# Fores et Fenestrae

## A Computational Study of Doors and Windows in Roman Domestic Space

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# Preface

This book is the result of research started almost six years ago when I decided to investigate the role of doors and windows in Roman private houses.

The original idea surfaced in my mind when I was creating a series of 3D models of a Late Antique *domus* in Aquileia (UD). The building was not very well-preserved and, therefore, I needed to search for comparisons to provide a plausible reconstruction. I started looking, confident that I would easily find some studies of the average sizes and proportions of doors and windows in the Roman buildings. I was mistaken. Very few analyses were devoted to the topic, and when present, it was mainly connected with Vesuvian examples, far too old to be used for a Late Antique reconstruction. After having worked on this topic for so long, I now can see why. The lack of preservation in the archaeological record of these structures forms a great hindrance to producing traditional-style research on the topic. Only by using a computational approach was I able to shed some new light on the issue.

This work, however, would not have been possible without the support of many individuals.

I firstly want to thank my supervisor Dr Ben Russell for all his support and discussion over the last five years, and for explaining the importance of the Oxford comma. I furthermore thank Prof. Jim Crow and Dr Lucy Grig for their helpful suggestions and comments. The suggestions and comments from my examiners Dr Xavier Rubio-Campillo and Dr Dominik Maschek have also been invaluable.

A big part of this work was based on a survey, the result of which would not have been as detailed as they have without the help of local *Soprintendenze*. The list of people who I wish to thank would be too long to name individually, but I am grateful to all who granted me access to archives and sites that are closed to the public and also to the *Custodi* that endured extreme summer and winter temperatures to accompany and show me hidden details of the houses I was surveying. Furthermore, these surveys would not have been possible without the financial support awarded by the Baldwin Brown Travelling Scholarship and the School of History, Classics and Archaeology of the University of Edinburgh. I am also very grateful to the School of History, Classics and Archaeology for granting me the School Doctoral Teaching Award to support my PhD.

I am furthermore grateful to Prof.ssa Stella Falzone for her suggestions concerning Ostia, the work of the secretaries of the BSR for allowing me access to sites in Rome, and the HCP staff for their advice and plans of the houses of Herculaneum. I have a debt of gratitude to Dr Dragana Mladenović and Dr James Miles for granting me access to the laser scanner 3D model of the Insula dell'Ara Coeli, and for their comments and advice. I would also like to thank Dr Taylor Lauritsen for his availability to discuss the results of his research on doors from Pompeii and Herculaneum and compare ideas on the topic; he was also instrumental in helping me start my PhD journey in Edinburgh.

Additionally, there is a long list of friends and colleagues who have supported me in various ways throughout this long process. Foremost in this list are Giulia Rossi, Zofia Guertin, and Katie Cullen, who made sure I would not lose my mind, mostly while enduring the last phases of this research. I am also profoundly grateful to the latter for all her efforts in polishing and correcting the text, making sure I was able to convey my ideas in clear and concise English. I also wish to thank all my friends who read and discussed various section of this work: Andrew Mclean, Bas Willems, Dr Claudia Baldassi, Elodie Powell, Dr Emilia Mataix Ferrándiz, Caity Concannon, Gianluca De Rosa, Guglielmo Strapazzon, James Page, Kathleen O'Donnell, Katie Paul, Laura Donati, Mario Antonioletti, Marta Alberti, Philip Harrison, Rory Nutter, Roseanna Doughty, Paul Jarvis and Tim Penn. I am very thankful to you all for the comments and exciting points of discussion that you offered. My appreciation also goes to my two desk neighbours during the PhD, Bobby Nolan and Audrey Scardina, who have endured me asking 'does it make sense to you?' way too many times, to Vincenzo Castaldo and Martina Astolfi for their constant support, and my brother Francesco for his help on image processing.

Last but not least, I wish to thank my parents who believed in me and my research even when I had moments of uncertainty and my father for enduring long hours of surveys in Rome and Ostia during the chilly winter months. I dedicate this thesis to them and to my Grandma Edda, who taught me how to love and lose myself in the magical world of books.

# Part A:
# Background and Approaches

This first section introduces the topic of doors and windows in Roman private dwellings and evaluates existing research in this field. After a brief introduction, an overview of the previous works on the topic is presented, then the methodology used throughout the study is assessed.

# Introduction

Doors and windows form an essential part of culture and daily life of Ancient Rome. They are fundamental in connecting not only rooms but also houses and the outside world. They profoundly shaped the privacy, security, and light in domestic spaces. They mediated a range of interactions, and therefore studying not only their shape and proportions but also the structure of the barriers can help provide a new and greater understanding of how Roman homes were lived in and perceived by both their inhabitants and the greater public.

A greater understanding of the functioning of doors and windows can also help to redefine some shared ideas on Roman domestic spaces. For example, Lauritsen stressed that the concept of 'boundless space' linked to dwellings in Pompeii and Herculaneum should be reconsidered.[1] Furthermore, the idea of a house closed toward the outside with no windows, or very few small ones, facing the public street requires reconsideration.[2] Additionally, not counting doors and windows in the analysis of the Roman private dwellings leads to an overestimation of the amount of natural light within houses.[3] Houses were much dimmer than what is usually thought, and this entails a reinterpretation of how these spaces could have been used and inhabited.

Privacy, security, and light are the main aspects of private spaces that are directly linked with doors and windows, but others are presented throughout this work.

As previously stressed, the importance of these structures in shaping not only the architecture but life within domestic spaces was until recently overlooked within scholarship.[4] For example, only limited space is devoted to these structures both in Roman housing syntheses and Roman architecture handbooks.[5] The perishable nature of the building materials used in doors and windows can perhaps partially explain the limited attention they have received. The only part that is usually conserved is the negative imprint of these features – this is to say the hole in the wall. Frames and barriers – glazed windows or door-leaves – are rarely found. This absence limits the possibilities of interpreting the structures with total certainty. Furthermore, walls are often poorly preserved – the average height of Roman walls in the north of Italy is just 0.3m.[6] Therefore, in these conditions, if doors are only partially recorded, windows would not be preserved at all. If one adds to these considerations the fact that houses are typically studied using the analysis of their plans, it is easy to understand how the role of doors and windows has been overlooked until recently. A vast range of data is still available in order to achieve a better understanding of doors and windows and their role in the Roman house. These data, however, are very scattered and heterogeneous, and therefore, an innovative approach is needed to synthesise the available material for examination. The methodology used in the present study brings together large-scale quantification and 3D reconstructions analysis.

The importance of using statistical analysis to investigate complex archaeological assemblages has been recognised since the 1940s and has become more widespread from the 1960s with the advent of New Archaeology. This approach is a standard feature in the archaeology of prehistory and protohistory, and mainly for the study of material culture, though it is still partially neglected in the study of Roman architecture.[7] Nevertheless, the discipline is not new to the use of computational approaches. Large scale use of numbers has been used mostly to assess labour times and costs.[8] The first step of the statistical analysis involved determining the key research questions that this project aimed to address. The first inquiry concerned the level of standardisation in sizes and proportions of doors and windows. Can one identify a standard for how these structures where built, or vice versa, are they attested in an array of sizes and proportions? Secondly, the geographical and chronological influence

[1] Lauritsen 2014: 1. In his doctoral thesis, Lauritsen highlighted how, by properly considering traces of barriers in doorways and passageways in the Vesuvian houses, it is possible to reshape the concept of spaces in the *atrium* house. He, furthermore, assesses how the presence of absence of these barriers deeply influences any spatial-analytical analysis, such as those working on depth and connectivity (2014: 225-232).

[2] This idea, originated by the outlook of the Vesuvian dwellings is recalled by multiple scholars when describing the outlook of standard Roman houses– e.g. Hales 2003: 106; Clarke 2014: 365. For the analysis on how this is not the case in the sample here analysed, see p. 74-77.

[3] The need for more advanced studies on the lighting of the Roman houses has already been stressed by Watts (1987).

[4] For an overview on studies on doors and windows and the way they were addressed in the broaden literature, see Chapter 1.

[5] See p. 6.

[6] See p. 15-16 and Ghedini and Annibaletto 2012a.

[7] For the statistics analyses techniques used, see p. 21-22 and Chapter 6 for the results.

[8] Among others, see: DeLaine 1997; DeLaine 2000; Camporeale *et al.* 2008; Camporeale *et al.* 2010; Camporeale *et al.* 2012; Maschek 2012; Bonetto *et al.* 2014; DeLaine 2015; DeLaine *et al.* 2016; Brogiolo *et al.* 2017. A quantitative approach is also used in the already mentioned work of Lauritsen (2014).

was addressed. Do doors and windows, change across time and depending on the site where the dwellings are located? Thirdly, does the level and type of dwelling they belong to influence their appearance, both concerning the general outlook and specific features (for example the threshold material)? Finally, do the proportions and sizes depend on the typology and size of the rooms the openings interconnect? In order to address these questions, a series of explanatory analyses were conducted. Thereafter these research trends were studied through a null-hypothesis significance testing (NHST) approach.

Moving back to other aspects of the methodology employed, the use of 3D reconstructions is a long-established practice in archaeology, mainly for public engagement purposes. The advancement in technologies, mostly in the development of rendering and game engines, has been widely used to convey a more immersive view of the past.[9] At the same time, the importance of 3D reconstructions for more academic proposes, from testing hypotheses to exploring new approaches to old questions, is becoming more widely recognised.[10] With the advancement of software interfaces, however, concerns were raised over the creation of 'too good' models. More studies have been devoted to the issue of how to convey the uncertainty of the reconstructions to avoid a false perception of the model given by its photorealism.[11] In the case of the present work, this problem is solved by approaching the issue from a different perspective – that is using this advancement in the rendering techniques to answer the study questions concerning lighting, view and privacy.[12]

It is beyond the scope of the present study to assess the role of doors and windows in the whole history of Roman houses. For this reason, a series of geographical and chronological limitations were applied. The focus of the work is to provide an analysis of town houses from Imperial Italy. The reason why only urban examples were collected is that privacy, security, light, and view are more important in the urban rather than rural context.[13] A villa in the countryside would still have needed adequate protection from intruders and a practical orientation of rooms to maximise the use of natural light, but it would not have been subject to the number of problems that achieving the same objectives would have created in an urban context. Concerning the geographical scope, the decision to focus on Italian sites was made with a view to testing the applicability of results derived from Pompeii and because the Italian peninsula presents a range of different topographic and climatic contexts. An interesting future project could examine whether the results from Italy are replicated elsewhere, notably in provinces where different variables are present, such as climate and building influences, or if they produce different outcomes.

Regarding the chronological scope, this project focuses on imperial phases for a series of reasons. Firstly, because the later periods, as opposed to republican ones, are more easily read in the kind of multi-layered contexts found on most Italian sites. Secondly, because during the Empire, and mainly in the second century AD, it is possible to detect an increase in the population living in urban contexts and is therefore interesting to see how doors and windows, and indeed domestic building types, developed in response.[14] Finally, since two recent studies by Proudfoot and Lauritsen have focused on the republican - early imperial phases of doors, both concentrating on the Vesuvian sites, it was decided to exclude Pompeii from this study and include only a sample of houses at Herculaneum to create a connection with their results.[15] This choice was made, not only to avoid a repetition of what has already been studied but also due to the peculiarities of Pompeii and Herculaneum. Firstly, it is wrong to consider them as standard Roman towns due to their building history and topographic location.[16] Secondly, even if buried in AD 79, both cities appear to be more Republican than Imperial in their urban form.[17]

The structure of this work takes the form of three parts. The first part (A) discusses the background of the topic and the basis of the methodology employed. After this brief introduction, an overview of the presence of door and window studies in literature are presented (Ch. 1). This chapter introduces the few specific studies on doors and windows (Ch. 1.2) and assesses how the topic has been addressed within broader scholarship: in studies on Roman houses, architecture, raw materials, archaeological reports, and symbolic and artistic analyses. In this way, it is possible to assess both the limited attention given to the topic in previous scholarship and the potential influence that this analysis can have on an array of disciplines. Chapter 2 discusses the research methodologies used for this examination.

[9] Maschek, Schneyder, and Tschannerl 2010.
[10] E.g. Strothotte *et al.* 1999; Anderson 2004; Ellis 2007; Gruber 2013.
[11] See p. 22-24.
[12] See Chapter 7.
[13] This is reflected on the role of openings on late antique legislation concerning town private buildings (see p. 38-39).
[14] On the topic see e.g. Gros and Torelli 1988: 236-242.
[15] The eight houses from Herculaneum analysed have been selected among those presenting a more defined imperial phase and that were not already studied by Lauritsen (2014).
[16] Hales describes Pompeii as: 'fairly insignificant, a prosperous market town in Campania, famous only to the people of Rome for her amphitheatre riot and, of course, the eruption of Vesuvius' that 'was not a Roman town till post 80 BC' (Hales 2003: 97).
[17] For example, from the private dwelling point of view, the high diffusion of the *atrium* is still traceable, a feature almost wholly absent in all the other proper imperial houses.

The second part of this work (B) examines the results of the analysis of the 'complementary sources'. These 'complementary sources' consist of all information concerning doors and windows that are generally not preserved in the archaeological records or that pertains to the perception of these structures in the eyes of the Roman. This information is vital to interpret the results of the statistical analyses better and to realise and interpret the renderings of Chapter 7. Part B is divided into three chapters on written (Ch. 3), visual (Ch. 4), and archaeological sources (Ch. 5). Chapter 3 brings together information from Latin authors and epigraphs. This chapter aims to analyse the perception of doors and windows in the eyes of the Romans and to collect information concerning their sizes, structures, and uses. Moving on to the analysis of the visual sources, Chapter 4 begins with an analysis of the representations of doors (Ch. 4.1), followed by a similar examination for window depictions (Ch. 4.2). Chapter 5 aims to analyse details of doors and windows that are not generally preserved in the archaeological record – from lintels, leaves and shutters, curtains, etc.

Part C is devoted to mining and synthesising the data collected on the field and those described in Part B. Chapter 6 lays out general patterns pertaining to both doors and windows (Ch.6.1), and then looks at the characteristics of doors (Ch.6.2), windows (Ch.6.3), thresholds and sills (Ch.6.4). This chapter aims to assess trends and to track similarities in order to establish the characteristics of standard Roman doors and windows, thus gaining a greater understanding of the role of these structures within Roman imperial houses and how they would have influenced life within these dwellings. Lastly, Chapter 7 examines some of these influences in further detail. The results of a series of renders are reviewed to assess the importance of doors and windows in determining views through, and the dispersal of natural light within, the Roman house.

Additionally, a series of Appendixes complete the work. Appendix 1 presents a detailed analysis of the case studies forming the dataset used for the statistical analysis. This section gives an overview of sites and contexts examined and analysis of the occupancy of these residences. In this way, it is possible to better understand the role of doors and windows in shaping the communal spaces – such as windows opening between adjoining housing units. The appendix ends with a short glossary of the terminology used in the Doorway and Windows Database (DaWD). Appendix 2 collects all the Renders produced from the 3D models and used to assess the level of light in Chapter 7. In Appendix 3, the full-texts of all written sources analysed are assembled.

Finally, the full dataset and the R code used to analyse it are available in GitHub.[18]

[18] https://github.com/Lucia-Michielin/DoorsAndWindows