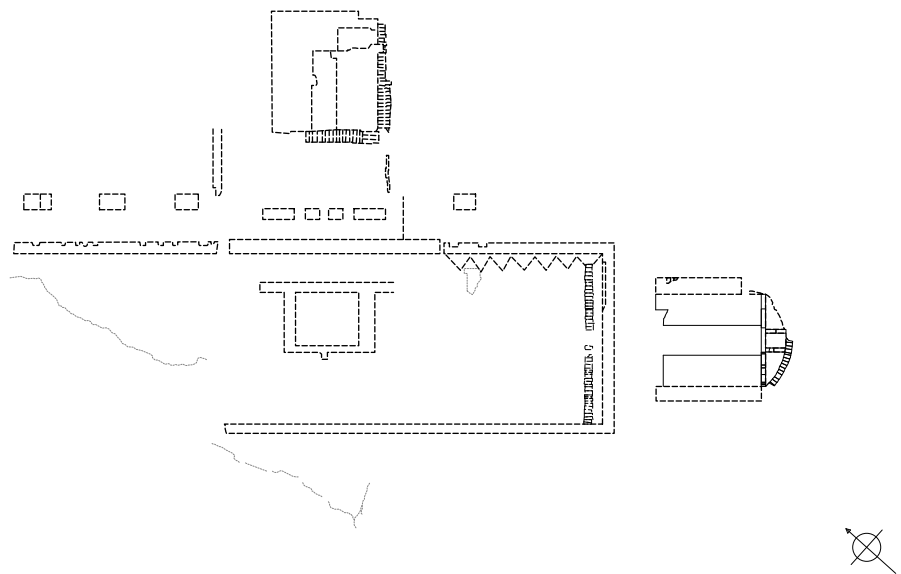
**Figure 5.37** Derivation of the plan of the Library at the gymnasium of Rhodes.



The grammar generated plan evaluates the existing reconstruction of the remains by Hoepfner (see chapter 3.1.4) as non-possible. The entrance of the library could not have been on a small passageway without a formal stoa, unless we consider that the relationship of the library with the odeium is more important than the typology of the library. In this case the library would have been an exceptional library with case-specific characteristics.

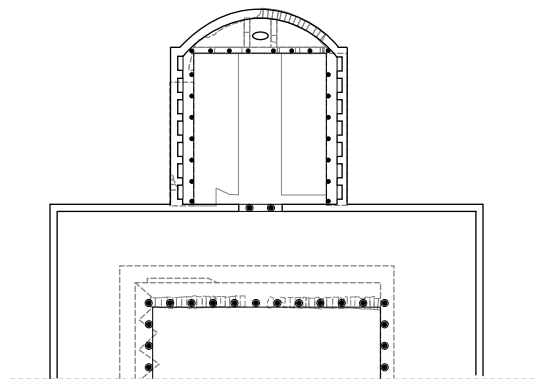
### 5.3.5. *A computational derivation of the Augustan Palatine Library, Rome*

The Augustan Palatine library includes the building remains of the main hall, attached to the portico of the Danaids, as known from literary sources (figure 5.38). This was one of the first libraries built in Rome, and was also used as a meeting place of the senate, often mentioned in literary sources as curia. The building remains verify the approximate dimensions of a curia.



**Figure 5.38** State of preservation plan of the Augustan Palatine Library.

The grammar generates the layout of the main hall, based on the building remains and suggests a hypothetical reconstruction for the parts of the building that do not survive. The derivation is given in figure 5.39. The generation of the niches and the colonnade are not based on building remains, but they explain well the existence of the massive walls and the foundations of blocks of tufa traversing the hall in front of the apse. The difference in the thickness of the side and back wall is translated in the absence of niches in the back wall, something that does not appear in other libraries but is possible based on the rules.



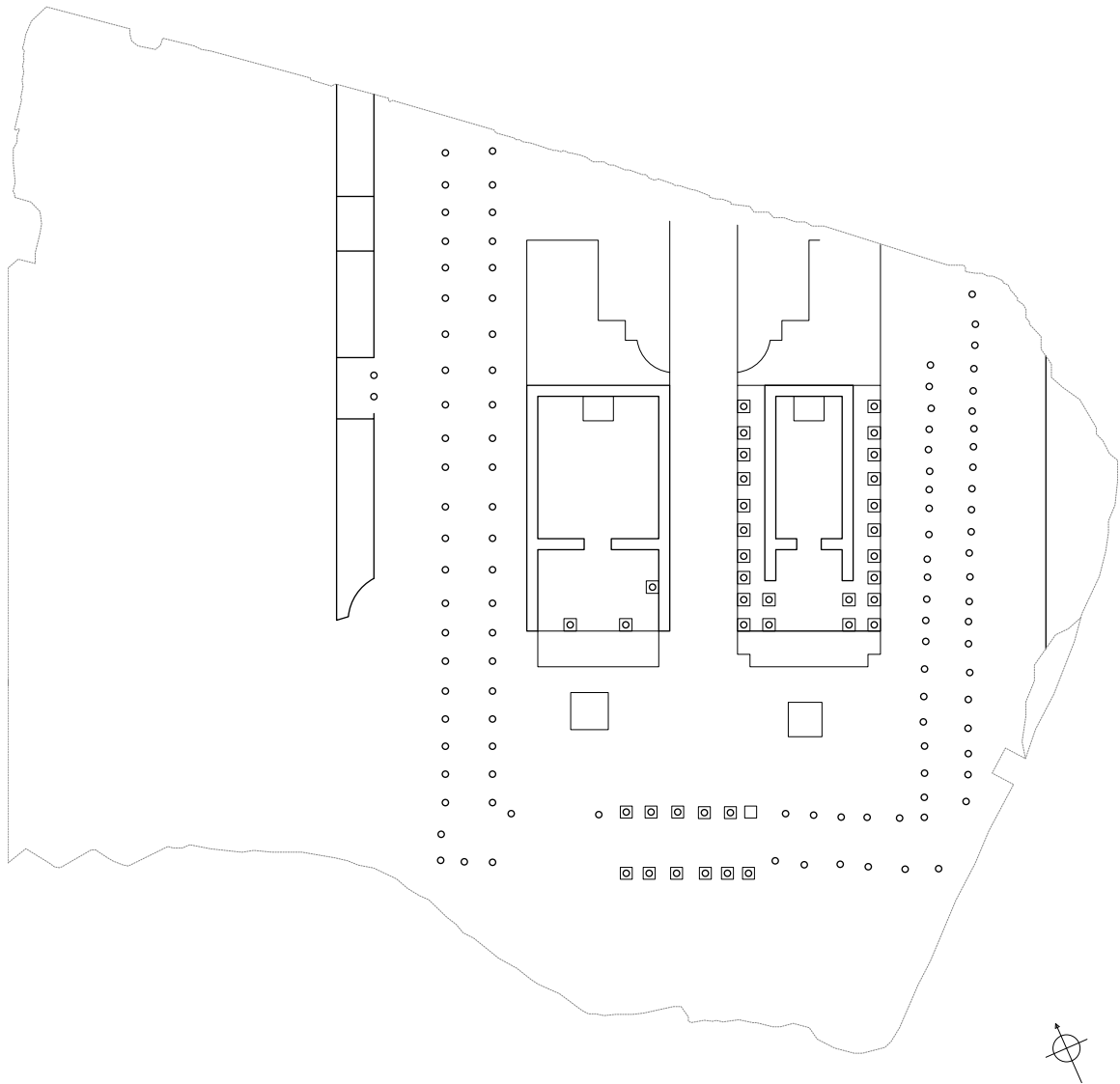
[2!, 4!, 6!, 11, 13, 16\*, 18\*, 26, 34, 38\*, 41\*, 50, 54, 56, 59, 61]

**Figure 5.39** Derivation for the Augustan Palatine Library.

Lastly, it must be noted that a strict application of the rules would not have been able to generate the corners in the joints between the side walls and the back wall, and also would have not been able to generate a rectilinear podium in an apsidal hall.

5.3.6. *A computational derivation of the Library in the Porticus Octaviae, Rome*

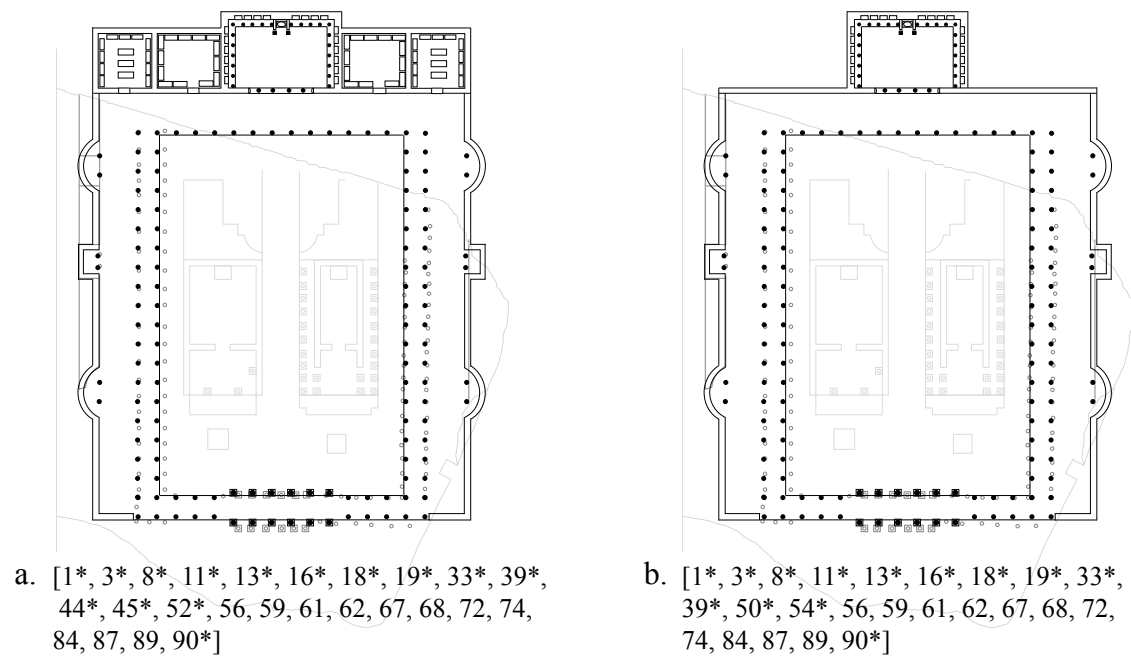
The form of the Porticus Octaviae is known through fragments of FUR, the marble map of Rome (figure 5.40). Building remains of the propylum verify the validity of the map.



**Figure 5.40** State of preservation plan of the Portico of Octavia.

The library within this complex is well documented in the ancient testimonia, and there have been several suggestions about its location in the building complex: either in the exedras attached to the east stoa of the complex, or in the apsidal structures attached to the rear of the temples. It has also been postulated that the library could have been in the north side of the temple, the form of which does not survive.

The grammar suggests a possible reconstruction of the library in the Porticus Octaviae and the overall form of the complex. The derivations start from scratch, and generate the north side of the complex. Only when the derivation reaches the general layout of the complex, does it take into account the known form of the building complex as known from FUR. The final designs of two possible derivations are shown here (figure 5. 41).



**Figure 5.41** Final designs of two alternative possible derivations of the library in the Porticus Octaviae.

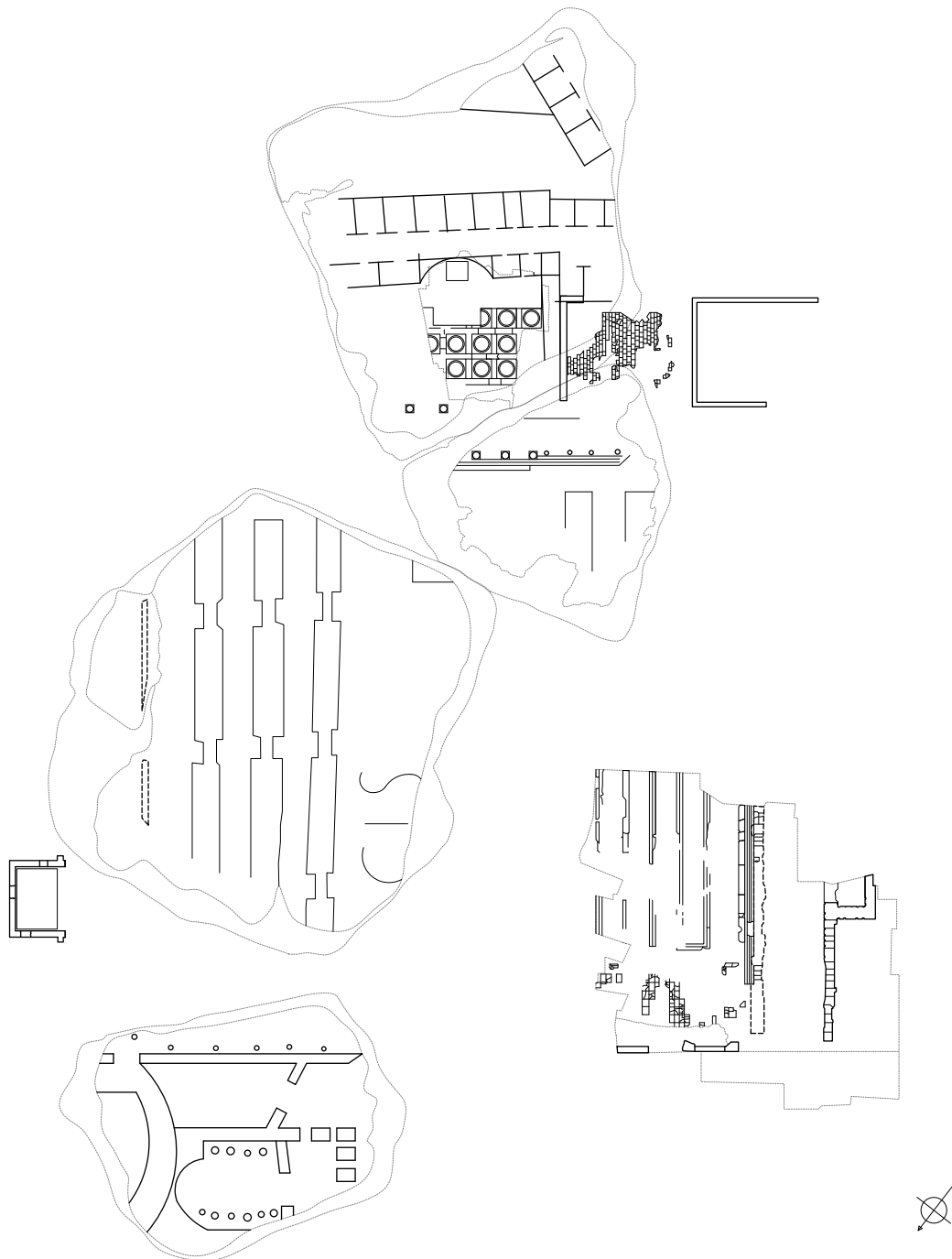
The first derivation generates the main hall, flanked by additional rooms on the axis of the north stoa of the complex and additional exedras in the east and west sides of the complex (figure 5.41a). An alternative derivation is possible that generates only the main hall without side rooms, as was the Augustan Palatine Library (figure 5.41b).

The main contribution of this derivation is that it demonstrates how the grammar can suggest one or more possible reconstructions of libraries, even in the cases in which there are no remains of the main hall. It also allows us to visualize what a major or a smaller library complex would entail.

#### *5.3.7. A computational derivation of the Library at Templum Pacis, Rome*

The Templum Pacis in Rome is an exceptional building complex that combines multiple functions: a temple to Peace, a library, exhibition space for paintings, sculpture and other precious artifacts and other administrative functions. Its architectural form is known partially through building remains and partially through the FUR (figure 5.42). Scholars have identified the library either with the main hall of the complex, combined with the cult of Peace, or with the adjacent rooms.

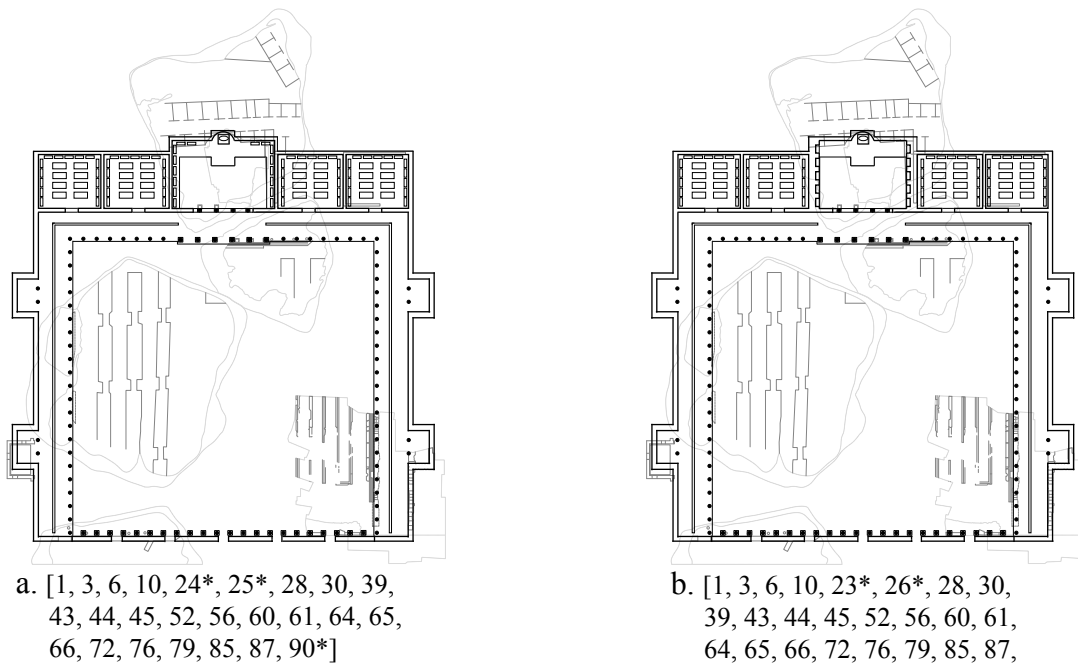
The grammar generates a derivation of the complex placing the library in the main hall of the southern side of the complex. Only the floor and the focal point of the main hall survive. The sidewalls are known through the fragment of FUR.



**Figure 5.42** State of preservation of the Templum Pacis.

Two possible derivations of the complex demonstrating how the library could have been located in the main hall are given in figure 5.43, each of them presenting a different

interpretation of the double lines that represent the sidewalls in the fragment of FUR. The first derivation embeds in the line along the sidewalls rule 6 that generates a podium. The second derivation embeds rule 1 and creates the sidewalls thicker, so that later it applies rule 23 and generates niches. In both derivations, the main hall is considered as the main hall of the library, combined with the function of the Temple of Peace.



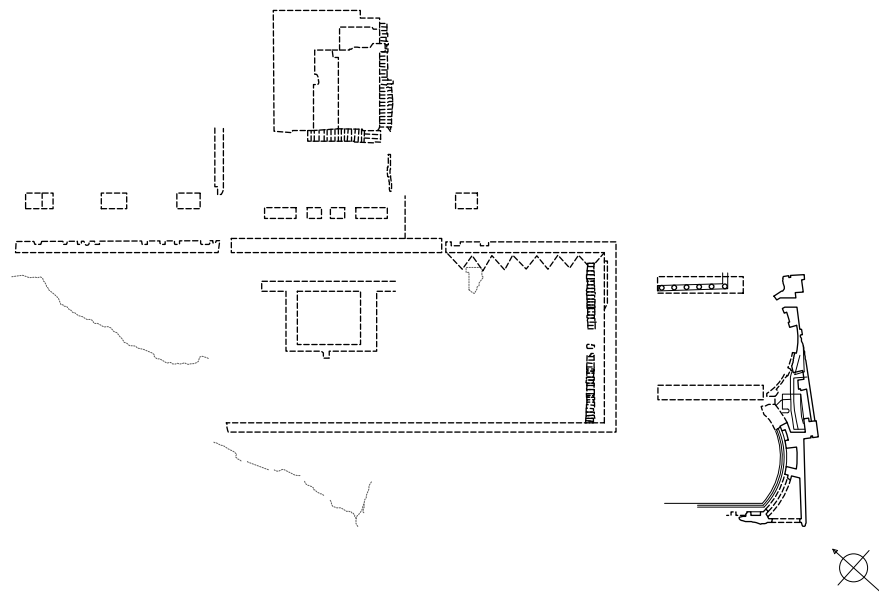
**Figure 5.43** Final designs of two alternative possible derivations of the library in the Templum Pacis: a) with armaria set on a podium; b) with armaria in niches.

One feature that the derivation reconstructs differently than current reconstructions of other scholars is the entrance to the library. Current reconstructions show an entry along the whole width of the hall with six columns, symmetrically to the six columns in the projection of the portico. The derivation is not able to generate so many openings. It generates instead an entrance subdivided by columns into five openings. This

interpretation, while limiting the width of the entry opening, is not in conflict with the interpretation of the projection with the six colossal columns as the pronaos to the main hall.

### 5.3.8. *A computational derivation of the Domitianic Palatine Library, Rome*

The architectural form of the Domitianic Palatine library is known through building remains, still visible today (figure 5.44). The main hall of the library was built exactly on top of the earlier Augustan phase, while a second hall was added to the south of the preexisting one.

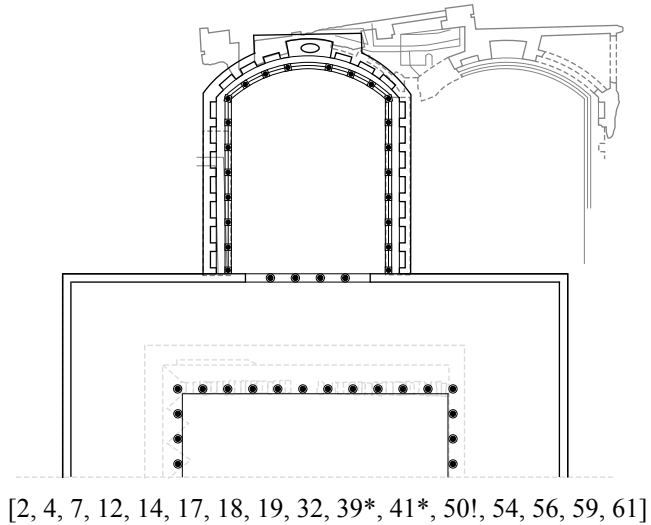


**Figure 5.44** State of preservation plan of Domitianic Palatine Library.

The grammar is able to generate the main hall of the library with the niches, the podium with steps, the focal point, and the colonnade based on the building remains. The



derivation of the entrance to the library is conjectural. The final design of the derivation is given in figure 5.45.



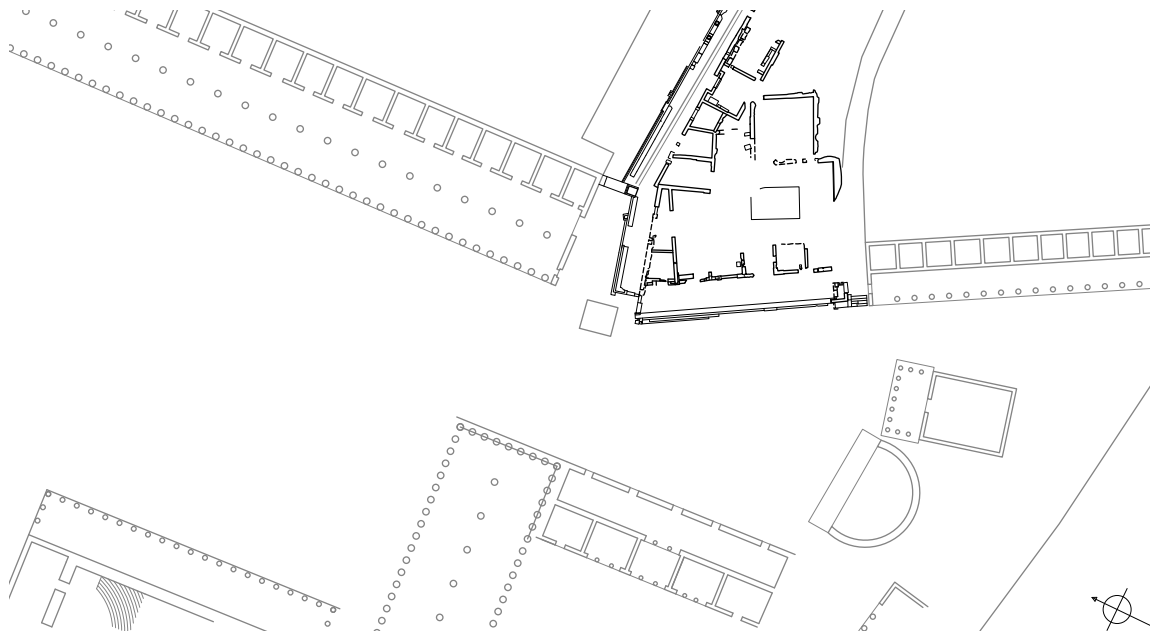
**Figure 5.45** The grammar generated plan of the Domitianic Palatine Library.

This library is one of the best preserved on the corpus, and the grammar relies on the analysis of its building remains. Thus, the derivation works as a confirmation that the grammar generates what it is set to generate.

One of the principles of the grammar is that it does not generate duplicated halls. The grammar is not able to generate the second hall built by Domitian, right next to the first one.

### 5.3.9. *A computational derivation of Pantainos Library, Athens*

The Pantainos Library is one of the most complicated buildings in the corpus, partially because there has not been a full publication of the remains yet. At least two building phases have been identified, but the sequence of alterations in the building is not clear. The library is embedded in a larger complex of irregular plan due to the urban context. The library is very poorly preserved due to subsequent intentional destruction, and thus the building remains leave a lot of space for speculation about the exact number of spaces and layout of the library (figure 5.46).



**Figure 5.46** State of preservation plan of the Pantainos Library.

Roughly, two sections can be identified in the building complex: a regular section to the south with a stoa, a peristyle and a large room, all having the same orientation, facing the Panathenaic Street; and an irregular section to the north, with a series of rooms facing the

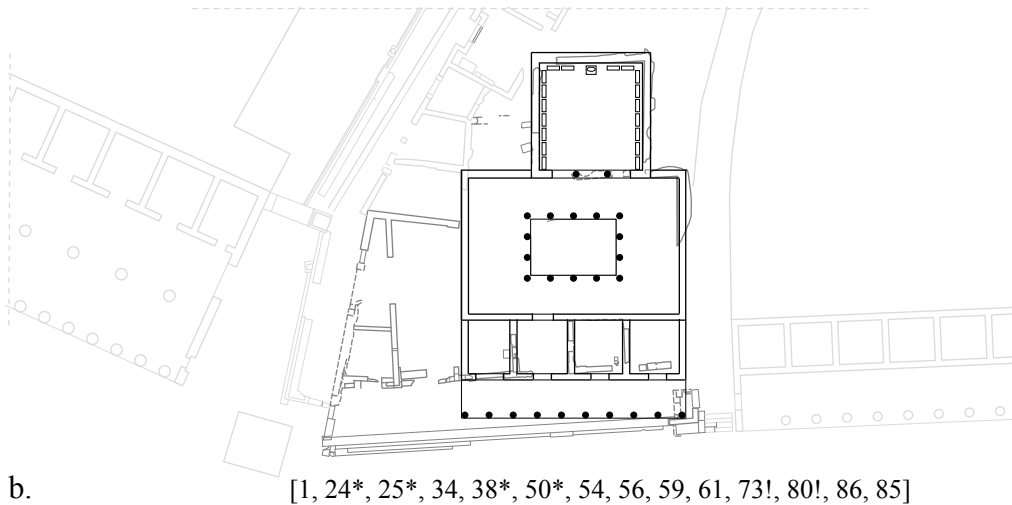
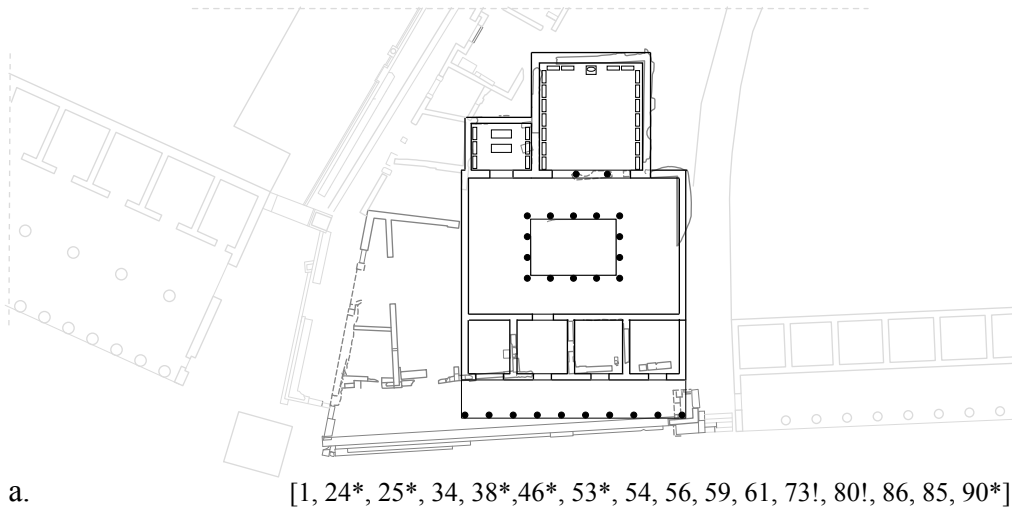
two northern stoas at an angle. Some of these irregular rooms have been associated with the library, but there is not enough evidence for this association due to the poor preservation of the remains.

The final designs of two possible derivations are shown in figure 5.47. The derivations identify the main hall of the library and reconstruct it as a simple room with armaria and a statue set on the floor. There is no evidence on site of niches, and there is evidence that there was no podium in the main hall. To the main hall of the library is attached a peristyle as a threshold, and optionally one more room to the left (figure 5.47a). The entrance to the building complex is articulated as a stoa with an entry room giving access to the peristyle flanked by shops facing the street.

The grammar generates a stoa with shops, but due to the case specific characteristics of this complex, the grammar is not able to generate the full length of the stoa that extends beyond the boundaries of the peristyle. The derivation points to this feature as exceptional.

The grammar is not able to generate the exedra, usually interpreted as part of the library, attached to the north side of the peristyle, on the basis that this room is irregular in shape and there is no other exedra symmetrically arranged to it. A closer inspection of the remains shows that this room has the same orientation as the other rooms attached to the northern stoa, and as such it is very possible that it was part of them, not related to the library.

Another feature suggested by traditional research that the grammar is not able to generate is the second entry to the complex through a room opening at an angle at the north stoa. This room has a different orientation than the other programmed components associated with the library. Also, there is no other library as a complex in the corpus that has more than one entrance. The grammar points to the interpretation of this room as not related to the library.

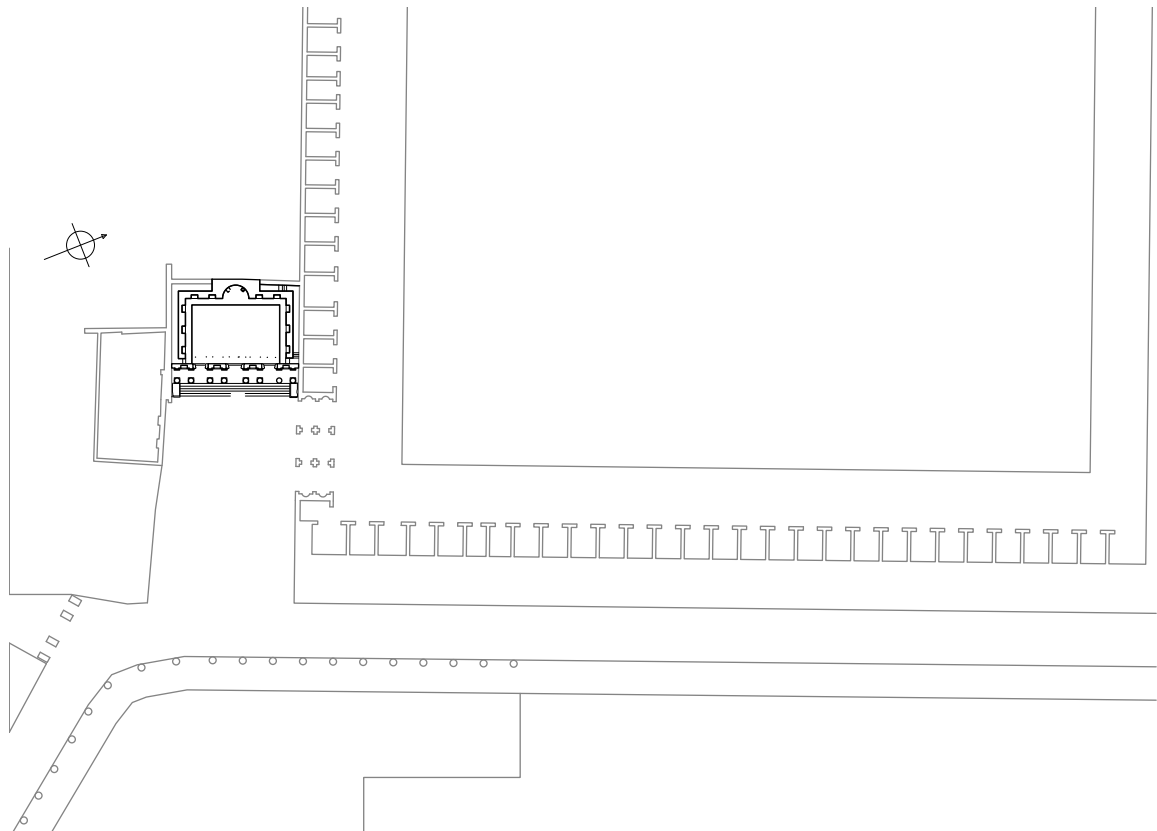


**Figure 5.47** Two grammar generated plans for the Pantainos library: a) with one side room; b) with only one main hall.

Overall, this derivation points to the obvious conclusion that the Pantainos Library is exceptional. However, it also opens more possibilities about the interpretation of the remains by identifying the northern spaces as part of the library or not.

### 5.3.10. A computational derivation of the Celsus Library

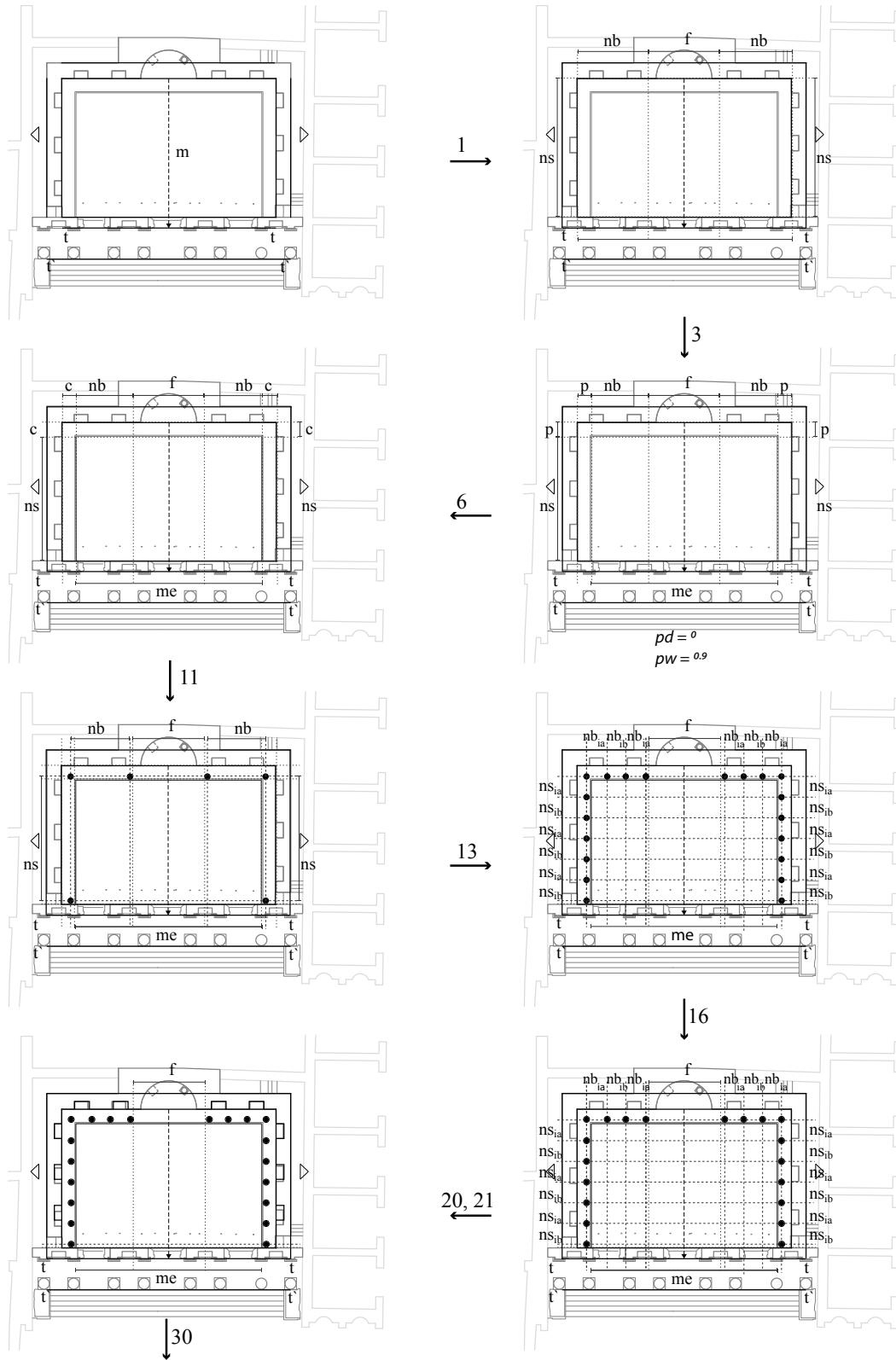
The Celsus library is located next to the Market of Ephesus (figure 5.48) and consists of only one hall. The building is well preserved giving evidence of the arrangement of its architectural features: the niches, the focal point the podium, the interior colonnade and the door openings.



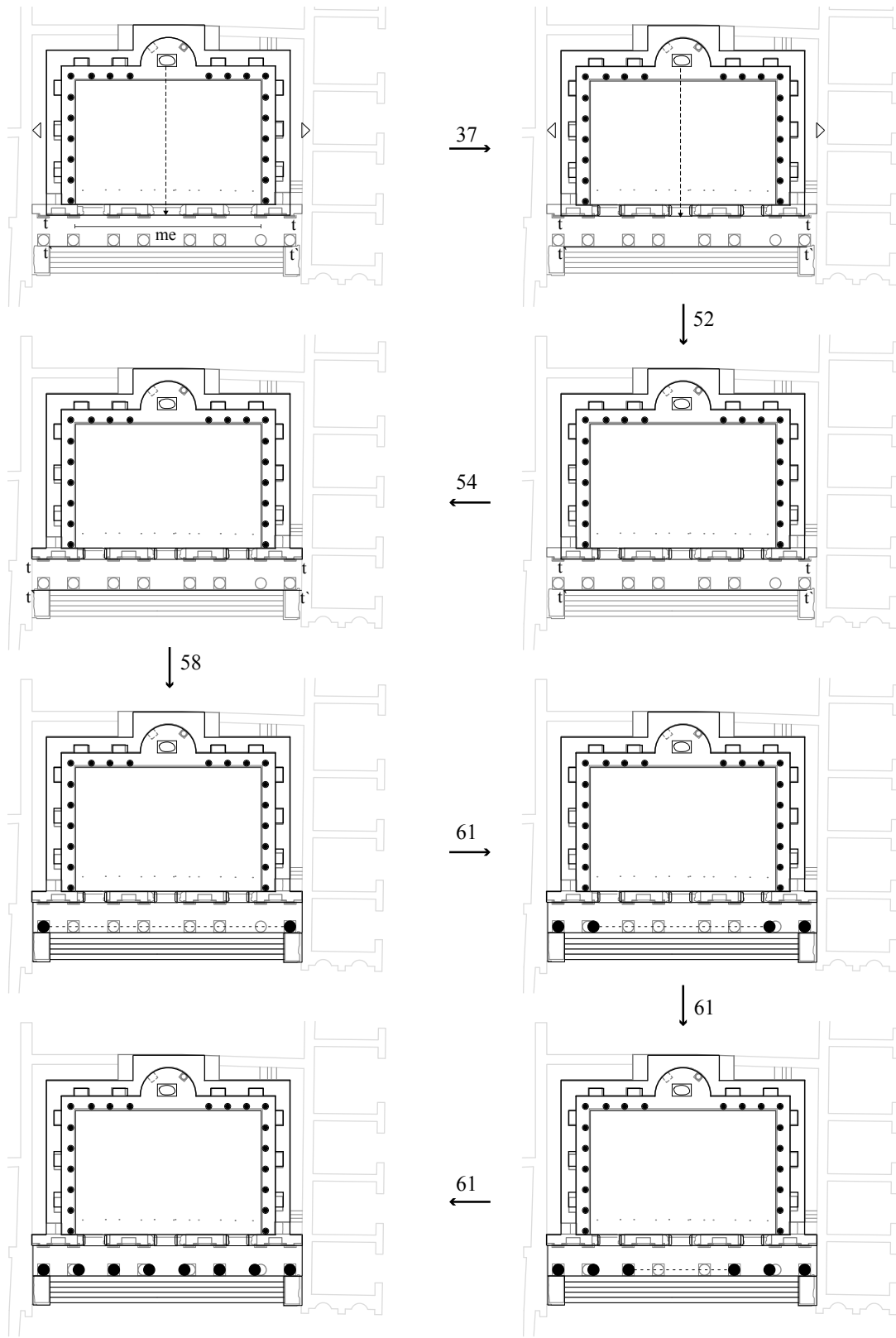
**Figure 5.48** State of preservation of the Celsus library, located next to the gate to the Agora, Ephesus.

The grammar starts with the initial shape that identifies the boundaries of the main hall, adds the axis of the hall and points to its entrance, and also defines the entrance wall with  $tt$  and the boundary of its threshold as  $t't'$ . Rules 1 and 3 make the basic subdivisions in the main hall and define the parts of the library: the side walls, the back walls, the focal point, the podium and the front wall, where the main entrance will be. From this point the derivation follows all stages that generate the podium, the interior colonnade, the niches the focal point and the entrance wall. Rule 6 adds a U-shaped podium against the walls, rule 11 adds the corner columns of the colonnade, rule 13 applies recursively to propagate the colonnade based on a set intercolumniation, then rules 20 and 21 generate the niches in the intercolumniations labeled  $ns_{ia}$  and  $ns_{ib}$ , thus leaving empty the interaxial spaces  $ns_{ib}$  and  $nb_{ib}$ . Next, rule 30 generates the focal point in the area labeled as  $f$  by adding a large semicircular niche and by translating the wall segment to retain the wall thickness. Lastly, rule 37 generates three entrance openings to the main hall.

In the second part, the derivation skips stage VI that generates side rooms and applies rule 50 to verify the exterior walls and to remove the triangular labels that would in another case be used to generate additional rules. Then rules 54 – 61 apply to generate the threshold of the building; rule 54 extends the threshold beyond the sidewalls of the library, rule 58 adds a portico in front of the building preceded by a stairwell and rule 61 applies recursively to generate the columns. The derivation of the Celsus Library is shown in Figure 5.49.



**Figure 5.49** Derivation of the plan of the Celsus Library.

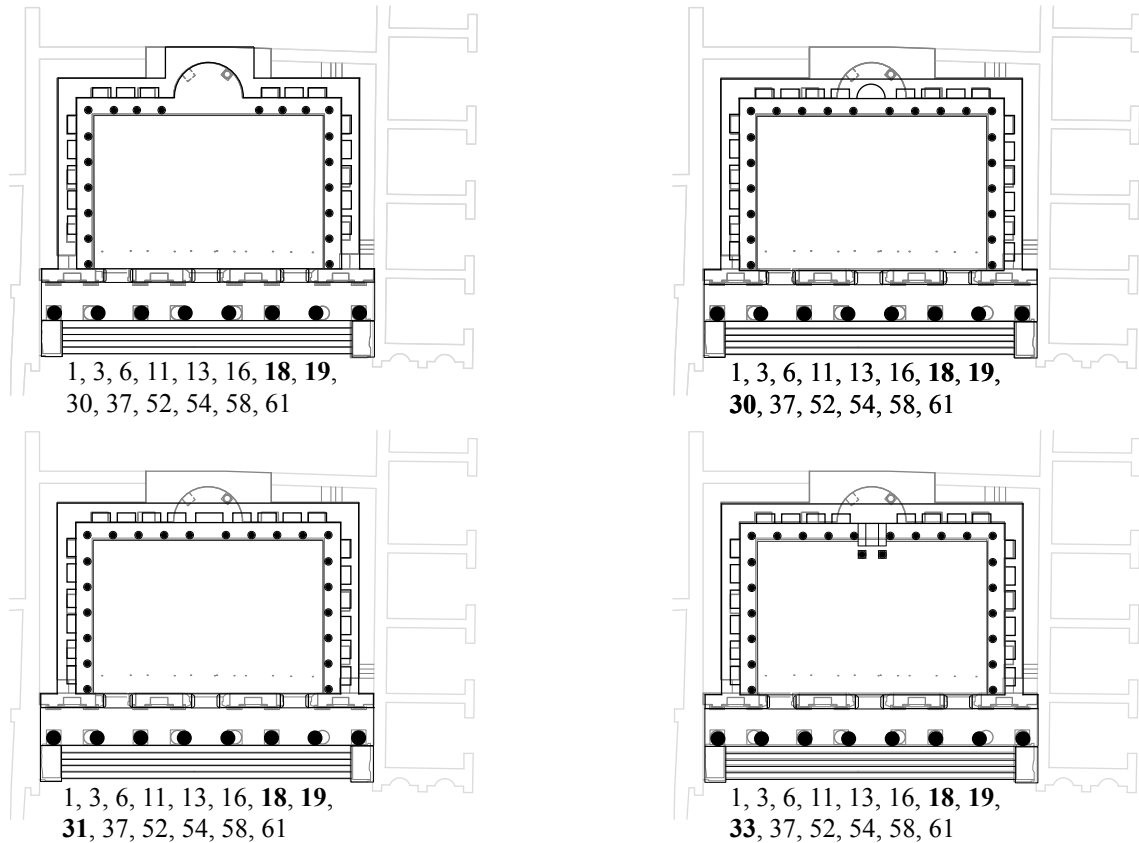


**Figure 5.49** (Continued) Derivation of the plan of the Celsus Library.



Alternative plans of the library can be generated with the application of rules that add niches in all interaxial spaces, or add smaller focal points that would allow for more niches to be added in the back wall of the main hall. Of course, these plans are not verified by the archaeological record but they are possible plans in the same style that the architect and the patron of the Celsus library could have chosen given the space restriction to generate a library of a higher book volume. In this sense the grammar helps evaluate the design intentions of the Celsus library: the architect and patron of the library were probably not interested in creating a public library with a large collection but rather a funerary monument with the fewer books. By generating alternative plans, in response to the site constraints, the grammar places the actual building among the possible and offers insights about the architectural form chosen. The alternative theoretical reconstruction of the Celsus library with a small focal point, a larger number of niches and thus larger book volume archival space is shown in Figure 5.50.

The grammar regenerates the general plan of the Celsus library, leaving out some architectural details or stylistic characteristics. For example, the rhythm of the columns in the portico and the massive buttress wall behind the focal point are not captured by the grammar. The grammar defines the focal point as the wall segment between the wall segments with the niches, but is not able to extend the back wall of the focal point beyond the boundaries of the corresponding wall segment to the focal point. Also, the grammar computes the colonnades based on a standard value to the parameter of the intercolumniation and is not able to capture the rhythm of the façade.



**Figure 5.50** Alternative derivations of the Celsus library that show that more niches could have fit in the main hall with the current focal point, provided a smaller focal point in the form of a rectangular niche, a semicircular niche, or an aedicula. The rules that are different compared to the derivation in figure 5.49 are shown in bold letters.

Most important though, the grammar is not able to generate the reconstruction plan suggested by Wilberg, in that it does not generate the “peristasis” or double exterior wall. The grammar is based on the principle that there were no double walls in libraries, and identifies these walls as walls of neighboring buildings. The grammar-generated plan is the first representation of the library excluding the walls of neighboring buildings and

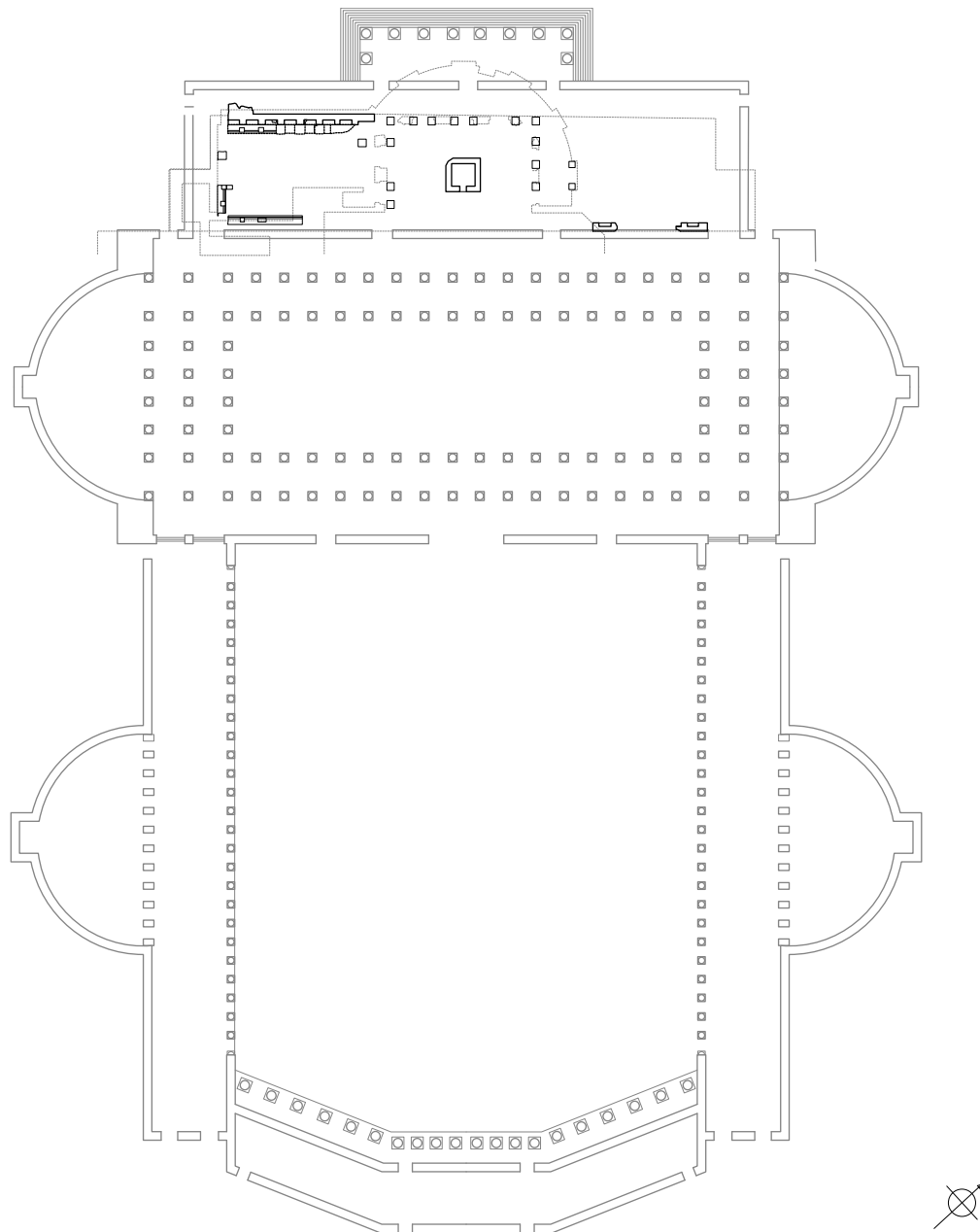
illustrating that the widened façade does not necessarily mean that the walls and the gap behind it are part of the building.

#### *5.3.11. A computational derivation of the Ulpian Library, Rome*

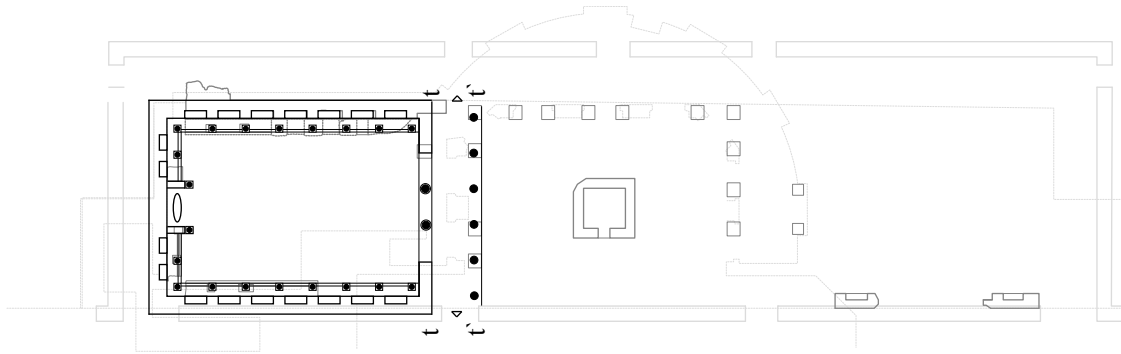
The Ulpian Library was built as part of the Forum of Trajan, and was attached to the portico with Trajan's column in the center. The building remains give the form of the library (figure 5.51).

The grammar is able to generate the plan of the library as a rectangular elongated hall with niches, an interrupted podium with steps and colonnade, niches on the walls and an aedicula as focal point. The only hypothetical is whether columns or piers subdivided the entry opening. The grammar is able to generate the threshold of the library, the stoa, which is part of the larger complex. The final design of the derivation is shown in figure 5.52.

The Ulpian Library is a well-documented library. Archaeological research has already determined the plan of the building. The only part of the building that still remains undetermined is the roof, but the grammar does not engage this issue. The derivation demonstrates how the grammar can generate libraries as part of larger complexes.



**Figure 5.51** The state of preservation plan of the Ulpian Library in the Forum of Trajan.

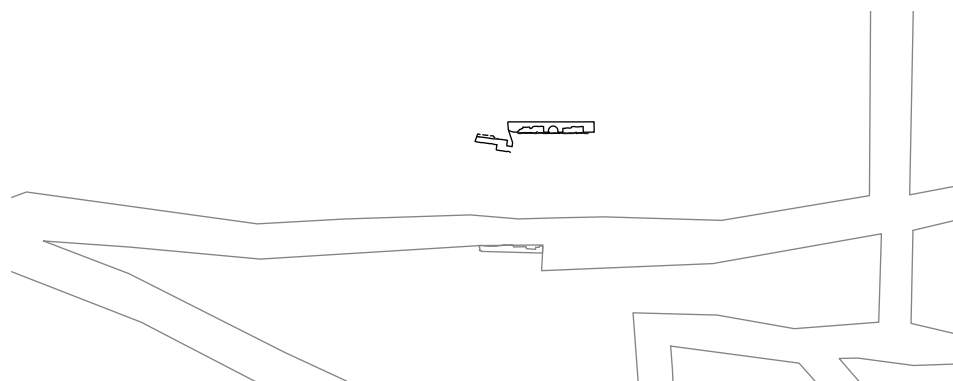


[1, 3, 8, 11, 13, 15, 16, 17, 18, 19, 33, 38, 41\*, 50, 56, 61]

**Figure 5.52** Derivation of the Ulpian Library.

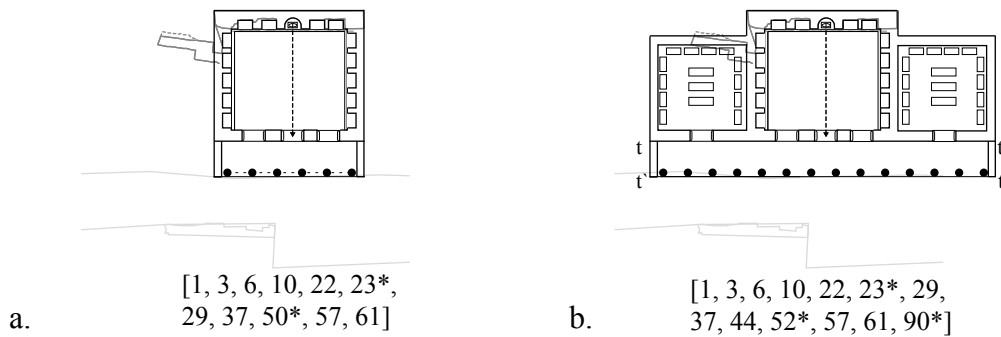
*5.3.12. A computational derivation of the Neon Library, Sagalassos*

The Neon Library survives after three phases of construction. Only the back wall of the building survives from the first phase when the library was built. It consisted of one hall with niches and a wall-socle along the back wall, which possibly continued in the sidewalls as well. The main hall of the library was directly set against the street, and was flanked by other rooms, which may or may not have been part of the library. The remains of the Neon Library are given in figure 3.53.



**Figure 5.53** State of preservation plan of the first phase of the Neon Library.

The grammar can compute the plan of the main hall with niches, a semicircular focal point, no interior colonnade and an entry condition either with doors or openings through colonnades. Regarding the threshold, the grammar can compute the main hall either independently with a colonnaded entrance (figure 5.54a), or as part of a larger complex, flanked by more rooms on the sides, all preceded by a stoa (figure 5.54b).

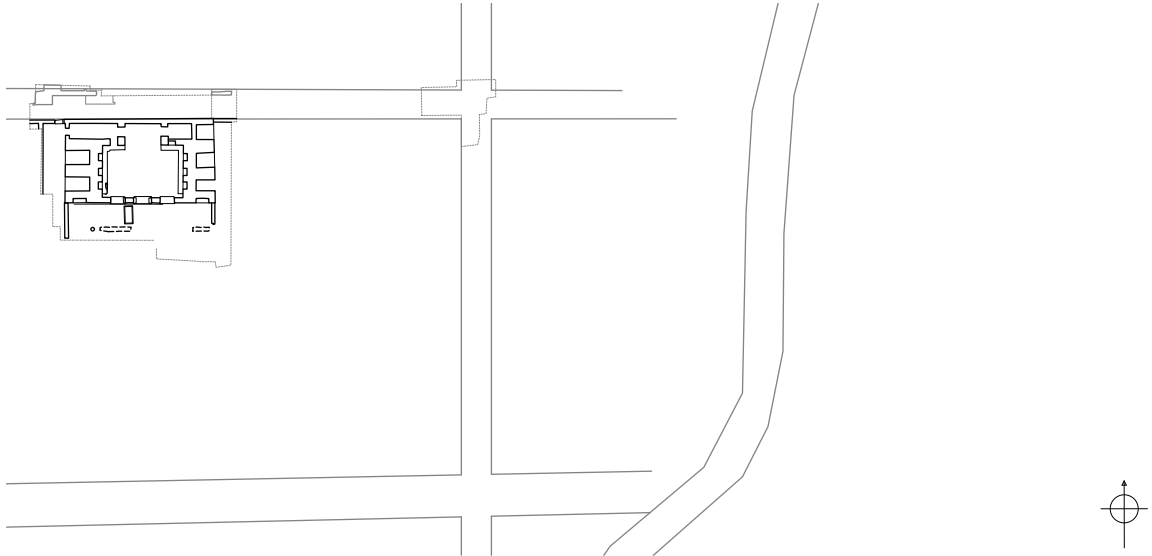


**Figure 5.54** Two alternative derivations of the Neon Library; a) with only one main hall; b) with additional rooms.

The grammar generates a regularized version of this complex, in which the specific orientation of this hall at an angle to the main hall of the library cannot be generated.

### 5.3.13. A computational derivation of the Library of Nysa, Asia Minor

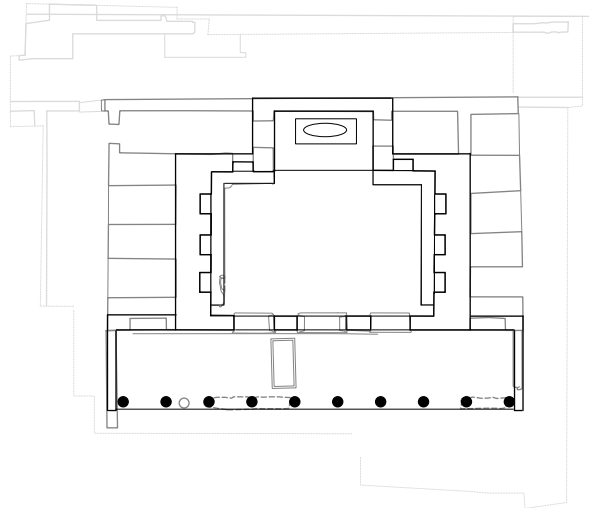
The building remains of the Library of Nysa include a colonnaded entrance, a main hall with niches, an interrupted podium and a widened rectangular in plan focal point in the back wall. The main hall is embedded in a building that includes smaller spaces between the buttresses that support the vaulted roof, and spaces that would have included stairways to the upper floor (figure 5.55).



**Figure 5.55** State of preservation plan of the Library of Nysa.

The grammar is able to generate the plan of the main hall of the library and the threshold in a similar way to the Celsus Library, but instead of adding an enlarged apse as a focal point, it adds a rectangular space. The final design of the derivation is shown in figure 5.56.

The grammar does not account for the flanking spaces of the building. It has been argued that these spaces were associated with the library main hall and that one would have been able to circulate from the focal point to the smaller rooms with stairwells on the side, to the upper floor. No other example in the corpus has stairways and allows access to other rooms from the main hall, and thus this library has been considered exceptional.



[1, 3, 8, 10, 18, 19, 32, 37, 52, 54, 57, 61]

**Figure 5.56** Derivation of the Library of Nysa.

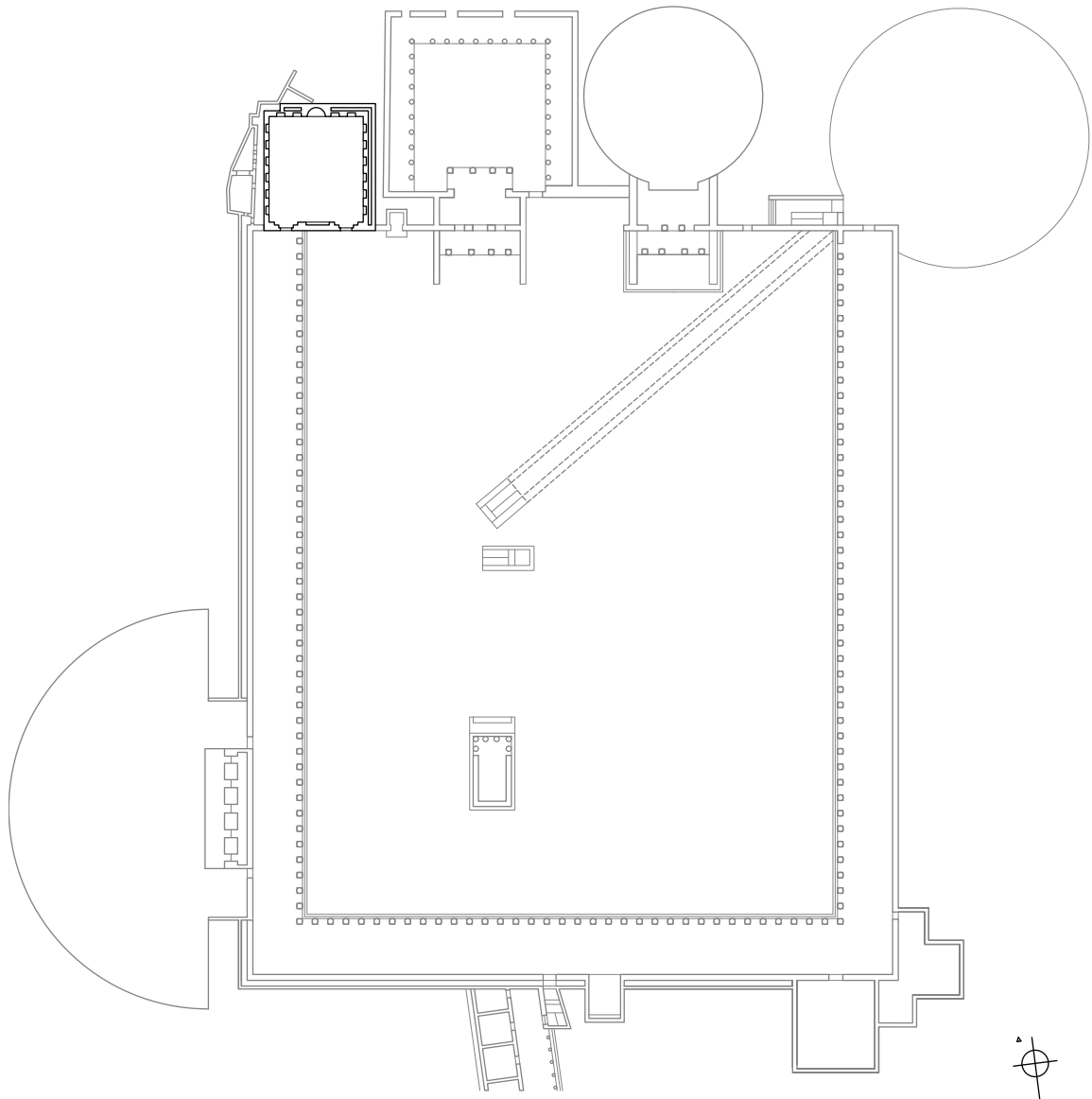
The grammar points to one more possibility: the possibility that the main hall was not connected with the other rooms and that the stairways were accessed directly from the exterior of the building. If this is the case, the library is restored following almost the same sequence of rules as the Celsus Library (figure 5.49).

#### *5.3.14. A computational derivation of the Melitine Library, Pergamon*

The Melitine Library in the Asklepeion in Pergamon has the usual interior design of a Roman library, but it is attached to a larger building complex in an unusual way: the library hall is attached to the small side of the stoa, and has two entrances, one from the stoa and one from the courtyard (figure 5.57). This is explained by the fact that the library was a later addition to the complex. Another important element of this library is that it



has evidence of niches, as well as a marble floor pavement that covered the whole floor, and thus excludes the possibility of a podium.

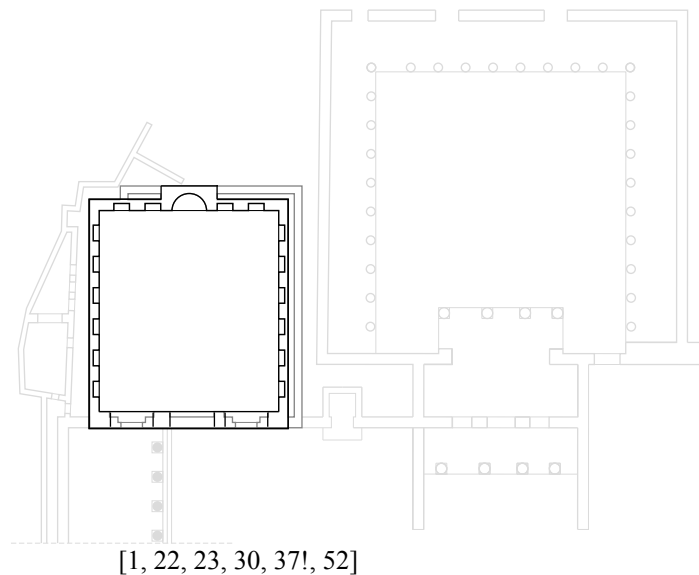


**Figure 5.57** State of preservation of the Melitine Library at the Asklepeion in Pergamon.

The grammar is not able to generate this library because the initial shape that includes a horizontal threshold with labels  $tt'$  cannot be embedded in the building remains.

However, with a modification in the initial shape, the grammar can generate the main hall with no podium, with niches on the walls and a widened semicircular focal point. The entrance to the main hall can be generated with rule 37, modified to generate three door openings, with the central closed up, due to the special context of the Melitine Library.

After this stage, the stages in part 2 are skipped and the derivation stops, because there is no threshold to continue the derivation. The final design of the derivation is given in figure 5.58.

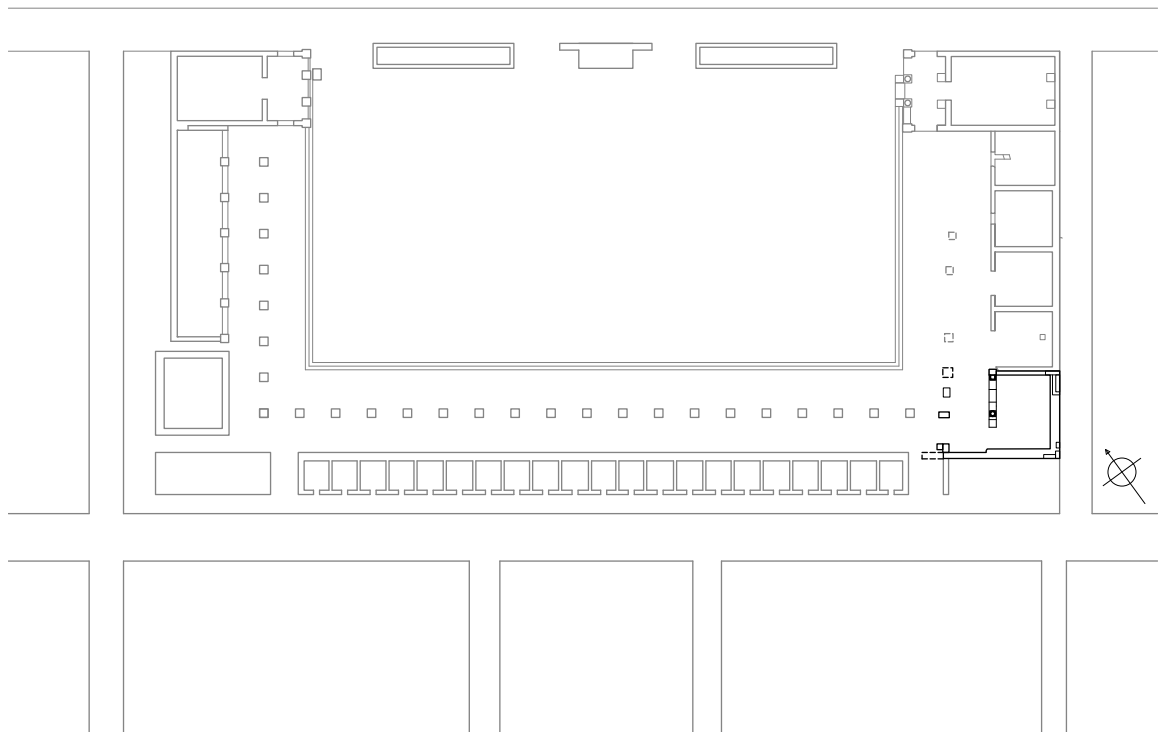


**Figure 5.58** Final design of the derivation of the Melitine Library.

The derivation points to the exceptional way in which the library is attached to the portico, and also shows how the grammar can account for a library with niches and focal point, but no podium and colonnade.

5.3.15. *A computational derivation of the Library in the Forum of Philippi, Northern Greece*

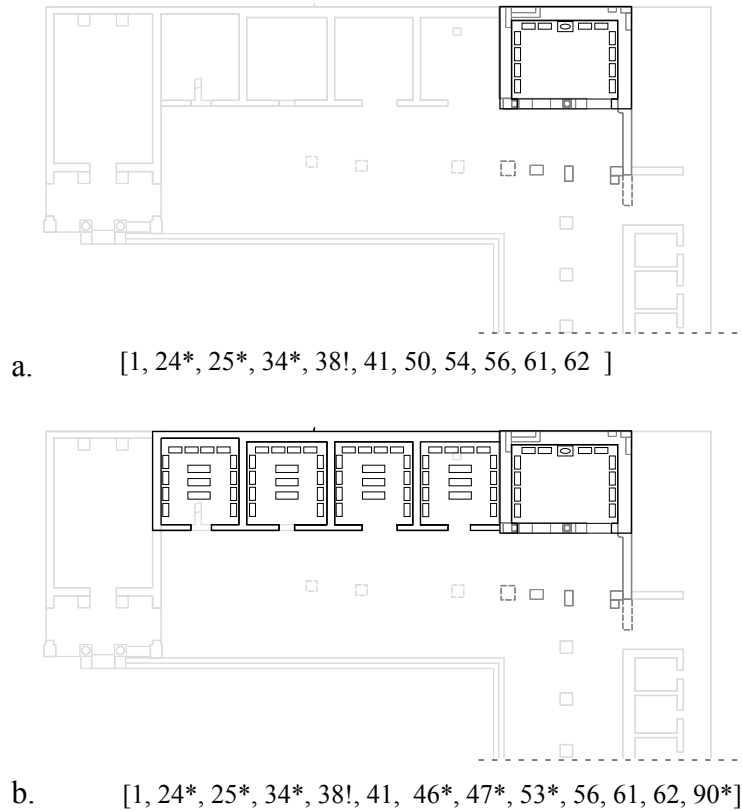
The library in the Forum of Philippi is one or more rooms in the southern corner of the Forum. The main hall of the library has been identified with the larger room in the corner, which is poorly preserved and does not have any remains of specific architectural characteristics (figure 5.59).



**Figure 5.59** State of preservation plan of the Forum of Philippi, with the library in the southeast corner.

The grammar is able to generate the main hall with the armaria set on the floor and the statue of the patron in the center of the back wall. After the generation of the main hall, the derivation can either terminate indicating that the library consisted of only one hall, or

it can continue to identify the rooms next the main hall as rooms associated with the library. The final designs of both options are visualized in figure 5.60.

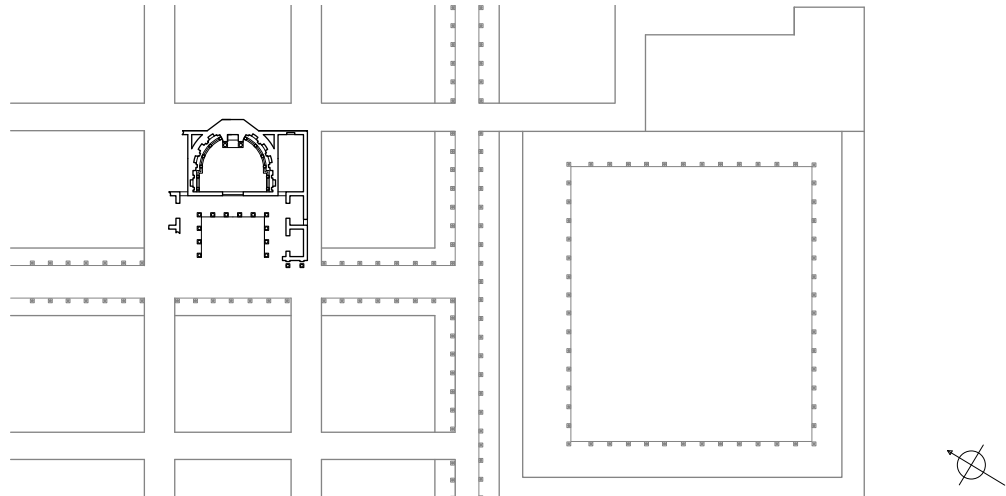


**Figure 5.60** Two derivations of the library at the Forum of Philippi.

An exceptional feature of this library that the grammar is not able to generate is the entrance openings; three columns subdivide the entrance opening into four openings. The unusual arrangement of the openings is in order for the columns to align with the interior colonnade of the stoa. This feature was considered case-specific in the analysis and was not incorporated in the grammar. Thus the grammar cannot generate it.

### 5.3.16. A computational derivation of the Library of Rogatinus, Timgad

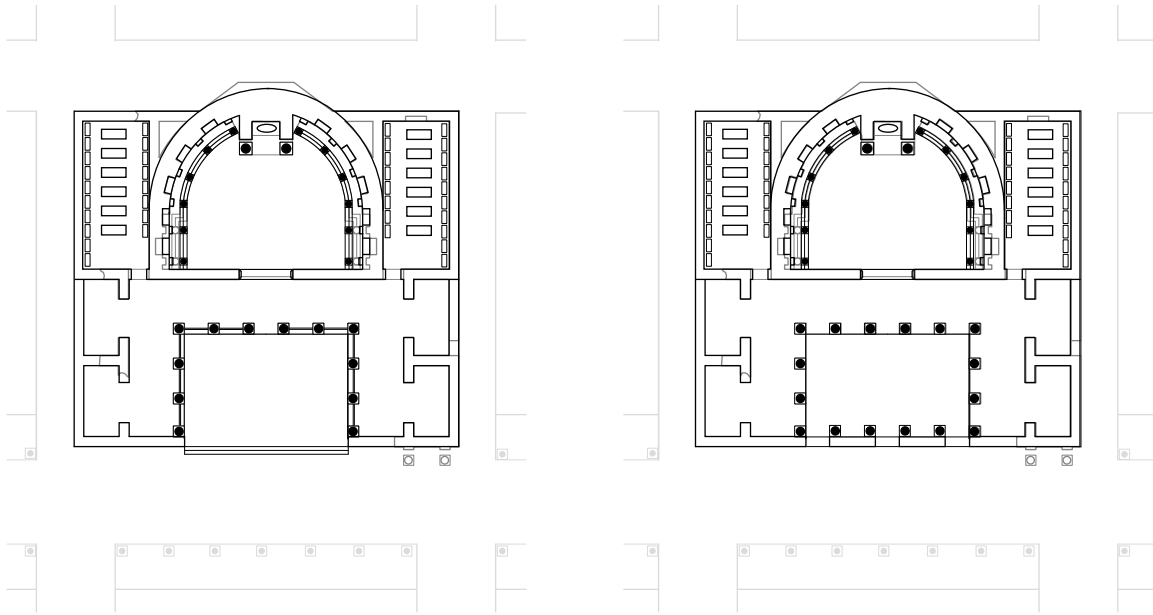
The Library of Rogatinus in Timgad is a well-preserved library. The building remains are shown in figure 5.61. The library has the plan of a library as a complex with additional rooms, a stoa, and a courtyard.



**Figure 5.61** State of preservation plan of the Rogatinus Library.

The grammar is able to generate the plan of the apsidal main hall, the niches, the interrupted podium with steps, the focal point as an aedicula, and the general layout of the library with the U-shaped stoa, the courtyard, and the additional rooms, as shown in figure 5.62.

The grammar is not able to generate some stylistic characteristics of the building, such as the linear ending of the exterior wall of the apsidal hall, the projecting side walls of the main hall that extend beyond the end of the curvilinear walls, and the columns in the façade of the building.



a. [2, 4, 9, 12, 14, 15, 17, 18, 19, 33, 36, 44, 52, 60, 61, 63, 70, 72, 75, 90]

b. [2, 4, 9, 12, 14, 15, 17, 18, 19, 33, 36, 44, 52, 60, 61, 70, 72, 76\*, 78\*, 90]

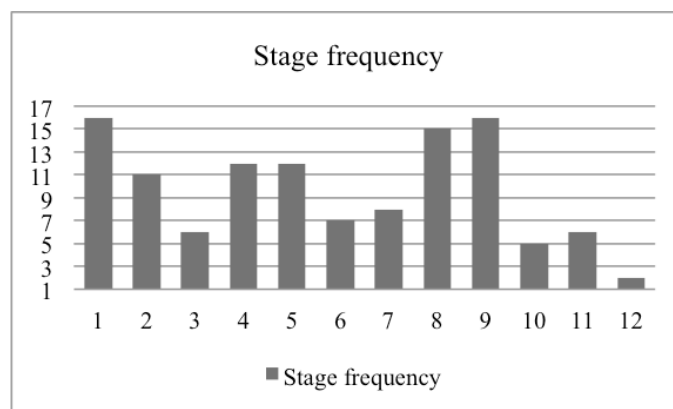
**Figure 5.62** Derivations of the Rogatinus Library: a) derivation of the actual design with steps in the entrance; b) hypothetical derivation with door openings in a wall.

As in the case of the Celsus library, the grammar points to the design choice of the architect and patron of the building to give direct access to the library from the street through a stairway. The grammar is able to generate alternative thresholds, such as a closed courtyard with a wall and give a controlled access through door openings (figure 5.62b). This option would have kept the courtyard more private and part of the space of the library, rather than an extension of its façade.

#### 5.4. Metadata Analysis for the building type definition of the library

The metadata of the rules in the grammar and the derivations of the seventeen known libraries provide us with quantitative data about the architectural form of ancient libraries. The strings of rules that apply for each derivation are used in a frequency analysis graph to draw conclusions about the occurrence of the individual architectural components as part of the building type of the library. Only rules that are based on building remains are considered in this analysis, and thus the frequency analysis reflects both the occurrence of the rules in the derivations and the metadata of the rules in the grammar. Firstly, the frequency analysis of the stages that appear in the seventeen derivations gives the mandatory and the optional architectural features of a library, and secondly the frequency analysis within each stage of rules shows the most probable forms that each architectural feature might have.

Figure 5.63 shows the frequency analysis of the twelve stages in the grammar that were used for the derivation of the seventeen known libraries.



**Figure 5.63** Histogram showing the occurrence of stages in the derivations of the known libraries.

The most obvious result of the frequency analysis is that the most frequent stages are the stage that generates the main hall (stage 1, 16 occurrences), and the stage that generates the threshold (stage 9, 15 occurrences). The first stage occurs in all libraries except for the Library in the Porticus Octavia, for which there is no evidence, and the second stage occurs in all libraries except for the Melitine Library, which is an exceptional library in the corpus. This shows the importance of the threshold, the stoa or the peristyle, in the architectural form of a library. The second most frequent stage is the stage that generates the exterior walls of the library (stage 8, 15 occurrences).

Secondly, the frequency analysis shows that the stages that occur more often are the stages that generate the niches (stage 4, 12 occurrences), and the focal point (stage 5, 12 occurrences). This shows that the two architectural components most probable to be found in a library are the niches and the focal point.

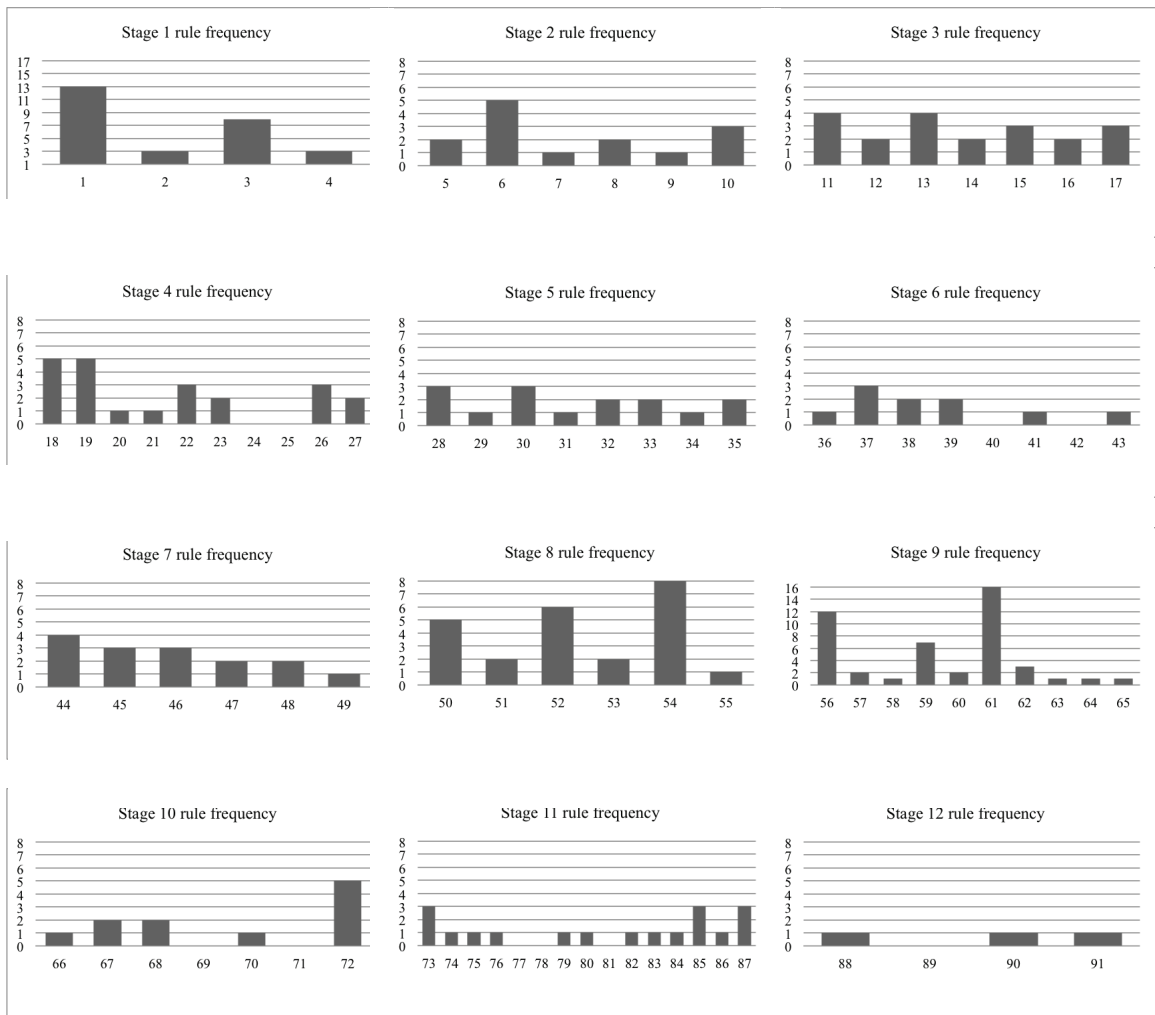
Thirdly, the frequency analysis shows that the next more frequent architectural component in a library is the podium (stage 2, 11 occurrences) and that the least frequent component of interior design of the main hall is the interior colonnade, which occurs almost half of the times (stage 3, 6 occurrences) that a podium occurs.

Moreover, the frequency analysis shows that in less than half of the times, the library consists of more than one room, the main hall (stage 7, 8 occurrences). If we add to this number the exceptional cases of the Ulpian Library and the Domitianic Library in Rome, that might have had duplicate halls, then in 10 cases only the library consists of more than one room. The least frequent features in a library are the exedras (stage 10, 5



occurrences) and the monumental propylon (stage 11, 6 occurrences). These facts emphasize the diversity of scale that occurs in the corpus of known libraries. Lastly, the very limited occurrences in stages 6 and 12 show the limited building remains that keep the reconstruction of the entries and the interior of the side rooms conjectural.

More specific conclusions can be drawn by looking at the frequency of rules within each stage separately, as shown in figure 5.64.



**Figure 5.64** Histograms showing the occurrence of rules in each stage in the derivations of the known libraries.

Frequency analysis in stage one shows that the main hall of the library is more probably rectangular rather than apsidal (rule 1). If there is a podium, it is most likely that the podium is continuous (rule 6), along the three walls of the room, and that on it is set a colonnade (rule 10). If there is a colonnade it is equally likely the columns to be supported on pedestals among which there are steps, and to be directly placed on the podium (rule 17), which remains unmodified. Also, a library is most likely to have niches on the walls, which take advantage of the whole wall length (rules 18 and 19), and a focal point. There is a great variety in the type of the focal point, and all types appear equally frequently, thus making the focal point the most flexible characteristic of the library. Lastly, the main hall of the library is most likely to have a wide entrance with more than one opening (rules 37 and 39), but it is equally likely to be articulated with openings among columns (rules 38 and 39) and door openings in the wall (rules 36 and 37).

In terms of the general layout of the library, it is most likely that the library constitutes a symmetric complex (rules 44 and 45). This is also reflected in the frequency of the rules that generate the exterior walls (rules 50 and 52). The frequency of rule 54 shows that the threshold of the library very often extends beyond the boundaries of the library, and this accounts for cases that the library is part of a larger complex, with or without extra rooms.

In stage 9, the frequency of rule 61 that generates columns reflects the importance of the threshold as expressed by the frequency of rule 9 as well. Rules 62-65 occur only sporadically, and this reflects that they are derived from stylistic characteristics of the colonnades, rather than from typological characteristics inherent to the building type of

the library. The frequency of rule 59 emphasizes the importance of a peristyle, which occurs as many times as a single stoa and a U-shaped stoa combined (rules 57, 58 and 60). Regarding exedras and auxiliary oikoi along the stoas, semicircular exedras appear almost with the same frequency as rectangular. The rule that occurs mostly is the rule that erases the label t in order to stop the computation of exedras, which shows the limited occurrence of exedras in the corpus.

In relationship to entrances, the distribution of occurrences shows that there is no consistent way of making a monumental entry to the complex, and that most rules are derived by stylistic characteristic of building remains. Lastly, the limited occurrences in stage 12 reflect the limited building remains and the fact that most reconstructions of side rooms are conjectural.

Conclusions about the building type of the library, the more paradigmatic and the more exceptional can be drawn by comparing the rules used for the derivation of each library and the frequency of their metadata (table 5.2). A set of libraries ( j, k, l, m, o) generated by rules with higher frequencies (13, 8, 4, 5) can be identified. These libraries constitute libraries built in Hadrian's period, in Athens, Rome and Asia Minor, and are the Celsus Library, the Ulpian Library, the Library of Nysa, the Neon Library and Hadrian's Library in Athens. These libraries differ to each other in urban context, and scale (with and without peristyle), but have common underlying characteristic the well-articulated interior with niches and focal point. Moreover, the table shows that Hadrian's Library (o) and the Templum Pacis (g) use many rules that appear only in these libraries, which emphasizes that these libraries are exceptional in scale and monumentality.

**Table 5.2** Table that shows the rules used in the derivations of the known libraries (a – q). The frequency of each rule in the metadata is given in square brackets.

																		91[1]	
																		88[1]	
																		87[3]	
						90[1]*	90[1]*											85[3]	
						89[0]*	87[3]											83[1]	
						87[3]	85[3]											82[1]	
						84[1]	79[1]											73[3]	
						74[1]	76[1]											72[5]	
						72[5]	72[5]											68[2]	
						68[2]	66[1]											67[2]	90[1]
		90[1]*				67[2]	65[1]											61[16]	75[1]
		81[0]*				62[3]	64[1]											59[7]	72[5]
		73[3]				61[16]	61[16]											56[12]	70[1]
		72[5]				59[7]	60[2]											55[1]	63[1]
	62[3]	61[16]		61[16]	56[12]	56[12]	61[16]	90[1]*										52[6]	61[16]
	61[16]	59[7]		59[7]	54[8]*	52[6]	59[7]	86[1]										49[1]	90[1]* 60[2]
90[1]*	56[12]	56[12]		56[12]	52[6]*	45[3]	56[12]	85[3]	61[16]	61[16]	90[1]*							48[2]	62[3] 56[12]
61[16]	54[8]	51[2]		54[8]	50[5]*	44[4]	54[8]	80[1]	58[1]	56[12]	61[16]							45[3]	61[16] 52[6]
59[7]	53[2]	48[2]		50[5]	45[3]*	43[1]	50[5]	73[3]	54[8]	50[5]	57[2]	61[16]						44[4]	56[12] 44[4]
56[12]	47[2]	45[3]		41[1]*	44[4]*	39[2]	41[1]*	61[16]	52[6]	38[2]	52[6]*	57[2]						41[1]*	54[8] 36[1]
54[8]	46[3]	44[4]	61[16]	38[2]*	39[2]*	30[3]	39[2]*	59[7]	37[3]	33[2]	50[5]*	54[8]						39[2]	53[2]* 33[2]
51[2]	41[1]*	41[1]*	57[2]*	34[1]	33[2]*	28[3]	32[2]	56[12]	30[3]	19[5]	44[4]*	52[6]						31[1]	50[5] 19[5]
47[2]	38[2]*	38[2]*	50[5]	26[3]	19[5]*	26[0]*	19[5]	54[8]	21[1]	18[5]	37[3]*	37[3]						19[5]	47[2]* 18[5]
46[3]	35[2]	35[2]	41[1]*	18[5]*	18[5]*	25[0]*	18[5]	53[2]	20[1]	17[3]	29[1]	32[2]	52[6]					18[5]*	46[3]* 17[3]
41[1]*	28[3]	28[3]	38[2]*	16[2]*	16[2]*	24[0]*	17[3]	46[3]	16[2]	16[2]	23[2]*	19[5]	50[5]*	15[3]				41[1]	15[3]
38[2]*	27[2]	27[2]	29[1]*	13[4]	13[4]*	23[2]*	14[2]	38[2]*	13[4]	15[3]	22[3]	18[5]	37[3]	13[4]	38[2]	14[2]			
34[1]*	26[3]	26[3]	23[2]	11[4]	11[4]*	10[3]	12[2]	34[1]*	11[4]	13[4]	10[3]	10[3]	30[3]	11[4]	34[1]*	12[2]			
25[0]*	5[2]	5[2]	22[3]	6[5]	8[2]*	6[5]	7[1]	25[0]*	6[5]	11[4]	6[5]	8[2]	23[2]	6[5]	25[0]*	9[1]			
24[0]*	3[8]	3[8]	18[5]	4[3]	3[8]*	3[8]	4[3]	24[0]*	3[8]	3[8]	3[8]	3[8]	22[3]	3[8]	24[0]*	4[3]			
1[13]	1[13]	1[13]	1[13]	2[3]	1[13]*	1[13]	2[3]	1[13]	1[13]	1[13]	1[13]	1[13]	1[13]	1[13]	1[13]	2[3]			
<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>	<i>k</i>	<i>l</i>	<i>m</i>	<i>n</i>	<i>o</i>	<i>p</i>	<i>q</i>			

In conclusion, the grammar solves the problem of the definition of the building type of the library by providing a probabilistic model of architectural features that includes mandatory architectural features, and other more probable and less probable architectural features. This model addresses the diversity of scale, monumentality and function of

libraries, emphasizing the general principles rather than the most monumental features that might attract attention but are not mandatory components of a library and gives a guide to the evaluation of possible libraries and the reconstruction of hypothetical libraries.

## **5.5. Grammatical derivations (and non-derivations) of possible libraries**

One of the objectives of the grammar is to use it to evaluate given building remains to verify whether these could have been libraries in the same style as the seventeen ancient libraries in the corpus. In chapter 3.2, I presented the corpus of possible libraries identified by building remains, for which it has been debated whether they were libraries or not. In this chapter, I use the grammar to determine whether they can be generated by the grammar, and if yes, which rules are used to generate their plans. Based on the metadata of the derivations (string of rules used) I will evaluate the probability that these buildings were libraries.

### *5.5.1. A non-derivation of the Private Library in Domus Area*

One room in the Domus Aurea (chapter 3.2.3, figure 3.65), the Palace of Nero in Rome, has been identified as a possible private library of Nero. The plan of Domus Aurea shows an apsidal room with niches in both the side and back walls and an enlarged recess as a focal point, from which open up rectangular niches in its side walls and a semicircular niche from its back wall. The hall is not connected to a peristyle, and it seems that circulation transverses it through openings in its sidewalls. There is no rule derived by the

known libraries that accounts for side openings. Also, this type of focal point, almost like an exedra from which open up three niches cannot be generated by the current set of rules. But most important, this room does not have a threshold. The threshold, as discussed in chapter 2, and according to the frequency analysis of the grammar, is one of the most important architectural components of the library that appeared in 16 out of the 17 libraries in the corpus. Thus, it is more likely that this building is not a library.

### *5.5.2. A non-derivation of the Library in the Forum of Pompeii*

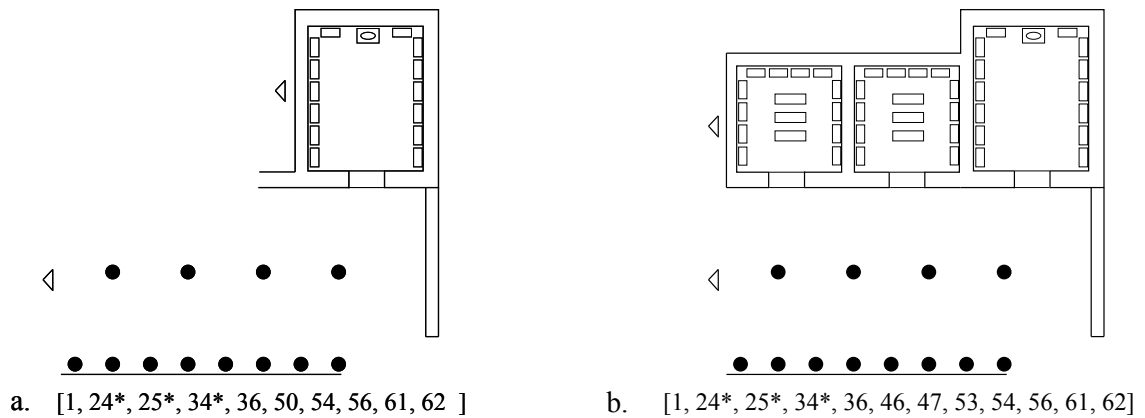
The rectangular hall of the “Cult of the Emperor” building at the east side of the forum of the Pompeii (chapter 3.2.4, figure 3.68) has been suggested to be a library because of its plan with an apsidal end and an aedicula as a focal point. Other features of this building include a podium along the apsidal back wall, without niches, and two large exedras opening from its sidewalls, which change the structure and typology of the building. The grammar does not include any rule to open exedras off the sidewalls of the main hall and thus the plan of this building cannot be generated by the grammar. Moreover, the exedras eliminate the available wall surface for niches, which is one of the most important features of the library. Thus, this building is unlikely to be a library.

### *5.5.3. A computational derivation of the Library in the Forum of Thessaloniki, Northern Greece*

One room in the forum of Thessaloniki (chapter 3.2.5, figure 3.71), attached to the southeast corner of the stoa of the forum, has been identified as a library because of its

close resemblance to the Library at the forum of Philippi – a library confirmed by its dedicatory inscription. The sidewalls in the room in the forum of Thessaloniki that survive have no evidence of niches or podium. The grammar is able to generate the library as a simple hall with movable furniture for the storage of rolls, and a statue as the focal point (figure 5.65a). An alternative derivation with side rooms is given in figure 5.65b.

The rules used for both derivations are the same as the rules used for the derivation of the Library in the Forum of Philippi, except for the rule that generates the entrance to the main hall, which verifies the analogy between the two libraries. Also, even though this library does not have any particular features, such as niches, the rules that are used to generate its plan, such as rule 1, 36, 54, 56 and 61, are rules with high frequency in the grammar, which makes this building very likely to be a library.



**Figure 5.65** Grammar-generated plans of the Library in the Forum of Thessaloniki.

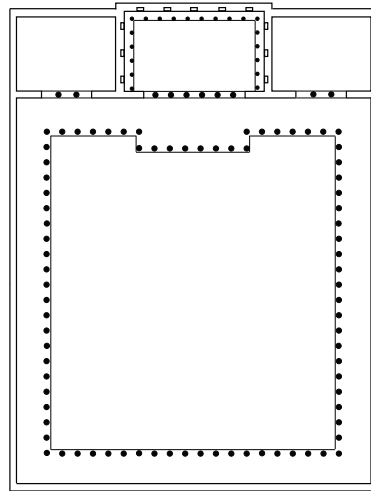
#### 5.5.4. *A computational derivation of the Library at Side*

A library has been proposed as part of a building complex at Side (chapter 3.2.6) that consists of a main hall, two side rooms and a peristyle. Different scholars have suggested the existence of a library in the side rooms and others in the main hall. This is an exceptional building with a very elaborate design and stylistic characteristics (figure 3.73) that the grammar is not able to generate as a whole. However interesting clues can be drawn from a possible derivation: the grammar excludes the possibility of identifying the library in the side rooms, because there are doors that give direct access to the exterior of the complex. This is not allowed by the rules in the grammar, which put a lot of emphasis on the importance of a threshold between the library main hall and the urban space. The grammar excludes the possibility that the central room was the main hall of a library, because of the small number of niches, and the very elaborate design of the angulating colonnade and the architectural sculpture that puts more emphasis on the colonnade rather than the niches, a relationship that is exactly the opposite in a library based on the metadata analysis of the grammar, as discussed in the chapter 5.4. If this building was a library, then it would have looked like the grammar generated plan in figure 5.66.

The string of rules used for the derivation of this plan includes rules that appear with high frequency in the corpus of known libraries and are very important in the definition of the building type of a library, such as rules 1, 2, 6, 11, 13, 44, 52, 59 and 61. However, the exclamation mark next to most of them indicates that they are not quite identifiable among the building remains. This means that even though the components are



identifiable, their special characteristics are not, which brings us to the conclusion that this is an exceptional building that could not have been only a library, but it could have included bookcases along with the sculpture, and could have functioned as a museum.



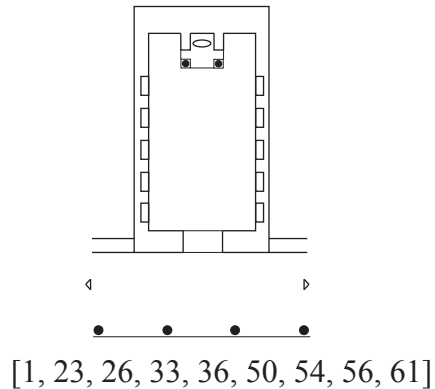
[1, 3, 6!, 11!, 13!, 20!, 21!, 31!, 39!, 44, 52, 36, 59, 61, 65!]

**Figure 5.66** Hypothetical grammar-generated plan of the Library at Side.

#### 5.5.5. *A computational derivation of the Library at Nîme*

An unusual building at Nîme, which included niches on the walls, columns framing the niches, a central aedicula and side doors that gave access to ramps, leading to the second floor, has been proposed as a library (chapter 3.2.7). The grammar is not able to generate the special characteristics of the colonnade, the niches framing the entrance, the steps on which the focal point was elevated, or the doors that gave access to the ramps (figure 3.77). However, the latter two features appear also in the library of Nysa. If we disregard them, the grammar can generate the overall plan of the hall, using rules with high

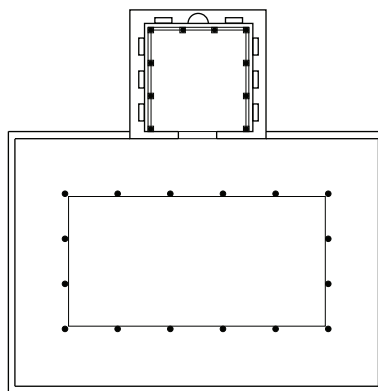
frequency in the corpus (rules 1, 23, 50, 54, 56, 61), that generate a hall with niches on the sidewalls and an aedicula on the back wall, attached to the stoa of a larger complex (figure 5.67). Thus, this building is likely to have been a library with exceptional features.



**Figure 5.67** Grammar-generated plan of the Library at Nîme.

5.5.6. *A computational derivation of the Private Library in Hadrian's Villa, Tivoli*

A room with niches, focal point, and podium with columns and steps, opening into a peristyle has been identified as a private library in Hadrian's villa (chapter 3.2.8).



[1, 3, 6, 11, 13, 17, 18, 19, 29, 36, 50, 54, 59, 61]

**Figure 5.68** Grammar-generated plan of the Private Library in Hadrian's Villa in Tivoli.

The grammar is able to generate the plan of the building (figure 3.81) using rules that appear with high frequency in the corpus of known libraries, such as rule 1, 3, 6, 18, 19, 50, 54, 59 and 61, which makes the identification of the building as a library highly likely.

#### *5.5.7. A non-derivation of the Philosophers' Hall in Hadrian's Villa, Tivoli*

The philosopher's hall in Hadrian's villa has been also suggested to be a library because it consists of an elongated main hall with an apsidal end that includes seven niches (chapter 3.2.9). The hall is accessed from the entry wall through three openings and from the sidewalls through openings to the neighboring building complexes. Even though the grammar can to a large extent generate the plan of the building, it cannot generate its general layout due to the absence of a threshold with a stoa, and the entrances to the neighboring complexes (figure 3.84). Moreover, the building does not feature a focal point, since all niches in the back wall are of equal width, height and depth. The grammar cannot verify this building as a library, because in a similar way to the room in Domus Aurea, it lacks a threshold, and it features an unusual circulation pattern for a library. Thus, the grammar cannot generate its layout and this building is evaluated as highly unlikely to have been a library.

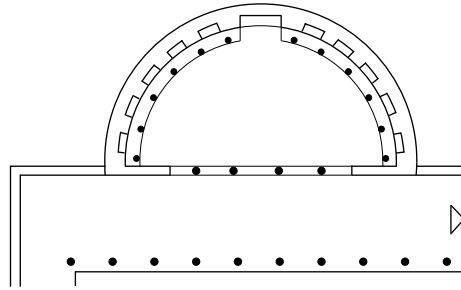
#### *5.5.8. A non-derivation of the so-called Greek and Roman Libraries, Tivoli*

The so-called Greek and Roman libraries in Tivoli have long been refuted as possible libraries (chapter 3.2.10). The grammar verifies that they do not have any of the features

of libraries identified in this work: they are not preceded by a stoa, they do not have a main hall flanked by one or more rooms, and they do not have any room with the characteristics of interior design of libraries. On the contrary, they are two loosely connected two-story buildings that include multiple rooms, interconnected to each other (figure 3.87). The initial shape of the grammar cannot be embedded in any of the building remains, the derivation cannot be instantiated, and the building is evaluated as a non-library.

#### *5.5.9. A computational derivation of the Library in the Baths of Trajan, Rome*

A possible library has been identified with a semicircular room in the baths of Trajan (5.2.11). The grammar is able to generate its plan with accuracy generating the apsidal hall with an interrupted podium, the interior colonnade, the niches and the widened niche as a focal point, the entry opening subdivide by four columns, and the stoa of the baths to which the apsidal room was attached (figure 5.69). The derivation, using rules at the core of the building type definition of the library identifies this building as a probable library. The only feature that the library has not been able to generate is the three wide steps that preceded the podium with the columns (figure 3.89) and formed a theatrical space. This is verified as an exceptional characteristic of this library, probably associated with the room as a meeting space for the athletic associations that met in the baths and overlooked athletic competitions by the stoa in front of the hall.



[2, 4, 9, 12, 14, 18, 19, 31, 39, 50, 54, 56, 61]

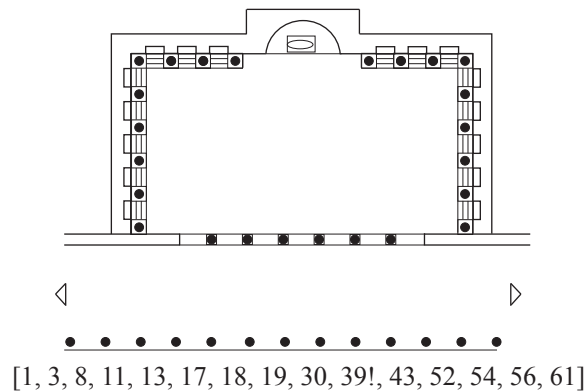
**Figure 5.69** Grammar-generated plan of the Library in the Baths of Trajan.

#### 5.5.10. *A computational derivation of the Library in the Baths of Caracalla, Rome*

A large hall attached to the stoa of the baths of Caracalla has been identified as a library based on the niches, the focal point, the stepped podium and the colonnade (chapter 3.2.12). The grammar is able to generate exactly the plan of the hall (figure 3.92), and thus to verify the identification of the building as a library. Exceptional features of this library are that the pedestals of the interior colonnade and the steps between them take the whole depth of the podium, and that the entrance is subdivided by six columns instead of the two or four that occur in the corpus of known libraries (figure 5.70).

More significantly though, the library is exceptional because of the dimensions of the main hall and of the individual components. The main hall of the library is 28 m. wide, surpassing the maximum width of 25 m. in the corpus. Also, the niches are 1.80 m wide, surpassing the average niche width in the corpus of 1.20 m and the maximum niche width of 1.60 m. Also, the height of the niches 4.10 m surpasses the maximum height of 3.8 of the niches of the Domitianic Library. The grammar is able to generate parametrically

plans of libraries with values in the parameters defined by the corpus of known libraries (Appendix D). Thus, following the parameters of the rules strictly, the grammar is not able to generate a library of such big dimensions as the Hall in the Baths of Caracalla. Thus, the grammar identifies this building as an exceptional library.



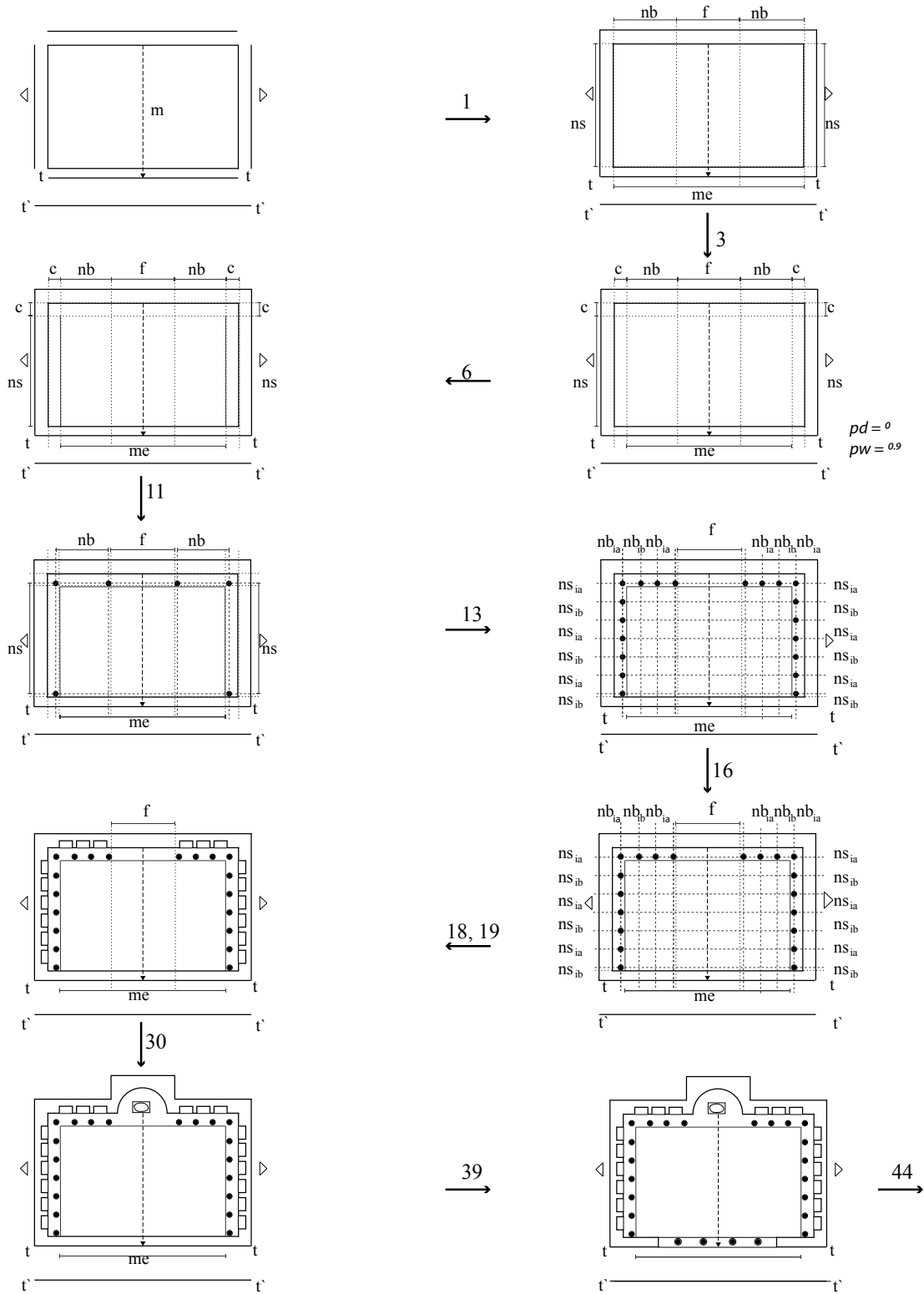
**Figure 5.70** Grammar-generated plan of the Library in the Baths of Caracalla.

### 5.6. Grammatical derivations of hypothetical (and/or unexcavated) libraries

The grammar is able to generate hypothetical libraries in the same style. Starting from the initial shape and applying the rules from stage to stage, the grammar can generate variant possible libraries in the same style. These hypothetical libraries can be very useful in giving form to libraries known through ancient testimonia (chapter 3.3), and especially to libraries, for which extensive descriptions of their architectural form are given in dedicatory inscriptions or ancient authors.

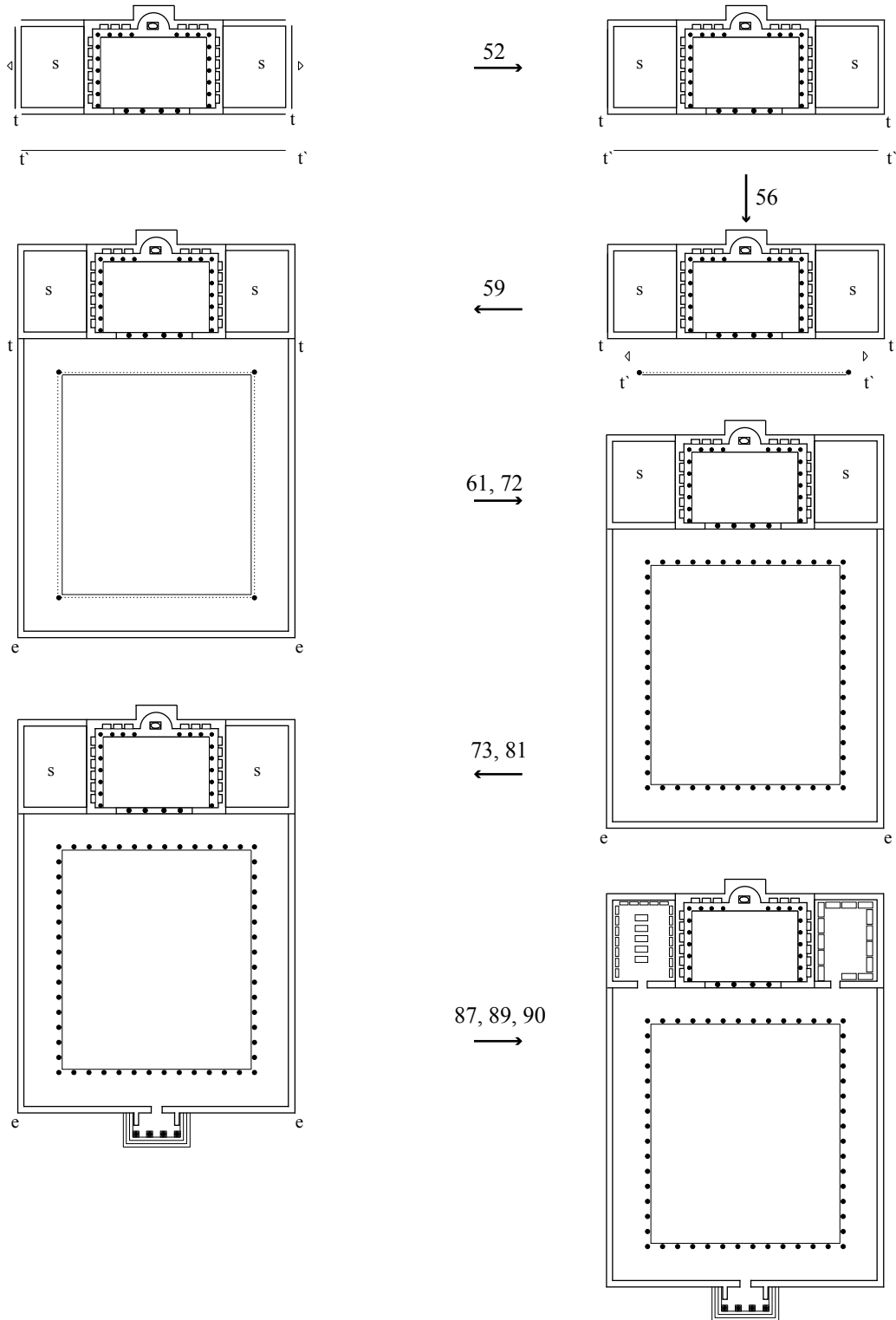
In theory, the number of possibilities is equal to the product of the different possibilities for each architectural element and is calculated into thousands. An example of a library with a main hall with an apse as a focal point, niches, a U-shaped podium, an entry opening subdivided by four columns into five openings, two support rooms in each side and a peristyle in front, is given in figure 5.71. There are no exedras or other spaces opening into the peristyle. Access to the complex is given from a tetrastyle propylon on the axis of the short side of the peristyle. This particular library combines components from several libraries in the corpus and the probability that it existed is reinforced by the metadata of the rules, pointing to a great degree of occurrence in the corpus of known libraries.

More variations of a hypothetical but possible library in the same style are immediately suggested by changing the sequence of the rules that are applied for one or more of the parts of the building: any of the architectural elements of the main hall and or any of the elements of the threshold. And even more variations in the general layout of the library are possible with different configurations of the side rooms and the exedras and also with different articulations of the entry side to the complex with different treatment of the façade with projecting wings and exterior colonnade, or an exterior stoa with shops. A set of possible variations upon the library plan illustrated in figure 5.38 is shown in figure 5.72.

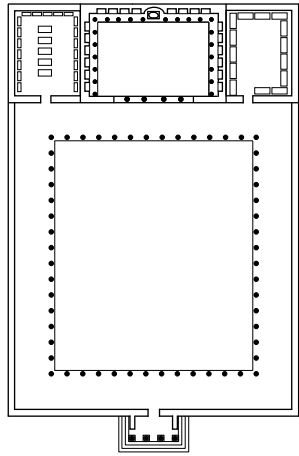


**Figure 5.71** Derivation of a hypothetical library with main hall, two side rooms and peristyle with courtyard and propylon.

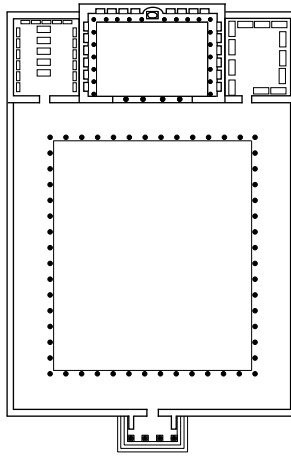




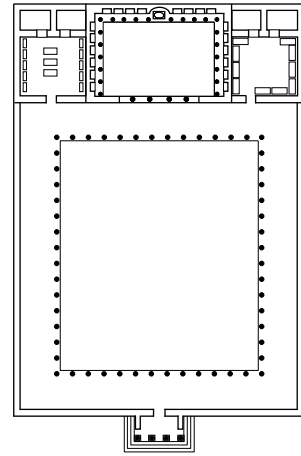
**Figure 5.71** (Continued) Derivation of a hypothetical library with main hall, two side rooms and peristyle with courtyard and propylon.



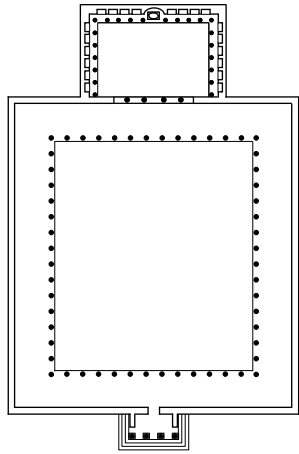
1, 3, 6, 11, 13, 16, 18, 19, **29**, 39, 44,  
51, 59, 61, 72, 73, 81, 87, 89, 90



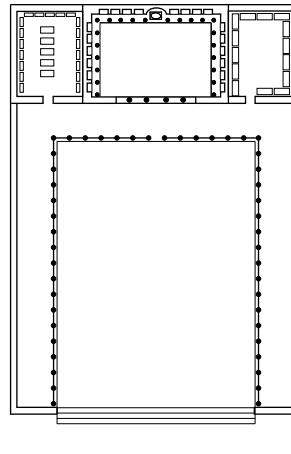
1, 3, 6, 11, 13, 16, 18, 19, **29**, 39, 44,  
52, 59, 61, 72, 73, 81, 87, 89, 90



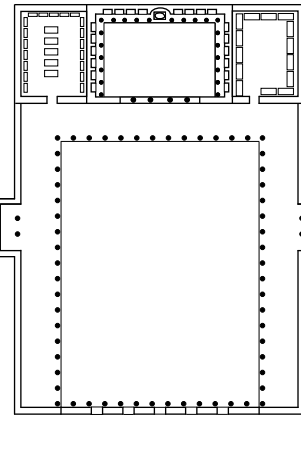
1, 3, 6, 11, 13, 16, 18, 19, **29**, 39, 44,  
**48, 49, 51**, 59, 61, 72, 73, 81, 87, 89,  
90



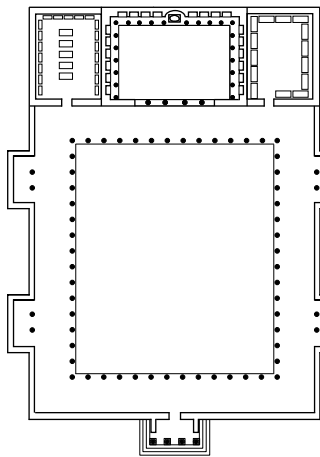
1, 3, 6, 11, 13, 16, 18, 19, **29**, 39, **50**,  
**54**, 59, 61, 72, 73, 81, 87, 89, 90



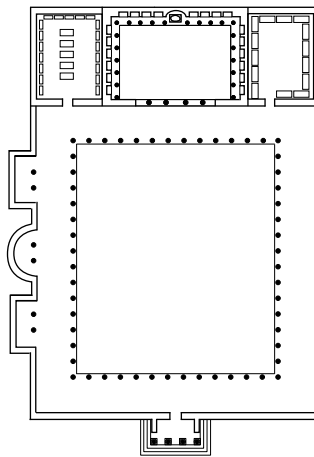
1, 3, 6, 11, 13, 16, 18, 19, **29**, 39, 44,  
**51, 54, 60**, 61, **63**, 72, **75**, 89, 90



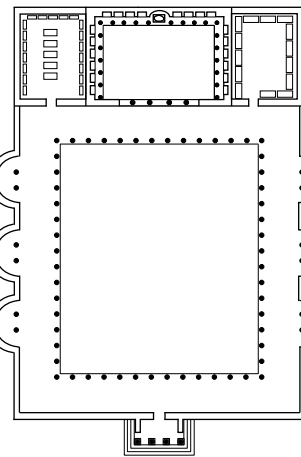
1, 3, 6, 11, 13, 16, 18, 19, **29**, 39, 44,  
**51, 54, 60**, 61, **63**, 72, **76, 79**, 89, 90



1, 3, 6, 11, 13, 16, 18, 19, **29**, 39, 44,  
**51**, 59, 61, **66**, 72, 73, 81, 89, 90



1, 3, 6, 11, 13, 16, 18, 19, **29**, 39, 44,  
**51**, 59, 61, **66, 69**, 72, 73, 81, 89, 90



1, 3, 6, 11, 13, 16, 18, 19, **29**, 39, 44,  
**51**, 59, 61, **67, 69**, 72, 73, 81, 89, 90

**Figure 5.72** Possible variations of the derivation of the library shown in figure 5.71.

## 5.7. Discussion

A shape grammar for the generative description of ancient Greek and Roman libraries has been given in detail. The main argument has been that the grammar provides a theoretical and constructive description of the ancient library as both an independent building with one hall and a complex. In both cases the expressive emphasis is on the core of the library – the main hall with its architectural elements including the podium, niches, focal point, interior colonnade, entry sequence and proportional relations encoded in parametric rules.

Also, the grammar has been designed to generate library main halls of simpler forms, for example libraries without a podium and interior colonnade, or libraries without niches and focal point but with armaria and a statue set directly on the floor, against the walls of the hall. Thus, the grammar is able to generate a whole spectrum of libraries, from the most monumental to the simplest. The underlying principle in all of them is the existence of a main hall in association with a colonnaded entrance or stoa.

Aspects of the buildings, which are evident in the archaeological record but cannot be generated by the grammar are stylistic characteristics unique to specific libraries. For example, in the Celsus Library the grammar cannot generate the polyrhythm of the exterior colonnade in front of the façade, which is the outcome of the articulation of the façade in elevation. Also, the grammar cannot capture the length of the retaining wall behind the focal point that extends up to the niches. The grammar generates the retaining wall but only up to the projection of the focal point. In a similar way, in Hadrian's Library in Athens the grammar cannot generate the projection of the wall of the main hall

in relationship to the side rooms, or the buttresses that are attached to the exterior of the back wall of the main hall. These constitute a level of detail that the grammar does not engage, but could be added in the future.

Other characteristics of libraries that the grammar does not deal with are case specific typological characteristics that are the outcome of specific context or functional circumstances. For example the grammar does not generate duplicate halls, which appear in the Domitianic Palatine Library in Rome (chapter 3.1.7 and 5.3.8). It was an intentional decision to treat the duplication of halls as a case specific characteristic rather than a general characteristic of all imperial libraries built in Rome, as they have been considered in traditional research. Also, the grammar does not insert doors into library main halls that offer access to maintenance corridors or to other spaces, for which the relationship to the main hall has not been clarified. This is the case for the Celsus Library (chapter 5.3.10) and the Library of Nysa (chapter 5.3.13). In the first case, the door openings in the sidewalls give access for ritual and maintenance purposes and are not related to the function of the building as a library, but as a funerary monument. In the second case, there might have been doors opening into spaces that possibly gave access to the upper floor, but there is no concrete evidence for this. If it was so, it would be a unique case and the relationship of the main hall to the upper rooms has not been proven, so this is not considered in the grammar, in order to avoid generalizations about the use of support spaces directly accessed from the main hall.

The grammar has been able to generate the libraries in the corpus, for which the building remains give the complete plan of the library. In these cases, the derivation worked as

verification that the grammar is a trustworthy rule-based system for the generation of libraries. For the libraries in the corpus that are not well-preserved and include several missing parts, the grammar helped make meaningful suggestions about the distinction of earlier and later phases, and generated variant possible plans, not necessarily copying the form of later phases, but speculating on what would have been possible in the language of ancient libraries, given the site and context restrictions, as for example for the Neon Library (chapter 3.3.12). Also, in cases where the existence of a library is known through ancient testimonia but no exact building remains have been identified for the main hall, the grammar was able to embed the rules in the possible building remains and generate possible reconstructions, as for example in the case of the Library at the Serapeum (chapter 3.3.1). Possible libraries were either verified or refuted based on whether they can be derived by the grammar. Last, the grammar was used to generate hypothetical libraries that are not testified by any building remains, but follow the same design rules, and therefore represent possible forms that we should consider when confronting archaeological remains.

## CHAPTER 6

### CONCLUSIONS AND FUTURE DIRECTIONS

In this chapter I offer a critical summary of the formal analysis of the architectural form of the ancient libraries and I provide future directions. The summary discusses both the history and logic of the architectural form of the ancient libraries. Within this context a critical assessment of the role and usage of shape grammars in archaeological research is offered along with the opportunities and challenges that emerge within this framework. The future directions include extensions of the formalism to include proportional and transformational relations in two and three dimensions as well as the encoding of the grammar in a digital software application to carry out derivations automatically.

#### **6.1. The architectural form of ancient libraries**

This dissertation presents the results of one hundred years of excavation and research in the architectural form of ancient libraries, including knowledge from recent excavations and newly identified case studies. This comparative study includes for first time the results from the excavation and documentation of the Library at the Serapeun, the Augustan Palatine Library, the Library of Nysa, the Neon Library, buildings for which a systematic study of their archaeological remains was completed in the past two decades. This work presents the plans of these buildings drawn to the same scale, so that their similarities and differences are apparent. My conclusions are the following.

The origins of the library are to be found in different public buildings that accommodated the storage of text, such as the civic prytaneion or metroon, housing state archives, and the gymnasium as the main educational institute in the Hellenic world.

The prototype library was the Mouseion in Athens, close to the Lyceum, a gymnasium in Athens, where Aristotle founded his philosophical school. This Museum was conceived as a Temple of the Muses, the patrons of the arts and sciences, and included book and art collections organized for the first time scientifically by Aristotle. This Museum was replicated to a much grander and monumental scale in Alexandria by the Ptolemies and was a symbol of intellectual and political power. This example was imitated later in the heart of Rome by Vespasian, who founded the Atrium Vestae, meaning the Temple of Peace, which included book and art collections of painting and sculpture, stoas, exedras and a landscaped garden. Hadrian founded in the heart of Athens a building complex with similar typology and spaces. In conclusion, it seems that the prototype library was conceived as an institution not separate from an exhibition space, combining what would later become the modern institutions of a library and a museum or gallery.

In addition to these Hellenistic and Roman monumental libraries, libraries were founded at smaller scales, designed in the urban fabric of a city in different configurations, based on the needs that they had to cover: libraries as parts of temples, libraries as parts of educational institutions, libraries as independent buildings commemorating and projecting the intellectual and political power of their sponsors. In proportion to their scale, libraries had to accommodate multiple users, who would be able to consult the books in the library, or even check them out according to the regulations in each case. Libraries had also to accommodate personnel with diverse qualifications and duties, such

as the copying, correcting and maintenance of manuscripts, the retrieval of books and content related tasks, and the maintenance of the facilities.

Ancient libraries, according to their scale, included one or more spaces: a main hall, a stoa, exedras and additional rooms, and auditoria. The absolutely necessary spaces were the main hall and its relationship to a threshold, the stoa. This is a feature that nearly all libraries had. In addition to that, libraries could have any of the additional spaces, and could reach a very monumental scale.

This work has examined carefully the archaeological record of surviving libraries. One of the goals was to treat issues of use and accessibility to the upper niches in the main hall of libraries. It has been argued in the past that one of the niches in the second level was in fact a door opening that gave access from adjacent spaces on the second floor, to a gallery or balcony in the main hall supported by the interior colonnade, that allowed circulation in the niches of the second level. No evidence has been verified of stairs in any of the libraries, and it seems more reasonable to conclude that there was no external access to the second floor of the library, other than through movable ladders in the main hall. Thus the upper niches can be explained better as having statues, rather than books that would be difficult to reach. The remains of openings in niches can be explained better as openings used during the construction of the building that were later closed and plastered and were not visible in the library.

This work has reexamined the relationship between the main hall of the library and the stoa. It has been argued that with the Roman innovations in construction techniques that allowed the construction of larger spaces, the main hall combined the storage of books



along with the reading functions, and thus the role of the stoa and the exterior space was undermined. Every time a library included a peristyle and its design was clearly emphasizing the relationship of the main hall with the peristyle and exterior space, it was considered as an exception to the general rule of Roman libraries. This work re-examined the evidence and concluded that the stoa continued being an integral part of the library throughout its history, from Greek to Roman times. In fact, the monumentalization of the main hall did not affect the integrity of the stoa and the subspaces attached to it. Libraries were always attached to stoas, which in many cases included exedras and other rooms opening from them to serve as semi-open spaces for reading and small instruction, and enclosed spaces with pleasant gardens.

Another aspect of libraries that this work has further explored is the funerary character of some libraries that combined the functions of a library and a mausoleum, and hosted the sarcophagus of the deceased patron and rituals to his honor, along with books, as a symbol of the intellectual and political power of the patron. The Celsus Library has been very well known but until recently remained a unique finding, since it was the only library to include the sarcophagus of its founder under the central apse. Recent findings include two more examples in the vicinity of Ephesus, the Library of Nysa and the Neon Library in Sagalassos, in which the character of the monument to the founders is emphasized. In the Library of Nysa the sarcophagus of the founder has been found in the portico with its lid being at the floor level, celebrating the importance of its founder in a similar way to that of the Celsus Library. In the Neon Library, seven inscriptions have been found in the main hall glorifying the founder and his family. These three libraries were built in the geographical area of Asia Minor in the period of Trajan and Hadrian and

until recently remained without parallels in imperial dedications. However, recent findings from the Ulpian Library indicate that in fact the mausoleum of Trajan and Plotina might have not been limited to the column in the center of the portico, but they might have included the two buildings flanking it. If this theory is correct, then the Ulpian Library would have been the prototype library of a funerary monument celebrating the intellectual and political power of the deceased, which the smaller libraries in Asia Minor would have imitated. In any case, it seems that by the second century CE, libraries as independent buildings, or small-scale complexes, dedications of wealthy individuals had become common.

It has been argued repeatedly that libraries in Rome had two main halls, one for the Latin and one for the Greek book collection, based on the philological use of the term *bibliotheca* in plural. Recent analysis has shown that this cannot be supported in archaeological evidence of early libraries in Rome, as for example the Augustan Palatine Library. Also, a careful analysis of the ancient testimonia has shown that there is no consistent way of using the word *bibliotheca* in singular and plural. It seems more reasonable to assume that the term in plural referred to the multiple bookcases or sections within the same main hall, and not to separate main halls. Thus, the duplication of halls should be considered coincidental or a case-specific architectural feature that might be apparent in some libraries, but not a consistent feature across Roman libraries generally.

Finally, there was no programmatic orientation in the design and construction of a library. Libraries had all kinds of orientations, defined by their location in the urban fabric, or the overall design of the building complex in which they are located.

## **6.2. Conclusions derived from the library grammar**

In this work, the above described design principles of ancient libraries have been encoded in a shape grammar consisting of 91 visual design rules, which gives a generative description of the building type of the library, and is able to generate library plans, known and hypothetical, of diverse scale, monumentality and urban context.

### *6.2.1. Conclusions on the type definition of the ancient library*

The grammar addresses the building type definition of the library with the metadata analysis of the rules in the grammar and the rules used in the derivations of the seventeen libraries in the corpus of known libraries. This provides us with quantitative data about the building type of the ancient library, about the mandatory, the most probable and the less probable architectural components in a library. The assumption is that rules that occur more often reflect the design principles at the core of the building typology of the ancient library, while rules that occur less frequently reflect stylistic and case-specific characteristics.

According to the metadata analysis, the building type of the library includes a main hall attached to a threshold, a stoa. Most probably the library includes niches and a focal point, and less often a podium and an interior colonnade. The threshold is one of the most striking features of the library, and is the architectural component that organizes the auxiliary spaces of the library, if any. At its less frequent but most monumental form, the library is a whole complex that includes semicircular and rectangular exedras, a

monumental propylon and additional rooms that function as auditoria, banquet halls or offices.

Overall, the grammar provides a model for identifying libraries of diverse scale and monumentality. We cannot deny that the set of architectural components that occur in a library do not occur in other building types of classical architecture, but this cannot exclude the definition of a building type for the ancient library, according to which specific architectural features are mandatory, some others are most likely and others are less likely to occur in a library. In all cases, this model of probabilities is an effective and systematic guide in identifying, evaluating and predicting the architectural form of ancient libraries.

#### *6.2.2. Conclusions on the corpus of known libraries*

The library grammar provides a generative description of libraries in the corpus of known and identified libraries. The grammar can generate: a) libraries whose initial state can be captured with certainty by excavation and on-site work, and b) variational schemas of libraries whose initial state cannot be verified by excavation and on-site work.

The evaluation of the grammar includes the following observations. In cases that a library is well preserved and the grammar is able to generate its plan, as in the case of Hadrian's Library and the Celsus Library, the computation works primarily as an evaluation of the grammar as a valid descriptive and analytical tool of building remains. Since the grammar is able to generate the forms of libraries well documented and reconstructed

with a high degree of certainty, the grammar is evaluated as a trustworthy tool for the description, analysis and reconstruction of other libraries in the same style.

Additionally, the evaluation works in the opposite way. The grammar can also be used to suggest other possible plans for a library, given the site specifications. By comparison to the actual plans, these computations can help the researcher evaluate the design choices that the architect and the patron of the library made and thus gain a better understanding of the social aspects of the library. For example the hypothetical derivations of the Celsus Library illuminated the funerary character of the library versus the goal to provide a space for books and learning. Also, hypothetical derivations of the Rogatinus Library illuminate the public character of the courtyard as part of the façade, rather than an enclosed space for the purposes of the library.

In cases that a library is not well preserved, the recursive computation of the rules generates a plausible reconstruction that is in the same style, and is a possible option for reconstruction of the specific library. Multiple options of reconstruction can be suggested depending on the evidence and the space it allows for speculation, as for example in the case of the Library at the Serapeum in Alexandria.

In cases that a library is not preserved at all, the grammar functions as a guide for identifying the possible spaces of the library among the building remains. If the initial shape is embedded in part or all of the building remains, then this is a valid hypothesis for the identification of the library. The computation of a possible library in the building remains of the Serapeum demonstrates this condition. The building remains are limited to the foundation trenches in the basement. So far no suggestion has been made for the

position of the library due to the lack of evidence. The grammar was able to generate a possible solution by embedding the side walls of the main hall in part of the building foundations and assuming that these walls would repeat on the first floor. Thus the grammar succeeded in making a hypothesis and verifying it as valid. This selective identification of the archaeological record, and the embedding of the rules in all or part of the remains, gives a clarity and guidance to the user of the grammar to create scenarios that might not stand out using traditional techniques of reconstruction.

Also, in cases where multiple phases of a library survive, it is the tendency of traditional methods of archaeology to project the final form of the remains into the original phase of the building. The grammar bypasses this problem, since it is solely based on the archaeological record of the phases of libraries and not later modifications of the buildings that might have had nothing to do with the library. The grammar suggests reconstructions for the missing parts that are based on the style and type of ancient libraries, and leads the user to look with fresh and objective eyes at the remains. This is demonstrated in the computation of the Neon Library, from which the only remains of the original phase of the building come from the back wall. Later phases include the entry wall to the building where there is no connection to a stoa. In archaeological research, the later phases led archaeologists to think that the original phase was similar to the final. However, the grammar is not able to verify such an entry to a library, and suggests several reconstructions of the façade not based on later remains, but based on the design principles in the type.

In a similar way, the grammar works as an evaluative tool of the remains of contemporary phases and can indicate whether they belong to the library or neighboring

buildings. Sometimes, the fragmentary degree of preservation of the remains makes it hard to tell the boundaries of each building. The grammar can help evaluate the remains: if the rules can be embedded into them, then they are likely parts of the library. If not, then the grammar obliges the archaeologist to reconsider the interpretation of the building remains and check whether they are part of other buildings or part of the same complex but with no connection to the library. This has been verified in the libraries of Celsus and Pantainos. In the first case, the grammar did not verify the second exterior wall as part of the library. In the second case, the grammar showed the possibility that the library of Pantainos was a regular building embedded in an irregular block that included two distinct parts, the library of Pantainos to the south with entry from the west, and the shops attached to the north stoa, accessed from the north. The grammar identifies the northern exedra and the northern entrance that are typically attributed to the library of Pantainos, as spaces attached to the north stoa, that thus unconnected with the library. In this instance, the archaeologists should reevaluate their original assumptions.

Lastly, the grammar derivations can be used to identify subcategories of libraries. The strings of rules used for each derivation give the type of the library in the architectural and urban scale. Comparisons can be drawn between different strings of rules and subclasses of libraries can be identified. For example, libraries can be classified based on the function of the main hall: whether it was used as a banqueting space can be determined by the use of rule 5 that adds a podium at a distance from the walls, or whether it was used as an auditorium can be determined by the use of rule 17 that generates steps in front of the podium and creates a theatrical space. Another example is the classification of libraries based on the urban context and the arrangement of rooms. Especially the rules

in stages 7 and 9 can be used for classification of libraries in libraries as independent buildings, as complexes or as part of complexes.

### *6.2.3. Conclusions on the corpus of possible libraries*

Also, the grammar works as an evaluative tool for possible libraries, i.e. buildings that have been suggested as libraries, but for which there is no reference in ancient testimonia to verify the identification. The grammar provides an effective computational tool for their evaluation. Derivations have been made for these buildings, which can be classified into three categories: a) derivations that capture and reconstruct the building remains of the proposed buildings; b) derivations that capture some of the features of the proposed buildings; and c) derivations do not exist that can approximate the plan of the building.

Clearly, the buildings for which a derivation is possible with high accuracy, such as the private library in Hadrian's Villa and the library in the forum of Thessaloniki, can be identified as libraries. Also, buildings for which a derivation is not possible at all, such as the so-called Greek and Roman Libraries in Hadrian's Villa in Tivoli, should be considered non-libraries. The question is how to interpret the buildings for which the grammar can capture some of the features, but not others. For these buildings, we can look at the rules used to generate them and the rules omitted in their derivation, and evaluate them based on the probability model discussed in the previous subchapter. The occurrence or not of rules that have been considered important in the building type definition of the library, such as the threshold and the circulation pattern with the side rooms will be critical in this evaluation. Rules that define stylistic characteristics related to specific components, such as the podium, the colonnade, the niches and the entrance



can be considered more flexible and lead to the identification of a library as exceptional. Following this process, the Philosophers' Hall and the Domus Aurea have been refuted as libraries on the basis that they have no threshold and that they allow circulation to the side rooms. The library in the forum of Pompeii has been refuted on the basis that from the side walls open exedras, instead of flat walls including niches or just armaria. On the contrary, the Library at Side and the Library at Nîme, despite their many case-specific characteristics, have been considered as exceptional libraries, on the basis that their overall layout is that of a library, generated by the rules. Lastly, the Libraries in the baths of Trajan and Caracalla have been accepted as libraries with some exceptional features defined by their location within an athletic facility.

#### *6.2.4. Conclusions on hypothetical libraries*

The grammar is able to generate hypothetical libraries, – in a sense, possible designs that can guide archaeological work. The metadata analysis of the library grammar serves as a tool of systematization of knowledge about the architectural form of the ancient libraries, known and hypothetical, and can give insights in advance in the case of an excavation about what and where to look for possible evidence, the range of possibilities and which of them are more possible than others.

The grammar can also be used to guide the representation of the architectural form of libraries described in ancient testimonia, but not identified with building remains. The grammar can map the parts of the building described in ancient testimonia with the corresponding generative rules that can generate them and by filling in the gaps to provide alternative scenarios of reconstruction. Such an example is the

Grammatophylakion of Aphrodisias, probably more an archive rather than a library, which is extensively described in one dedicatory inscription. The building remains to be found. Possible grammar generated reconstructions of the building might help its identification with building remains.

### **6.3. Shape grammars and archaeological research**

In general, archaeologists think in the opposite direction of designers. Designers generate designs within a particular style or visual language. Archaeologists work with a set of artifacts, from which they try to extract the common design principles and define a style, whether the medium is pottery, sculpture, painting or architecture.

In this process archaeologists take several steps of interpretation: first, they document the archaeological record, as descriptively as possible. They clarify the stratigraphy and document the different layers of data with different building phases, following the principle that later phases might include part or all of the earlier phases, but earlier phases cannot include part of the later phases. The quality of the archeological record can differ dramatically. One goal of the archaeologist is to reconstruct the original state of the monument. In the process of reconstruction, archaeologists rely on analogy to parallel artifacts to supply ideas they are missing from a monument under consideration. Sometimes, archaeologists assume that the later phases repeat the original design, and thus fall into the paradox of using the later phases as “precedents.”

Shape grammars as a formalism can approach the issue of parallels and precedents in the interpretation and reconstruction process in an explicit and systematic way. The

formalism can help archaeologists build up a “thesaurus” of vocabulary and syntactic relationships, in other words, shapes and spatial relationships, as they are found in the archaeological record. Then the archaeologist can use them to compute a given problem in variant ways.

Archaeologists do this without computation: they look at spatial relationships in analogous situations and try to apply them to the artifacts under investigation. But the advantage of the formalism is that it includes the vocabulary and spatial relationships systematically. This data can be understood not as a single recipe, but as a recipe with stages, in each of which there are different options. The archaeologist can choose each time a different path in the lattice of options, until s/he achieves an enumeration of different possibilities. The actual and most probable interpretation/reconstruction is certainly among them. Then it is the responsibility of the informed archaeologist to look at the possibilities, narrow them down based on social and ideological criteria, or criteria based on context and identify the ones that are more probable.

Having an enumeration of possible scenarios is of value even in cases where the most probable scenario is obvious. In the event new evidence comes to light, and the probabilities change, the scholar can go back to the possibilities and reevaluate them. Thus s/he is not entrapped into a possible reconstruction that was suggested by one archaeologist at one given time.

Moreover, embedding design rules into the building remains for the computation of the rules helps to better understand the archaeological record, and encourages the archaeologist to look for evidence that might not look important at first sight, or that

might be stripped off the building at a later phase. For example, for the reconstruction of the Porticus of Octavia, the evidence comes from a broken marble plate that depicts the Porticus partially. Most researchers have reconstructed the portico using the evidence at hand and thus reconstructing the northern side of the portico exactly like the southern, thus creating a fully symmetrical structure with two propyla. Also, researchers in search for the location of the library exhausted themselves discussing how the library could be located in the spaces depicted in the marble plate, i.e. at the exedras attached to the stoa, or the semicircular structures at the rear of the temples. Researchers rarely tried to reconstruct the library or the portico based on the design principles that theoretically would have applied in the design of the north stoa of the portico, and that might explain better the overall architecture of the portico and the library. Looking at the design principles that might have generated the building allows the archaeologist to think like a designer, and look not only at the final outcome of the building but also at the design intent of the building that might not be obvious in the way the archaeological record has formed through later interventions or decay.

Also, the visualization of different possibilities has value in reaching a better understanding on the classification of the archaeological record into variable and non-variable remains. Obviously, the variable parts are the ones least preserved that allow room for speculation and the variant application of different rules for their reconstruction.

In conclusion, shape grammar functions as a powerful methodology that helps the archaeologist have consistency in the interpretation process and understand the repercussions of his/her theories in different settings. Firstly, the grammar helps the archaeologist achieve the full enumeration of possibilities according to his/her theories,

and secondly, it helps the archaeologist understand and visualize his/her theories in different buildings and understand the variation with which the proposed design principles in a style or type appeared.

The grammar as a computational tool made by the archaeologist incorporates the subjectivity of the archaeologist in the acceptance or rejection of current theories. The grammar encodes in visual rules the design principles that the archaeologist has already defined, accepted or rejected, and thus cannot be considered as an objective methodology, stripped of any layer of interpretation. However, it is a systematic way of visualizing and approaching variation that can help the archaeologist understand the full spectrum of possibilities within his/her own theory. As new evidence comes to light, or as the interpretation model changes, the grammar can be modified to reflect the changes and thus can be used again for the investigation of the new ideas.

#### **6.4. Future directions**

Future directions for the development of the library grammar include: a) further refinement in the formal description of the grammar to include proportional relations found or identified with specific languages of design akin to library buildings; b) development of the formal description to capture transformational relations between subtypes of the language; c) extension of the formal description to capture successive plans, if any, sections and elevations and in essence three-dimensional models; d) encoding of the grammar in a software application to generate automatically the library designs; and e) and perhaps most importantly- the extension of the grammar and the lessons learned to other buildings and building typologies in the ancient world to address

what was suggested earlier, that the shape grammars offer a powerful tool of systematization of the knowledge about the architectural form of the ancient artifacts. These future developments are briefly discussed below.

#### *6.4.1. Proportional grammar*

The current library grammar uses a range of dimensions that is derived from the analysis and documentation of remains of ancient libraries in the corpus. Other than the conditions that define the range of valid values to the parameters, there is no other condition that needs to be satisfied for the generation of any space. Thus, the grammar does not necessarily account for or comply with systems of ratios that are observed or theorized in Greek and Roman architecture. An extension of this work can include the formal specification of ratios and geometric system that could have been employed in principle in the design of the libraries, including for example arithmetical, geometrical and harmonic means, extreme and mean ratios, root rectangles, sacred cuts. These can be applied in the whole plan of the library or parts of it, for example, the rhythmic articulation of interior and exterior colonnades, the geometric definition of apsidal spaces.

#### *6.4.2. Transformation grammars*

The current grammar is a general formal description of the architectural form of ancient libraries, including small-scale libraries and monumental libraries of the Hellenistic and Roman periods. Different sequences of different rules can generate subtypes of libraries. A future goal is to formally describe the different subtypes of libraries in terms of

transformation grammars, meaning instead of having one general grammar, to define related grammars, each being a transformed version of the original with rule change, rule addition, and rule subtraction.

All these grammars will belong in the same family of grammars and will be able to generate related languages of designs. Still, each of them will be more limited in what it can generate: each will be able to generate a specific subcategory of libraries, such as libraries with duplicate halls, or libraries with apsidal halls as auditoria or meeting places, or Hellenistic libraries with the main hall as a banqueting space. The differences between these grammars, described formally with rule change, meaning a modification in a rule, or rule addition, or rule deletion, will give a formal description of the stylistic changes employed from subtype to subtype.

#### *6.4.3. Three dimensional grammars*

The current library grammar generates two-dimensional plans. An extension of the grammar in three dimensions, to generate complete models with elevations and exterior and interior spaces is clearly welcome. The implementation of the grammar in three dimensions will allow the grammar to take advantage of the full archaeological record by taking into account variations in elevation and section for the niches and the focal point in the interior of the main hall. The main challenge in reconstructing libraries and ancient buildings in general is the reconstruction of the roof, especially in cases of vaulted roofs. The reconstruction must embed structural analysis for the definition of the thrust line in relationship to the thickness and the height of the walls and the existence or not of additional rooms to the side to function as buttresses for the main hall.

To facilitate the three dimensional reconstructions, a library of three dimensional components, such as columns, column bases, pilasters, niche frames, podium profiles, statues, etc., needs to be defined, so that they can be retrieved and used in each reconstruction. These components need to be defined parametrically based on different systems of ratios so that they can be instantiated and adapted to the scale of any library model. Parametric modeling is already well developed and applied in the discourse of architecture and archaeology as well, and there is no computational difficulty in encoding the architectural elements of the grammar as parametric schemes.

#### *6.4.4. Encoding of the grammar in a software application*

The current library grammar generates two-dimensional plans of the libraries in a manual way with pencil and eraser, or in a way that simulates a manual approach using some digital graphics application. Clearly the development of a computer implementation of the grammar is a most welcome next step. The goal would be to program the design rules of the library grammar in a software application that can be used to generate automatically tables of grammatical derivations of possible libraries, or instead to assist the archaeologist in her/his inquiry by suggesting automatically possibilities for reconstruction. In the latter sense, the archaeologist should be able to import the archaeological remains in a digital format, either drawn in design software or modeled through methods of digital acquisition. The application should be able to identify in which parts of the remains the rules can apply, and subsequently apply the rules, suggesting different actions and generating variant reconstructions.



Currently, significant progress has been made in the computer implementation of grammars, primarily with procedural modeling techniques that are able to generate recursively instances in the same type. These software applications work primarily in a top-down approach that include the successive subdivisions of surfaces that reach a high degree of detail including sculptural details such as frieze, cornices, ornamental details like acanthi and rosettes. Examples of procedural modeling include the digital reconstruction of the Mayan Puuc buildings in Xhipchè,<sup>489</sup> the city of Pompeii,<sup>490</sup> and the city of Rome.<sup>491</sup> In these projects, the procedural modeling of the city allows for the quick generation of alternative buildings and cities with components that follow an initial set of rules and therefore are in the same style and type, without evoking an overt sense of repetition. Procedural modeling is based on input from the user about the structure of artifacts and their parameters, and cannot account for shapes that emerge in the process.

A recent computational environment built upon graph grammars<sup>492</sup> has successfully implemented two of the most difficult constructs of shape grammars in the representation of shapes, the notions of maximal lines and the embedding relation, and therefore is able to identify all possibilities of matching a rule (any rule) to a part of a design.<sup>493</sup> It is envisioned that the encoding of the library grammar in this environment will proceed along the two stages discussed above: one to generate tables of candidate solutions and another to help the archaeologist in real case studies by suggesting possibilities for reconstruction.

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<sup>489</sup> Müller, Vereenooghe, et al. (2006).

<sup>490</sup> Müller, Wonka, et al. (2006).

<sup>491</sup> Dylla et al. (2009).

<sup>492</sup> Grasl and Economou (2011); Grasl (2013).

<sup>493</sup> Grasl and Economou (2013).

#### *6.4.5. Extension of the grammar for other building types*

Finally, the library grammar can be extended to account for other building types of Greek and Roman architecture. The development of the library with three dimensional elements common in Roman architecture, such as columns, trabeated and arcuated systems can be used in other building types as well, such as gymnasia, Roman fora, and baths. The expertise acquired from the library grammar can be employed for the type definition of the other building types in terms of scale and configuration of spaces, and new related grammars can be defined. Ultimately this system can be used for the formal description and digitization of classical architecture.

### **6.5. Epilogue**

Knowledge about the shape of artifacts can be obtained through the documentation of the archaeological remains and based on analogy to other geographic, temporal and typological parallels. Analogy can be done systematically by formalizing the parallels in a system of a vocabulary of shapes and design rules, which applied under different configurations can generate possible designs in the same language.

The intent of this research has been to demonstrate the power of specific formal techniques in the analysis and synthesis of archaeological fragments, primarily shape grammar formalism. From an archaeological point of view, shape grammars provide a powerful strategy to an increasingly scientific form of inquiry in the field of archaeology. From a computational point of view, the application of grammars in archaeology

provides a meaningful field for future developments of grammars employing metadata and probabilistic models.

## APPENDIX A

### GLOSSARY OF TERMS

**Aedicula:** An opening or a shrine framed by columns or pilasters supporting an entablature and pediment, often used ornamentally. In Roman libraries it was placed as a focal point and contained a statue.

**Ancient testimonia:** Ancient testimonia include literary and epigraphic, i.e. written sources from antiquity. Literary sources are texts of ancient authors that are passed down to us through direct or indirect sources. Epigraphic sources include dedicatory, honorific or other inscriptions.

**Armarium/a:** Wooden, horizontal or vertical cabinets for the storage of equipment (Latin term: arma). In reference to libraries, armaria were bookcases with doors for the storage of papyrus rolls. The Greek term for book cabinets is κιβωτός. Armaria were freestanding furniture in a room. In imperial architecture, they also appear embedded in wall recesses (niches).

**Banquet klinai:** mattresses placed on a podium on which men were reclining during banquets.

**Columnar screens:** System of Roman interior decoration, that was constructed of columns and entablatures, and was set along walls, brought forward and back by spur walls alternating with niches or recesses.

**Exedra:** A recess to a space, rectangular or semicircular.

**Focal Point:** Focal points were essential elements of design of Roman interior design. They were terminal hollows that fixed the axis of the space. They were centered at the end of the axis of a space and were the visual or physical goal; a concave feature- an apse or an apsidal niche- or an aedicula that focused attention usually in the center, i.e. on axis and contained the statue of the god or emperor, patron of the library.

**FUR (Forma Urbis Romae):** Map of Rome constructed between 203 and 211 CE by the Severans in a sequence of marble plates that were secured on the wall of one of the rooms of Templum Pacis. Fragments of this map survive today and give evidence of the form of buildings that are not known otherwise.

**Interaxial:** the space between the axes of two columns.

**Intercolumniation:** the space between two columns

**Niches:** Recesses in the walls of buildings, where one could put armaria with books in libraries, or more commonly in other buildings, statues. Niches were rectangular or apsidal in plan or elevation.

**Peripatos:** Pathway for pleasant walks

**Peristasis:** A term used in Roman architecture that refers to the gap between the exterior and interior walls in a building, that was used for better insulation of the building.

**Peristyle:** An open courtyard or garden surrounded by columnar porticoes.

**Pilaster:** A rectangular column projecting only slightly from a wall, used to suggest structure. It can be plain or fluted, and have the base and capital of any order.

**Propylon/propylum:** A monumental gate to a building complex.

**Podium:** A podium is a raised platform on which a building, usually a temple is built. In Roman interior design, the podium is a continuous raised design element, set along walls.

Depending on its height, it gives access to recesses on the walls and supports columnar screens. It is often preceded by steps, which give easier access or function as a seating area during meetings or lectures. In some occasions, the podium has a structural role in a building, for example when the exterior walls of the building are set directly on the podium.

**Temenos:** A sacred space cut out and separated from the profane, usually through a wall.

**Stoa:** A freestanding portico with a long back wall with a row of columns in the front, and a roof and walls in the short ends connecting them.

## **APPENDIX B**

### **LIBRARIES IN ANCIENT TESTIMONIA**

Appendix B includes the complete references to a specific library in ancient testimonia. Two tables in the beginning give tabulated information on terminology used to describe the libraries: Table B.1 gives the list of terms referring to libraries in alphabetical order, with the goal to show the flexibility in the terminology in the naming of libraries and emphasize the popularity of some terms versus others. Table B.2 gives the list of libraries known from ancient testimonia, and the terms used by different sources to describe them, with the goal to show the flexibility with which different sources named the same library. The numbers in parentheses, if any, show multiple occurrences. The complete catalogue of references with the original text and the translations follows, classified by library, in the order that they are presented in chapter 3.

**Table B.1.** Terminology used to refer to libraries and the occurrences for each term.

	<i>Terminology</i>	<i>Library</i>	<i>Ancient Testimonia</i>
1.	βιβλιοθήκη	Rome, Library in Domus Tiberiana	Galen
2.	βιβλιοθήκη	Smyrne, Library in the Homereium	Strabo
3.	βιβλιοθήκης	Library of Pergamon	Strabo
4.	βιβλιοθήκης	Domitian's Palatine Library	Galen
5.	βιβλιοθήκης	Celsus Library	Inscription
6.	δημοσίας βιβλιοθήκης	Antiochia, Hellenistic Royal Library of	Suidas
7.	βιβλιοθήκη δημοσία	Library in Pergamon	Galen
8.	βιβλιοθήκη	Library at the Pantheon	Julius Africanus
9.	βιβλιοθηκη	Augustann Palatine Library	Oxyrhynchus Papyri
10.	βιβλιοθήκην	Pantainos Library	Inscription
11.	βιβλιοθήκην	Mylasa, Gymnasium of	Inscription
12.	βιβλιοθήκην	Library at the Asklepeion, Epidaurus	Inscription
13.	βιβλιοθήκην	Melitine Library	Inscription
14.	βιβλιοθήκην	Library of Pergamon	Diogenes Laertius
15.	βιβλιοθήκην	Alexandria, Hellenistic Royal Library at the Museum	Epiphanes
16.	βιβλιοθήκην	Celsus Library	Inscription
17.	βιβλιοθήκην	Celsus Library	Inscription (2)
18.	βιβλιοθήκην	Library in the Porticus Octaviae	Plutarch
19.	βιβλιοθήκην	Delphi, Library at the Gymnasium	Inscription
20.	βιβλιοθήκην	Antiochia, Library of	Suidas
21.	βιβλιοθήκην	Antiochia, Library of	Malalas
22.	βιβλιοθήκην	Constantinople, Library of	Zosimos
23.	βιβλιοφυλακίου	Soli, Library of	Inscription
24.	bibliotheca	Library at the Temple of Hercules, Tivoli	Aullus Gellius
25.	bibliotheca	Patra, Library of	Aullus Gellius
26.	bibliotheca	Ulpian Library	Aullus Gellius
27.	bibliotheca	Rome, Library in Domus Tiberiana	Aullus Gellius



28.	bibliotheca	Rome, Library at Templum Pacis	Aullus Gellius
29.	bibliotheca	Prusa, Library of	Pliny
30.	bibliotheca	Rome, Library at the Atrium Libertatis	Pliny
31.	bibliotheca	Rome, Library in the Temple of Augustus	Pliny
32.	bibliotheca	Cumae, Library of Faustus	Cicero
33.	bibliotheca	Ulpian Library	SHA
34.	bibliotheca	Ulpian Library	SHA
35.	bibliotheca	Ulpian Library	SHA
36.	bibliotheca	Ulpian Library	SHA
37.	bibliotheca	Ulpian Library	SHA
38.	bibliotheca	Ulpian Library	SHA
39.	bibliotheca	Library in the Temple of Augustus	Suetonius
40.	bibliotheca Latina Graecaque	Augustan Palatine Library	Suetonius
41.	bibliotheca Latina	Library in the Porticus Octaviae	Inscription
42.	bibliothecam	Carthage, Library of	Apul. Florid
43.	bibliothecam	Augustan Palatine Library	Scoliaſt on Juvenal
44.	βιβλιοθήκην	Gymnasium of Ptolemy, Athens	Inscription (2)
45.	βιβλιοθήκη]ν	Gymnasium of Ptolemy, Athens	Inscription (2)
46.	βιβλιοθήκων	Library at the Gymnasium of Rhodes	Inscription
47.	βιβλιοθήκων	Library at the Gymnasium of Rhodes	Inscription
48.	βιβλιοθήκων	Cos, Library at the Gymnasium	Inscription (2)
49.	bybliothecca Latina	Domitian's Palatine Library	Inscription
50.	bybliothecca Graeca	Domitian's Palatine Library	Inscription
51.	bybliothecca	Matidiana Library in Suessa	Inscription
52.	bybliotheccam	Library of Pergamon	Vitruvius
53.	βιβλιοθηκαι	Domitian's Palatine Library	Galen
54.	βιβλιοθηκῶν	Domitian's Palatine Library	Galen
55.	βιβλιοθήκαις	Domitian's Palatine Library	Galen
56.	βιβλιοθήκαις	Aphrodisias, Library of Archive	Inscription (2)
57.	βιβλιοθήκας	Library of Pergamon	Plutarch
58.	βιβλιοθήκαις	Library of Pergamon	Strabo

59.	βιβλιοθήκαις	Alexandria, Library at the Sebasteion	Philon
60.	αποθήκας τῶν Βιβλίων	Augustan Palatine Library	Dio Cassius
61.	αποθήκας τῶν Βιβλίων	Library in the Porticus Octaviae	Dio Cassius
62.	βιβλίων ἀποθήκας	Ulpian Library	Dio Cassius
63.	οἰκήματα μετὰ τῶν βιβλίων	Library in the Porticus Octaviae	Dio Cassius
64.	οἰκήματα (...) κατὰκειται δὲ ἐς αὐτὰ βιβλία	Hadrian's Library in Athens	Pausanias
65.	ταμεῖα γεγεννημένοι ταῖς βίβλοις	Library in the Serapeum at Alexandria	Aphthonios
66.	bibliothecae	Ulpian Library	Scriptores Historiae Augustae
67.	bibliothecabus	Augustan Palatine Library	Fronto
68.	bibliothecas	Domitian's Palatine Library	Suetonius
69.	bibliothecas Graecas atque Latinas	Rome, Library at the Atrium Libertatis	Isidor
70.	βυβλιοθηκῶν	Pergamon, Library at Gymnasium	Inscription
71.	βυβλιοθηκῶν	Pergamon, Library at Gymnasium	Inscription
72.	βυβλιοθήκαις	Halicarnassus, Library of	Inscription
73.	bybliothecae	Dyrrachium, Library of	Inscription
74.	bybliothecae	Ulpian Library	Sidonius
75.	bybliothecae	Library in the Serapeum at Alexandria	Ammianus Marcellinus
76.	bybliotheicum	Volsinii, Library of	Inscription
77.	opus bybliothecae	Library at the Forum of Philippi	Inscription
78.	opus bybliothecae	Rogatius Library	Inscription
79.	curiae (genitive sing.)	Augustan Palatine Library	Tacitus
80.	curia	Augustan Palatine Library	Res Gestae Divi Augustus

**Table B.2.** Terminology used in reference to each library.

<i>Library</i>	<i>Terminology</i>	<i>Ancient testimonia</i>
Library in the Serapeum at Alexandria	ταμεῖα ταῖς βίβλοις bybliothecae	Aphthonius Ammianus Marcellinus
Library of Pergamon	βιβλιοθήκη (3)  βιβλιοθήκαι (2) bybliotheca	Strabo, Galen, Diogenes Laertius  Strabo, Plutarch Vitruvius
Library at the Gymnasium of Rhodes	βυβλιοθήκη (2)	Inscription
Augustan Palatine Library	bibliotheca (2)  bibliothecae αποθήκαι βιβλίων curia (2)	Suetonius, Scoliast on Juvenal  Fronto Dio Cassius Tacitus, Res Gestae Divi Augustus
Library in the Porticus Octaviae	βυβλιοθηκη οικήματα μετὰ τῶν βιβλίων bibliotheca Latina αποθήκαι τῶν βιβλίων βιβλιοθήκη	Oxyrhynchus Papyri Dio Cassius  Inscription Dio Cassius Plutarch
Library at Templum Pacis	bibliotheca	Aullus Gellius
Domitian's Palatine Library	βιβλιοθήκη βιβλιοθήκαι (3) bibliothecae bybliotheca Latina bybliotheca Graeca	Galen Galen Suetonius Inscription Inscription
Pantainos Library	βιβλιοθήκη	Inscription
Celsus Library	βιβλιοθήκη (4)	Inscription (3)
Ulpian Library	bibliotheca (6) bybliothecae (2) ἀποθήκαι βιβλίων	SHA SHA, Sidonius Dio Cassius
Melitine Library	βιβλιοθήκη	Inscription
Hadrian's Library in Athens	οικήματα (...) βιβλία	Pausanias

Library at the Forum of Philippi	opus bybliothecae	Inscription
Rogatinus Library	opus bybliothecae	Inscription
Alexandria, Hellenistic Royal Library	βιβλιοθήκη	Epiphanes
Alexandria, Library at the Sebasteion	βιβλιοθήκαις	Philon
Antiochia, Hellenistic Royal Library of	βιβλιοθήκης βιβλιοθήκην	Suidas Malalas
Antiochia, Library of	βιβλιοθήκην	Suidas
Aphrodisias, Library of Archive	βιβλιοθήκαι (2)	Inscription
Athens, Library at the Gymnasium of Ptolemy	βυβλιοθήκη]ν βυβλιοθήκην	Inscription (2) Inscription (2)
Carthage, Library of	bibliotheca	Apul. Florid
Constantinople, Library of	βιβλιοθήκη	Zosimos
Cos, Library at the Gymnasium	βυβλιοθήκων	Inscription (2)
Cumae, Library of Faustus	bibliotheca	Cicero
Delphi, Library at the Gymnasium	βιβλιοθήκη	Inscription
Dyrrachium, Library of	bybliothecae	Inscription
Epidaurus, Library at the Asklepeion	βιβλιοθήκην	Inscription
Halicarnassus, Library of	βυβλιοθήκαι	Inscription
Mylasa, Gymnasium of	βιβλιοθήκη	Inscription
Patra, Library of	bibliotheca	Aullus Gellius
Pergamon, Library at Gymnasium	βυβ)λιοθήκαι (2)	Inscription (2)
Prusa, Library of	bibliotheca	Pliny
Rome, Library at the Atrium Libertatis	bibliotheca bibliothecae	Pliny Isidor
Rome, Library in the Temple of Augustus	bibliotheca (2)	Pliny, Suetonius
Rome, Library in Domus Tiberiana	βιβλιοθήκη bibliotheca	Galen Aullus Gellius
Rome, Library at the Pantheon	βιβλιοθήκη	Julius Africanus
Smyrne, Library in the Homereium	βιβλιοθήκη	Strabo
Soli, Library of	βιβλιοφυλακίου	Inscription
Suessa, Matidiana Library	bybliothecca	Inscription
Tivoli, Library at the Temple of Hercules,	bibliotheca	Aullus Gellius
Volsinii, Library of	bybliothecae	Inscription

## Library in the Serapeum at Alexandria (Chapter 3.1.1)

### Epiphanes, *De mensuris et ponderibus*, 11

ἐν τῇ πρώτῃ βιβλιοθήκῃ τῇ ἐν τῷ Βρουχείῳ οἰκοδομοθείσῃ ἔτι δὲ ὕστερον καὶ ἕτερα ἐγένετο βιβλιοθήκη ἐν τῷ Σεραπίῳ, μικροτέρα τῆς πρώτης ἣτις καὶ θυγάτηρ ὠνομάσθη αὐτῆς ἐν ἣ ἀπετέθησαν αἱ τοῦ Ἀκύλα καὶ Συμμάχου καὶ Θεοδοτίωνος καὶ τῶν λοιπῶν ἐρμηνεῖαι μετὰ διακοσιοστὸν καὶ πεντηκοστὸν ἔτος.

...were placed in the first library, which was built in the Bruchion hill. But there was later also another library in the Serapeum, smaller than the first, which was also called its daughter, in which were placed the translations of Aquila, Symmachus, Theodotion, and the rest, two hundred and fifty years later.<sup>494</sup>

### Aphthonius, *Progymnasmata*, 12

Εἰσιόντι δὲ παρ' αὐτὴν τὴν ἀκρόπολιν τέτρασι πλευραῖς εἷς χῶρος ἴσαις διήρηται, καὶ τὸ σχῆμα πλαίσιον τυγχάνει τοῦ μηχανήματος. αὐλὴ δὲ κατὰ μέσον περίστυλος. καὶ τὴν μὲν αὐλὴν στοαὶ διαδέχονται, στοαὶ δὲ ἴσαις διαιρούμεναι κίοσι, καὶ μέτρον αὐταῖς, μεθ' ὅ,τι πλέον οὐχ ὑπάρχει λαβεῖν. ἐκάστη δὲ στοὰ τελευτᾷ πρὸς ἐγκαρσίαν ἕτεραν, καὶ κίων διπλῆ πρὸς ἑκατέραν διαιρεῖται στοάν, τῆς μὲν αὖ λήγουσα, τῆς δὲ αὖ πάλιν κατάρχουσα. παρῶκοδόμηται δὲ σηκοὶ τῶν στοῶν ἔνδοθεν, οἱ μὲν ταμεῖα γεγενημένοι ταῖς βίβλοις, τοῖς φιλοπονοῦσιν ἀνεφγμένοι φιλοσοφεῖν καὶ πόλιν ἅπασαν εἰς ἐξουσίαν τῆς σοφίας ἐπαίροντες, οἱ δὲ τοὺς πάλαι τιμᾶν ἰδρυμένοι θεοῦς.

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<sup>494</sup> Translation by the author.

On going into the acropolis itself, one enters a single open space, bounded by four equal sides, and its figure is rather like that of a war machine (i.e., a hollow rectangle). In the middle is a courtyard, surrounded by a colonnade. Stoas continue the courtyard and the stoas are divided by equal columns, and as for their measure, it is the largest possible. Each stoa ends in another stoa, one ending and the other beginning again. Small covered structures are built inside the stoas; some are reading rooms for books offering an opportunity for the studios to pursue knowledge and arousing the whole city to the possibility of wisdom; others were built as shrines to the ancient gods.<sup>495</sup>

**Ammianus Marcellinus, 22.16.12-13 and 15**

His accedunt altis sufflata fastigiis templa, inter quae eminet Serapeum, quod licet minuatur exilitate verborum, atriis tamen columnatis amplissimis et spirantibus signorum figmentis, et reliqua operum multitudine ita est exornatum, ut post Capitolium, quo se venerabilis Roma in aeternum attollit, nihil orbis terrarum abitiosius cernat. In quo bybliothecae fuerunt inaestimabiles: et loquitur monumentorum veterum concinens fides septingenta voluminum milia, Ptolemaeis regibus vigiliis intentis composita, bello Alexandrino, dum diripitur civitas, sub dictatore Caesare, conflagrasse. Sed Alexandria ipsa non sensim (ut aliae urbes), sed inter initia prima aucta per spatiosos ambitus intenisque seditionibus diu aspere fagitata ad ultimum multis post annis, Aureliano imperium agente, civibus iurgiis ad certamina interneciva prolapsis, dirutisque moenibus,

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<sup>495</sup> Kennedy (2003).

amisit regionus maximam partem, quae Bruchion appellabatur, diuturnum praestantium hominum domicillium

There are besides in the city temples pompous with lofty roof, conspicuous among them the Serapeum, which though feeble words merely belittle it, yet is so adorned with extensive columned halls, with almost breathing statues, and a great number of other works of art, that next to the Capitolium, with which revered Rome elevates herself to eternity, the whole world beholds nothing more magnificent. In this were invaluable libraries, and the unanimous testimony of ancient records declares that 700.000 books, brought together by the unremitting energy of the Ptolemaic kings, were burnt in the Alexandrian war, when the city was sacked under the director Caesar. But Alexandria herself, not gradually (like other cities), but at her very origin, attained her wide extent; and for a long time she was grievously troubled by internal dissensions until at last, many years later under the rule of Aurelian, the quarrels of the citizens turned into deadly strife; then her walls were destroyed and she lost the greater part of the district called Bruchion, which had long been the adobe of distinguished men.<sup>496</sup>

**Rufinus, *Historia Ecclesiastica* 11. c 23**

quadratis et ingentibus spatiis omni ex parte distentibus; cuncta vero, quo ad summum pavementorum evadatur, opera forniceo cnstructa, quae inmissis desuper luminaribus et occultis adytibus invicem in senem distinctis usum diversis ministeriis et clandestinis officiis exhibebant. iam vero in superioribus extrema totius ambitus spatia occupant

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<sup>496</sup> Ammianus and Rolfe (1940).

exedrae et pastophoria domusque in excelsum porrectae, in quibus vel aeditui vel hi, quos appellabant ἀγνεύοντας, id est, qui se castificant, commanere soliti erant. porticus quoque post haec omnem ambitum quadratis ordinibus distinctae intrinsecus circumibant. in medio totius spatii aedes erat pretiosis edita columnis et marmoris saxo extrinsecus ample magnificeque constructa. in hac simulacrum Serapis erat ita vastum..

stretched open on every side with huge rectangular spaces. Until the highest art of the flooring is reached, in fact, everything is built with vaulted work, and with the lighting let in from above and with the shrines hidden, each structure in turn has a use given over to distinct and particular rituals, in addition to secret functions. Now then, in the upper areas, around the extreme edges of the whole periphery, there are exedrae and priests-quarters and houses that reach a great height, in which temple-keepers or those whom they used to call hagneuontes (that is, the ones who make themselves pure) had been accustomed to gather. There were also porticoes beyond these that went round all this circumference on the inside, defined by a rectangular arrangement. In the midst of the whole space was the temple, wrought with expensive columns and built impressively and magnificently with marble stone on the outside. In this was an image of Serapis, so huge...<sup>497</sup>

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<sup>497</sup> McKenzie, Gibson, and Reyes (2004, 106).



## Library of Pergamon (Chapter 3.1.2)

### Vitruvius, *On Architecture*, 7. Preface. 4

Regis Attalici magnis philologiae dulcedinibus inducti cum egregiam bybliotheacam Pergami ad communem delectationem instituissent.<sup>498</sup>

The Attalid kings, impelled by their delight in literature, established for general perusal a fine library at Pergamum.

### Strabo, *Geography*, 13.1.54

ἐπειδὴ δὲ ἤσθοντο τὴν σπουδὴν τῶν Ἀτταλικῶν βασιλέων, ὑφ' οἷς ἦν ἡ πόλις, ζητούντων βιβλία εἰς τὴν κατασκευὴν τῆς ἐν Περγάμῳ βιβλιοθήκης, κατὰ γῆς ἔκρυψαν ἐν διώρυγί τινί·

But when they heard how zealously the Attalid kings to whom the city was subject were searching for books to build up the library in Pergamum, they hid their books underground in a kind of a trench.<sup>499</sup>

### Strabo, *Geography*, 13.4.2

κατεσκεύασε δ' οὗτος τὴν πόλιν καὶ τὸ Νικηφόριον ἄλσει κατεφύτευσε, καὶ ἀναθήματα καὶ βιβλιοθήκας καὶ τὴν ἐπὶ τοσόνδε κατοικίαν τοῦ Περγάμου τὴν νῦν οὖσαν ἐκεῖνος προσεφιλοκάλησε·

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<sup>498</sup> Vitruvius and Granger (1934).

<sup>499</sup> Strabo and Jones (1929).

He built up the city and planted Nicephorion with a grove, and the other elder brother, from love of splendor, added sacred building and libraries and raised the settlement of Pergamum to what it now is.<sup>500</sup>

**Pliny, *Natural History*, 13.70**

mox, aemulatione circa bibliothecas regum Ptolemaei et Eumenis, supprime chartas Ptolemaeo, idem Varro membranas Pergami tradit repertas; postea promiscue patuit usus rei qua constat immortalitas hominum

Subsequently, also according to Varro, when owing to the rivalry between King Ptolemy and King Eumenes about their libraries Ptolemy suppressed the export of paper, parchment was invented at Pergamum; and afterwards the employment of the material on which the immortality of human beings depends spread indiscriminately.<sup>501</sup>

**Diogenes Laertius, *Lives of Eminent Philosophers*, Zeno, 7.34**

τοιουτότροπά τινά ἐστι παρὰ τῷ Κασσίῳ, ἀλλὰ καὶ Ἰσιδώρῳ τῷ Περγαμηνῷ ῥήτορι· ὅς καὶ ἐκτιμηθῆναί φησιν ἐκ τῶν βιβλίων τὰ κακῶς λεγόμενα παρὰ τοῖς στωικοῖς ὑπ' Ἀθηνοδώρου τοῦ στωικοῦ πιστευθέντος τὴν ἐν Περγᾶμῳ βιβλιοθήκην.

So much for the criticisms to be found not only in Cassius but in Isidorus of Pergamum, the rhetorician. Isidorus likewise affirms that the passages disapproved by the school

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<sup>500</sup> Strabo and Jones (1929).

<sup>501</sup> Pliny and Rackham (1945).

were expunged from his works by Athenodorus the Stoic, who was in charge of the Pergamine Library.<sup>502</sup>

### **Plutarch, *Antony*, 58.5**

Καλουσῖος δὲ Καίσαρος ἑταῖρος ἔτι καὶ ταῦτα τῶν εἰς Κλεοπάτραν ἐγκλημάτων Ἀντωνίῳ προὔφερε· χαρίσασθαι μὲν αὐτῇ τὰς ἐκ Περγάμου βιβλιοθήκας, ἐν αἷς εἴκοσι μυριάδες βιβλίων ἀπλῶν ἦσαν.

Again, Calvisius, who was a companion of Caesar, brought forward against Antony the following charges also regarding his behavior towards Cleopatra: he had bestowed upon her the libraries from Pergamum in which there were two hundred thousand volumes.<sup>503</sup>

### **Galen, *Hippocratis de Medici Officina Liber et Galeni in eum Commentarius I*,<sup>504</sup> 18.2.7**

τινὲς μὲν γὰρ καὶ πάνυ παλαιῶν βιβλίων ἀνευρεῖν ἐσπούδασαν πρὸ τριακοσίων ἐτῶν γεγραμμένα, τὰ μὲν ἔχοντες ἐν τοῖς βιβλίοις, τὰ δὲ ἐν τοῖς χάρτοις, τὰ δὲ ἐν διαφόροις φύλλοις, ὥσπερ τὰ παρ' ἡμῖν ἐν Περγάμῳ.

Some tried to find very old books written three hundred years ago, which were preserved partially on rolls, partially on papyrus, and partially on limewood pieces as were preserved here at Pergamon.<sup>505</sup>

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<sup>502</sup> Diogenes and Hicks (1925b).

<sup>503</sup> Plutarch and Perrin (1920).

<sup>504</sup> Galen and Kühn (2011, 630).

<sup>505</sup> Platthy (1968, 161, n.143).

**Galen, *On the avoidance of grief*, 21**

Διπλᾶ γὰρ ἐγγράπτο πάντα τὰ πρὸς ἔκδοσιν ἤδη, χωρὶς τῶν ἐν τῇ Ῥώμῃ μελλόντων μένειν, ἀξιούντων μὲν καὶ τῶν ἐν τῇ πατρίδι φίλων ἀπασας αὐτοῖς πεμφθῆναι τὰς ὑπ' ἐμοῦ γεγονείας πραγματείας ὅπως ἐν βιβλιοθήκῃ δημοσίᾳ στῶσι,

Because at that time all my works destined for publication were copied twice, except for those destined to stay in Rome, since my friends in my home country asked me to send them all the works I had written in order to find a place for them in a public library.<sup>506</sup>

**Academy of Plato (Chapter 3.1.3)**

**Travlos, 1971, pp. 42**

ΗΟΡΟΣ ΤΕΣ ΗΕΚΑΔΕΜΕΙΑΣ

Boundary of the Academy<sup>507</sup>

**Diogenes Laertius, *Lives of Eminent Philosophers*, Plato, 3.7**

ἐπανελθὼν δὲ εἰς Ἀθήνας διέτριβεν ἐν Ἀκαδημείᾳ. τὸ δ' ἐστὶ γυμνάσιον προάστειον ἀλσῶδες ἀπὸ τινος ἥρωος ὀνομασθὲν Ἐκαδήμου, καθὰ καὶ Εὐπολις ἐν Ἀστρατεύτοις φησὶν· ἐν εὐσκίοις δρόμοισιν Ἐκαδήμου θεοῦ.

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<sup>506</sup> Tucci (2008).

<sup>507</sup> Translation by the author.

Having returned to Athens, he lived in the Academy, which is a gymnasium outside the walls, in a grove named after a certain hero, Hecademus, as is stated by Eupolis in his play entitled *Shirkers*: In the shady walls of the divine Hecademus.<sup>508</sup>

### Library at the Gymnasium of Rhodes (Chapter 3.1.4)

#### SEG 54-726

Βοιωτικός.

. . . . .

Ἀρίσταιμος

Κλέων ἔν

Φαιδώνδας ἢ περί ο[

Περὶ τῆς Ἀθήνησι

νομοθεσίας πέ[ντε

Περὶ τῶν Ἀθήνησι πολι[τειῶν

Ἦγησίου οἱ Φιλαθηναῖοι

Ἀσπασία ἔν

Ἀλκιβιάδης ἔν

Θεοδέκτου τέχνης τέσσα[ρα

Ἀμφυκτυονικός ἔν

Θεο[πό]μπου Λακωνικός ἔν

Π[αν]ιωτικός ἔν

[Μαύσ]σωλος ἔν

[Ὀλυμ]πικός ἔν

Π

[Φιλ]ππος ἔν

Ἵπ[έρ]

[Ἀλεξά]νδρου ἐγκώμιον ἔν

Ἵπ[έρ]

Ἵπ[έρ] τῶν ΟΛΗ. . . . ἔν

[Ἵ]π[έρ] τοῦ . . . . . ίου ἔν Διονυσί[ου] . . . .

Πρὸς Εὐαγόραν [Κυ]πρια[κῶν] δ[ύο] περ . . . .

Ἐπιστολὴ πρὸς [Ἀντίπα]τρο[ν ἔν] Περὶ τῶ[ν] . . . .

Συμβουλευτικός πρὸς] Περὶ παίδ . . . .

Ἀλέξαν[δρον] Διοδό[?]του π . . . .

Παναθηναϊκό[ς] . . . . Ἄρμωδ. . . . .

Καταδρομὴ τῆ[ς Πλάτωνος] Δαμοκλείδα

διατριβῆς . . . . . Περὶ γενέσ[εως]

Θεοπόμπου ἄλλου. Πρὸς Ἀλέξ[ανδρον]

<sup>508</sup> Diogenes and Hicks (1925a).

Fragment of an inscription that was the official catalogue of the books of the library. It lists the names of the authors of the books, and the titles of books in two columns. The inscription survives in such a fragmentary state that no translation has been given.<sup>509</sup>

#### Maiuri, NSER (1925), 4

- χει[?]ρας τῶν χρηζόντων | [κατὰ τὰ δε]δογμένα τῶι δάμω[ι] | [-ποι]είσθων ποτὶ τοὺς  
 πρ[υ]τάνεις? | [-οἱ κα] μέλλωντι ἀνατιθέ[μειν βυβλία — || [-τὰ ὀνόματ]α ἐμφανίζοντω  
 τοῖς | [τῶν γυμν]ασιάρχων μὴ ἀναγρ[ά] | [- εἰς τὰν βυ]βλιοθήκαν. τοῦτ[ο] ἔδοξε πάσαις

[ἐπ' ἱερέως, — — μηνὸς Πα]νάμου ὀγδᾶ[ι]. | [ἐπειδὴ — —] εἰς τὰν βυβλιοθήκαν  
 ἀ[νέθεσαν?] | - πολλῶν ἐόντων τῶν [χρηζόντων ?] | - των. ὅπως οὖν πο[λλοὶ | ἐμάχου  
 Κασαρίδος Ε | - δης Κοσμία Ὑπερενχε[ύς] | -[κρ]άτης οὐ ἔχοντι τὸν ἀ | -ν δὲ  
 Ἀριστοφάντου κ[αὶ] | - πος Τιμαχίδα Ὑπ[ερενχεύς] | [Κασ]αρεὺς ὑπ' Ἀρι[στο] |  
 ἐνγράφας

...accoridng to the decree of the people...let them make the subscriptions...] to the  
 officials of the pr[ytaneis] whoever intend to donate [books?]...let the gymn[asiarchs]  
 record [the names?]...for the public library.

On the eight of Panamos [have contributed] to the library ...there being many who  
 ...that, therefore, there may be many...<sup>510</sup>

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<sup>509</sup> Maiuri (1925, Nr. 11); Segre (1935, 215).

## SEG 37-699

Rhodes. Inscription containing three decrees concerning the library of the rhodian gymnasium, 2nd cent. B.C.E.<sup>511</sup>

## Augustan Palatine Library, Rome (Chapter 3.1.5)

### Ovid, *Tristia*, 3.1.59-72

inde tenore pari gradibus sublimia celsis ducor ad intonsi candida templa dei, signa peregrinis ubi sunt alterna columnis, Belides et stricto barbarus ense pater, quaeque viri docto vetere cepere novique pectore, lecturis inspicienda patent. querebam fratres, exceptis scilicet illis, quos suus optaret non genuisse pater. quaerentem frustra custos e sedibus illis praepositus sancto iussit abire loco altera templa peto, vicino iucta teatro: haec quoque erant pedibus non adeunda meis. nec me, quae doctis patuerunt prima libellis, atria Libertas tangere passa sua est. in genus auctoris miseri fortuna redundat, et patimur nati, quam tulit ipse, fugam. forsitan et nobis olim minus asper et illi evictus longo tempore Caesar erit. di, precor, atque adeo-neque enim mihi turba roganda est—” Caesar, ades voto, maxime dive, meo! interea, quoniam statio mihi publica clausa est, privato liceat delituisse loco. vos quoque, si fas est, confusa pudore repulsae sumine plebeiae carmina nostra manus.

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<sup>510</sup> Platthy (1968, 151, n.119).

<sup>511</sup> Papachristodoulou (1988, pl.75).

Then with even pace up the lofty steps I was conducted to the shining temple of the  
ushorn god, where alternating with the columns of foreign marble stand the figures of the  
Belids, the barbarian father with a drawn sword, and all those things which the men of  
old or modern times conceived in their learned souls are free for the inspection of those  
who would read. I was seeking my brothers, save those indeed whom their father would  
he had never begot, and as I sought to no purpose, from the abode the guard who presides  
over the holy place commanded me to depart. A second temple I approached, one close to  
a theater: this too might not be visited by my feet. Nor did Liberty allow me to touch her  
halls, the first that were opened to books. The fate of our unfortunate sire overflows upon  
his offspring, and we suffer at our birth the exile which he has borne. Perhaps sometime  
both to us and to him Caesar conquered by long years will be less severe. O gods, or  
rather (for it is not meet that I should pray to a throng), Caesar, mightiest of gods,  
hearken to my prayer! In the meanwhile, since a public resting place is closed to me, may  
it be granted me to lie hidden in some private spot. You too, hands of the people, receive,  
if you may, our verses dismayed by the shame of their rejection.<sup>512</sup>

**Horace, *Epistles*, 1.3.15 – 20**

monitus multumque monendus, privatas ut quaerat opes et tangere vitet scripta Palatinus  
quaecumque recepti Apollo...

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<sup>512</sup>Ovid and Wheeler (1996).



He was warned, and must often be waned to search for home treasures, and to shrink from touching the writings which Apollo on the Palatine has admitted.<sup>513</sup>

**Suetonius, *Lives of the Caesars*, Augustus, 29. 3**

Templum Apollinis in ea parte Palatinae domus excitavit, quam fulmine ictam desiderari a deo haruspices pronuntiarant; addidit porticus cum bibliotheca Latina Graecaque, quo loco iam senior saepe etiam senatum habuit decuriasque iudicum recognovit.

He reared the temple of Apollo in that part of his house of the Palatine for which the soothsayers declared that the god had shown his desire by striking it with lightning. He joined to it colonnades with Latin and Greek libraries, and when he was getting to be an old man he often held meetings of the senate there as well, and revised the lists of jurors.<sup>514</sup>

**Tacitus, *Annals*, 2.37**

Igitur quattuor filiis ante limen curiae adstantibus, loco sententiae, cum in Palatio senatus haberetur, modo Hortensii inter oratores sitam imaginem, modo Augusti intuens, ad hunc modum coepit:

With his four sons then, standing before the threshold of the Curia, he awaited his turn to speak; then, directing his gaze now to the portrait of Hortensius among the orators (the

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<sup>513</sup>Horace and Fairclough (1926).

<sup>514</sup>Suetonius and Rolfe (1914a).

senate was meeting in the Palace), now to that of Augustus, he opened in the following manner.<sup>515</sup>

**Tacitus, Annals, 15.39**

Neque tamen sisti potuit, quin et Palatium et domus et cuncta circum haurirentur.

It proved impossible, however, to stop it from engulfing both the Palatine and the house and all their surroundings.<sup>516</sup>

**Scholiast on Juvenal, Satire 1.128**

Quia bibliothecam iuris civilis et liberalium studiorum in templo Apollinis Palatini dedicavit Augustus.

Since Augustus dedicated the library of civil law and liberal studies in the Temple of Apollo on the Palatine Hill.<sup>517</sup>

**Fronto, Marcus Aurelius, 4.5 (Vat. 155)**

legi Catonis orationem *De bonis Pulchrae*, et aliam quam tribuno diem dixit. *Io*, inquis puero tuo, *uade quantum potes, de Apollinis bibliothecabus has mihi orationes apporta*. Frustra mittis, nam et isti libri me secuti sunt. Igitur Tiberianus bibliothecarius tibi subigitandus est; aliquid in eam rem insumendum, quod mihi ille, ut ad urbem venero, aequa divisione impertiat.

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<sup>515</sup> Tacitus and Jackson (1931).

<sup>516</sup> Tacitus and Jackson (1937).

<sup>517</sup> Translation by the author.

reading Cato's speech *On the property of Pulchra*, and another in which he impeached a tribune. *Ho, you cry to your boy, go as fast as you can and fetch me those speeches from the libraries of Apollo!* It is no use your sending, for those volumes, among others, have followed me here. So, you must get round the librarian of Tiberius's library: a little *douceur* will be necessary, in which he and I can go shares when I come back to town.<sup>518</sup>

### **Dio Cassius, *Roman History*, 53.1.3**

τὸ τε Ἀπολλώνιον τὸ ἐν τῷ Παλατίῳ καὶ τὸ τεμένισμα τὸ περὶ αὐτό, τὰς τε ἀποθήκας τῶν Βιβλίων, ἐξεποίησε καὶ καθιέρωσε.

Moreover, he completed and dedicated the temple of Apollo on the Palatine, the precinct surrounding it, and the Libraries.<sup>519</sup>

### **Res Gestae Divi Augusti, 19**

Curiam et contines ei Chalcidicum, temenumque Apollinis in Palatio cum porticibus...feci

I built the curia and the Chalcidicum adjoining it, the temple of Apollo on the Palatine with its porticoes.<sup>520</sup>

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<sup>518</sup> Fronto and Haines (1919).

<sup>519</sup> Dio, Cary, and Foster (1917b).

<sup>520</sup> Velleius and Shipley (1924).

**Papyrus Oxyrinchus, 25. 2435**

[. . . .] .δ\_ ωρας θ\_ εκαθισεν ο Σε- | [[βαστος] εν τωι τον Απολλωνος ιερω | [εν τη  
Ρ]ωμαικη βιβλιοθηκη και δι- | [ηκονσ]εν των πρεσβεντων <των> Αλεξαν- | [δρεων]...

he sat in the Roman library in the Temple of Apollo and heard the ambassadors from  
Alexandria.

**Library in the Porticus Octaviae, Rome (Chapter 3.1.6)**

**CIL, 6.4431**

DECURIO  
HYMNUS  
AURELIANUS  
A · BIBLIOTHECE  
LATINA · PORTICUS ·  
OCTAVIAE  
VILICUS  
QUINTIA  
C · L  
CLARA

Inscription that references the latin library in the Porticus Octaviae.

**Dio Cassius, *Roman History*, 66.24.2**

καὶ τὰ Ὀκταουίεια οἰκήματα μετὰ τῶν βιβλίων, τὸν τε νεὼν τοῦ Διὸς τοῦ Καπιτωλίου  
μετὰ τῶν συννάων αὐτοῦ κατέκαυσεν.

it consumed the Octavian buildings together with their books, and the temple of Jupiter Capitolinus with its surrounding temples.<sup>521</sup>

**Dio Cassius, *Roman History*, 49.43.8**

ἐπειδὴ τε οἱ Δελμάται παντελῶς ἐκεχείρωντο, τὰς τε στοὰς ἀπὸ τῶν λαφύρων αὐτῶν, καὶ τὰς ἀποθήκας τῶν Βιβλίων τὰς Ὀκταουιανὰς ἐπὶ τῆς ἀδελφῆς αὐτοῦ κληθείσας, κατεσκεύασεν.

And after the Dalmatians had been utterly subjugated, he erected from the spoils thus gained the porticos and the libraries called the Octavian, after his sister.<sup>522</sup>

**Suetonius, *Lives of the Caesars*, Augustus, 29.4**

Quaedam etiam opera sub nomine alieno, nepotum scilicet et uxoris sororisque fecit, ut porticum basilicamque Gai et Luci, item porticus Liviae et Octaviae theatrumque Marcelli.

He constructed some works too in the name of others, his grandsons and nephew to wit, his wife and his sister such as the colonnade and basilica of Gaius and Lucius; also the colonnades of Livia and Octavia, and the theater of Marcellus.<sup>523</sup>

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<sup>521</sup> Dio, Cary, and Foster (1925).

<sup>522</sup> Dio, Cary, and Foster (1917a).

<sup>523</sup> Suetonius and Rolfe (1914a).

**Plutarch, *Marcellus*, 30.6**

εις δὲ τιμὴν αὐτοῦ καὶ μνημὴν Ὀκταβία μὲν ἡ μήτηρ τὴν βιβλιοθήκην ἀνέθηκε, Καῖσαρ δὲ θέατρον ἐπιγράψας Μαρκέλλου.

In his honour and to his memory Octavia his mother dedicated the library, and Caesar the theater, which bear his name.<sup>524</sup>

**Velleius Paterculus, *Roman History*, 1.11.3**

Hic est Metellus Macedonicus, qui porticus, quae fuerunt circumdatae duabus aedibus sine inscriptione positae, quae nunc Octaviae porticibus ambiuntur, fecerat, quinque hanc turmam statuarum equestrium, quae frontem aedium spectant, hodieque maximum ornamentum eius loci, ex Macedonia detulit.

This is the Metellus Macedonicus who had previously built the portico about the two temples without inscriptions which now are surrounded by the portico of Octavia, and who brought from Macedonia the group of equestrian statues, which stand facing the temples, and, even at the present time, are the chief ornaments of the place.<sup>525</sup>

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<sup>524</sup> Plutarch and Perrin (1917).

<sup>525</sup> Velleius and Shipley (1924).

## Library at Templum Pacis, Rome (Chapter 3.1.7)

### Aulus Gellius, *Attic Nights*, 5.21.9

Tum ille amicus noster, cum hominem confidentem pluribus verbis non dignum existimaret, “Sinni”, inquit, “Capitonis, doctissimi viri, epistulae sunt uno in libro multae positae, opinor, in templo Pacis.

Then that friend of mine, thinking that the self-confident fellow deserved few words, said: “there are numerous letters of Sinius Capito, a very learned man, collected in a single volume and deposited, I think in the temple of Peace.”<sup>526</sup>

### Aulus Gellius, *Attic Nights*, 16.8.1-2

Cum in disciplinas dialecticas induci atque imbui vellemus, necessus fuit adire atque cognoscere quas vocant dialectici εισαγωγὰς. Tum, quia in primo περὶ ἀξιωματικῶν discendum, quae M. Varro alias “profata”, alias “proloquia” appellat, *Commentarium De Proloquiis* L. Aelii, docti hominis, qui magister Varronis fuit, studiose quaesivimus eumque in Pacis bibliotheca repertum legimus.

When I wished to be introduced to the science of logic and instructed in it, it was necessary to take up and learn what the dialecticians call εισαγωγαί or “introductory exercises”. Then because at first I had to learn about axioms, which Marcus Varro calls, now profata, or “propositions”, and now proloquia, or “preliminary statements”, I sought

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<sup>526</sup> Aulus and Rolfe (1927a).

diligently for the *Commentary on Proloquia* of Lucius Aelius, a learnt man, who was the teacher of Varro; and finding it in the library of Peace, I read it.<sup>527</sup>

**Galen, *On the avoidance of grief*, 18**

Διεφθάρη δὲ νῦν τὰ μὲν ἐν τῷ Παλάτιῳ κατὰ τὴν αὐτὴν ἡμέραν τοῖς ἡμετέροις, τῆς πυρκαϊᾶς οὐ μόνον ταῖς κατὰ τὴν ἱερὰν ὁδὸν ἀποθήκαις λυμνηαμένης ἀλλὰ καὶ πρὸ αὐτῶν μὲν ταῖς κατὰ τὸ τῆς Εἰρήνης τέμενος, μετὰ ταῦτα δὲ ταῖς κατὰ τὸ Παλάτιον τε καὶ τὴν Τιβεριανὴν καλουμένην οἰκίαν ἐν ἧ καὶ αὐτῇ βιβλιοθήκη τις ἦν

the books on the Palatine were destroyed on the same day as mine, since the fire spread out not only over the warehouses located along the Via Sacra, but also, before them, over those located next to the Temple of Peace, and after them, over those located in the vicinity of the Palatium and of the domus called Tiberiana where, here also, there was a library.<sup>528</sup>

**Dio Cassius, *Roman History*, 74.24.1-3**

πῦρ τε νύκτωρ ἀρθὲν ἐξ οἰκίας τινὸς καὶ ἐς τὸ Εἰρηναῖον ἐμπεσὼν τὰς ἀποθήκας τῶν τε Αἰγυπτίων καὶ τῶν Ἀραβίων φορτίων ἐπενείματο, ἐς τε τὸ παλάτιον μετεωρισθὲν ἐσῆλθε καὶ πολλὰ πάνυ αὐτοῦ κατέκαυσεν, ὥστε καὶ τὰ γράμματα τὰ τῆ ἀρχῆ προσήκοντα ὀλίγου δεῖν πάντα φθαρῆναι.

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<sup>527</sup> Aulus and Rolfe (1927c).

<sup>528</sup> Tucci (2008).



and a fire that began at night in some dwelling leaped to the temple of Pax and spread to the storehouses of Egyptian and Arabian wares, whence the flames borne aloft, entered the palace and consumed very extensive portions of it, so that nearly all the state records were destroyed.<sup>529</sup>

**Suetonius, *Lives of the Caesars, The Deified Vespasian, 8.9***

Fecit et nova opera templum Pacis Foro proximum Divique Claudii in Caelio monte coeptum quidem ab Agrippina, sed a Nerone prope funditus destructum;

He also undertook new works, the temple of Peace hard by the Forum and one to the Deified Claudius on the Caelian mount, which was begun by Agrippina, but almost utterly demolished by Nero.<sup>530</sup>

**Pliny, *Natural History, 36.24.102***

non inter magnifica basilicam Pauli columnis e Phrygiis mirabilem forumque divi Augusti et templum Pacis Vespasiani Imp. Aug., pulcherrima operum quae umquam vidit orbis?

should we not mention among our truly noble buildings the Basilica of Paulus, so remarkable for its columns from Phrygia, or the Forum of Augustus of Revered Memory

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<sup>529</sup> Dio, Cary, and Foster (1927).

<sup>530</sup> Suetonius and Rolfe (1914b).

or the Temple of Peace built by his Imperial Majesty the Emperor Vespasian, buildings the most beautiful the world has ever seen?<sup>531</sup>

**Pliny, *Natural History*, 24.19.84**

atque ex omnibus, quae rettuli, clarissima quaeque in urbe iam sunt dicata a Vespasiano principe in templo Pacis aliisque eius operibus.

And among the list of works I have referred to all the most celebrated have now been dedicated by the emperor Vespasian in the Temple of Peace and his other public buildings.<sup>532</sup>

**Josephus, *The Jewish War*, 7.158**

Μετὰ δὲ τοὺς θριάμβους καὶ τὴν βεβαιωτάτην τῆς Ῥωμαίων ἡγεμονίας κατάστασιν Οὐεσπασιανὸς ἔγνω τέμενος Εἰρήνης κατασκευάσαι· ταχὺ δὲ δὴ μάλα καὶ πάσης ἀνθρωπίνης κρεῖττον ἐπινοίας ἐτετελείωτο. τῇ γὰρ ἐκ τοῦ πλούτου χορηγία δαιμονίῳ χρησάμενος, ἔτι καὶ τοῖς ἔκπαλαι κατωρθωμένοις γραφῆς τε καὶ πλαστικῆς ἔργοις αὐτὸ κατεκόσμησεν.

The triumphal ceremonies being concluded and the empire of the Romans established on the firmest foundations, Vespasian decided to erect a temple of Peace. This was very speedily completed and in a style surpassing all human conception. For, besides having

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<sup>531</sup> Pliny and Eichholz (1962).

<sup>532</sup> Pliny and Jones (1952).

prodigious resources of wealth on which to draw he also embellished it with ancient masterpieces of painting and sculpture.<sup>533</sup>

### **Domitianic Palatine Library, Rome (Chapter 3.1.8)**

#### **Suetonius, *Lives of the Caesars*, Domitian 8. 20**

Liberalia studia imperii initio neglexit, quanquam bibliothecas incendio absumptas impensissime reparare curasset, exemplaribus undique petitis missisque Alexandream qui describerent emendarentque. Numquam tamen aut historiae carminibusve noscendis operam ullam aut stilo vel necessario dedit. Praeter commentarios et acta Tiberi Caesaris nihil lectitabat; epistulas orationesque et edicta alieno formabat ingenio.

At the beginning of his rule he neglected liberal studies, although he provided for having the libraries, which were destroyed by fire, renewed at very great expense, seeking everywhere for copies of the lost works, and sending scribes to Alexandria to transcribe and correct them. Yet he never took any pains to become acquainted with history or poetry, or even to acquiring an ordinary good style. He read nothing except the memoirs and transactions of Tiberius Caesar, for his letters, speeches and proclamations he relied on others' talents.<sup>534</sup>

#### **CIL, 6.5188**

ALEXANDER · C · CAE

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<sup>533</sup> Josephus and Thackeray (1928).

<sup>534</sup> Suetonius and Rolfe (1914b).

SARIS · AUG · GERMANICI · SER  
PYLAEMENIANUS · AB · BYBLI  
OTHECE · GRAECA · TEMPLI APOLLI  
NIS · VIX · ANNIS · XXX ·

Inscription that mentions the Greek library in the Temple of Apollo.

**CIL, 6.5884**

SULPICIAE  
THALLUSAE  
ANTIOCHUS · TI · CLAUDI  
CAESARIS · A BYBLIOTHECA  
LATINA · APOLLINIS  
CONIUGI · SUAE  
BENE · MERITAE

Inscription that mentions the Latin library in the Temple of Apollo.

**Galen, *De Compositione medicamentorum*, 1.1**

ἡνίκα τὸ τῆς Ἐιρήνης τέμενος ὅλον ἐκαύθη καὶ κατὰ τὸ παλάτιον αἱ μεγάλαι βιβλιοθηκαὶ

Until today, the whole Temple of Peace was burnt, and the great libraries at the  
Palatine.<sup>535</sup>

**Galen, *On the avoidance of grief*, 12 -17**

Τὸ γάρ τοι δεινότατον ἐπὶ τῇ τῶν βιβλίων ἀπωλεία λέληθέ σε μηδὲ ἐλπίδα ἔτι τῆς  
κατασκευῆς ὑπολειπομένην ὡς ἂν τῶν ἐν τῷ Παλατίῳ βιβλιοθηκῶν πασῶν  
κατακαυθεῖσ(ῶν) ἐν ἐκείνῃ τῇ ἡμέρᾳ. Οὔτε οὖν ὅσα σπάνια καὶ ἀλ<λ>αχόθι μηδαμόθεν  
κείμενα δυνατόν ἐστιν εὐρεῖν [ἐστιν], οὔτε τῶν μέσων, διὰ δὲ τὴν τῆς γραφῆς ἀκρίβειαν  
ἐσπουδασμένων, Καλλίνια καὶ Ἀττικιανὰ καὶ Πεδουκίνα καὶ μὴν Ἀριστάρχεια οἵτινες

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<sup>535</sup> Translation by the author.

είσιν Ὅμηροι δύο καὶ Πλάτων ὁ Παναιτίου καὶ ἄλλα πολλὰ τοιαῦτα, διασωζομένων ἐν ταύταις τῶν γραμμάτων ἐκείνων αὐτῶν ἅ καθ' ἕκαστον βιβλίον ἢ ἔγραψαν ἢ ἀνεγράψαντο οἱ ἄνδρες ὧν ἦν ἐπώνυμα τὰ βιβλία. Καὶ γὰρ γραμματικῶν πολλῶν αὐτόγραφα βιβλία τῶν παλαιῶν ἔκειντο καὶ ῥητόρων καὶ ἰατρῶν καὶ φιλοσόφων. Ἐπὶ τούτοις οὖν τοιούτοις καὶ τοσοῦτοις ἀπόλεσα κατὰ τὴν αὐτὴν ἡμέραν ὅσα μετὰ τὴν ἐπανόρθωσιν εἰς καθαρὸν ἔδαφος ἐγγράπτο βιβλία τῶν ἀσαφῶν <μέν>, ἡμαρτημένων δὲ κατὰ τὰς γραφὰς οἷον τοῦ προσηυρημένου ἔκδοσιν ἐμὴν ποιήσασθαι, ...

Τοιαῦτα ἦν τὰ Θεοφράστου καὶ Ἀριστοτέλους καὶ Εὐδήμου καὶ Κλίτου καὶ Φαινίου βιβλία καὶ Χρυσίπ<π>ου τὰ πλεῖστα καὶ τῶν παλαιῶν ἰατρῶν πάντων. Λυπήσει δὲ σε καὶ ταῦτα μάλιστα ὡς τῶν ἐν τοῖς καλουμένοις πίναξι τούτων γεγραμμένων βιβλίων ἔξωθεν ἠῦρον τινα, κατὰ τινὰ τε τῆς ἐν τῷ Παλατίῳ βιβλιοθήκης, καὶ τὰ[ς] ἐναντία ἃ φανερώς ἦν οὐπὲρ ἐγγράπτο κατὰ τὴν λέξιν, οὔτε κατὰ διάνοιαν ὅμοια μὲν αὐτῷ, καὶ τὰ Θεοφράστου καὶ μάλιστα τὰ κατὰ τὰς ἐπιστημονικὰς πραγματείας· ἔστιν ἄλλα τὰ περὶ φυτῶν βιβλία κατὰ δύο πραγματείας ἐκτεταμένας ἡρμενευμένα <ἅ> πάντες ἔχουσι· ἢ δ' Ἀριστοτέλ(ει) σύναρμος ἀκριβῶς ἦν εὐρεθεῖσά μοι καὶ μεταγραφεῖσα ἢ καὶ νῦν ἀπολομένη, κατὰ δὲ τὸν αὐτὸν τρόπον καὶ Θεοφράστου καὶ τῶν ἄλλων τινῶν ἀνδρῶν παλαιῶν μὴ φερόμενα κατὰ τοὺς πίνακας, τινὰ δὲ ἐν ἐκείνοις γεγραμμένα μὲν, μὴ φαινόμενα δ' αὐτά. Τούτων οὖν ἐγὼ πολλὰ μὲν ἐν ταῖς κατὰ τὸ Παλάτιον βιβλιοθήκαις ἠῦρον, τὰ δ' ἐναντία κατεσκεύασα. Διεφθάρη δὲ νῦν τὰ μὲν ἐν τῷ Παλάτιῳ κατὰ τὴν αὐτὴν ἡμέραν τοῖς ἡμετέροις, τῆς πυρκαϊᾶς οὐ μόνον ταῖς κατὰ τὴν ἱερὰν ὁδὸν ἀποθήκαις λυμνηαμένης ἀλλὰ καὶ πρὸ αὐτῶν μὲν ταῖς κατὰ τὸ τῆς Εἰρήνης τέμενος, μετὰ ταῦτα δὲ ταῖς κατὰ τὸ Παλάτιον τε καὶ τὴν Τιβεριανὴν καλουμένην οἰκίαν ἐν ἧ καὶ αὐτῇ βιβλιοθήκη τις ἦν

And you have overlooked the most terrible thing, beside the loss of the books: that there is not even the hope of reconstructing everything, since all the libraries on the Palatine were burnt on the same day. it is no longer possible to find what is rare and cannot be found anywhere else, among those things which are absolutely ordinary but are demanded because of the exactness of their writing: the manuscripts of the collection of Callinos, of Atticus, of Pedoukos, and most certainly of Aristarchus, that corresponded to two copies of Homer, and the manuscript of Plato owned by Panaetius, and many others of this kind, because these famous writings were kept there - writings that those men who gave their names to their books either had well copied each of them by their hand or had had them well copied by others. And indeed there were the original books of several grammarians, orators, doctors and philosophers. Besides such important and numerous books, on that same day I lost all the books that I had written after correction, in order to use them as faultless and error-free models, and to publish myself an edition based on new information...

Such were the books of Theophrastus, Aristotle, Eudemos, Cleitus, and of Phainias, as also the most part of those of Chrysippus and of all the ancient doctors. And will make you feel more pain is that I have found outside certain books, which are mentioned in those that are called catalogues, and for what concerns certain books of the library of the Palatine, I had also found that, contrary to what was generally assumed, they did not conform either to the style or to the thought of their authors, and I had also found some books by Theophrastus and particularly those concerning scientific subjects. There were also his other books on the plants which have been commented on in two works of great

importance that everybody owns; and a work that I had discovered and copied, and that at present is lost, was in perfect concordance with Aristotle; and like the case of Theophrastus, there were also the books of other ancient authors, not mentioned in the catalogues, while others, that were mentioned, did not exist any longer. On my side, among the former, I found out many in the libraries of the Palatine, and in the opposite case, I obtained them. the books on the Palatine were destroyed on the same day as mine, since the fire spread out not only over the warehouses located along the Via Sacra, but also, before them, over those located next to the Temple of Peace, and after them, over those located in the vicinity of the Palatium and of the domus called Tiberiana where, here also, there was a library, filled with several books of different kinds.<sup>536</sup>

### **Pantainos Library, Athens (Chapter 3.1.9)**

#### **Agora I 848**

Ἀθηνᾶ Πολιάδι καὶ Αὐτοκράτορι Καίσαρι Σεβαστῷ Νέρβα Τραϊανῷ Γερμανικῷ καὶ τῇ πόλι τῇ Ἀθηναίων ὁ ἱερεὺς Μουσῶν Φιλοσόφων Τ. Φλάβιος Πάνταινος Φλαβίου Μενάνδρου Διαδόχου υἱὸς τὰς ἔξω στοάς, τὸ περίστυλον, τὴν βιβλιοθήκην μετὰ τῶν βιβλίων, τὸν ἐν αὐτοῖς πάντα κόσμον, ἐκ τῶν ἰδίων μετὰ τῶν τέκνων Φλαβίου Μενάνδρου καὶ Φλαβίας Σεκουνδίλλης ἀνέθηκε.

To Athena Polias and to the Emperor Caesar Augustus Nerva Trajan Germanicus and to the city of the Athenians, the priest of the wise Muses, T. Flavius Pantainos, son of

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<sup>536</sup> Tucci (2008).

Flavius Menandros Diadochos, with his children Flavius Menandros and Flavia Secundilla, has dedicated from his own means the outer stoas, the peristyle, the library and its books and all the decorations in the building.<sup>537</sup>

### **Agora I 2729**

βιβλίον οὐκ ἐξενεχθήσεται ἐπεὶ ὠμόσαμεν· ἀνυγήσεται ἀπὸ ὥρας πρώτης μέχρι ἕκτης

No book shall be taken out, since we have sworn it. It will be open from the first hour until the sixth.<sup>538</sup>

### **Celsus Library, Ephesus (Chapter 3.1.10)**

#### **IK 17, 3009**

ἀγαθὴ τύχη | ἡ πόλις τὸ σύστρω[μα] | τὸ πρὸ τοῦ αὐδευωρίου | καὶ τῆς Κέλσου  
βιβλιοθή- || κης κατεσκεύασεν ἐκ προ- | σόδων κληρονομίας | Ἰου[λία]ς Πονεντίλλης |

Good Fortune. The city has constructed the pavement in front of the auditorium and the library of Celsus from the revenue of the inheritance of Julia Potentilla.<sup>539</sup>

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<sup>537</sup> Shear (1935, 330-331).

<sup>538</sup> Shear (1936, 42).

<sup>539</sup> Johnson (1984, 13).



### **JÖAI, 8.67**

Τι(βέριον) Ἰούλ[ιον Κέλσον Πολεμαιανόν,] | ὕπατον, ἀνθύπατον Ἀσίας | Τι(βέριος)  
Ἰούλιος Ἀκύλα, ὕπατος, ὁ υἱός, | κατεσκεύασεν τὴν βιβλιοθήκην || [τὸ ἔργον  
ἀπα]ρτ[ι]σάν[τ]ων τῶν Ἀκύλα | κληρ[ονόμων ἐπμε]ληθέντος | Τι(βερίου Κλ(αυδίου)  
Ἀριστίωνος, γ´ ἀσιάρχου

To Tiberius Julius Celsus Polemaeanus, Consul, Proconsul of Asia. Tiberius Julius Aquila, his son, founded the library. The heirs of Aquila have made it complete, and it was dedicated by Tiberius Claudius Aristion, three times Asiarch.<sup>540</sup>

### **JÖAI, 8.67**

[Τι(β(ερίω) Ἰουλίω Κέλσω] Πολεμαιανῶ, ὑπάτω,  
[ἀνθυπάτω τῆς Ἀσί]ας, Τι(β(έριος) Ἰούλιος Ἀκύλας  
[Πολεμ]αιανός, ὕπατος, ὁ υἱός, τὴν Κελσι-  
[αν]ήν βιβλιοθήκην κατ[ε]σκεύασεν ἐκ τῶν  
[ιδίων] σὺν παντὶ τῷ κόσ[μ]ῳ καὶ ἀναθήμασι  
[καὶ βυ]βλίαις κατέλιπε δὲ κ[αὶ] εἰς ἐπισκευὴν αὐτῆς  
[καὶ ὠνή]ν βυβλίων μ[υρι]άδας δύο ἡμισυ, ἐξ ὧν ὕφη-  
[ρέθη β ἐπιε]τῆ, ὥστ[ε μενόντων τῶν] ἀρχαίων δισμυρίων γ  
[ἀπὸ τῶν κατ' ἔτος γιγνομέ]νων τόκων ἐπεσκευ-  
[άζεσθαι τὴν βιβλιοθήκην κ]αὶ τοὺς προσμένον-  
[τας αὐτῇ λαμβάνειν ., ἅ αὐτοῖς χορηγη[θ]ήσεται ἐπὶ

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<sup>540</sup> Johnson (1984, 12).

[τῆ γενεθλίῳ τοῦ Κέλσου ἡμέρα εἰς αἰεὶ καὶ ὁμοίως]  
 κατὰ διαθήκην τοῦ Ἀκύλα κατ' ἔτος ἀγορᾶς [εἶσθαι νέα]  
 βιβλία ὁμοίως καὶ στεφανοῦσθαι τοὺς ἀνδριάντας]  
 [αὐ]τοῦ τρίς [τ]οῦ ἑνιαυτοῦ ὁμοίως [κοσμεῖσθαι τὰς]  
 [ἄλλ]ας εἰκόνας κατ' ἔτος ἐν τῇ ἑορτῇ τοῦ Κέλσου].  
 [Ἐπιτελεσθεῖσης ἀπὸ τῶν ,β, ἄ] ὑψηρέθ[η, ὑπ' α]υτῶν τῶν  
 [κληρονόμων τῆς λοιπῆς ἐπισκευῆς καθιερώθῃ] ἡ βιβλιο-  
 θήκη τῇ τοῦ Κέλσου ἑορτῇ, ὥστε μηνὸς -----ῶνο]ς ἑπτα-  
 καιδεκάτῃ τῶν χρημάτων ...σ.....τῶν ἐγγεγραμμένων]  
 κατὰ τὸ ρητὸν τῆς διαθήκης μή[τε γραφὰς μήτε] κατ[α]ρήσ[εις μήτε]  
 ἀναλώματα ἐπιγενήσεσθαι αὐτοῖς, ἐντελὲς]) ἀπαρτισάντων τῶν  
 τοῦ Ἀκύλα κληρονόμων τὸ ἔργον ἐπιμεληθέντος κατὰ διαθήκην  
 Τιβερίου Κλαυδίου Ἀριστίωνος, τρίς [vacat ἀσιάρ]χου.

To Tiberius Julius Celsus Polemaeanus, Consul, Proconsul of Asia, Tiberius Julius Aquila Polemaeanus, Consul, his son, founded the Celsian Library (the building) from his own wealth with all decorations, dedications and books. He bequeathed for the maintenance of the library and for the acquisition of books, 25.000 denarii from which it (the library) will make its start. Secondly, from the interest each year from the remaining principal 20.000 denarii, let the library and those things related to it be maintained. According to the will of Aquila, let there be a chorus performed on the birthday of Celsus from now on and let new books be purchased every year. Similarly, let the portrait statues be wreathed on each third anniversary. Similarly, let the other images be decorated in

each year of the festival of Celsus...the heirs of Aquila have made it complete and according to the testament, the building was dedicated by Tiberius Claudius Aristion, three times Asiarch.<sup>541</sup>

### **Ulpian Library, Rome (Chapter 3.1.11)**

#### **Dio Cassius, *Roman History*, 68.16.3**

Κατεσκεύασε δὲ καὶ βιβλίων ἀποθήκας καὶ ἔστησεν ἐν τῇ ἀγορᾷ καὶ κίονα μέγιστον ἅμα μὲν ἐς ταφήν ἑαυτοῦ, ἅμα δε ἐς ἐπίδειξιν τοῦ κατὰ τὴν ἀγορὰν ἔργου.

He also built libraries. And he set up in the Forum an enormous column, to serve at once as a monument to himself and as a memorial of his work at the Forum.<sup>542</sup>

#### **Aulus Gellius, *Attic Nights*, 11.17.1-3**

Edicta veterum praetorum sedentibus forte nobis in bibliotheca templi Traiani et aliud quid quaerentibus cum in manus incidissent, legere atque cognoscere libitum est. Tum in quodam edicto antiquiore ita scriptum invenimus: “Qui flumina retanda publice redempta habent, si quis eorum ad me eductus fuerit, qui dicatur quod eum ex lege locationis facere oportuerit non fecisse.” “Retanda” igitur quid esset quarebatur.

As I chanced to be sitting in the library of Trajan’s temple, looking for something else, the edicts of the early praetors fell into my hands, and I thought it worthwhile to read and

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<sup>541</sup> Johnson (1984, 12).

<sup>542</sup> Dio, Cary, and Foster (1925).

become acquainted with them. Then I found this, written in one of the earlier edicts: “If anyone of those who have taken public contracts for clearing the rivers of nets shall be brought before me, and shall be accused of not having done that which by the terms of his contract he was bound to do.” Thereupon the question arose what “clearing the nets” meant.<sup>543</sup>

**Sidonius, *Letters*, 9.16.25**

Cum meis poni statuam perennem  
Nerva Traianus titulis videret,  
inter auctores utriusque fixam bybliothecae

When Nerva Trajan saw my statue, with all my honors inscribed, set up for all time, firmly fixed amidst the writers to the two libraries.<sup>544</sup>

**Scriptores Historiae Augustae, *The Deified Aurelian*. 1.6**

quae omnia ex libris linteis, in quibus ipse cotidiana sua scribi praeceperat, pro tua sedulitate condisces. curabo autem ut tibi ex Ulpia bibliotheca et libri lintei proferantur. tu velim Aurelianum ita ut est, quatenus potes, in litteras mittas. parui, mi Ulpiane, praecepis, accepi libros Graecos et omnia mihi necessaria in manum sumpsi, ex quibus ea quae digna erant memoratu in unum libellum contuli. tu velim meo muneri boni consulas et, si hoc contentus non fueris, lectites Graecos, linteos etiam libros requiras, quos Ulpia tibi bibliotheca, cum volueris, ministrabit.

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<sup>543</sup> Aulus and Rolfe (1927c).

<sup>544</sup> Sidonius and B. (1965).

All these things you may learn in your zeal for research from the linen books, for he gave instructions that in these all that he did each day should be written down. I will arrange, moreover, that the Ulpian Library shall provide you with the linen books themselves. It would be my wish that you write a work on Aurelian, representing him, to the best of your ability, just as he really was. I have carried out these instructions my dear Ulpiano, I have procured the Greek books and laid my hands on all that I needed, and from these sources I have gathered together into one little book all that was worthy mention. You I should wish to think kindly of my work, and if you are not content therewith, to study the Greeks and even to demand the linen books themselves, which the Ulpian Library will furnish you whenever you desire.<sup>545</sup>

**Scriptores Historiae Augustae, *The Deified Aurelian*, 8.1**

Inveni nuper in Ulpia Bibliotheca inter linteos libros epistolam divi Valeriani de Aureliano principe scriptam, quam ad verbum, ut decebat, inserui.

I have recently found among the linen books in the Ulpian Library a letter, written by the Deified Valerian concerning the Emperor Aurelian, which I have inserted word for word, as seemed right.<sup>546</sup>

**Scriptores Historiae Augustae, *The Deified Aurelian*, 24.7**

haec ego et a gravibus viris comperi et in Ulpiae Bibliothecae libris relegi et pro maiestate Apollonii magis credidi

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<sup>545</sup> David (1932).

<sup>546</sup> David (1932).

This incident I have learned from trustworthy men and read over again in the books in the Ulpian Library, and I have been the more ready to believe it because of the reverence in which Apollonius is held.<sup>547</sup>

**Scriptores Historiae Augustae, Tacitus, 8.1**

ac ne quis me temere Graecorum alicui Latinorumve aestimet credidisse, habet in Bibliotheca Ulpia in armario sexto librum elephantinum, in quo hoc senatus consultum perscriptum est, cui Tacitus ipse manu sua subscripsit. nam diu haec senatus consulta quae ad principes pertinebant in libris elephantinis scribebantur.

And now, lest any one consider that I have rashly put faith in some Greek or Latin writer, there is in the Ulpian Library, in the sixth case, an ivory book, in which is written out this decree of the senate, signed by Tacitus himself with his own hand. For those decrees which pertained to the emperors were long inscribed in books of ivory.<sup>548</sup>

**Scriptores Historiae Augustae, Probus, 2.1**

Usus autem sum, ne in aliquo fallam carissimam mihi familiaritatem tuam, praecipue libris ex Bibliotheca Ulpia, aetate mea Thermis Diocletianis, et item ex Domo Tiberiana, usus etiam et registis scribarum Porticus Porphyreticae, actis etiam senatus ac populi.

I have used, moreover - not to deceive in any respect your friendly interest which I hold most dear - chiefly the books from the Ulpian Library (in my time in the Baths of

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<sup>547</sup> David (1932).

<sup>548</sup> David (1932).

Diocletian) and likewise from the House of Tiberius, and I have used also the registers of the clerks of the Porphyry Portico and the transactions of the senate and of the people.<sup>549</sup>

### **Scriptores Historiae Augustae, Numerian, 11.3**

huius oratio fertur ad senatum missa tantum habuisse eloquentiae ut illi statua non quasi Caesari sed quasi rhetori decernerentur, ponenda in Bibliotheca Ulpia, cui subscriptum est: “Numeriano Caesari, oratori temporibus suis potentissimo.

The speech, moreover, which he sent to the senate is said to have been so eloquent that a statue was voted him not as a Caesar but as a rhetorician, to be set up in the Ulpian Library with the following inscription: “To Numerian Caesar, the most powerful orator of his time.”<sup>550</sup>

### **Neon Library, Rome (Chapter 3.1.12)**

#### **Devijver, 1993, p. 107**

ἡ βουλὴ καὶ ὁ δῆμος | Τ(ίτον) Φ(λάουιον) Σεουηριανὸν Νέωνα, υἱὸν πόλεως, φιλό |  
πατρὶν, κτίστην, πανάρετον, ἀγωνοθέτην ἐκ τῶν | ἰδίων δι' αἰῶνος, τεμῆς καὶ εὐνοῖας τῆς  
εἰς ἑαυτοῦς

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<sup>549</sup> David (1932).

<sup>550</sup> David (1932).

the senate and the people honored Titus Flavius Severian Neon, son of the city, patriotic, builder, all-virtuous, organizer of competitions, because of his honor and favor with regard to them.<sup>551</sup>

**Devijver, 1993, p. 107**

ἡ βουλὴ [καὶ] ὁ δῆμος | Τ(ίτον) Φ(λάουιον) Ἀτταλιανὸν | Κουαδρᾶτον, ἔπαρχον σπείρης  
β' | Θρακῶν, χειλίαρχον λεγεῶνος γ' Γαλλικῆς, πανάρε- | τον, ἥρωα

the senate and the people honored T(itus) F(lavius) Attalianus Quadratus, praefectus cohortis II Thracorum, tribunus legionis III Gallicae, all-virtuous, hero.<sup>552</sup>

**Devijver, 1993, p. 107**

ἡ βουλὴ καὶ ὁ δῆμος | Τ(ίτον) Φ(λάουιον) Ἀττάλλου υἱὸν Κυρεῖνα | Νέωνα, ἀρχιερέα τῶν  
Σε- | βαστῶν πρῶτον, διὰ βίου δὲ ἀγωναθέτην, υἱὸν τῆς | πόλεως, φιλοκαίσαρα καὶ  
φικόπατριν, πανάρετον

the senate and the people honored T(itus) F(lavius), son of Attalus, Quirina Neon, first high priest of the imperial cult, organizer of competitions throughout his life, son of the city, friend of Caesar, patriotic, all-virtuous.<sup>553</sup>

**Devijver, 1993, p. 108**

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<sup>551</sup> Translation by the author.

<sup>552</sup> Translation by the author.

<sup>553</sup> Translation by the author.



ἡ βουλὴ καὶ ὁ δῆμος | Πόπλιον Φλάουιον Φλαοῦιου Νέωνος | υἱὸν Κυρεῖνα Δαρεῖον,  
ἥρωα | πανάρετον.

the senate and the people honored Publius Flavius, son of Flavius Neon, Quirina Dareius,  
hero, all-virtuous.<sup>554</sup>

**Devijver, 1993, p. 108**

ἡ βουλὴ καὶ ὁ δῆμος | Κλαυδίαν Σεουήραν, γυναῖκα Τίτου | Φλαοῦιου Νέωνος, μητέρα  
πόλεως, | Πανάρετον

the senate and the people honored Claudia Severa, wife of Titus Flavius Neon, mother of  
the city, all-virtuous.<sup>555</sup>

**Devijver, 1993, p. 108**

ἡ βουλὴ καὶ ὁ δῆμος | Φλαοῦιαν Σεουήραν, γυναῖκα Ἰουλίου Μα- | ξιμιανοῦ ἐπιτρόπου  
τῶν Σεβαστῶν, | θυγατέρα πόλεως, πανάρετον

the senate and the people honored Flavia Severa, wife of Iulius Maximianus, procurator  
Augustorum, daughter of the city, all-virtuous.<sup>556</sup>

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<sup>554</sup> Translation by the author.

<sup>555</sup> Translation by the author.

<sup>556</sup> Translation by the author.

**Devijver, 1993, p. 108**

ἡ βουλὴ καὶ ὁ δῆμος | Μ(ἄρκον) Ἰ(ούλιον) Σάνκτον Μαξιμῖνον, ἔπαρ(χον) | σπείρης  
χειλί(αρχον) λεγ(εῶνος) κβ' | Δηιοτεριανῆς, ἔπαρ(χον) ἄλης Γαιτουλῶν, | ἐπίτρ(οπον)  
Σεβ(αστοῦ), | δικαιοδότην Ἀλεξανδρείας, πανάρετον

the senate and the people honored M(arcus) I(ulius) Sanctus Maximinus, praefectus  
cohortis, tribunus legionis XXII Deiotarianaе, praefectus alae Gaetulorum, procurator  
Augusti, iuridicus Alexandriae, all-virtuous.<sup>557</sup>

### **Library of Nysa, Asia Minor (Chapter 3.1.13)**

**Julius Africanus, Cestos 18 (Oxyrhynchus Papyri 3. 412)**

τήνδε τὴν σύνπασαν ὑπόθεσιν ἀνακειμένην εὐρέσεις ἐν τε τοῖς ἀρχείοις τῆς ἀρχαίας  
πατρίδος κολωνείας Αἰλίας Καπιτωλίνης τῆς Παλαιστίνης, κὰν Νύση τῆς Καρίας, μέχρι  
δὲ τοῦ τρισκαιδεκάτου ἐν Ῥώμῃ πρὸς ταῖς Ἀλεξάνδρου θερμαῖς ἐν τῇ ἐν Πανθείῳ  
βιβλιοθήκῃ τῇ καλῇ ἣν αὐτός ἡρχιτεκτόνησα τῷ Σεβαστῷ.

You will find this whole work unexceptionally in the archives of the ancient county of  
the colony of Aelia Capitolina in Palestine, and at Nysa in Caria, and (my work) up to the  
thirteenth line, in Rome, close to the baths of Alexander, in the beautiful library of  
Pantheon, which I designed myself to the honored.<sup>558</sup>

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<sup>557</sup> Translation by the author.

<sup>558</sup> Julius, Grenfell, and Hunt (1898).

**Strabo, *Geography*, 14.1.43**

Νῦσα δ' ἴδρυται πρὸς τῇ Μεσωγίδι τὸ πλέον τῷ ὄρει προσανακεκλιμένη, ἔστι δ' ὡσπερ δίπολις: διαιρεῖ γὰρ αὐτὴν χαράδρα τις, ποιοῦσα φάραγγα, ἣς τὸ μὲν γέφυραν ἐπικειμένην ἔχει, συνάπτουσιν τὰς δύο πόλεις, τὸ δ' ἀμφιθεάτρῳ κεκόσμηται κρυπτὴν ἔχοντι τὴν ὑπόρρυσιν τῶν χαραδρωδῶν ὑδάτων: τῷ δὲ θεάτρῳ δύο ἄκραι, ὧν τῇ μὲν ὑπόκειται τὸ γυμνάσιον τῶν νέων, τῇ δ' ἀγορὰ καὶ τὸ γεροντικόν· πρὸς δὲ νότον ὑποπέπτωκε τῇ πόλει τὸ πεδῖον, καθάπερ καὶ ταῖς Τράλλεσιν.

Nysa is situated near Mt. Mesogis, for the most part lying upon its slopes; and it is a double city, so to speak, for it is divided by a torrential stream that forms a gorge, which at one place has a bridge over it, joining the two cities, and at another is adorned with an amphitheatre, with a hidden underground passage for the torrential waters. Near the theatre are two heights, below one of which is the gymnasium of youths; and below the other is the market place and the gymnasium for older persons. The plain lies to the south of the city, as it does to the south of Tralles.<sup>559</sup>

**Melitine Library, Pergamon (Chapter 3.1.13)**

**AvP 8, 3 No. 38, Inv.1936, 2.**

Ἡ βουλὴ καὶ ὁ δῆμος τῆς μητροπόλεως τῆς Ἀσίας καὶ δις νεωκόρου πρώτης Περγαμηνῶν πόλεως vac. ἐτίμησεν Φλ. Μελιτίνην, γυναῖκα Φλ. Μητροδώρου πρυτάνεως

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<sup>559</sup> Strabo and Jones (1929).

καὶ μητέρα vac. Φλ. Μητροδώρου πρυτάνεως, κατασκευάσασαν τὴν ἐν τῷ ἱερῷ τοῦ Σωτῆρος Ἀσκληπιοῦ βιβλιοθήκην.

The council and the people of the metropolis of Asia, twice custodian of a temple and city of the Pergamenes honored Fl. Melitine, the wife of Fl. Metrodoros, Prytanis, and mother of Fl. Metrodoros, Prytanis, who set up the library in the sanctuary of Asklepios Soter.<sup>560</sup>

**AvP 8, 3 No. 6, Inv. 1930, Nr. 12**

Θεὸν Ἀδριανόν | Φλ. Μελιτίνη

To the god Hadrian, Fl. Melitine.<sup>561</sup>

### **Hadrianic Library, Athens (Chapter 3.1.14)**

**Pausanias, *Description of Greece*, 1.18.9**

Ἀδριανὸς δὲ κατασκευάσατο μὲν καὶ ἄλλα Ἀθηναίοις, ναὸν Ἑρας καὶ Διὸς Πανελληνίου καὶ θεοῖς τοῖς πᾶσιν ἱερόν κοινόν, τά δὲ ἐπιφανέστατα ἑκατὸν εἰσι κίονες Φρυγίου λίθου· πεποίηνται δὲ καὶ ταῖς στοαῖς κατὰ τὰ αὐτὰ οἱ τοῖχοι. καὶ οἰκήματα ἐνταῦθα ἐστὶν ὀρόφω τε ἐπιχρῦσῳ καὶ ἀλαβάστρῳ λίθῳ, πρὸς δὲ ἀγάλμασι κεκοσμημένα καὶ γραφαῖς· κατάκειται δὲ ἐς αὐτὰ βιβλία. καὶ γυμνάσιόν ἐστιν ἐπώνυμον Ἀδριανοῦ. κίονες δὲ καὶ ἐνταῦθα ἑκατὸν λιθοτομίας τῆς Λιβύων.

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<sup>560</sup> Johnson (1984, 78).

<sup>561</sup> Translation by the author.

Hadrian constructed other buildings also for the Athenians: a temple to Hera and Zeus Panhellenios (Common to all Greeks), a sanctuary common to all the gods, and, most famous of all, a hundred pillars of Phrygian marble. The walls too are constructed of the same material as the cloisters. And there are rooms adorned with a gilded roof and with alabaster stone, as well as with statues and paintings. In them are kept books. There is also a gymnasium named after Hadrian; of this too the pillars are a hundred in number from the Libyan quarries.<sup>562</sup>

### **Library in the Forum of Philippi, Northern Greece (Chapter 3.1.16)**

**Collart P., *BCH* 57, 1933, p. 316-320**

...in honorem divinae domus et coloniae Iulia Augustae

Philippiensium...Iunior...s...oni...Optatus opus bybliothecae...

...In honor of the divine house and the colony of Julia Augusta of Philippi...the younger...Optatus (dedicates) the work of the library...<sup>563</sup>

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<sup>562</sup> Pausanias and Jones (1918).

<sup>563</sup> Johnson (1984, 41).

## **Library of Rogatinus, Timgad (Chapter 3.1.17)**

### **Dedicatory Inscription, Cagnat, 1909, p. 11**

Ex liberalitate M. Juli(i) Quintiani Flavi(i) Rogatiani c(larissimae) m(emoriae) v(iri) quam testamento suo reipublicae coloniae Thamagadensium patriae suae legavit opus bibliothecae ex sestertium CCCC mil(ibus) num(mum) curante republica perfectum est.

From the gift which M. Julius Quintianus Flavius Rogatianus, a man of most famous memory, bequeathed in his will to the state, the colony of Thamugadae, his homeland, the building of the library was completed from the sum of 400,000 sesterces, with the state attending to it.<sup>564</sup>

## **Alexandria, Hellenistic Royal Library at the Museum (Chapter 3.3.1)**

### **Epiphanes, *De mensuris et ponderibus*, 11**

ἐν τῇ πρώτῃ βιβλιοθήκῃ τῇ ἐν τῷ Βρουχείῳ οἰκοδομοθεΐσῃ ἔτι δὲ ὕστερον καὶ ἕτερα ἐγένετο βιβλιοθήκη ἐν τῷ Σεραπίῳ, μικροτέρα τῆς πρώτης ἥτις καὶ θυγάτηρ ὠνομάσθη αὐτῆς ἐν ἧ ἀπετέθησαν αἱ τοῦ Ἀκύλα καὶ Συμμάχου καὶ Θεοδοτίωνος καὶ τῶν λοιπῶν ἐρμηνεῖαι μετὰ διακοσιοστὸν καὶ πεντηκοστὸν ἔτος.

In addition to the first library that had been constructed on the Brouchion (Hill), another library was set up in the Serapeum that was smaller than the first, and for which reason it

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<sup>564</sup> Translation of the author.

was named daughter of the latter. In that library, were placed the translations of Aquila, Symmachus and Theodotius after the 250th year.<sup>565</sup>

**Strabo, *Geography*, 13.1.54**

καὶ ὁ τοῦ Κορίσκου υἱὸς Νηλεύς, ἀνὴρ καὶ Ἀριστοτέλους ἢ κροαμένος καὶ Θεοφράστου διαδεδεγμένος δὲ τὴν βιβλιοθήκην τοῦ Θεοφράστου, ἐν ἧ ἦν καὶ ἡ τοῦ Ἀριστοτέλους. ὁ γοῦν Ἀριστοτέλης τὴν ἑαυτοῦ Θεοφράστῳ παρέδωκεν, ὥπερ καὶ τὴν σχολὴν ἀπέλιπε, πρῶτος ὧν ἴσμεν συναγαγὼν βιβλία καὶ διδάξας τοὺς ἐν Αἰγύπτῳ βασιλέας βιβλιοθήκης σύνταξιν.

and Neleus the son of Coriscus, this last a man who not only was a pupil of Aristotle and Theophrastus, but also inherited the library of Theophrastus, which included that of Aristotle. At any rate, Aristotle bequeathed his own library to Theophrastus, to whom he also left his school; and he is the first man, so far as I know, to have collected books and to have taught the kings in Egypt how to arrange a library.<sup>566</sup>

**Strabo, *Geography*, 17.1.8**

τῶν δὲ βασιλείων μέρος ἐστὶ καὶ τὸ Μουσεῖον, ἔχον περίπατον καὶ ἐξέδραν καὶ οἶκον μέγαν ἐν ᾧ τὸ συσσίτιον τῶν μετεχόντων τοῦ Μουσειῦ φιλολόγων ἀνδρῶν.

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<sup>565</sup> Translation of the author.

<sup>566</sup> Strabo and Jones (1929).

The Museum is also part of the royal palaces; it has a public walk, an exedra with seats, and a large house, in which is the common mess-hall of the men of learning who share the Museum.<sup>567</sup>

### **Alexandria, Library at the Sebasteion (Chapter 3.3.2)**

#### **Philon, *Legatio Ad Gaium*, 131**

οὐδὲν γὰρ τοιοῦτόν ἐστι τέμενος, οἷον τὸ λεγόμενον Σεβαστεῖον, ἐπιβατηρίου Καίσαρος νεώς,

<ὄς> ἀντικρὺ τῶν εὐορμοτάτων λιμένων μετέωρος ἴδρυται μέγιστος καὶ ἐπιφανέστατος καὶ οἶος οὐχ ἐτέρωθι κατὰπλεως ἀναθημάτων, [ἐν] γραφαῖς καὶ ἀνδριάσι καὶ ἀργύρῳ καὶ χρυσῷ περιβεβλημένος ἐν κύκλῳ, τέμενος εὐρύτατον στοαῖς, βιβλιοθήκαις, ἀνδρῶσιν, ἄλσεσι, προπυλαίοις, εὐρυχωρίαῖς, ὑπαίθροισι, ἅπασιν τοῖς εἰς πολυτελέστατον κόσμον ἡσκημένον, ἐλπὶς καὶ ἀναγομένοις καὶ καταπλέουσι σωτήριος.

There is no other precinct like our so-called “Augusteum”, the temple of Caesar, the protector of sailors. It is situated high up, opposite the sheltered harbours, and is very large and conspicuous; it is filled with dedications on a unique scale, and is surrounded on all sides by paintings, statues, and objects of gold and silver. The extensive precinct is furnished with colonnades, libraries, roofed enclosures, gardens, propylaea, and

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<sup>567</sup> Strabo and Jones (1932).



everything that makes for lavish decoration. It gives hope of safety to sailors when they set out to sea and when they return.<sup>568</sup>

### **Antiochia, Hellenistic Royal Library of (Chapter 3.3.3)**

#### **Suidas s.v. Εὐφορίων**

...ἦλθε πρὸς Ἀντίοχον τὸν μέγαν ἐν Συρίᾳ βασιλεύοντα καὶ προέστη ὑπ' αὐτοῦ τῆς ἐκεῖσε δημοσίας βιβλιοθήκης

He [Euphorion of Chalchis, a distinguished poet] went to Antiochus the Great who ruled in Syria and who had appointed him as head of the public library there.<sup>569</sup>

#### **Joannes Malalas, *Chronographia*, 60, O 304**

καὶ τὸ ἱερὸν τῶν Μουσῶν τὸ κτισθὲν ὑπὸ Ἀντιόχου τοῦ Φιλοπάτορος ἐκ τῶν ἐαθέντων χρημάτων κατὰ διαθήκας ὑπὸ Μάρωνος Ἀντιοχέως, μετοικήσαντος εἰς τὰς Ἀθήνας καὶ κελεύσαντος τότε ἐκ τῶν αὐτοῦ κτισθῆναι τὸ τῶν Μουσῶν ἱερὸν καὶ βιβλιοθήκην.

The shrine of the Muses which was built by Antiochus Philopator with the money left in his will by Maron of Antioch, who had emigrated to Athens and had then stipulated that there should be built the shrine of the Muses and a library with his money.<sup>570</sup>

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<sup>568</sup> Philo (1961).

<sup>569</sup> Platthy (1968, 170, n.166).

<sup>570</sup> Platthy (1968, 170-171, n.167).

### **Antiochia, Library of (Chapter 3.3.4)**

#### **Suidas, s.v. Ἰοβιανός**

ὁ δὲ Ἰοβιανός, ἐκ τῆς γυναικὸς αὐτοῦ κινηθεὶς τὸν ὑπὸ Ἀδριανοῦ τοῦ βασιλέως κτισθέντα ναὸν χαριέστατον ἐς ἀποθέωσιν τοῦ πατρὸς Τραϊανοῦ, παρὰ δὲ τοῦ Ἰουλιανοῦ κατασταθέντα βιβλιοθήκην εὐνούχῳ τινὶ Θεοφίλῳ κατέφλεξε σὺν πᾶσιν οἷς εἶχε βιβλίους.

Then Jovian, urged by his wife, burned down a very nice temple established by the emperor Hadrian for the deification of his father Trajan, which had been established into a library by Julian for one of his eunuchs, Theophilus. Jovian set it on fire along with all its books.<sup>571</sup>

### **Aphrodisias, Library of Archive (Chapter 3.3.5)**

#### **MAMA VIII, 498, 2.8-31**

τετελειωκότα [δὲ καὶ] | ἐκ τῶν ἰδίων τοῦ γραμματοφυλακίου, [σὺν] | καὶ Ἰουλίᾳ Παύλᾳ τῇ γυναικί, τοῦ περ[ιστώ]ου στοᾶς μεσημβρινῆς ἀπὸ θεμελίων τὸ [λιθι]κὸν πᾶν · καὶ τὸν ἐν αὐτῇ οἶκον σὺν περιφλ[ιώμασιν] | καὶ βιβλιοθήκαις καὶ τοῖς παρ' αὐτὸν ἐργαστη[ρίοις] | διστέγοις δυσίν · καὶ στοᾶς ἀνατολικῆς ἀπὸ θ[εμελίω]ν διάστυλα ὀκτώ · μετενηχότα δὲ [εἰς | ταύτη]ν καὶ τῆς παλαιᾶς στοᾶς καὶ τὸ γενόμε[ενον] | ψήφισμα διάσ]τυλα ὀκτώ · καὶ στοᾶς δυσμικῆ[ς διά]στυλον ἓν · τοῖς τε κείοσιν [τῆς ταύτης προσ]επιθεικέναι τὰς κεφαλὰς πᾶσι[ν τά τε ἐπιστύλια] | καὶ ζωφόρους καὶ γείση τῶν κείοσιν ἐπι[τεθεικέναι] |

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<sup>571</sup> Translation by the author.

πᾶσιν· κείουσιν τε αὐτῆς πέντε ἔχουσιν τοὺς [θρά]|νοὺς μόνο ἐπιτεθεικέναι τοὺς λοιποὺς [ς  
σφον]|δύλους πάντας· τοῦ δὲ οἴκου τοῦ βορινοῦ [τῆς τε]| ἐξέδρας λείποντα λευκόλιθα  
πεποιηκό[τα πάν]|τα σὺν ὀροφαῖς καὶ τοῖς ἐν τῷ οἴκῳ κείουσιν καὶ β[ιβλιοθή]|καις καὶ τοῖς  
φυ[ραμ]ατικοῖς καὶ τοῖς λοιποῖς πᾶ[σιν· ἐρ]|γαστήρια τε σὺν τοῖς ἐν τῇ ἐξέδρᾳ  
τετελειω[κότα δέκα] | ἑννέα· τὸ δὲ περιστῶν ὅλον δεδοκῶσ[θαι καὶ] | κεκεραμῶσθαι  
καὶ ὠροφῶσθαι καὶ συντε[τελει]ῶσθαι ἐκ τῶν ἰδίων ὑφέαυτοῦ σὺν [καὶ τοῖς] |  
ἐφεστῶσιν θυρώμασιν πᾶσιν.

Who completed with his own funds, together with his wife Iulia Paula, the entire stone construction of the south porticus of the peristoon of the archive from the foundation up; and the oikos withi is in the portucis together with the door frames and the bookcases and the two adjacent two-storey workshops; and eight diastylof the east stoa, from the foundation up, bringing to it also eight diastylo of the old stoa in accordance with the decree which was passed; and one diastylon of the west stoa; and he added to all the columns of this stoa the capitals, and also placed on all the columns the architraves and the friezes and the cornices; and to five columns, which only possessed wooden beams he added all the other drums; he also made all the missing/remaining white stone parts of the north oikos and of the exedra, together with the ceilings and the columns in the oikos and the bookcases and the stucco decorations and all the rest; and he completed nineteen workshops (counting also those which are in the exedra); and he placed wooden beams

and tiles and ceilings to the entire peristoon and completed it with his own funds and by himself together with all the standing doorways.<sup>572</sup>

### **MAMA VIII, 498 bis**

[--- κατασκ]ευάσας τὴν μεση[μβρίνην στοὰν τ]οῦ γραμματοφυλακίου

--- who built the south stoa of the grammatofylakion<sup>573</sup>

### **Athens, Library at the Lyceum (Chapter 3.3.6)**

#### **Strabo, *Geography*, 13.1.54**

ὁ γοῦν Ἀριστοτέλης τὴν ἑαυτοῦ Θεοφράστῳ παρέδωκεν, ὅπερ καὶ τὴν σχολὴν ἀπέλιπε, πρῶτος ὧν ἴσμεν συναγαγὼν βιβλία καὶ διδάξας τοὺς ἐν Αἰγύπτῳ βασιλέας βιβλιοθήκης σύνταξιν.

Aristotle bequeathed his own library to Theophrastus, to whom he also left his school; and he is the first man, so far as I know, to have collected books and to have taught the kings in Egypt how to arrange a library.<sup>574</sup>

#### **Diogenes Laertius, *Lives of Eminent Philosophers*, Theophrastus, 5.51-52**

πρῶτον μὲν τὰ περὶ τὸ μουσεῖον καὶ τὰς θεὰς συντελεσθῆναι κἄν τι ἄλλο ἰσχὺν περὶ αὐτὰς ἐπικοσμηθῆναι πρὸς τὸ κάλλιον: ἔπειτα τὴν Ἀριστοτέλους εἰκόνα τεθῆναι εἰς τὸ

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<sup>572</sup> Chaniotis (2008, 66).

<sup>573</sup> Chaniotis (2008, 67).

<sup>574</sup> Strabo and Jones (1929).

ἱερὸν καὶ τὰ λοιπὰ ἀναθήματα ὅσα πρότερον ὑπῆρχεν ἐν τῷ ἱερῷ: εἶτα τὸ στωίδιον οἰκοδομηθῆναι τὸ πρὸς τῷ μουσεῖῳ μὴ χειρόν ἢ πρότερον: ἀναθεῖναι δὲ καὶ τοὺς πίνακας, ἐν οἷς αἱ τῆς γῆς περίοδοι εἰσιν, εἰς τὴν κάτω στοάν: 19 [52] ἐπισκευασθῆναι δὲ καὶ τὸν βωμόν, ὅπως ἔχη τὸ τέλειον καὶ τὸ εὐσχημον. βούλομαι δὲ καὶ τὴν Νικομάχου εἰκόνα συντελεσθῆναι ἴσην. τὸ μὲν τῆς πλάσεως ἔχει Πραξιτέλης, τὸ δ' ἄλλο ἀνάλωμα ἀπὸ τούτου γενέσθω. σταθῆναι δὲ ὅπου ἂν δοκῇ τοῖς καὶ τῶν ἄλλων ἐπιμελουμένοις τῶν ἐν τῇ διαθήκῃ γεγραμμένων. καὶ τὰ μὲν περὶ τὸ ἱερὸν καὶ τὰ ἀναθήματα τοῦτον ἐχέτω τὸν τρόπον. τὸ δὲ χωρίον τὸ ἐν Σταγείροις ἡμῖν ὑπάρχον δίδωμι Καλλίνῳ: τὰ δὲ βιβλία πάντα Νηλεΐ. τὸν δὲ κῆπον καὶ τὸν περίπατον καὶ τὰς οἰκίας τὰς πρὸς τῷ κήπῳ πάσας δίδωμι τῶν γεγραμμένων φίλων ἀεὶ τοῖς βουλομένοις συσχολάζειν καὶ συμφιλοσοφεῖν ἐν αὐταῖς,

First, they should be applied to finish the rebuilding of the Museum with the statues of the goddesses, and to add any improvements which seem practicable to beautify them.<sup>7</sup> Secondly, to replace in the temple the bust of Aristotle with the rest of the dedicated offerings which formerly were in the temple. Next, to rebuild the small cloister adjoining the Museum at least as handsomely as before, and to replace in the lower cloister the tablets containing maps of the countries traversed by explorers. [52] Further, to repair the altar so that it may be perfect and elegant. It is also my wish that the statue of Nicomachus should be completed of life size. The price agreed upon for the making of the statue itself has been paid to Praxiteles, but the rest of the cost should be defrayed from the source above mentioned. The statue should be set up in whatever place seems desirable to the executors entrusted with carrying out my other testamentary dispositions. Let all that concerns the temple and the offerings set up be arranged in this manner. The

estate at Stagira belonging to me I give and bequeath to Callinus. The whole of my library I give to Neleus. The garden and the walk and the houses adjoining the garden, all and sundry, I give and bequeath to such of my friends hereinafter named as may wish to study literature and philosophy there in common.<sup>575</sup>

**Diogenes Laertius, *Lives of Eminent Philosophers*, Straton, 5.62**

καταλείπω δὲ τὴν μὲν διατριβὴν Λύκωνι, ἐπειδὴ τῶν ἄλλων οἱ εἰσι πρεσβύτεροι, οἱ δὲ ἄσχολοι. καλῶς δ' ἂν ποιοῖεν καὶ οἱ λοιποὶ συγκατασκευάζοντες τούτῳ. καταγεγράφαμεν, καὶ τὰ σκεύη πάντα κατὰ τὸ συσσίτιον καὶ τὰ στρώματα καὶ τὰ ποτήρια.

I leave the school to Lyco, since of the rest some are too old and others too busy. But it would be well if the others could co-operate with him. I also give and bequeath to him all my books, except those of which I am the author, and all the furniture in the dinning-hall, the cushions and the drinking-cups.<sup>576</sup>

**Diogenes Laertius, *Lives of Eminent Philosophers*, Lykon, 5.70-71**

τὸν δὲ περίπατον καταλείπω τῶν γνωρίμων τοῖς βουλομένοις, Βούλωνι, Καλλίνῳ, Ἀρίστῳ, Ἀμφίῳ, Λύκωνι, Πύθῳ, Ἀριστομάχῳ, Ἡρακλείῳ, Λυκομήδει, Λύκωνι τῷ ἀδελφιδῷ. ...

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<sup>575</sup> Diogenes and Hicks (1925a).

<sup>576</sup> Diogenes and Hicks (1925a).

τῶν δ' ἐν Αἰγίνῃ μοι γενομένων μοριῶν μετὰ τὴν ἐμὴν ἀπόλυσιν καταχωρισάτω Λύκων τοῖς νεανίσκοις εἰς ἐλαιοχρηστίαν, ὅπως κάμοῦ καὶ τοῦ τιμήσαντος ἐμὲ μνήμη γένηται διὰ τῆς χρείας αὕτη ἢ προσήκουσα.

I leave the Peripatus to such of my friends as choose to make use of it, to Bulo, Callinus, Ariston, Amphion, Lyco, Pytho, Aristomachus, Heracleus, Lycomedes and my nephew Lyco...

After my decease Lyco shall make over, for the use of the young men, the oil from the olive-trees belonging to me in Aegina for the due commemoration- so long as they use it- of myself and the benefactor who did me honour.<sup>577</sup>

### **Athens, Library at the Gymnasium of Ptolemy (Chapter 3.3.7)**

#### **IG II<sup>2</sup> 1009**

ἀνέθη- | [καν δὲ καὶ φιάλην τεῖ τε] Δήμητρι καὶ τεῖ Κόρει καὶ τεῖ μητρὶ τ[ῶν] θεῶν κα[ὶ  
βυ]βλία ἑκα - | [τὸν εἰς τὴν βιβλιοθήκη]ν | πρῶτοι κατὰ τὸ ψήφισμα ὃ Θεοδωρίδη[ς]  
Πειραι[εὺς] εἶπεν

dedicated a vase to Demeter and the Daughter and to the mother god, and one hundred books for the library, as was proposed first by Thodorides of Piraeus.<sup>578</sup>

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<sup>577</sup> Diogenes and Hicks (1925a).

<sup>578</sup> Platthy (1968, 110, n.29).





they dedicated books ... to the library of Ptolemaion in accordance with the degree which Metrophanes proposed.<sup>581</sup>

**Pausanias, *Description of Greece*, 1.17.2**

ἐν δὲ τῷ γυμνασίῳ τῆς ἀγορᾶς ἀπέχοντι οὐ πολὺ, Πτολεμαίου δὲ ἀπὸ τοῦ κατασκευασαμένου καλουμένῳ, λίθοι τέ εἰσιν Ἑρμαῖ θεᾶς ἄξιοι καὶ εἰκὼν Πτολεμαίου χαλκῆ·

In the gymnasium not far from the market place, called Ptolemy's from the founder, are stone Herms well worth seeing and a bronze statue of Ptolemy.<sup>582</sup>

**Cicero, *On ends*, 5.1.1**

Cum audissem Antiochum, Brute, ut solebam, cum M. Pisone in eo gymnasio quod Ptolemaeum vocatur,

My dear Brutus, once I had been attending a lecture of Antiochus, as I was in the habit of doing, with Marcus Piso, in the building called the Gymnasium of Ptolemy.<sup>583</sup>

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<sup>581</sup> Platthy (1968, 112, n. 35).

<sup>582</sup> Pausanias and Jones (1918).

<sup>583</sup> Cicero and Rackham (1914).

## **Carthage, Library of (Chapter 3.3.8)**

### **Apuleius, *Florida*, 4.18.85**

Mihi liceat ... ipsius Carthaginis vel curiam vel bibliothecam substituere; et quelques lignes plus loin: si erudita fuerint, ut si in bibliotheca legantur.

I beg your leave to shift my scene, not, however, to any distant city overseas, but to the senate-house or public library of Carthage (...) if my words reveal learning, I beg you to regard them as though you were reading them in the public library.<sup>584</sup>

## **Como, Library of (Chapter 3.3.9)**

### **Pliny, *Letters*, 1.8**

Petiturus sum enim ut rursus vaces sermoni quem apud minicipes meos habui bibliothecam dedicaturus.

I intend to ask you to spare another look at the speech I delivered to my fellow-citizens at the official opening of the library at Comum.<sup>585</sup>

### **CIL, 5.5262**

[item bybliotheam et] in tutelam bybliothecae sestertium C milia

He also gave a library and one million sesterces for the maintenance of the library.<sup>586</sup>

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<sup>584</sup> Apuleius (1970).

<sup>585</sup> Pliny and Radice (1969a).

## Constantinople, Library of (Chapter 3.3.10)

### Codex Theodosianus, 14.9.2

Antiquarios ad bibliothecae codices componendos vel pro vetustate reparandos quattor Graecos et tres Latinos scribendi peritos legi iubemus.

We command that four Greek and three Latin copyists, skilled in writing, shall be selected for copying the manuscripts of the library and for repairing them on account of their age.<sup>587</sup>

### Zosimos, 3.11.3

βιβλιοθήκην ἐν τῇ βασιλέως οἰκοδομήσας στοᾶ καὶ ταύτη βιβλους ὅσας εἶχεν ἐπαποθέμενος ἐπὶ τὸν κατὰ Περσῶν παρεσκευάζετο πόλεμον.

He built a library to the Imperial portico, in which he placed all the books he possessed; and having done this, he prepared for the Persian war.<sup>588</sup>

## Corinth, Library of (Chapter 3.3.11)

### Dio Chrysostom, *Discourses*, 37.8

ἀλλά γε τὴν εἰκὼ τοῦ σώματος ἐποιήσασθε καὶ ταύτην φέροντες ἀνεθήκατε εἰς τὰ βιβλία, εἰς προεδρίαν, οὗ μάλιστ' ἂν ᾤεσθε τοὺς νέους προκαλέσασθε τῶν αὐτῶν ἡμῖν ἐπιτηδευμάτων ἔχεσθαι.

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<sup>586</sup> Translation by the author.

<sup>587</sup> Pharr, Davidson, and Pharr (1952).

<sup>588</sup> Translation by the author.

you did have a bust made of me, and you took this and set it up in your Library, a front-row seat as it were, where you felt it would most effectively stimulate the youth to persevere in the same pursuits as myself.<sup>589</sup>

### **Cos, Library at the Gymnasium (Chapter 3.3.12)**

**BCH, 59 (1935), 421,61**

Οἶδε επαγγείλαν[το] εἰς τὰν βιβλιοθήκην ·/Δίοκλῆς Ἀπολλοδώρου καὶ Ἀπολλόδωρος  
Διοκλεῦς τὰν βιβλιοθήκην καὶ βύβλια ρ·

The following contributed to the library: Diocles, son of Apollodoros, and Apollodoros  
Diocles contributed the library and 100 books.<sup>590</sup>

### **Cos, Library at the Asklepeion (Chapter 3.3.13)**

**IC nr. 92; JKDAI 18, 4, 193-194**

Γάιος Στερτίνιος Ἡρακλείτου υἱὸς Ξενοφῶν φιλόκαι | σαρ ἱερεὺς Ἀσκλαπιοῦ Ὑγείας  
Ἀπίο | νας καὶ τῶν Σε | βαστῶν τοῖς Σε | βαστοῖς καὶ τῷ δάμοι ἐκ τῶν ἰδίων τὰν  
(βυ[βλιοθήκην])...

Caius Stertinius Xenophon, son of Heracleitus, friend of the Caesar, the priest of  
Asclepius, of Hygieia, of Apiona and of the Imperial deities <dedicates> the library to the  
Imperial deities and to the people out of his own weath.<sup>591</sup>

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<sup>589</sup> Chrysostom and Crosby (1946).

<sup>590</sup> Platthy (1968, 146-147, n.112).

<sup>591</sup> Platthy (1968, 147, n.113).

## **Cumae, Library of Faustus (Chapter 3.3.14)**

### **Cicero, *Ad Atticus*, 4.10 (Letter 84)**

Ego hic pascor bibliotheca Fausti. fortasse tu putabas his rebus Puteolanis et Lucrinensibus. ne ista quidem desunt, sed mehercule <ut> a ceteris oblectationibus deseror et voluptatibus cum propter aetatem tum propter rem publicam, sic litteris sustentor et recreor maloque in illa tua sedecula quam habes sub imagine Aristotelis sedere quam in istorum sella curuli tecumque apud te ambulare quam cum eo quocum video esse ambulandum.

I am living here on Faustus' library - you perhaps think it's on these Puteolan and Lucrine commodities. Well, I have them too. But seriously, while all other amusements and pleasures have lost their charm because of my age and the state of our country, literature relieves and refreshes me. I would rather sit on that little seat you have underneath Aristotle's bust than in our Consul's chairs of state, and I would rather take a walk with you at your home than with the personage in whose company it appears that I must walk.<sup>592</sup>

## **Soli, Library of (Chapter 3.3.15)**

### **IGR 3. 930**

Ἀπολλώνιος τῷ πατρὶ .../ καὶ τῇ μητρὶ Ἄρ... / τον περίβολον καὶ .../ υμῶν αὐτῶν ἐντολάς  
εα...// ἑαυτοῦ τῆς Σολίων πόλεως.../ ἱεραρχήσας Πανματείας, [ἐπιμελητῆς] /

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<sup>592</sup> Cicero and Shackleton Bailey (1999).

βιβλιοφυλακίου γενόμενος ... [Δημαρχ] / ἐξουσίῳ κε , τιμητεύσας τὴν βουλὴν ... /  
λήσας τῶν ἐπὶ Παύλου [ἀνθυ]πάτου.

Apollonius to his father and his mother Ar-... <dedicated> the enclosure, and their  
order...//... of the citizens of Soli...high priest of the Mother god, curator of the public  
library... month of) May 27, having been a censor to the Council...(in the year) of [L.  
Sergius] Paullus, proconsul.<sup>593</sup>

### **Delphi, Library at the Gymnasium (Chapter 3.3.16)**

**BCH 20, pp. 720; Rheinisches Museum für Philologie, 18, 1863, p. 268**

τὸ κοινὸν τῶν Ἀμφικτυόνων ἐκ τῶν τοῦ θεοῦ χρημάτων ὑπὸ τῆς Φλαουίου Σωκλάρου  
ἐπιμελητείας τὴν βιβλιοθήκην κατεσκεύασεν.

The union of the Amphiktyonic council from the money of the god under the supervision  
of Flavius Soclarus constructed the library.<sup>594</sup>

### **Dertona, Library of (Chapter 3.3.17)**

**CIL, 5.7376**

Lectio tota incerta est et parum fida

The whole selection is uncertain and little trustworthy.<sup>595</sup>

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<sup>593</sup> Platthy (1968, 145, n.109).

<sup>594</sup> Platthy (1968, 138, n.93).

<sup>595</sup> Translation by the author.



### **Halicarnassus, Library at the Gymnasium (Chapter 3.3.20)**

**Le Bas (1972, 3.1, n.1618)**

ἐνηφίσθαι δὲ καὶ τοῖς βιβλ[ί]οις αὐτοῦ δημοσίαν ἀνάθεσιν ἐν τε βιβλιοθήκαις ταῖς παρ’  
ἡμεῖν

it shall be decreed that his works be shelved on the expense of the state in the public  
libraries, which are in our town.<sup>598</sup>

### **Mylasa, Library at the Gymnasium (Chapter 3.3.21)**

**AM 14, 1889, p.109; BCH, 22(1898) 391 Nr. 38**

...τὴν περὶ τὴν βιβλιοθήκην πα...

...τὴν παραδρομίδα παρὰ το...

... about the library...the arcade running around<sup>599</sup>

### **Patras, Library of (Chapter 3.3.22)**

**Aulus Gellius, *Attic Nights*, 18.9.5**

Ego arbitror et a M. Catone “insecenda” et a Q. Ennio “insece” scriptum sine u littera.

Offendi enim in bibliotheca Patrensi librum verae vetustatis Livii Andronici, qui

inscriptus est Ὀδύσσεια, in quo erat versus primus cum hoc verbo sine u littera:

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<sup>598</sup> (Platthy 1968).

<sup>599</sup> (Platthy 1968).



I think that both Marcus Cato and Quintus Ennius wrote *insecenda*: and *insece* without *u*. For in the library of Patrae I found a manuscript of Livius Andronicus of undoubted antiquity, entitled Ὀδύσσεια, in which the first line contained this word without the letter *u*.<sup>600</sup>

### **Pella, Hellenistic Royal Library (Chapter 3.3.23)**

#### **Plutarchus, *Aemilius Paulus*. 28**

μόνα τὰ βιβλία τοῦ βασιλέως φιλογραμματοῦσι τοῖς υἱέσι ἐπέτρεψεν ἐξελέσθαι

It was only the books of the king that he allowed his sons, who were devoted to learning, to choose out for themselves.<sup>601</sup>

### **Pergamon, Library at the Gymnasium (Chapter 3.3.24)**

#### **AM 33, 1908, p. 383**

-----| IOΛΟΙ--- | -----ἡ στήλη ἐν |-----Λρεις | -----ΟΜ τὸ δέ ||-----ΚΛΙ τα | -----  
ΤΩΙΔΟ | ---δρ)αχμάς Μ, τὰ δέ | ---βυβ)λιοθηκῶν καὶ τὰς | ----ἦναι τὰ ἐν τῷ Πυθί- || ωι-  
---π)λεῖστα ἀχάρακτα | -----ΕΡΙΩ ----μοις ὑπάρ- | χοντα-----)ντων ἐν τῷ Πυθί- | ωι----)  
...40,000 drachmas.../...library and/ the Pythian Apollo.../...the largest part  
unmarked...

---

<sup>600</sup> Aulus and Rolfe (1927c).

<sup>601</sup> Plutarch and Perrin (1918).

**AM 33, 1908, 41, p. 409**

ο δήμος ἐτίμησεν | -----ν Δημέου----- | -----βιβλιοθηκῶ(ν----- |-----  
καὶ αἰσχροδοκίῳ || -----καὶ δι ἣν ἔσχε(εν-- | ----φιλοτιμίαν πε)ρὶ τὰ κάλλισ(τα-- | καὶ  
-- τῶν ζητημάτων(ν-----

The people honored/...son of Demeas.../library.../ ...and incorruptible.../ ... and  
according to his/ aspiration he received the highest.../ ... and research...<sup>602</sup>

**Pireaus, Library of (Chapter 3.3.25)**

**IG II<sup>2</sup> 2362**

[Ἐρεχθεΐδος] | — — — | [Ἀγρυλὴ καθύπερ] | [Ἀγρυλὴ ὑπέ]νε[ρ] || [Ἀναγυ]ρ[οῦς] |  
[Λαμπ]τραὶ καθύπερ | [Λαμπ]τραὶ ὑπέ]νερ | [Κηδ]οί || [Πα]μ[βω]τάδαι | [Ε]ὐώνυμον |  
[Π]εργασὴ καθύπερ | Περγασὴ ὑπέ]νερθ || [Σ]υβρίδαι | Φηγοῦ[ς] | [Α]ἰγεΐδο[ς] |  
[Κ]ολλυ[τός] || Ἀγκυλὴ [καθύπερ] | Ἀγκυλ[ῆ] ὑπέ]νερ | Διόμ[ε]ια | Κ[ολωνό]ς ||  
Ἐσ[τ]ίαια | Βατή | Ἐρίκεια | Ὀτρύνη || Γαργητὸς  
— — — | — — — | [Πανδιονίδος] || — — — | [Προ]βάλ[ινθος] | Στειρί[α] |  
Φηγαιεῖς || Γραῆς  
Ἵαῆς | Λεωντίδος | Σκαμβωνίδ α [ι] | Λευκονοε[ῖς] || Ποταμός | Ποταμός | Κηττός |  
Ἄλμ[ο]ῦ[ς] | Δε[ι]ραδιῶται || Φ ρ [εάρριοι] | [Σου]νιεῖς | Παιονίδαι | Ὑβάδαι ||  
Πήληκες | Κρωπίδαι | Εὐπυρίδαι | Κολωνεῖς || Οἶ[ον] | — — — | — — — |  
[Πτο]λεμαίδος | Θυ[ργωνίδαι] || Ἐδω — | ΣΛ — Περ[ρ]ίδαι | . . . .Ρ — | Ὑπώρει[α] ||  
Εὐνοστίδαι | Αἰ[γ]ιλί[ε]ις | — — — | — — — | [Ἀκαμαν]τίδος | [Κ]εραμεῖς |

<sup>602</sup> Platthy (1968, 160, n.139).

Ἰ[φι]στιάδαι || Εἰρεσίδαι | Ἔρμος | Χολαργεῖς | Εἰτέα | Σφηττ[ός] | Κ[ίκωννα]? ||  
— — — | col. IV.65b 12+ vs. perierunt | [Ἰπποθωντίδος] | — — — |  
Κ[όπρος] | Ἐλα[ιοῦς]

Incomplete inscription that mentions a list of authors, among which Euripides.

### **Pontus, Hellenistic Royal Library (Chapter 3.3.26)**

#### **Isidor, *Etymologies*, 6.5.1**

De eo qui primum Romam libros advexit. Romam primus librorum compiam advexit  
Aemilius Paulus Perse Macedonum rege devicto, deinde Lucullus e pontica praeda  
Aemilius Paulus first brought a good supply of books to Rome after he had conquered  
Perseus, king of Macedonia; then Lucullus from the Pontic spoils.<sup>603</sup>

### **Prusa, Library of (Chapter 3.3.27)**

#### **Pliny, *Letters*, 10.81.7**

Ipse in re praesenti fui et vidi tuam quoque statuam in bibliotheca positam, id autem in  
quo dicuntur sepulti filias et uxor Dionis in arca collocatum quae porticibus includitur.  
I have visited the building myself and have seen your statue in position in the library [i.e.  
Trajan's]; the alleged burial-place of Dio's wife and son is in an open space surrounded  
by a colonnade.<sup>604</sup>

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<sup>603</sup> Isidore and Barney (2006, 139).

## Rome, Library in the Atrium Libertatis (Chapter 3.3.28)

### Ovid, *Tristia*, 3.1.71-72

nec me, quae doctis patuerunt prima libellis, atria Libertas tangere passa sua est.

Nor did Liberty allow me to touch her halls, the first that were opened to learned books.<sup>605</sup>

### Isidor, *Etymologies*, 6.5.2

primum autem Romae bibliothecas publicativ Pollio Graecas simul atque Latinas addits auctorum imaginibus in atrio, quod de manubiis magnificentissimum instruxerat.

Pollio first made libraries, Greek as well as Latin, for public use at Rome, with statues of the authors added in the atrium that he had built most magnificently from spoils.<sup>606</sup>

### Pliny, *Natural History*, 7.30.115

M. Varronis in bibliotheca, quae prima in orbe ab Asinio Pollione ex manubiis publicata Romae est, unius viventis posita imago est.

In the library founded at Rome by Asinio Poliiio, the earliest library in the world established out of the spoils of war, the only statue of a living person erected was that of Marcus Varro.<sup>607</sup>

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<sup>604</sup> Pliny and Radice (1969b).

<sup>605</sup> Ovid and Wheeler (1996).

<sup>606</sup> Isidore and Barney (2006, 139).

<sup>607</sup> Pliny and Rackham (1942).

## Rome, Library in the Temple of Augustus (Chapter 3.3.29)

### Suetonius, *Lives of the Caesars*, Tiberius, 74

Supremo natali suo Apollinem Temenitem, et amplitudinis et artis eximiae, advectum Syracusis, ut in bibliotheca templi novi poneretur, viderat per quietem affirmantem sibi non posse se ab ipso dedicari.

On his last birthday he dreamt that the Apollo of Temenos, a statue of remarkable size and beauty, which he had brought from Syracuse to be set up in the library of the new temple, appeared to him in a dream, declaring that it could not be dedicated by Tiberius.<sup>608</sup>

### Pliny, *Natural History*, 34.8.43

Factitavit colossos et Italia. Videmus certe Tuscanicum Apollinem in bibliotheca templi Augusti quinquaginta pedum a pollice, dubium aere mirabiliorem an pulchritudine.

Italy was also fond of making colossal statues. At all events we see the Tuscanic Apollo in the library of the Temple of Augustus, 50 ft. in height measuring from the toe: and it is a question whether it is more remarkable for the quality of the bronze or for the beauty of the work.<sup>609</sup>

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<sup>608</sup> Suetonius and Rolfe (1914a).

<sup>609</sup> Pliny and Rackham (1952).

## Rome, Library in Domus Tiberiana (Chapter 3.3.30)

### Fronto, *Marcus Aurelius*, 4.5 (Vat. 155)

Legi Catonis orationem *De bonis Pulchrae*, et aliam quam tribuno diem dixit. *Io*, inquis puero tuo, *uade quantum potes, de Apollinis bibliothecabus has mihi orationes apporta*. Frustra mittis, nam et isti libri me secuti sunt. Igitur Tiberianus bibliothecarius tibi subigitandus est; aliquid in eam rem insumendum, quod mihi ille, ut ad urbem venero, aequa divisione impertiat.

reading Cato's speech *On the property of Pulchra*, and another in which he impeached a tribune. *Ho*, you cry to your boy, *go as fast as you can and fetch me those speeches from the libraries of Apollo!* It is no use your sending, for those volumes, among others, have followed me here. So, you must get round the librarian of Tiberius' s library: a little *douceur* will be necessary, in which he and I can go shares when I come back to town.<sup>610</sup>

### Aulus Gellius, *Attic Nights*, 8.20.1

Cum in domus Tiberianae bibliotheca sederemus ego et Apollinaris Sulpicius et quidam alii mihi aut illi familiares, prolatus forte liber est ita inscriptus: M. Catonis Nepotis. Tum quaeri coeptum est quisnam is fuisset M. Cato Nepos.

When Sulpicius Apollinaris and I, with some others who were friends of his or mine, were sitting in the library of the Palace of Tiberius, it chanced that a book was brought to

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<sup>610</sup> Fronto and Haines (1919).

us bearing the name of Marcus Cato Nepos. We at once began to inquire who this Marcus Cato Nepos was.<sup>611</sup>

### **Scriptores Historiae Augustae, *Probus*, 2.1**

Usus autem sum, ne in aliquo fallam carissimam mihi familiaritatem tuam, praecipue libris ex Bibliotheca Ulpia, aetate mea Thermis Diocletianis, et item ex Domo Tiberiana, usus etiam et registis scribarum Porticus Porphyreticae, actis etiam senatus ac populi.

I have used, moreover - not to deceive in any respect your friendly interest which I hold most dear - chiefly the books from the Ulpian Library (in my time in the Baths of Diocletian) and likewise from the House of Tiberius, and I have used also the registers of the clerks of the Porphyry Portico and the transactions of the senate and of the people:<sup>612</sup>

### **Galen, *On the avoidance of grief*, 18**

Διεφθάρη δὲ νῦν τὰ μὲν ἐν τῷ Παλάτιῳ κατὰ τὴν αὐτὴν ἡμέραν τοῖς ἡμετέροις, τῆς πυρκαϊᾶς οὐ μόνον ταῖς κατὰ τὴν ἱερὰν ὁδὸν ἀποθήκαις λυμνηναμένης ἀλλὰ καὶ πρὸ αὐτῶν μὲν ταῖς κατὰ τὸ τῆς Εἰρήνης τέμενος, μετὰ ταῦτα δὲ ταῖς κατὰ τὸ Παλάτιον τε καὶ τὴν Τιβεριανὴν καλουμένην οἰκίαν ἐν ἧ καὶ αὐτῇ βιβλιοθήκη τις ἦν, πολλῶν μὲν καὶ ἄλλων βιβλίων μεστή, τὰ δὲ ἐναντία διὰ τὴν ἀμέλειαν τῶν ἐκάστοτε ληστευομένων ἐκ διαδοχῆς αὐτὰ (...) καθ' ὃν χρόνον ἐγὼ ἀνέβην εἰς Ῥώμην πρῶτον ἐγγὺς ἦν τοῦ διεφθάρθαι. Τοῦτ' ἄρα καὶ κάματον ἡμῖν παρέσχεν οὐ μίκρον ἐγγραφομένοις αὐτα· ἰδοὺ

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<sup>611</sup> Aulus and Rolfe (1927b).

<sup>612</sup> David (1932).

δὲ τελέως ἐστὶν ἄχρηστα μηδὲ ἀνελιχθῆναι δυνάμενα διὰ τὸ κεκολληθῆσθαι τὰς χάρτας ὑπὸ τῆς σηπεδόνης.

The books on the Palatine were destroyed on the same day as mine, since the fire spread out not only over the warehouses located along the Via Sacra, but also, before them, over those located next to the Temple of Peace, and after them, over those located in the vicinity of the Palatium and of the domus called Tiberiana where, here also, there was a library, filled with several books of different kinds; however, this library was already about to be destroyed owing to the negligence following a succession of regular pillages (...) at the time when I first arrived in Rome. This has caused me an amount of grief, which is far from being forgotten, since I copy those books for my use. But now they are completely unusable and they cannot be unrolled since the sheets have pasted together because of moisture: the area indeed is marshy and very deeply enclosed and is very hot in summer.<sup>613</sup>

### **Rome, Library in the Temple of Asklepeios (Chapter 3.3.31)**

#### **Mirabilia Romae cap. 23**

iuxta arcum septem lucernarum templum Aesculapii : ideo dicitur Cartularium, quia ibi fuit bibliotheca publica, de quibus xxviii fuere in urbe

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<sup>613</sup> Tucci (2008).



Nigh unto the arch of Seven Lamps the temple of Aesculapius; it is therefore called Cartulary, because there was a common library there, of which there were twenty and eight in the city.<sup>614</sup>

### **Rome, Library in the Pantheon (Chapter 3.3.32)**

#### **Julius Africanus, Cestos 18 (Oxyrhynchus Papyri 3.412)**

τήνδε τὴν σύνπασαν ὑπόθεσιν ἀνακειμένην εὐρέσεις ἐν τε τοῖς ἀρχείοις τῆς ἀρχαίας πατρίδος κολωνείας Αἰλίας Καπιτωλίνης τῆς Παλαιστίνης, κὰν Νύση τῆς Καρίας, μέχρι δὲ τοῦ τρισκαιδεκάτου ἐν Ῥώμῃ πρὸς ταῖς Ἀλεξάνδρου θερμαῖς ἐν τῇ ἐν Πανθείῳ βιβλιοθήκῃ τῇ καλῇ ἣν αὐτός ἤρχιτεκτόνησα τῷ Σεβαστῷ.

You will find this whole work unexceptionally in the archives of the ancient county of the colony of Aelia Capitolina in Palestine, and at Nysa in Caria, and (my work) up to the thirteenth line, in Rome, close to the baths of Alexander, in the beautiful library of Pantheon, which I designed myself to the honored.<sup>615</sup>

### **Rome, Library in the Baths of Diocletian (Chapter 3.3.33)**

#### **Scriptores Historiae Augustae, *Probus*, 2.1**

Usus autem sum, ne in aliquo fallam carissimam mihi familiaritatem tuam, praecipue libris ex Bibliotheca Ulpia, aetate mea Thermis Diocletianis, et item ex Domo Tiberiana, usus etiam et regestis scribarum Porticus Porphyreticae, actis etiam senatus ac populi. et

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<sup>614</sup> Nichols (1889, 100-101).

<sup>615</sup> Julius, Grenfell, and Hunt (1898).

quoniam me ad colligenda talis viri gesta ephemeris Turduli Gallicani plurimum iuuit, viri honestissimi ac sincerissimi, beneficium amici senis tacere non debui.

I have used, moreover - not to deceive in any respect your friendly interest which I hold most dear - chiefly the books from the Ulpian Library (in my time in the Baths of Diocletian) and likewise from the House of Tiberius, and I have used also the registers of the clerks of the Porphyry Portico and the transactions of the senate and of the people: and since in collecting the deeds of so great a man I have received most aid from the journal of Turdulus Gallicanus, a most honourable and upright man, I ought not to leave unmentioned the kindness of this aged friend.<sup>616</sup>

### **Smyrne, Library in the Homereium (Chapter 3.3.34)**

#### **Strabo, *Geography*, 14.1.37**

Ἔστι δὲ καὶ βιβλιοθήκη καὶ τὸ Ὀμήρειον, στοὰ τετράγωνος, ἔχουσα νεῶν Ὀμήρου καὶ ξόανον·

There is also a library; and the Homereium, a quadrangular portico containing a shrine and wooden statue of Homer;<sup>617</sup>

### **Suessa, Matidiana Library (Chapter 3.3.35)**

#### **CIL, 10.4760**

Suessae, in bybliotheca M[at]idiana

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<sup>616</sup> David (1932).

<sup>617</sup> Strabo and Jones (1929).

In Suessa, in the Matidiana library.<sup>618</sup>

### **Tivoli, Library in the Temple of Hercules (Chapter 3.3.36)**

#### **Aulus Gellius, *Attic Nights*, 14.5.4**

Promit e bibliotheca Tiburti, quae tunc in Herculis templo satis commode instructa libris erat, Aristotelis librum eumque ad nos adfert

from the library of Tibur, which at that time was in the temple of Hercules and was well supplied with books, he drew out a volume of Aristotle and brought it to us.<sup>619</sup>

### **Volsinii, Library of (Chapter 3.3.37)**

#### **CIL, 11.2704**

is bybliotheicum a solo ... [cu]mqe libris et statuis... [t]estamento dedit

He gave from only his ... a library ... along with books and statues ... in his will.<sup>620</sup>

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<sup>618</sup> Translation by the author.

<sup>619</sup> Aulus and Rolfe (1927c).

<sup>620</sup> Translation by the author.

**APPENDIX C**

**MEASUREMENTS OF ARCHITECTURAL FEATURES OF**

**LIBRARIES**

Measurements are given in meters. When an architectural feature was not part of the library, it is signified with a dash “-“. When an architectural feature existed but its dimensions are not available or there is not enough evidence to decide on the dimensions, it is signified with a “?”.

**Table C. 1.** Measurements of Main Hall.

<i>Library Name</i>	<i>Main Hall Length</i>	<i>Main Hall Width</i>	<i>Main Hall Area</i>
Library in the Serapeum at Alexandria	-	-	-
Library of Pergamon	15.95	13.53	215.80
Academy of Plato at Athens	15.49	11.34	175.66
Library at the Gymnasium of Rhodes	11.7	20.5	239.85
Augustan Palatine Library, Rome	18	15	270
Library in the Porticus Octaviae, Rome	-	-	-
Library at Templum Pacis, Rome	21.97	20.81	457.20
Domitianic Palatine Library, Rome	19.5	17.50	341.25
Pantainos Library, Athens	10.75	9.75	104.81
Library of Celsus, Ephesus	10.92	16.72	182.58
Ulpian Library, Rome	24	17	408
Neon Library, Sagalassos	9.5	11.8	112.1
Library of Nysa	8.68	13.35	115.88
Library of Melitine, Pergamon	18.5	16.52	305.62
Hadrian's Library in Athens	14.05	20.22	284.09
Library in the Forum of Philippi	9.37	13.07	122.47
Library of Rogatinus, Timgad	10	15	150

**Table C.2.** Measurements of Niches.

<i>Library Name</i>	<i>Levels</i>	<i>Number of Niches</i>	<i>Width</i>	<i>Depth</i>	<i>Height</i>	<i>Inter niche space</i>	<i>Distance to floor</i>	<i>Distance to podium</i>	<i>Distance to wall</i>
Library in the Serapeum at Alexandria	?	?	?	?	?	?	?	?	?
Library of Pergamon	-	-	-	-	-	-	-	-	-
Academy of Plato at Athens	?	?	?	?	?	?	?	?	?
Library at the Gymnasium of Rhodes	1	8	2	0.6	0	0.56	?	0	0.28
Augustan Palatine Library, Rome	?	?	?	?	?	?	?	?	?
Library in the Porticus Octaviae, Rome	?	?	?	?	?	?	?	?	?
Library at Templum Pacis, Rome	?	?	?	?	?	?	?	?	?
Domitianic Palatine Library, Rome	1	18	1.2	0.6	3.8	0.85	1.5	0.3	0.5
Pantainos Library, Athens	-	-	-	-	-	-	-	-	-
Library of Celsus, Ephesus	2	20	1.07	0.6	2.55	2.3	1	0	0.91
Ulpian Library, Rome	2	16	1.6	0.75	0	1.2	1.35	0.55	11.8
Neon Library, Sagalassos	1	24	1.21	0.9	0	0.8	2.35	0	0.81
Library of Nysa	2	16	1.18	0.6	1.9	1.18	1.31	0.44	1.31
Library of Melitine, Pergamon	1	16	1.45	0.65	0	1.45	1.75	0	1.34
Hadrian's Library in Athens	2	44	1.22	0.5	2.35	0.9	1.7	0.3	1.71
Library in the Forum of Philippi	?	?	?	?	?	?	?	?	?
Library of Rogatinus, Timgad	1	8	1.25	0.5	0	1.25	1.25	0.75	0.9

**Table C.3.** Measurements of Focal Point.

<i>Library Name</i>	<i>Elevation</i>	<i>Levels</i>	<i>Plan</i>	<i>Depth</i>	<i>Width</i>	<i>Height</i>	<i>Distance to Floor</i>	<i>Distance to Podium</i>
Library in the Serapeum at Alexandria	?	?	?	?	?	?	?	?
Library of Pergamon	-	1	rectangular	2.11	2.74	0.9	0	0
Academy of Plato at Athens	-	-	-	-	-	-	-	-
Library at the Gymnasium of Rhodes	?	?	?	?	?	?	?	?
Augustan Palatine Library, Rome	rectangular	1	semicircular	3.38	15	?	?	?
Library in the Porticus Octaviae, Rome	?	?	?	?	?	?	?	?
Library at Templum Pacis, Rome	?	1	semicircular	11.5	8.56	?	1.5	0
Domitianic Palatine Library, Rome	?	1	rectangular	1.74	1.65	3.25	1.5	0.3
Pantainos Library, Athens	-	-	-	-	-	-	-	-
Library of Celsus, Ephesus	Apsidal	1	semicircular	2.19	4.35	7	1.14	0.2
Ulpian Library, Rome	Rectangular	2	rectangular	2.5	3.5	?	0	0
Neon Library, Sagalassos	?	1	semicircular	1	1.5	?	2.35	0
Library of Nysa	?	0	rectangular	3.5	5.92	?	0.31	0
Library of Melitine, Pergamon	Apsidal	1	semicircular	1.56	3.18	?	1.75	?
Hadrian's Library in Athens	Apsidal	2	rectangular	0.5	2.34	4.32	1.7	0.3
Library in the Forum of Philippi	?	?	?	?	?	?	?	?
Library of Rogatinus, Timgad	?	1	rectangular	1	1.8	5	0	0

**Table C.4** Measurements of Podium.

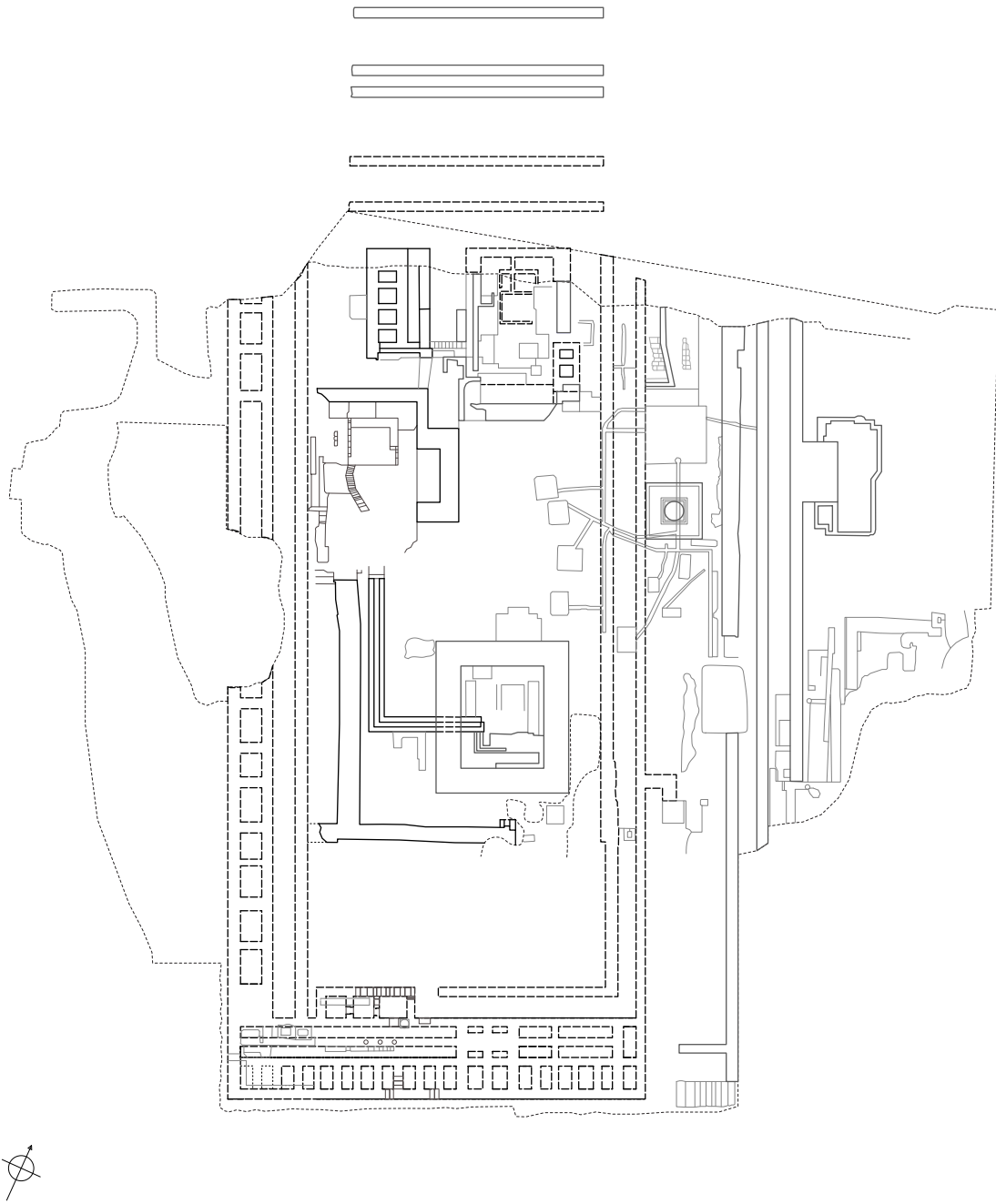
<i>Library Name</i>	<i>Depth</i>	<i>Height</i>	<i>Pedestals</i>	<i>Pedestals height</i>	<i>Steps</i>	<i>Step depth</i>	<i>Step height</i>
Library in the Serapeum at Alexandria	0	0	-	-	0	0	0
Library of Pergamon	1.05	0.9	No	0	0	0	0
Academy of Plato at Athens	1.35	0	No	-	0	0	0
Library at the Gymnasium of Rhodes	0	0	No	-	0	0	0
Augustan Palatine Library, Rome	-	0	-	-	3	1.65	0
Library in the Porticus Octaviae, Rome	0	0	-	-	0	0	0
Library at Templum Pacis, Rome	6.2	1.5	-	-	0	0	0
Domitianic Palatine Library, Rome	0.7	1.2	Yes				
Pantainos Library, Athens	0	0	No	-	0	0	0
Library of Celsus, Ephesus	1.025	0.94	No	-	0	0	0
Ulpian Library, Rome	1	0.8	Yes	0.50	3	0.25	0.25
Neon Library, Sagalassos	0	2.35	No	-	0	0	0
Library of Nysa	0.82	0.87	No	-	0	0	0
Library of Melitine, Pergamon	0	0	No	-	0	0	0
Hadrian's Library in Athens	1.56	1.4	No	0	0	0	0
Library in the Forum of Philippi			No	-		0	0
Library of Rogatinus, Timgad	0.6	0.5	Yes	0.55	2	0.3	0.2



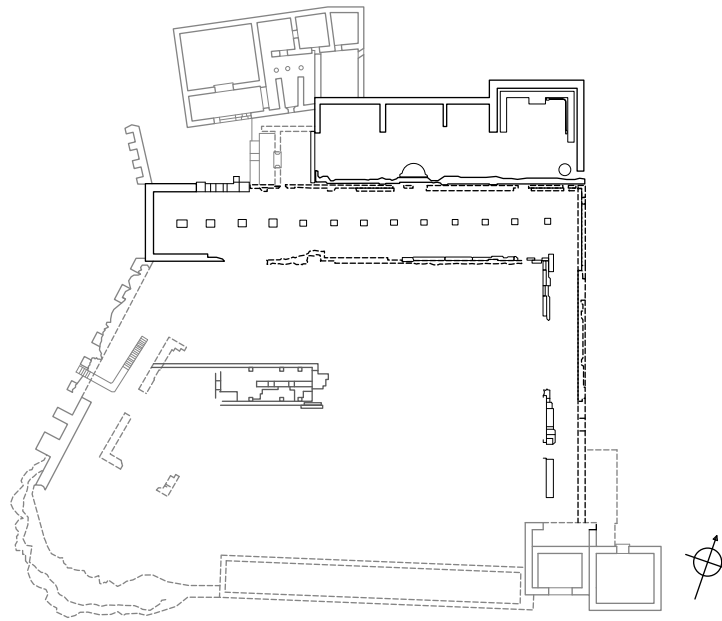
## **APPENDIX D**

### **STATE OF PRESERVATION PLANS OF LIBRARIES**

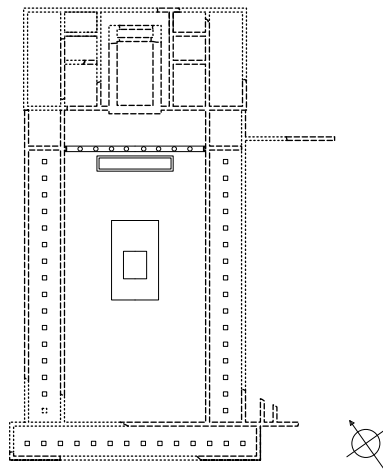
The state of preservation plans of the libraries are redrawn in the same scale, 1:1000 following the same conventions. Earlier and later phases as well as the context are presented in grey tones to foreground the main building remains of the libraries. Foundations are given with a dashed line.



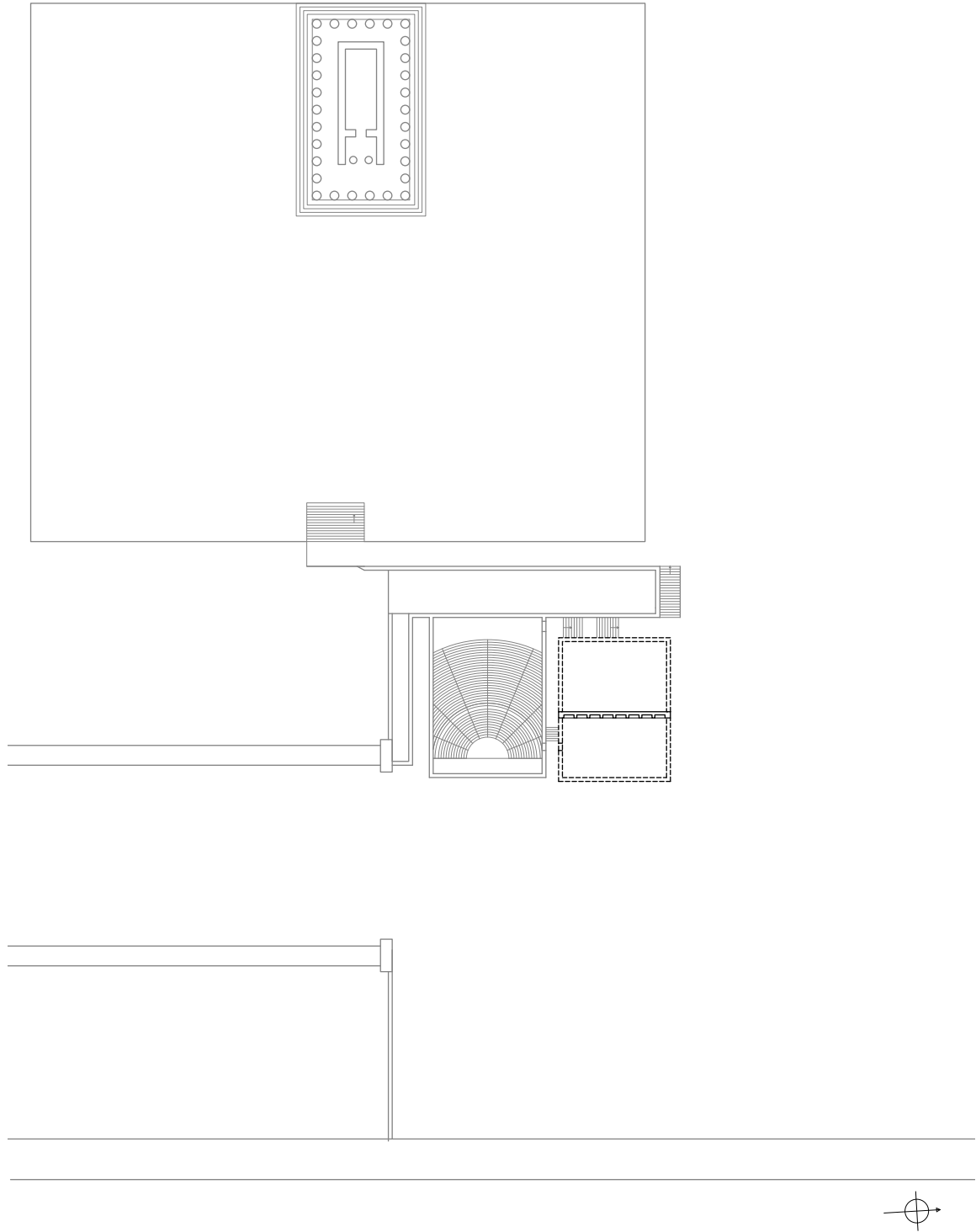
**Figure D.1** State of preservation plan of the Serapeum.



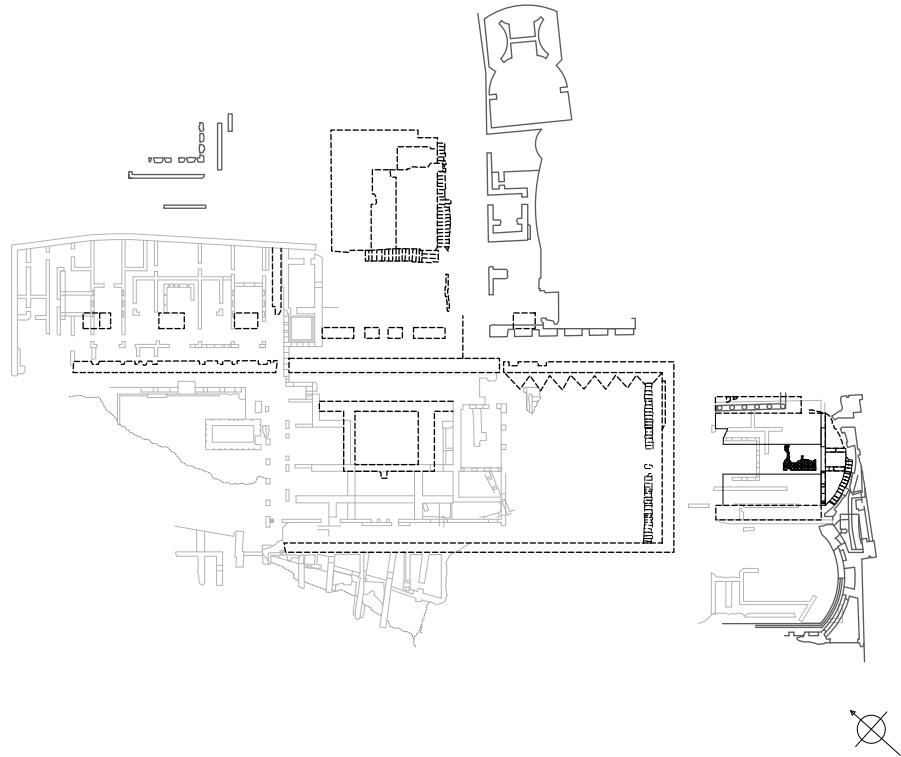
**Figure D.2** State of preservation plan of the Library of Pergamon.



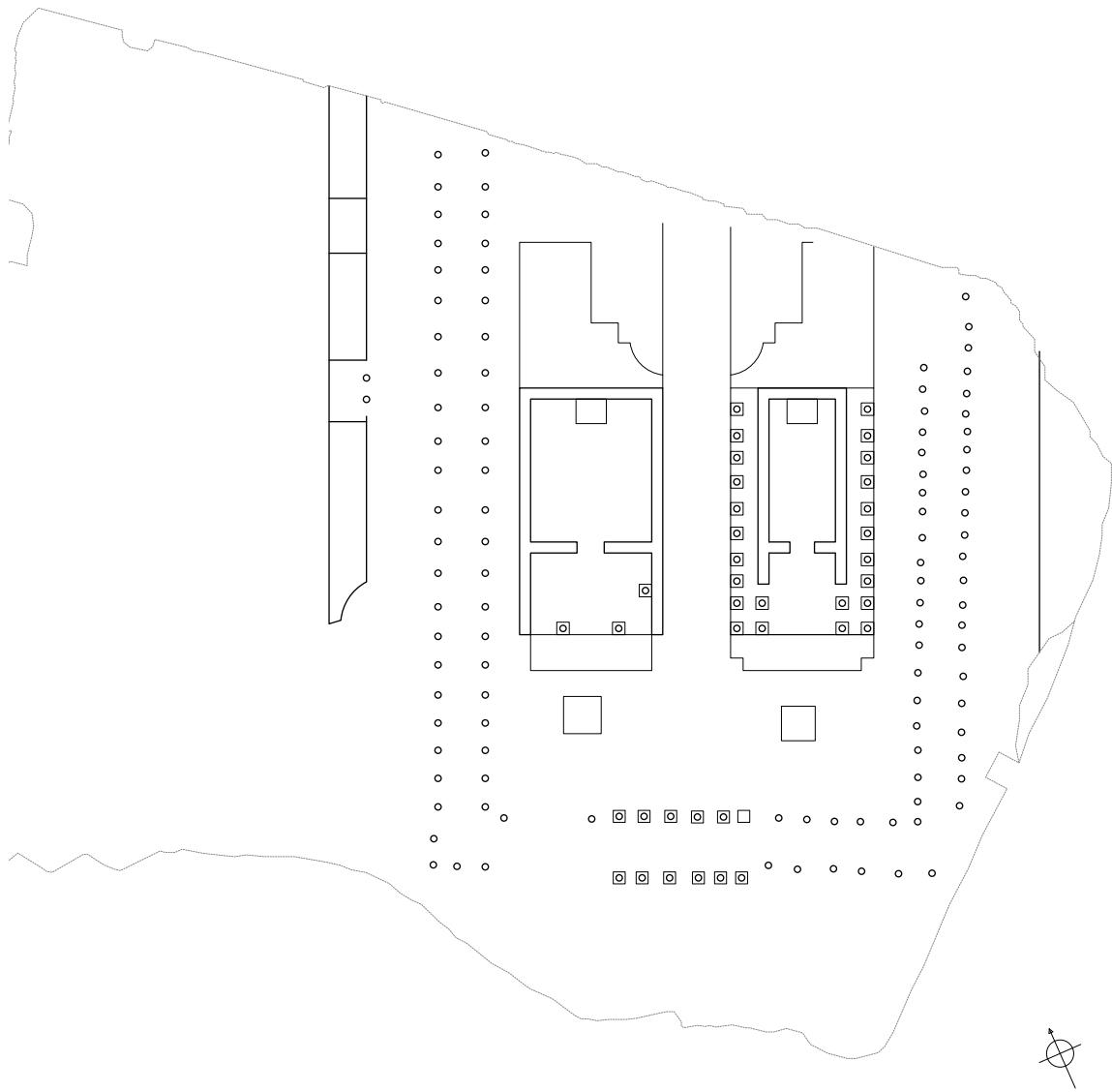
**Figure D.3** State of preservation plan of the Academy of Plato.



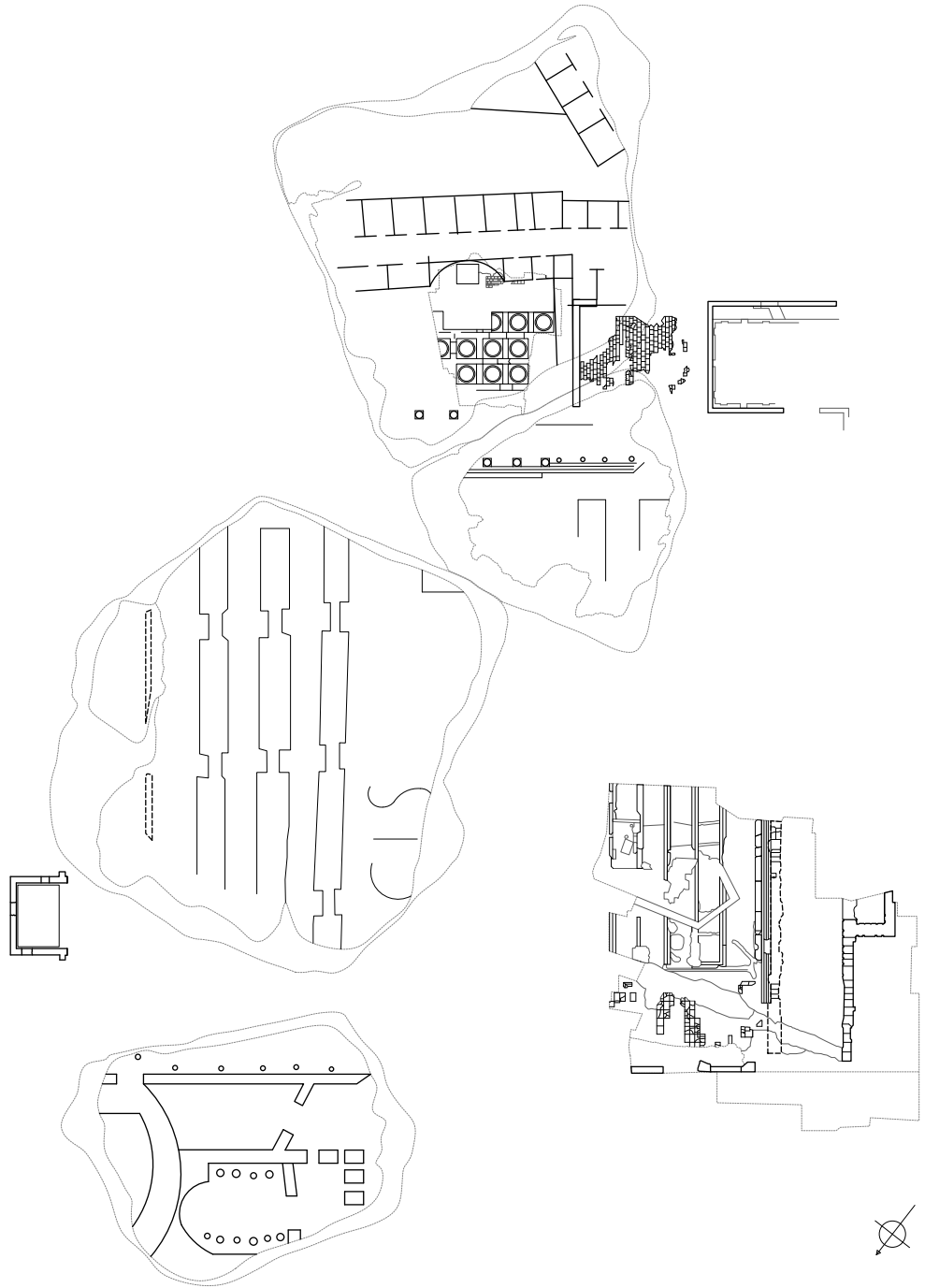
**Figure D.4** State of preservation plan of the Library at the Gymnasium of Rhodes.



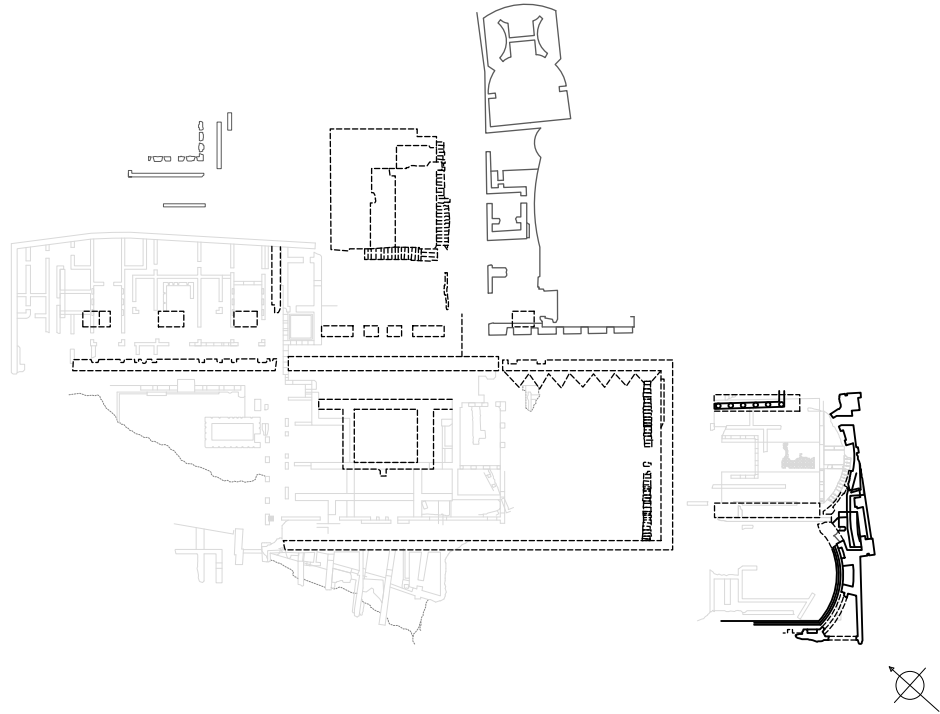
**Figure D.5** State of preservation plan of the Augustan Palatine Library.



**Figure D.6** State of preservation plan of the Porticus Octaviae.

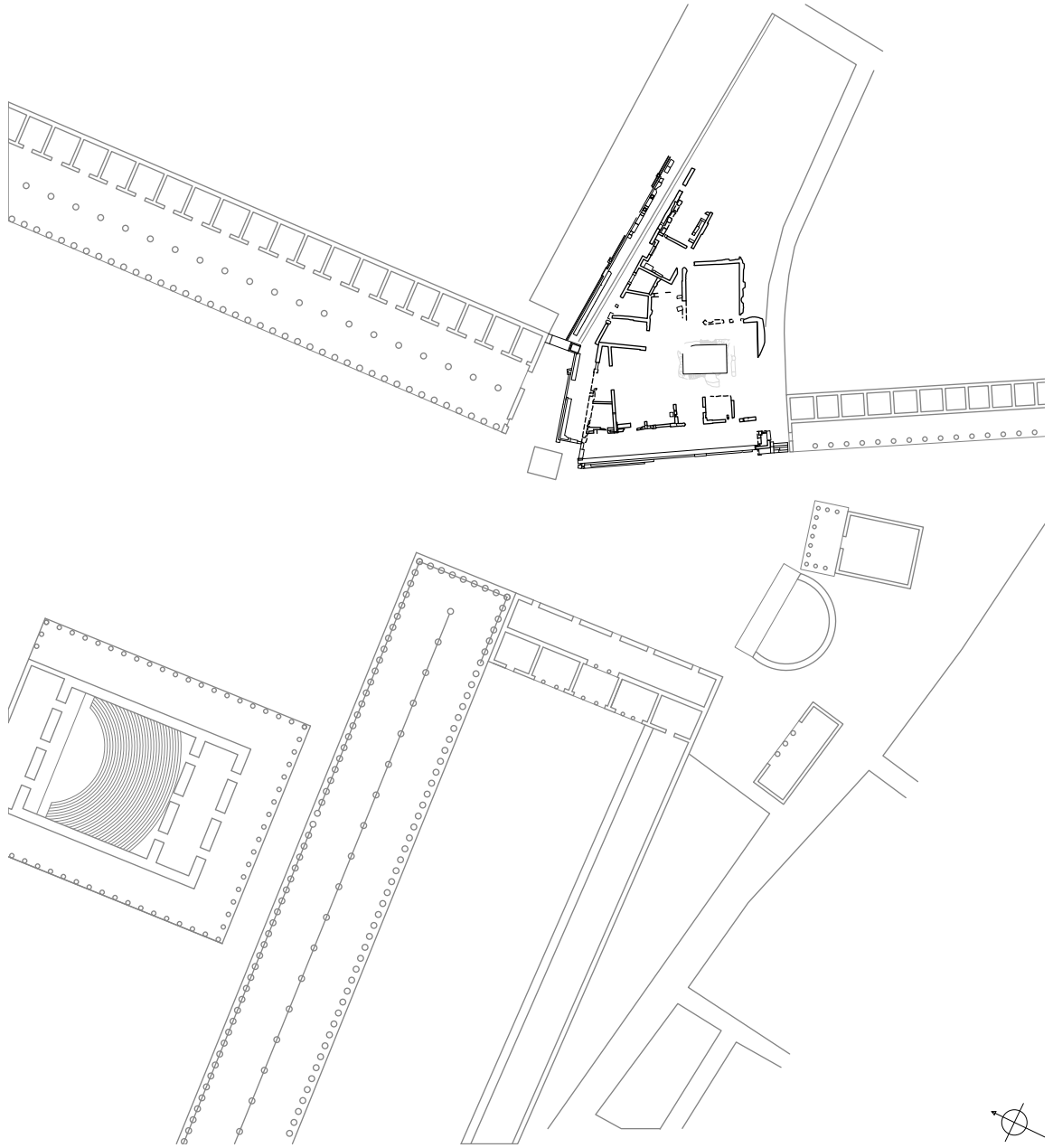


**Figure D.7** State of preservation plan of the Templum Pacis.

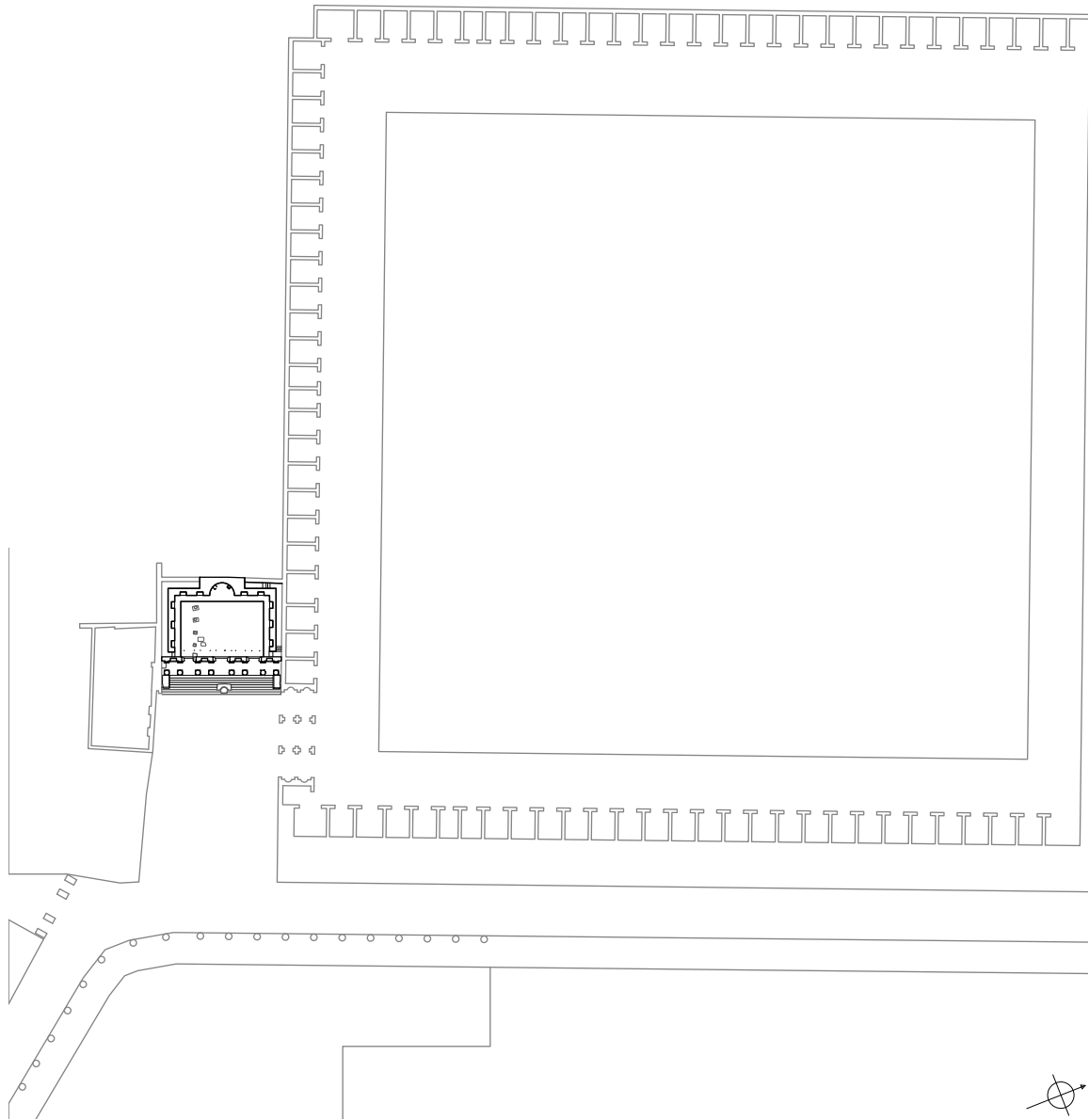


**Figure D.8** State of preservation plan of the Domitianic Palatine Library.

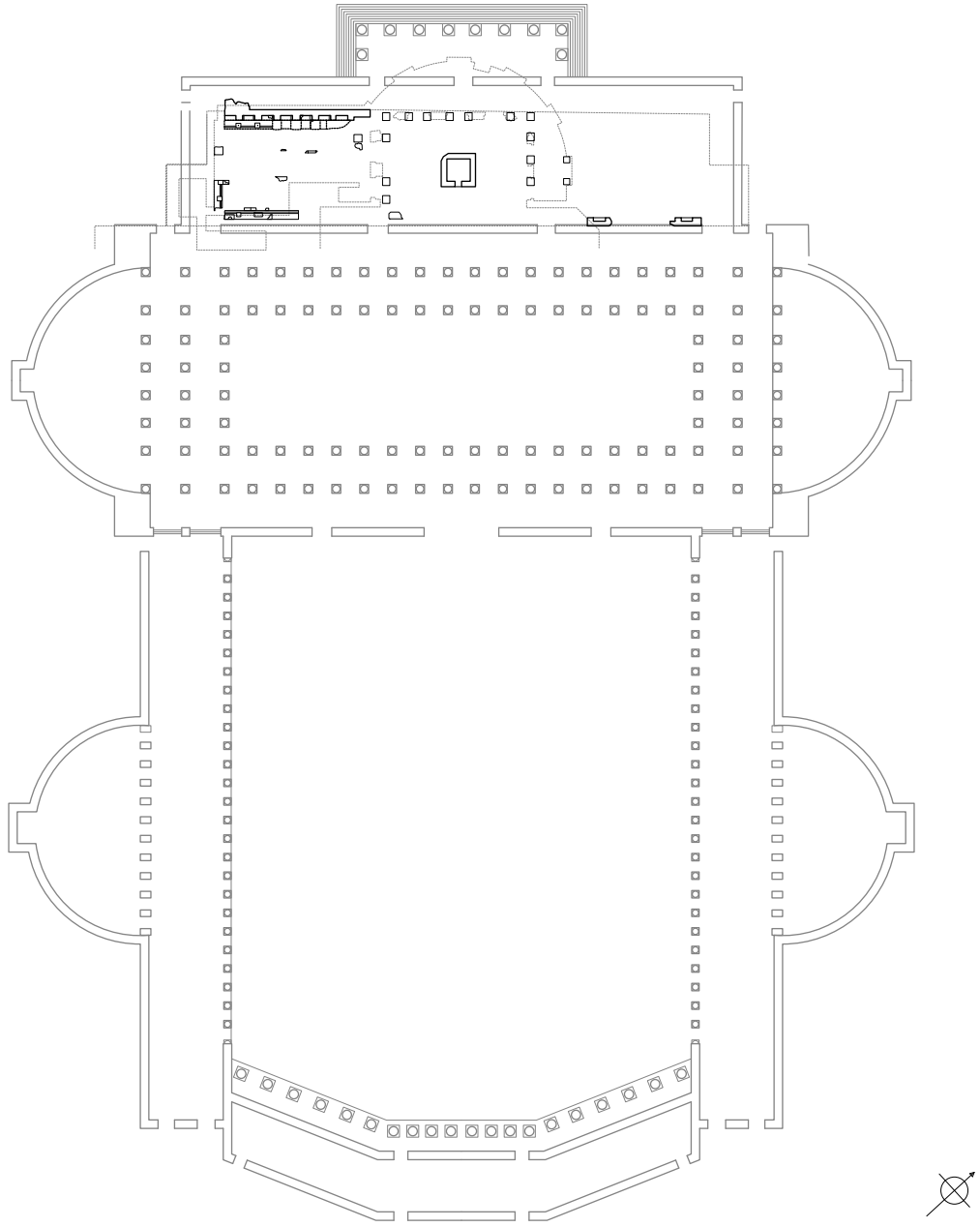




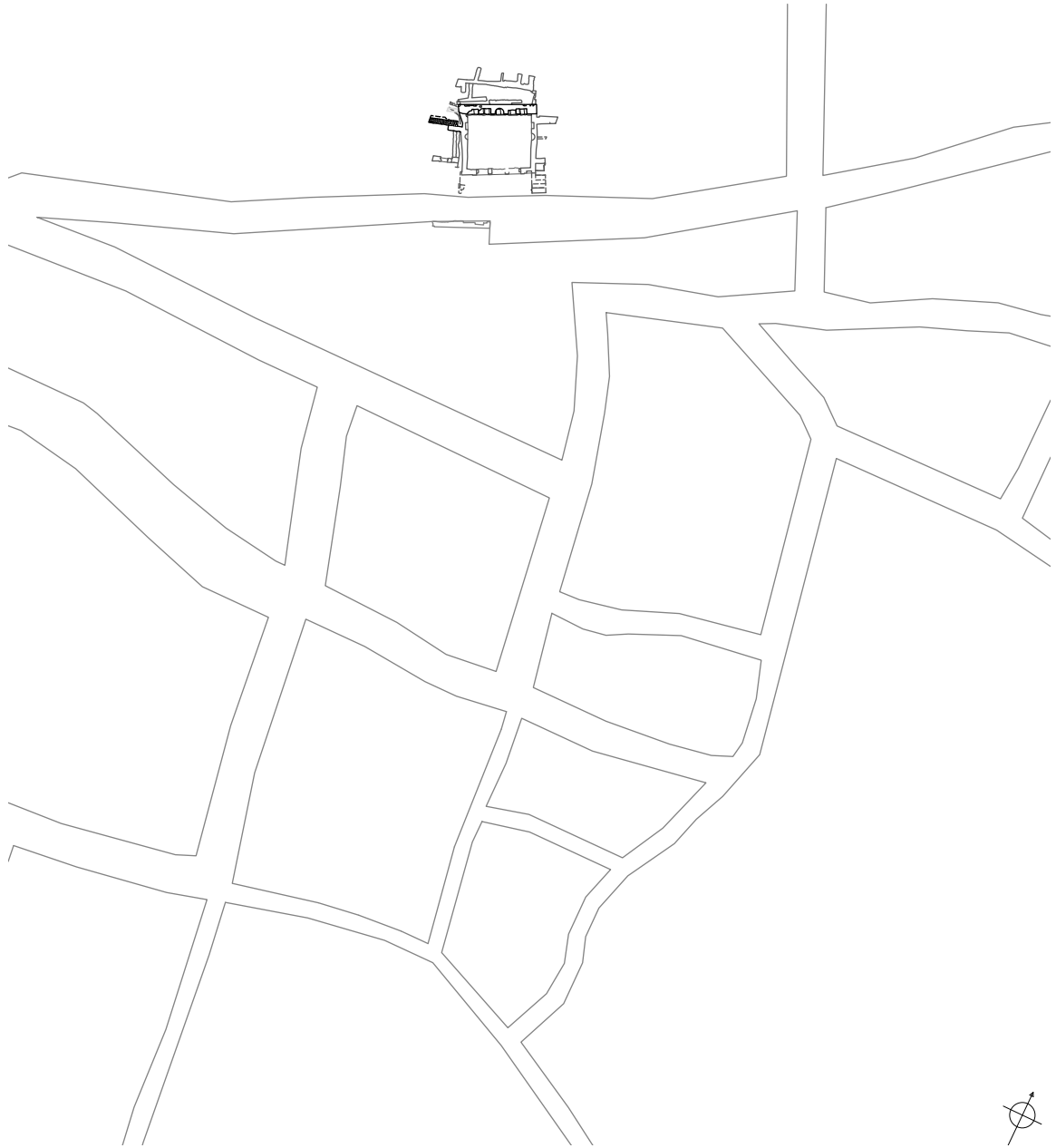
**Figure D.9** State of preservation plan of the Pantainos Library.



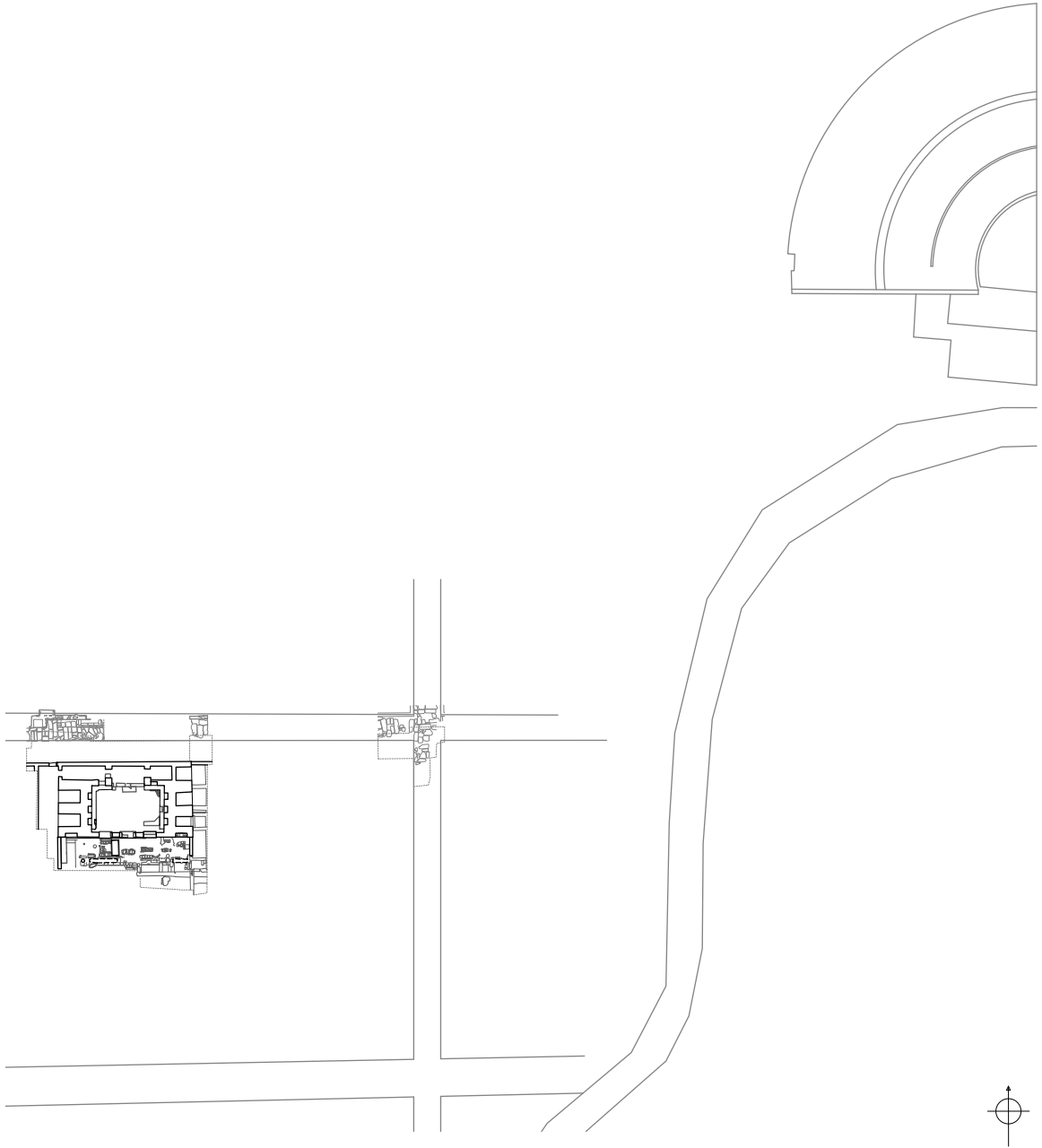
**Figure D.10** State of preservation plan of the Celsus Library.



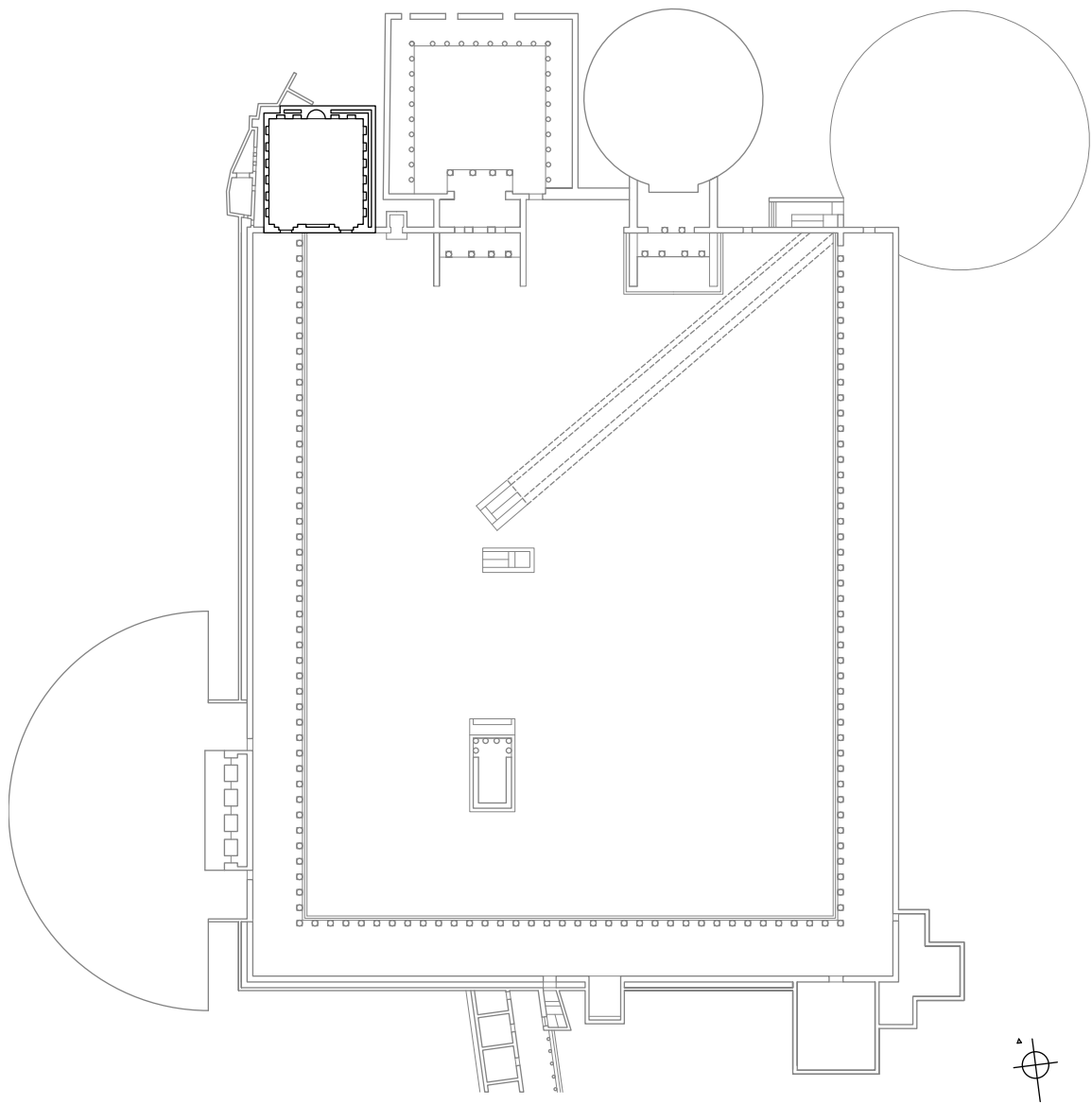
**Figure D.11** State of preservation plan of the Ulpian Library.



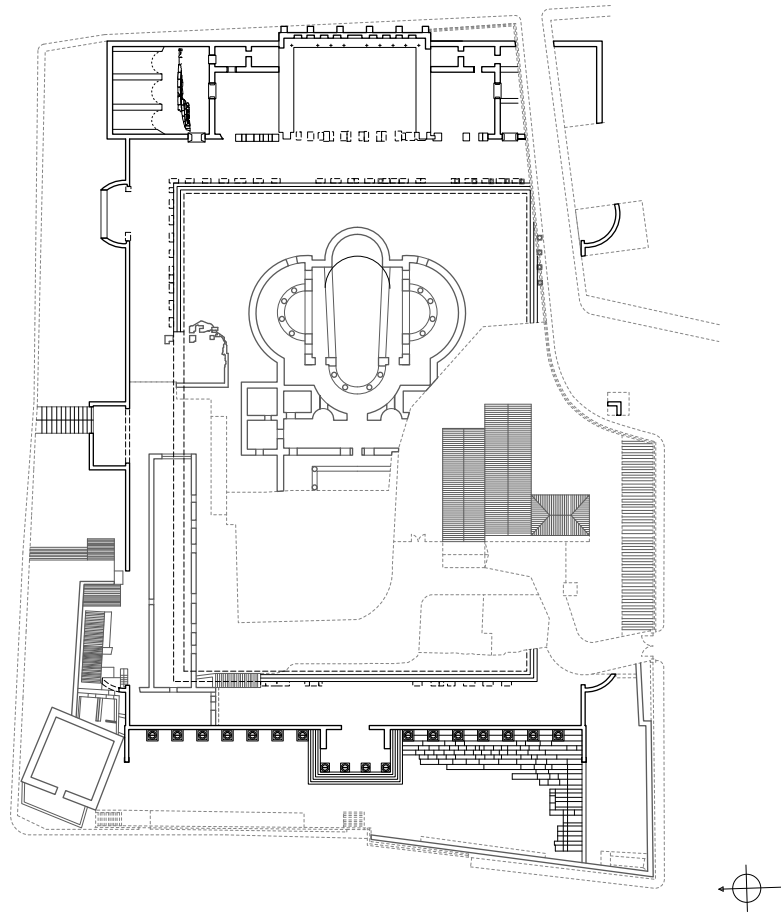
**Figure D.12** State of preservation plan of the Neon Library.



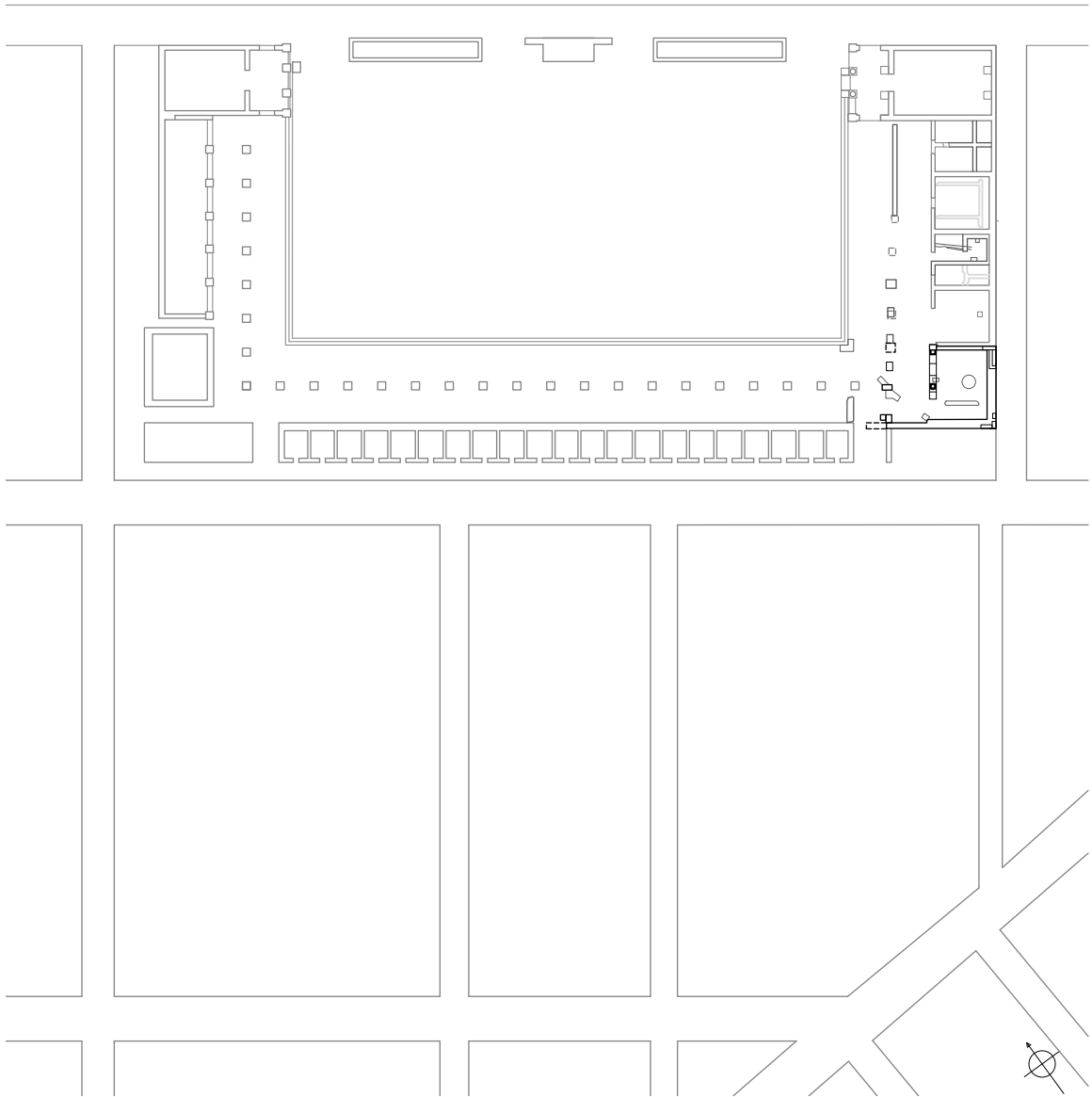
**Figure D.13** State of preservation plan of the Library of Nysa.



**Figure D.14** State of preservation plan of the Melitine Library.

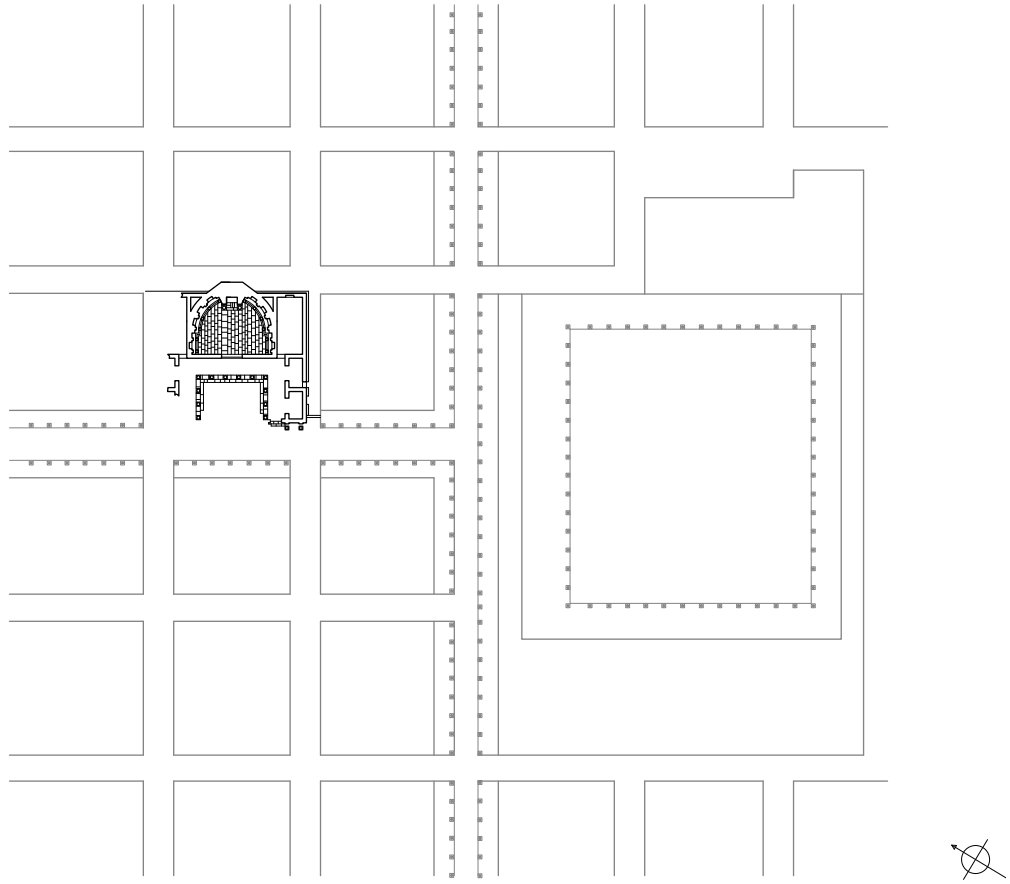


**Figure D.15** State of preservation plan of Hadrian's Library in Athens.



**Figure D.16** State of preservation plan of the Library in the Forum of Philippi.





**Figure D.17** State of preservation plan of the Rogatinus Library, Timgad.

## APPENDIX E

### METADATA ON THE GRAMMAR

**Table E.1** Labels, parameters and conditions to stages of rules.

<i>Description of Stage</i>	<i>Label</i>	<i>Label Description</i>	<i>Parameter</i>	<i>Parameter Description</i>	<i>Conditions</i>
MAIN HALL LAYOUT	m	main hall			
	ns	niche side wall			
	nb	niche back wall			
	ne	niche endpoint to wall			
	me	main hall entrance wall			
	f	focal point	$f_w$	focal point width	
ADD PODIUM	p	podium	$p_d$	podium distance to the entrance wall	$m_l = ns_l + p_w + p_d$ $w = f + 2p_w + 2nb_l$ $nb_l = (m_w \cdot f_w - 2p_w) / 2$ $ns = l - p_w - p_d$ $p_d \geq 0$  $m_{arc} \leq 180$ $ns \geq 0$ $p_d \geq 0$
			$p_w$	podium width	$f_{df} \geq p_h$
			$p_h$	podium height	$f_{df} < p_h$ $f_{df} \geq p_h$ $f_{df} < p_h$
ADD INTERIOR COLONNADE			$c_d$	column diameter	$ns = nsc_i \times c_n$
	$ns_{ia}$	interaxial a in the side wall	$nbc_i$	interaxial space in the back wall	$nb = nbc_i \times c_n$
			$nsc_i$	interaxial space in the side walls	

	<p><math>ns_{ib}</math> interaxial b in the side wall</p> <p><math>nb_{ia}</math> interaxial a in the back wall</p> <p><math>nb_{ib}</math> interaxial b in the back wall</p>	<p><math>hp_d</math> halfpilaster depth</p> <p><math>hp_w</math> halfpilaster width</p> <p><math>cb_d</math> column base diameter</p> <p><math>cp_w</math> column pedestal width</p> <p><math>ps_n</math> number of steps</p> <p><math>ps_d</math> step depth</p>	<p><math>cb_d = c_d</math> and <math>c_d &lt; cb_d</math></p> <p><math>cp_w = ps_n \times ps_d</math></p>
ADD FOCAL POINT	f focal point	<p><math>pp_d</math> podium projection depth</p> <p><math>pp_w</math> podium projection width</p> <p><math>f_w</math> focal point width</p> <p><math>f_d</math> focal point depth</p> <p><math>f_h</math> focal point height</p> <p><math>f_i</math> focal point levels</p> <p><math>f_f</math> focal point distance from the floor</p> <p><math>f_p</math> focal point distance from the podium</p>	<p><math>f_d = n_d</math></p> <p><math>f_d &gt; n_d</math> and <math>f_d \geq w</math></p> <p><math>f_d = n_d</math></p> <p><math>f_d &gt; n_d</math> and <math>f_d \geq w</math> and <math>f_p \geq 0</math></p> <p><math>f_f \geq 0</math> and <math>f_f &lt; p_h</math></p>
ADD NICHE		<p><math>ns_w</math> niche width</p> <p><math>n_d</math> niche depth</p> <p><math>ns_{in}</math> inter-niche space</p> <p><math>nb_w</math> width of niche bay</p> <p><math>n_d</math> niche depth</p> <p><math>nb_{in}</math> inter-niche space</p>	<p><math>nsc_i = ns_w + ns_{in}</math></p> <p><math>ns_{in} = nsc_i - ns_w</math></p> <p><math>ns_{in} = 2 \times nsc_i - ns_w</math></p> <p><math>nbc_i = nb_w + nb_{in}</math></p> <p><math>nb_{in} = 2 \times nbc_i - nb_w</math></p>
ENTRANCE OPENINGS	me main hall entrance	<p><math>me_w</math> main hall entrance maximum possible width <math>me_w = m_w - 2 \times p_w</math></p> <p><math>om_w</math> middle opening width</p> <p><math>os_w</math> side opening width</p> <p><math>ws_w</math> wall segment width</p> <p><math>d_w</math> door post width</p> <p><math>a_w</math> anta width</p>	<p><math>om_w &lt; me_w</math></p> <p><math>om_w + 2 \times os_w + 2 \times ws_w &lt; me_w</math></p> <p><math>om_w = 3 \times c_i</math></p>

			$c_d$ column diameter $cb_d$ column base diameter $c_d$ half-column depth $pl_w$ pilaster width	$om_w = 5 \times c_i$ and $om_w \leq me_w$	
<b>SIDE ROOMS INTERIOR DESIGN</b>					
ADD FUNCTION TO SIDE ROOMS	s	side room	$a_{arc}$	arc of the koilon	
	a	auditorium	$ar_h$ auditorium seat row height $ar_d$ auditorium seat row depth $ar_n$ auditorium number of seat row $as_n$ auditorium stairs number of steps $as_w$ auditorium stairs width of step $as_d$ auditorium stairs depth of step		
	b	banquet hall	$bb_n$ number of banquet beds $bb_w$ width of banquet beds $bb_d$ depth of banquet beds		
	o	office/ stacks	$oa_w$ office armaria width $oa_d$ office armaria depth $oa_n$ office number of armaria $ot_w$ office table width $ot_l$ office table depth		
LAYOUT DEFINITION	tt	threshold condition	$m_d$	main hall depth	
	m	main hall	$m_w$ main hall width $s_w$ support room width $s_d$ support room		$s_w < m_w$ $s_d \leq m_d$

				depth	
			$a$	area of the main hall	$m_w \times m_d$
			$w$	wall thickness	
			$tt^{\wedge}$	depth of threshold	
GENERATE WALL OUTLINE					
	$tt$	length of threshold			
ADD STOAS	$tt$	length of stoa	$tt_l$	tt width of stoa	
			$tt_i$	space between two corner columns	$tt_i = tt_l - 2 \times st_d - c_d$
	$tt^{\wedge}$	stoa in front of the main hall	$st_d$	depth of stoa = depth of threshold	
			$st_i$	intercolumniation $st_i = tt_i / c_n$	
			$c_o$	column order (doric, ionic or corinthian)	
			$cb_d$	column base diameter	
			$c_d$	lower column diameter	
			$c_n$	number of columns	
			$cr_n$	number of steps in the crepis, i.e. in front of the stylobate	
			$cr_d$	depth of step of crepis	
	$te$	stoa along the axis of the main hall	$te_l$	length of stoa	$te_l = n \times st_i + 2 \times st_d - c_d$
	$ee$	stoa in the entrance of the library complex			
			$dst_d$	double colonnade depth	$dst_d = 2 \times st_d$
			$dc_o$	double colonnade order (doric, ionic or corinthian)	<i>all steps follow the new coordinates of the colonnade</i>
			$th_w$	thorakion width	

ADD EXEDRAS	ex	number of exedra	$pj_d$	stoa projection depth	all steps follow the angulation of the projection $prc_d \geq c_d$  <i>Rules apply in parallel to both the stoas</i> <i>Rules apply parametrically. The distance between two exedras can be <math>n</math> interaxials (<math>st_i</math>).</i>
			$pjc_d$	column diameter in stoa projection	
			$ex_{arc}$	semicircular exedra arc	
			$ex_d$	exedra depth	
			$ex_w$	exedra width	
			$exa_w$	exedra anta width	
			$exc_d$	exedra column diameter	
ADD ENTRANCE TO COMPLEX	ee	entrance side	$o_w$	opening width	
	om	opening			
	P	propylon			
			$ees_n$	exterior number of steps	
			$ees_d$	exterior step depth	
			$eesh_n$	exterior number of shops	
			$eesh_d$	entrance shop depth	
			$eesh_w$	entrance shop width	
			$eesh_{ow}$	entrance shop opening width	
			$eest_d$	entrance stoa depth	
			$pr_w$	exterior propylon width	
			$pr_d$	exterior propylon depth	
			$prs_n$	exterior propylon number of steps	
			$prs_d$	exterior propylon step depth	
			$prsh$	exterior propylon step height	

	<i>ec<sub>d</sub></i>	entrance column diameter	as above
	<i>ec<sub>i</sub></i>	entrance column interaxial	as above
	<i>ecb<sub>d</sub></i>	entrance column base diameter	
	<i>prw<sub>l</sub></i>	exterior propylon wings length	
	<i>ec<sub>d</sub></i>	entrance column diameter	as above
	<i>ec<sub>i</sub></i>	entrance column interaxial	as above
	<i>ecb<sub>d</sub></i>	entrance column base diameter	
	<i>ecp<sub>w</sub></i>	entrance column pedestal width	
	<i>c<sub>d</sub></i>	column diameter	
	<i>st<sub>i</sub></i>	stoa intercolumniation	

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## VITA

Myrsini Mamoli was born and raised in Mytilene, on the island of Lesbos, in Greece. Myrsini studied History and Archaeology in the Aristotle University of Thessaloniki, Greece (2000-2004). During her studies, she studied for a semester as an Erasmus exchange student at Freie Universität Berlin, Germany, in the Department of Klassische Archäologie.

Myrsini continued her studies with masters in Culture, Technology and Communication in the University of the Aegean, Greece (2004-2006), where she worked on interactive and immersive three-dimensional reconstructions of archaeological sites.

Subsequently, Myrsini was awarded a Fulbright Scholarship (2006) for Doctoral studies at the School of Architecture, at Georgia Institute of Technology, Atlanta GA. During her PhD studies, Myrsini worked as research and teaching assistant at Georgia Tech and was a visiting student at Massachusetts Institute of Technology, Cambridge MA.